

SecureSync Option Card information

Note: This document contains both “Public Information” and “Internal Use Only Information” (do not release this document in its entirety)

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Spectracom Product roadmaps

Refer to Emmanuel's Product Roadmaps at: <I:\Customer Service\EQUIPMENT\SPECTRACOM\EQUIPMENT\Spectracom Product roadmap>

Associated with many or all Option Card variants

SecureSync 2400 supported Option Cards (as of Dec 2020)

SECURESYNC 2400 SUPPORTED OPTION CARDS

Supported in Bedrock

Supported on 2400 Initial Release, and 1200:

- **1204-02** ASCII Time Code In/Out [RS-232]
- **1204-05** IRIG In / (2) IRIG Out
- **1204-08** (3) 5 MHz Out
- **1204-10** (4) HaveQuick Out
- **1204-11** STANAG Out
- **1204-15** (4) IRIG Out
- **1204-17** (4) Programmable Square Wave Output [TTL]
- **1204-18** (4) 1PPS Out [TTL]
- **1204-1C** (1-3) 10 MHz Out
- **1204-1D** STANAG In
- **1204-22** (4) IRIG Out [RS-485]
- **1204-24** Isolated STANAG In
- **1204-25** Isolated STANAG Out
- **1204-26** (3) 1 MHz Out
- **1204-27** IRIG In [Fiber] / (2) IRIG Out [Fiber]
- **1204-28** 1PPS In / (3) 1PPS Out

New to 2400 with Bedrock, **not** supported on 1200:

- **1204-49** Dual SFP 1Gb NTP (4-in-1)
- **1204-4A** Quad SFP 1Gb NTP (4-in-1)
- **1204-50** SAASM, single slot form factor

Black - Supported on 2400 Initial Release & 1200
Blue - New on 2400, supported on 1200
Orange - New on 2400, **not** supported on 1200

New to 2400 with Bedrock, supported on 1200:

- **1204-01** 1PPS In/Out [TTL], Freq In [Sine]
- **1204-03** 1PPS In/Out, Freq In [RS-485]
- **1204-04** ASCII Time Code In/Out [RS-485]
- **1204-09** 2.048 MHz Out [TTL] / (2) E1 Out [75ohm]
- **1204-0A** 1.544/2.048MHz [485] / (2) T1/E1 Out [100/120ohm]
- **1204-0F** (3) Relay Out
- **1204-13** (4) Programmable Clock Out (Sine)
- **1204-14** Simulcast CTCSS / Data Clock / Data Sync Out
- **1204-19** (4) 1PPS Out [10V]
- **1204-1B** (4) HaveQuick Out [RS-485]
- **1204-1E** (4) IRIG Out [Fiber]
- **1204-1F** NENA Card (Dual Slot with Slot 1 connector)
- **1204-21** (4) 1PPS Out [RS-485]
- **1204-23** Event Capture w/ Broadcast [RS-232]
- **1204-29** HaveQuick In / (3) HaveQuick Out
- **1204-2A** 1PPS In [Fiber] / (2) 1PPS Out [Fiber]
- **1204-2B** (4) 1PPS Out [Fiber]
- **1204-2E** Failover
- **1204-2F** (4) Programmable Clock Out (TTL)
- **1204-30** (4) Programmable Clock Out (RS485)
- **1204-32** Korusys Gb PTP Master
- **1204-3E** STL Phase 2, (1) RJ45, (1) SMA
- **1204-4C** (4) T1/E1 Out [100/120ohm]
- **1204-53** (4) T1/E1 Out [75ohm]

Not Supported in Bedrock

Supported on 1200, Supported on 2400 in future releases:

- **1204-34** (3) Frequency Monitoring Input
- **1204-36** USNO Frequency Special
- **1204-37** (3) 1PPS Output [RS-423]
- **1204-38** (1-3) 10 MHz Out
- **1204-39** (4) IRIG Out
- **1204-3C** (2) FAA Timestamping
- **1204-45** 10 MHz Pass Through
- **1204-46** (4) 5 MHz Out

New to 2400, supported in future releases:

- **1204-43** GNSS Reference
- **1204-44** (2) GNSS Reference
- **1204-49** Dual SFP 1Gb NTP/**PTP** (4-in-1)
- **1204-4A** Quad SFP 1Gb NTP/**PTP** (4-in-1)
- **1204-4E** (1) Out of Band 1Gb Configuration (4-in-1)
- **1204-40** (4) LPN 100 MHz Out
- **1204-41** (11) 10 MHz Out
- **1204-42** (1) In / (10) Out 10 MHz Distribution

No Plan to Support with 2400:

- **1204-06** (3) Gb Ethernet
- **1204-07** Force 22E SAASM
- **1204-0B** RS-485 Comm Protocol
- **1204-0C** ID Only - (3) 10 MHz Out plate
- **1204-12** PTP
- **1204-1A** GB-GRAM SAASM
- **1204-3B** Slave Gb PTP Card
- **1204-3D** STL Phase 1



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OPTION CARDS NOTES – FOR 2400

▪ Network

- Check whether customer needs more than 2 x GbE ports with VLAN support
- If the case, quote 1204-4A or 49 (based on requirements)
- Do NOT quote 1204-06 for 2400, it's for 1200 only

▪ SAASM

- Will need to add the 1204-50 SAASM option card to the quote as well as indicating the base unit for SAASM (240w-xy7)

Engineering/Design info for Option Cards

Refer to S:\Projects\Lafayette\200 Engineering Documents\Option_Cards

Option bus (consists of FPGA Wishbone bus, SPI bus, Core Signals and Power)

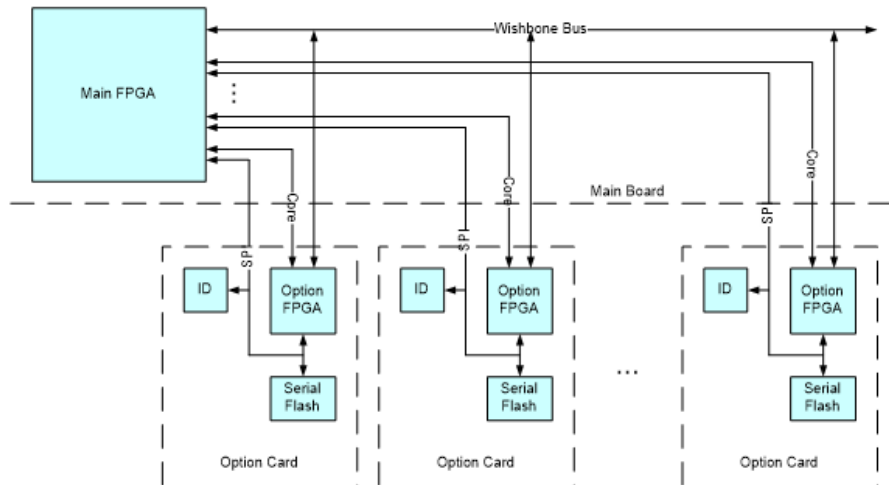


Figure 1 - Option Bus Block Diagram

➤ Refer to “LAF-200-B OptionBusInterface” documents in: S:\Projects\Lafayette\200 Engineering Documents\Option_Cards

- **Wishbone bus**

- Reduced pin-count Wishbone interface with multiplexed Address and Data pins. (Identical VHDL components can be used in Main FPGA and Option FPGAs)

- **SPI bus**

- May be used for Board ID
- May be connected to support out of band programming of option card flash
- May be used to control SPI peripherals if no FPGA is present
- Three chip selects (Could be multiplexed to support seven devices)

- **Core signals**

- Two PPS inputs from each option card
- One PPS output to each option card
- One IRQ from each option card
- One 10MHz clock to each option card

- **Power**

- +1.2V, +3.3V, and +12V power provided

***FPGA Wishbone bus: FPGA communications for the six Option Card slots

- Option Cards communicate with the **FPGA** (on the main PCB) via the **Wishbone** bus

Option Card Wishbone bus (FPGA) communications issue (fixed in version 5.8.8. Applicable to versions 5.8.7 and below) results in "communication error" messages

Symptoms of peculiar communication error messages in logs (such as these from Salesforce Case 215921)

- A) "Failed to get license data (DT_GetPII2Alarm ->KW_DCS_GetOptions) (KAD)"
- B) "Failed to read alarm info from KTS (KAD)"
- C) "All inputs Detected" / "Power or Configuration Fault"

Slot Number associated (slots 4, 5 and 6 affected. Slots 1, 2 and 3 are fine)

Fixed in version 5.8.8 (March 2020)

- Refer to Upgrade Version 5.8.8 (in Arena) https://app.bom.com/changes/detail-attach?change_id=2400115001

Per the version 5.8.8 Release Notes

Updated the FPGA versions of the following option cards to increase communication reliability: 1204-01, 1204-02, 1204-03, 1204-04, 1204-05, 1204-15, 1204-1F, and 1204-23.

***SPI bus (associated with Option Cards such as 1204-01, 1204-02, 1204-03, 1204-04, 1204-05, 1204-15, 1204-1F, 1204-23, 1204-24, 1204-32)

Programming issues associated with the SPI bus (FPGA version reported as v0000)

| | | |
|-----------|--------------------------------|----------------------------------|
| HW Slot 1 | 1204-04 ASCII Timecode, RS-485 | SW V0002 / FPGA V0122 |
| HW Slot 2 | 1204-24 STANAG In, Isolated | SW V0001 / FPGA V0000 |
| HW Slot 3 | 1204-0F Relay Output | SW V0004 / FPGA V0000 |
| HW Slot 4 | 1204-24 STANAG In, Isolated | SW V0001 / FPGA V0000 |
| HW Slot 5 | 1204-17 Sq Wv Out, BNC | SW V0001 / FPGA V0103 |
| HW Slot 6 | 1204-32 Gb PTP | SW V0001 / FPGA V0131 / FW V0031 |

Refer to more recent Salesforce Case 288850, and earlier cases such as 118732

Refer to JIRA ticket **SSS-106** for 1200s (excerpted below) and **DMND-1835** for 2400s

Note: I don't see that there was an actual fix to SSS-106

The 1204-25 STANAG Option Card fails to program correctly. Others have reported 1204-1D option card also. I found one in engineering NOT programmed too after an update to 5.4.A. I suspect an electrical/programming board issue because it worked for me after a power cycle and appears to occur in one form or another as far back as Release 4.8.7. However, the 1204-1D updated for me when I reapplied the Factory Update. In this case the 1204-1D was in slot 6. Could it be a reading card issue when is slot 6?

The 1204-25 was found to behave as below.
It can fail in 2 ways:

1. On Update or Factory Update the FPGA programming can time out leaving current version
2. On Update or Factory Update the FPGA programming can fail leaving card NOT programmed with FPGA version 0000

Problem Description:

Type 1:

This is assumed to affect all versions when it times out and leaves a programmed card. It has been observed on 5.4.1, 5.3.1 and 4.8.8 and 4.8.7.

This problem does NOT degrade performance because the 1204-25 FPGA version 1.03 has been NOT changed since 14-Nov 2012 Release 4.8.8. The user experiences a FPGA timeout maximum delay (~2 min) which SLOWS the upgrade process and the Update Log has in it the following entry:

Jan 11 20:53:20 Spectracom spectracom: [spupdate] Upgrading Option Card 25 Default in Slot 1 (SWUE)
Jan 11 20:54:53 Spectracom spectracom: [spupdate] Option Card Default update timed out (SWUE)

IF you are downgrading to version 4.8.7 the web page will show an error because the FPGA version remains 1.03 and does not downgrade to 1.01.

Type 2:

This affects ALL versions and has been observed on 5.4.2, 5.4.1, and 5.3.1 for Type 2 Failures.

This problem does DEGRADE performance because the 1204-25 FPGA is NOT programmed and returns version 0000. The update page shows an error because the version fails to match.

These errors can only be recovered from allowing the FPGA to reprogram at least when I tried it by removing power.

1. Shutdown
2. Remove power
3. Wait
4. Reboot
5. Reapply update and check 1204-25 FPGA version

If an invalid version is reported (such as FPGA V0000 as shown below), there may be an issue with the card's SPI bus, a problem with the slot on the main PCB, or the card is dead. Try moving card to a different slot to test for bad card or bad slot.

| | | |
|-----------|--------------------------------|----------------------------------|
| HW Slot 1 | 1204-04 ASCII Timecode, RS-485 | SW V0002 / FPGA V0122 |
| HW Slot 2 | 1204-24 STANAG In, Isolated | SW V0001 / FPGA V0000 |
| HW Slot 3 | 1204-0F Relay Output | SW V0004 / FPGA V0000 |
| HW Slot 4 | 1204-24 STANAG In, Isolated | SW V0001 / FPGA V0000 |
| HW Slot 5 | 1204-17 Sq Wv Out, BNC | SW V0001 / FPGA V0103 |
| HW Slot 6 | 1204-32 Gb PTP | SW V0001 / FPGA V0131 / FW V0031 |

Slots/Slot numbering (1200s and 2400s)

A) 2400 SecureSyncs

Units must be equipped with an Extension Board to fill option card slots 3, 4, 5, and 6.

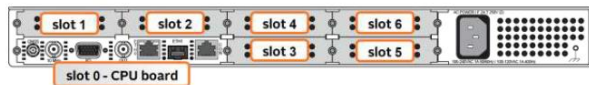


Figure 1: Unit rear view

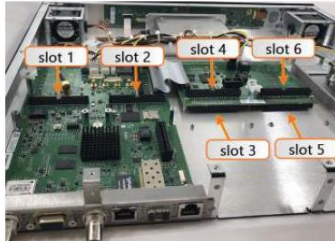


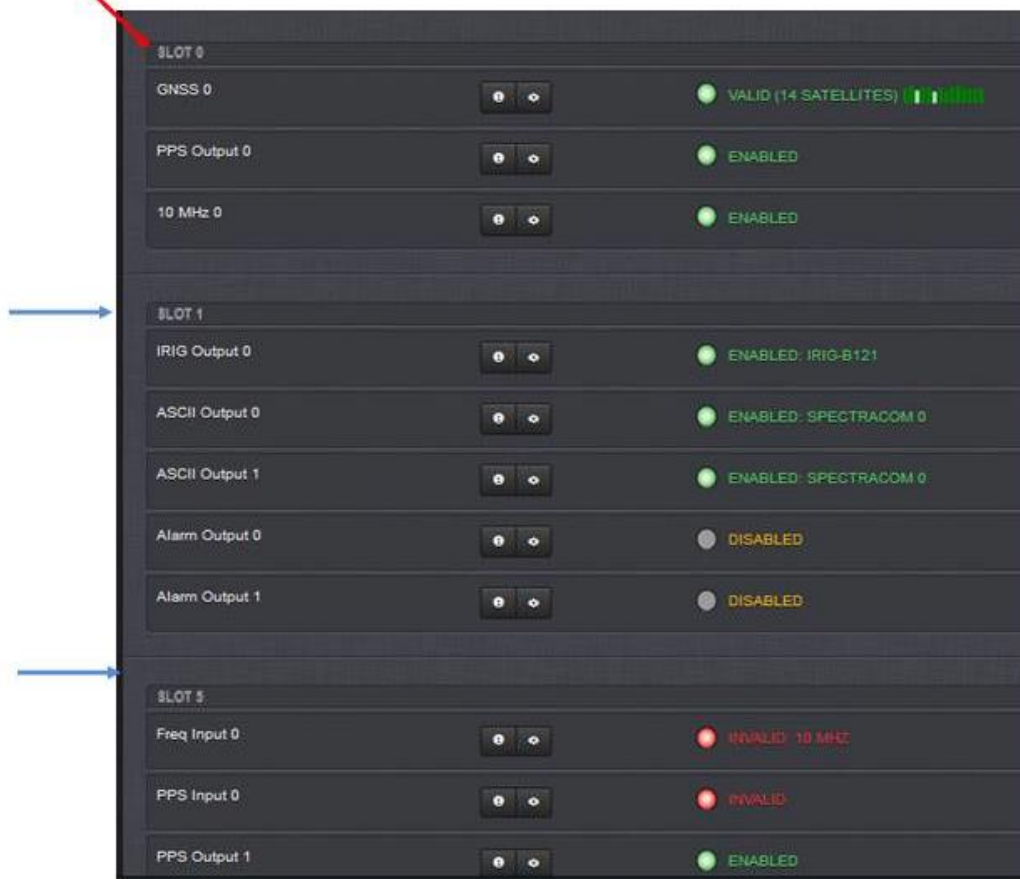
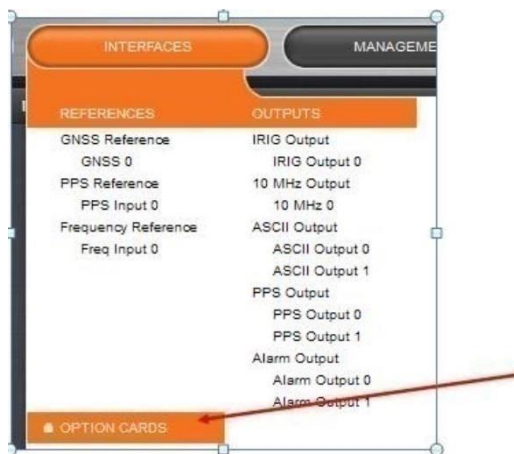
Figure 2: Unit internal view (from rear)

B) 1200 SecureSyncs



(1200s) Viewing slot numbers in the new web browser (version 5.1.2 and higher)

- Q. In the new web interface, there's no way to correlate option cards to hardware slot numbers. Where I have been used to configuring "PTP option card in slot 3" for example, I now need to select between PTP0 PTP1 PTP2 etc
There's no clear way to know which PTP card "instance number" is in which slot... I don't know in what order the system will label the cards!
- A. (Per Dave Sohn, 11 Mar 2014) An Option Card view of the rear panel is available by clicking on the INTERFACES -> OPTION CARDS menu



This will list all features on the unit organized by option card slot. Also, any of the INTERFACES sub menu item selections will display an image of the back panel with the installed option cards and tool tips displaying the feature and instance.



Installing or relocating Option Cards/Moving Cards from a 1200 to a 2400

Option Card Install Guides/Option Card install Ancillary kit (Anc kit)

A) 2400 series SecureSyncs

- Shortcut to **Option Card install guide (2400-5000-0052)** in Arena: https://app.bom.com/items/detail-spec?item_id=1271819535&version_id=11422521608&orb_msg_single_search_p=1
- Shortcut to 2400 SecureSync user manual (**2400-**) in Arena:

B) 1200 series SecureSyncs

- Shortcut to **Option Card install guide (1200-5000-0052)** in Arena: https://app.bom.com/items/detail-spec?item_id=1202845056&version_id=10212762598&orb_msg_single_search_p=1&redirect_segno=6041538275
- Shortcut to 1200 series **SecureSync user manual (1200-5000-0050)** in Arena: https://app.bom.com/items/detail-attach?item_id=1203165562&version_id=10381283008

Note: For **pictures** of the various Option Card Modules, refer to “Process Details”: [I:\New Released\Process Details\1204-xxxx-0600 \(SecureSync\) Process Details](I:\New Released\Process Details\1204-xxxx-0600 (SecureSync) Process Details)

1200-1000-0709s (Empty Option Bay slot covers)

- For purchase of replacement slot covers: Refer to our Online Store (<https://store.oralia.com/>)

1204-0000-0700 (Option Card install Ancillary kit for both 1200s and 2400s)

- P/N for the 1200/2400 SecureSync Option Card install Anc kit: **1204-0000-0700** (In Arena: https://app.bom.com/items/detail-spec?item_id=1202845078&version_id=10642393148&)

The following additional items are included with the ancillary kit for the option card(s) and may be required for installation depending upon your card type, and installation location:

| Item | Quantity included | Part Number | In Arena at / MFG's website |
|---|-------------------|-----------------|--|
| 50-pin ribbon cable | 1 | CA20R-R200-0R21 | |
| Washer, flat, alum., #4, .125 thick | 2 | H032-0440-0002 | |
| Screw, M3-5, 18-8SS, 4mm, thread lock | 5 | HM11R-03R5-0004 | |
| Standoff, M3 x 18mm, hex, M-F, Zinc-pl. brass | 2 | HM50R-03R5-0018 | https://app.bom.com/items/detail-spec?item_id=1202836836&version_id=10278369038&orb_msg_single_search_p=1 MCMaster-CARR P/N 98952A049 https://www.mcmaster.com/catalog/126/3475 |
| Standoff, M3 x 12mm, hex, M-F, Zinc-pl. brass | 1 | HM50R-03R5-0012 | |
| Cable tie | 2 | MP00000 | |

| Item | Quant. | Part Number |
|--|--------|-----------------|
| 50-pin ribbon cable | 1 | CA20R-R200-0R21 |
| Washer, flat, alum., #4, .125 thick | 2 | H032-0440-0002 |
| Screw, M3-5, 18-8SS, 4 mm, thread lock | 5 | HM11R-03R5-0004 |
| Standoff, M3 x 18 mm, hex, M-F, Zinc-pl. brass | 2 | HM50R-03R5-0018 |
| Standoff, M3 x 12 mm, hex, M-F, Zinc-pl. brass | 1 | HM50R-03R5-0012 |
| Cable tie | 2 | MP00000 |

Metal bracket screws and stand-offs used on the Option Cards

Email from Scott Holmes (4/2/12)

The material we specify is 0.81mm (20 ga) thick aluminum alloy 5052-H32. Before screening, we plate it with RoHS compliant clear plating. The plating is electrically conductive.

Email from Dave Lorah (5/10/12)

The mounting bracket screws are a M4, Flathead Phillips, 10MM black machine screw, stainless steel. I think these are all fine thread.

The option card standoffs are a Hex spacer, M3x18mm, zinc plated brass. These are pretty soft metal. I have broken some myself.

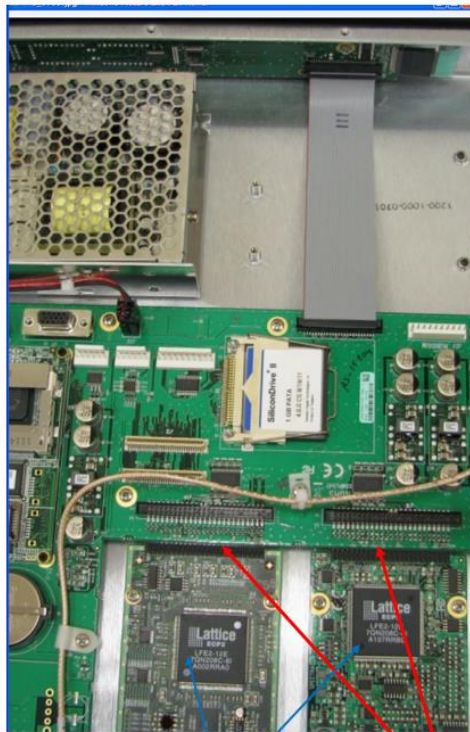
Standoff lengths

Q. (Email from Sylvain)...we have noticed an important bending of the 1204-06 card when it is mounted with another board below. It seems the pillar is too high. The pillar can be OK when there is no board below but not for a "sandwich mode" ...

Here are the pictures of the 1204-06 mounting. The 892,3,4 show mounting with card in bottom slot and 895,6 show mounting with no card underneath (no additional spacer in place of PCB). I used a thin nylon spacer (0.5mm) + the supplied 19mm pillar to give the correct height. I think that the supplied pillars are 1mm too long.



Reply from Scott Holmes (10/26/12) There are two standoffs we use for the option cards. One is longer and allows a card to be installed in an upper slot with no card below. The other is shorter and used when there are cards in both upper and lower slots. It looks like the longer standoff was used. Did they move the cards around and mix up the standoffs or was the mistake made on our production floor?



Option Cards on bottom plug straight into rear connector.

Option Cards on top are connected to the main board via a [50 pin](#) ribbon cable (CA20R-R200-0R21)

- Refer to the SecureSync Option Card Installation Guide (1200-5000-0052) I:\New Released\Manuals\1200-xxxx-xxxx.

50 pin Ribbon cable (CA20R-R200-0R21) requirements for Option Card installation

A) Model 2400 SecureSyncs (required for Top Slots, Slots 1 and 2, 4 and 6)

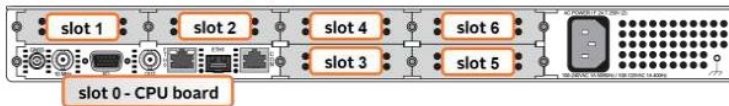


Figure 1: Unit rear view

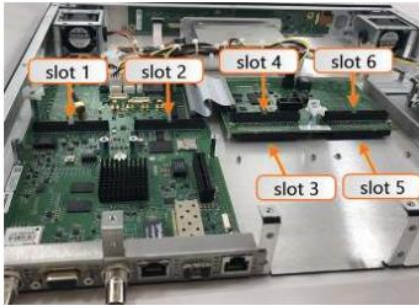


Figure 2: Unit internal view (from rear)

- Option cards installed in **Slot 1 or Slot 2** sit on top of and are screwed into pre-installed standoffs and plug in to the unit through the included ribbon cable.

(2406 only) Ribbon cable not required for bottom Slots, Slots 3 and 5)

B) Model 1200 SecureSyncs



- Ribbon cable required for top slots (Slots 2, 4 and 6)
- Ribbon Cable not required for bottom slots (Slots 1, 3 and 5)

Ribbon cable requirements when moving an Option Card from the bottom row of a 1200 to the top row of a 2402/2406

- When removing an Option Card from the bottom row of an existing 1200 SecureSync, there won't be a ribbon cable available to use in the Model 2400 SecureSync.
- Unlike with a Model 2406 SecureSync, for a **Model 2402** SecureSync (which can only have a total two Option Cards installed) this is an issue, because Slots 1 and 2 are on the top row and **require the ribbon cable**.
- With a Model 2406, a ribbon cable is only needed if the Option Card(s) is being installed in top Slots (Slots 1, 2, 4 or 6). They can be installed in bottom Slots 3 and 5 without the need for a ribbon cable.

CLI commands associated with Option Cards

CLI command to list all installed Option Cards

options

```
spadmin@Spectracom /home/spectracom $ options
1:IRIG 2324:None
2:Gb Eth 5:PPS TTL
3:485 RLY6:GB PTP
spadmin@Spectracom /home/spectracom $
```

List all cards and which slot they are in

ofdf.conf

```
cert      config      default  mibs      updatecli
cert.csr  customize  log      update    xfer
spadmin@Spectracom ~ $ cd config
spadmin@Spectracom ~/config $ cat ofdf.conf
0,0,0,41,0,0,0
0,0,0,50,0,0,0
0,0,0,53,0,0,0
0,0,0,49,0,0,0
0,0,0,45,0,0,0
0,0,0,45,0,1,1
0,0,0,67,0,0,-1
1,31,1,47,0,0,0
1,31,1,51,0,0,0
1,31,1,51,0,1,1
1,31,1,57,0,0,0
1,31,1,57,0,1,1
2,6,2,0,0,0,0
4,1,1,58,0,0,0
4,1,1,46,0,0,0
4,1,1,53,0,0,1
5,2,1,51,0,0,2
5,2,1,44,0,0,0
6,18,1,59,0,0,0
spadmin@Spectracom ~/config $
```

First number (1-6) in each row is the slot number. If a slot is empty, its slot number is not listed.

Second value is the Option Card Model Number (reported in decimal). Convert this decimal value to hex to determine the actual Model Number. For example, an "18" (decimal) in the list equates to "12" in hex. An "18" reported in a slot means a Model 1204-12 card is installed in that slot. (See note and dec/hex converter below the screenshot)

Other examples

"21" = 1204-15

"50" = 1204-32

"31" = 1204-1F

Note: Option Cards are called by their hex number, but handled in the system by the corresponding decimal value

Example: The 1204-32 card in the system is actually "50" (refer to sites such as: <http://www.binaryhexconverter.com/hex-to-decimal-converter>)

Hexadecimal to Decimal Converter

To use this online **hex to decimal converter** tool, type a hex value like 1E into the left then hit the Convert button. You can convert up to 16 hex characters (max. value of decimal).

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| | |
|--|---|
| Hex Value (max. 7fffffffffff) | Decimal Value |
| <input type="text" value="32"/> | <input type="text" value="50"/> |
| <input type="button" value="Convert"/> | swap conversion: Decimal to Hex |

ktsif.conf file

```
spfactory@Spectracom ~ $ cd config
spfactory@Spectracom ~/config $ cat ktsif.conf
0,0,0,35,0,0,-1,CS_SetTimeScale 0 2
0,0,0,50,0,0,0,DP_SetTimeScale 0 0 2
1,31,1,47,0,0,0,IP_SetTimeScale 0 0 0
1,31,1,47,0,0,0,IP_SetFormat 0 0 1
1,31,1,47,0,0,0,IP_SetCodedExp 0 0 1
1,31,1,47,0,0,0,IP_SetCtrlField 0 0 1
1,31,1,51,0,1,1,AP_SetFormat 0 1 0 65535 65535
1,31,1,51,0,1,1,AP_SetUartCfg 0 1 9600 0 0 0
0,0,0,35,0,0,-1,CS_SetTimeScaleOff 0 2 18
0,0,0,35,0,0,-1,CS_SetTimeScaleOff 0 1 37
spfactory@Spectracom ~/config $
```

- Stores the configurations for each installed Option card (except the 1204-12 card) to reconfiguring the Option Cards after each boot-up
- Unlike most Option Cards, 1204-12 configs are not stored in the “**ktsif.conf**” file, or any other conf file in the System. This one card stores its own settings internally, so there will be no “PTR:” calls in this file. When a config change is made for this card, a “PTR” call tells the card to change and store internally the new value.
 - This KTS hardware configuration file is located in the home/spectracom/config directory
 - It's like a batch file for hardware configuration at each boot-up.
 - With the exception of the 1204-12 PTP card (which is the only card to internally store its own configs- so there won't be any listed PTR calls listed in this file), this file defines which cards are installed, and in which slots they are installed in (it will vary unit to unit, if the same cards aren't installed in the same slots).
 - Defines other parameters such as Holdover timeout, System Timescale, etc.

Note: Option Cards are called by their hex number, but handled in the system by the corresponding decimal value

Example: The 1204-32 card in the system is actually “50” (refer to sites such as: <http://www.binaryhexconverter.com/hex-to-decimal-converter>)

Hexadecimal to Decimal Converter

To use this online **hex to decimal converter** tool, type a hex value like 1E into the left then hit the Convert button. You can convert up to 16 hex characters (max. value of decimal).

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| Hex Value (max. 7fffffffffff) | Decimal Value |
|---|---------------|
| 32 | 50 |
| <input type="button" value="Convert"/> | |
| swap conversion: Decimal to Hex | |

Internal note: this file is a great way to see syntaxes of various TSync calls (such as **IR_** calls for IRIG input, **IP_** calls for IRIG outputs for example), configure a particular Option Card as desired and then view the file to get the full api call (login to cli as spfactory, cd to config and then type **cat ktsif.conf**)/ Example screenshot below is from v5.6.0

```

bert cert.csr config Timing default log mibs update xfer
spfactory@spectracom ~ $ cd config
spfactory@spectracom /home/spectracom/config $ cat ktsif.conf
0,0,0,45,0,1,1,HR_SetMode 0 1 1
0,0,0,35,0,0,-1,CS_SetTimeScale 0 0
0,0,0,50,0,0,0,DP_SetLocal 0 0 1 3 5 0 1 10 5 0 1 3600 3600
0,0,0,50,0,0,0,DP_SetTimeScale 0 0 0
0,0,0,41,0,0,0,GR_SetMode 0 0 1 0
0,0,0,41,0,0,0,GR_SetConstSel 0 0 13
6,50,1,69,0,0,0,GPR_SetControl 0 0 1 1
6,50,1,69,0,0,0,GPR_SetProfile 0 0 0
6,50,1,69,0,0,0,GPR_SetDomain 0 0 32
6,50,1,69,0,0,0,GPR_SetClockMode 0 0 1
6,50,1,69,0,0,0,GPR_SetDHCPEn 0 0 1
6,50,1,69,0,0,0,GPR_SetStaticIPv4 0 0 10.2.100.170 10.2.1.1 255.255.0.0
6,50,1,69,0,0,0,GPR_SetUnctMasterCfg 0 0 13 1004 13 10000 9 10000 4000
6,50,1,69,0,0,0,GPR_SetBcastMech 0 0 1 1 1 1
6,50,1,69,0,0,0,GPR_SetEthTrans 0 0 0
6,50,1,69,0,0,0,GPR_SetClockClassCfg 0 0 0
6,50,1,69,0,0,0,GPR_SetTTL 0 0 64
6,50,1,69,0,0,0,GPR_SetPPSOffset 0 0 0
6,50,1,69,0,0,0,GPR_SetPriority 0 0 1 2
6,50,1,69,0,0,0,GPR_SetSyncEth 0 0 0 0 0
0,0,0,35,0,0,-1,CS_SetLeapSec 0 -1 0 0 334 1999
0,0,0,35,0,0,-1,CS_SetTimeScaleOff 0 2 18
0,0,0,35,0,0,-1,CS_SetTimeScaleOff 0 1 37
1,31,1,47,0,0,0,IP_SetLocal 0 0 1 3 5 0 1 10 5 0 1 3600 3600
1,31,1,47,0,0,0,IP_SetTimeScale 0 0 3
1,31,1,47,0,0,0,IP_SetFormat 0 0 1
1,31,1,47,0,0,0,IP_SetCodedExp 0 0 6
1,31,1,47,0,0,0,IP_SetCtrlField 0 0 2
spfactory@spectracom /home/spectracom/config $

```

Q The ktsif.conf file in the TU that was upgraded to 5.2.0 (with existing configuration) displays the following, but the ktisf.conf file in the manually configured file does not include the following:

```

0,0,0,37,0,0,-1,SS_SetHoldoverTO 0 432000
0,0,0,53,0,0,0,PP_SetSigCtrl 0 0 1
1,40,2,53,0,0,1,PP_SetSigCtrl 0 1 1
1,40,2,53,0,1,2,PP_SetSigCtrl 0 2 1
1,40,2,53,0,2,3,PP_SetSigCtrl 0 3 1

```

A Keith's response: these are internal hardware configurations that are dependent on which Option Cards are installed and what slots those cards are installed in. This info is updated upon each reboot and users don't have access to be able to edit this hardware configuration information.

SetHoldover to 432000 indicates Holdover was changed by a user to be 432,000 seconds

SetSigCtrl is related to Signature Control configuration for the various system/Option card outputs.

Multiple instances of the same type Option Card installed (like more than one IRIG card, for example)
If more than one of the same type Option Card is installed (such as more than one IRIG card, for example), the instance/name of that particular card (such as IRG 0, IRG 1, etc), will be based on the slot number order of the installed cards (starting with Slot 1). This is determined at start-up and provides consistently to the name of the cards. Unless the Option Cards are moved to a different slot or another same-type card is installed in a slot that is closer to Slot 1, each card will always be the same instance number.

Configuration settings of the Option Cards

The Option Card configurations are stored in the ktsif.conf file located in the home/spectracom/config directory. If a customer is having any problems with configuring Option Cards or settings not persisting through power cycles, have them FTP/SCP this file off the SecureSync and also send the System/timing logs for engineering review. Refer to Salesforce case 3918 for Open Access.

I have been working with one of our SecureSync engineers to try to determine why these IRIG output settings may not be persisting through power cycles on at least two of their SecureSyncs. To help us better analyze what may be causing this and when you get a chance, can you send me the following items from at least one of the two SecureSyncs exhibiting this reported symptom issue:

A copy/paste of the **System** and **Timing** logs (Tools/Logs page of web browser).
In the **Home/Spectracom/Config** directory, can you export (using FTP or SCP) the "ktsif.conf" file (as shown below):

```

Telnet 10.2.100.7

Linux 2.6.15-USAGI <Spectracom> <0>

Spectracom login: spadnin
Password:
Spectracom SecureSync Version 4.7.0
[spadnin@Spectracom ~]$ ls
cert.csr  config  default  log  mibs  xfer
[spadnin@Spectracom ~]$ cd config
[spadnin@Spectracom config]$ ls
drdf.conf  lccf.conf  ofdf.conf  relay.map  snmpd.conf
fpmcf.conf  lcdf.conf  ofdf.conf.bak  rmnf.conf  speclog.conf
gpscf.conf  nesf.conf  ofdf.conf.diff  rmnf.conf.bak
ktsif.conf  notcf.conf  pudcf.conf  s485addr.conf
[spadnin@Spectracom config]$

```

We will then analyze the data and get back to you with our findings!

(View ktsif.conf with Notepad/wordpad) Example file from SecureSync is below:

```

ktsif.conf - WordPad
File Edit View Insert Format Help
0,0,0,50,0,0,0,DP_SetLocal 0 0 0 0 0 0 0 0 0 0 19800
0,0,0,37,0,0,-1,SS_SetHoldoverIO 0 100000000
0,0,0,50,0,0,0,DP_SetTimeScale 0 0 3
3,5,1,47,0,0,0,IP_SetMod 0 0 0
3,5,1,42,0,0,0,IR_SetMode 0 0 1
3,5,1,42,0,0,0,IR_SetCtrlField 0 0 2
3,5,1,47,0,1,1,IP_SetMod 0 1 0
3,5,1,47,0,0,0,IP_SetCtrlField 0 0 2
3,5,1,47,0,1,1,IP_SetCtrlField 0 1 2
3,5,1,47,0,0,0,IP_SetCodedExp 0 0 5
3,5,1,47,0,1,1,IP_SetCodedExp 0 1 5
3,5,1,47,0,0,0,IP_SetFormat 0 0 1
3,5,1,47,0,1,1,IP_SetFormat 0 1 1
0,0,0,35,0,0,-1,CS_SetTimeScaleOff 0 2 15
0,0,0,35,0,0,-1,CS_SetTimeScaleOff 0 1 34

```

Various ktsif.conf entries associated with specific Option Cards

To watch ktsif.conf file update once-per-second

```

spfactory@SpectracomCS176 /home/spectracom/config $ watch -n 1 cat ktsif.conf

```

A) 1204-32 (“GPR_” calls)

- 1,50,1,69,0,0,0,GPR_SetControl 0 0 **1 1** (**0 0 1 0** = “Enable PTP” not selected or **0 0 1 1** = “Enable PTP” selected)
- 1,50,1,69,0,0,0,GPR_SetProfile 0 0 **0** (**0 0 0** = default profile or **0 0 1** = Telecom profile)
- 1,50,1,69,0,0,0,GPR_SetDomain **0 0 10** (digits after 0 0 indicate domain value, in this case its domain “10”)
- 1,50,1,69,0,0,0,GPR_SetClockMode 0 0 **2** (last digit “1” = one step master or last digit “2” two step master)
- 1,50,1,69,0,0,0,GPR_SetDHCPEn 0 0 **0** (**0 0 0** = DHCP not enabled or **0 0 1** = DHCP enabled)
- 1,50,1,69,0,0,0,GPR_SetStaticIPV4 0 0 **192.168.253.17 192.168.253.18 255.255.255.252** (IP, gateway mask)
- 1,50,1,69,0,0,0,GPR_SetUnctMasterCfg 0 0 **1 10000 1 10000 4 10000 4000**
- 1,50,1,69,0,0,0,GPR_SetBcastMech 0 0 **1 1 1 1** (**0 0 0** = or **0 0 1** =)
- 1,50,1,69,0,0,0,GPR_SetEthTrans 0 0 **0** (“Transport protocol” **0 0 0** = “IPv4” or **0 0 1** = “802.3/Ethernet”)
- 1,50,1,69,0,0,0,GPR_SetClockClassCfg 0 0 **0** (0 = “PTP Clock Class” “1” = “Arbitrary” “2” = “ITUT G2865.1”)
- 1,50,1,69,0,0,0,GPR_SetTTL 0 0 **64** (digits after 0 0 indicate TTL value, in this case its TTL is “64”)

1,50,1,69,0,0,0,GPR_SetPPSOffset 0 0 0 (last digit "0" =1PPS offset value, in this case its PPS offset is "0")

1,50,1,69,0,0,0,GPR_SetPriority 0 0 128 254 (digits after 0 0 indicate Priority 1 and Priority 2 values, in this case Priority 1 is "128" and Priority 2 is "254")

1,50,1,69,0,0,0,GPR_SetSyncEth 0 0 0 0 0 0 (0 0 0 0 0 0 indicates "Enable SyncE" and "Enable ESMC" are not selected, while

API calls associated with Option Cards

- Refer to Tim Tetreault's "cheat sheet" at: <..\EQUIPMENT\SPECTRACOM EQUIPMENT\Timing boards\TSync family\Tsync driver calls cheat sheet>
- These API calls are primarily for internal use, but the associated "get" calls are available via the CLI interface ("sets" are not available to either spadmin or user accounts)
- examples - additional calls may have since been added

SECURESYNC OPTION CARD Commands

DCS_GetCardInfo
DCS_GetFeatByIdx
DCS_GetInstance
DCS_GetOptions
DCS_GetSlot

| API calls | Area of the board (Hardware, supervisory software, etc) | Description |
|-----------|---|--|
| AP_ | ASCII Option Cards (ASCII outputs) | |
| AR_ | ASCII Option Cards (ASCII inputs) | |
| EC_ | LED Component | Drive the LED indicators. |
| FP_ | Frequency Output | Configures the output frequency. |
| GI_ | General Purpose Input Component | Configure and monitor the general purpose input pins. |
| GO_ | General Purpose Output Component | Configure and monitor the general purpose output pins. |
| GR_ | GPS Reference Component | Execute the GPS receiver's protocol and determine 1PPS and time validity. |
| HA_ | Host Agent | Obtain the capabilities of the TSync. |
| HR_ | Host Reference | Uses information from the host PC to determine 1PPS and time validity. |
| IP | IRIG Option Cards (IRIG outputs) | Generate and output IRIG streams. |
| IR | IRIG Option Cards (IRIG inputs) | Control and process decoded IRIG input streams to determine 1PPS and time validity. |
| PP_ | 1PPS Option Cards (1PPS outputs) | Control a 1Hz output. |
| PR_ | 1PPS Option Cards (1PPS inputs) | Monitor the 1PPS input reference. |
| PTR_ | 1204-3B PTP input option cards (PTP input) | Control and process decoded PTP network packets (either as an input reference or a time output). |
| XO_ | Oscillator Component | Analyze frequency measurements and make corrective adjustments to the timing system oscillator. |
| XS_ | Oscillator Monitor Service | Measure and provide the accuracy and stability of the timing system oscillator. |
| CS_ | Clock Service | Provides an abstract interface to the timing subsystem. |
| EC_ | LED Component | Drive the LED indicators. |
| FP_ | Fixed Frequency Outputs | Configures the output frequency. (such as 10/5/1 MHz) |
| FR_ | Fixed Frequency Inputs | Configures the input frequency. (such as 10/5/1 MHz) |
| GI_ | General Purpose Input Component | Configure and monitor the general purpose input pins. |

| | | |
|------------|---|---|
| GO_ | General Purpose Output Component | Configure and monitor the general purpose output pins. |
| GR_ | GPS Reference Component | Execute the GPS receiver's protocol and determine 1PPS and time validity. |
| HA_ | Host Agent | Obtain the capabilities of the TSync. |
| HR_ | Host Reference | Uses information from the host PC to determine 1PPS and time validity. |
| HW_ | Hardware | Provide access to the direct HW accessible control/status of the timing subsystem. |
| IN | Initializer Service | Perform initial configuration and setup of each software module. |
| IP_ | IRIG Option Cards (IRIG outputs) | Generate and output IRIG streams. |
| IR_ | IRIG Option Cards (IRIG inputs) | Control and process decoded IRIG input streams to determine 1PPS and time validity. |
| QP_ | Have Quick Option Cards (Haveuick Outputs) | |
| QR_ | Have Quick Option Cards (Have Quick inputs) | |
| | | |

Halt command/Halt-Shutdown

- When a Halt or Halt/Shutdown is performed, the Network Processor Software (NPS), stops running (the web browser/CLI/ front panel display, NTP etc all stop working). However, the KTS timing system continues running after a Halt command has been performed
- Because the Timing System continues to operate after a Halt, unless the SecureSync is using NTP as its input (NTP stops running on a Halt), the SecureSync can remain in sync and Option Cards can continue providing outputs.

For example, the PTP Option Cards can continue indicating they are Clock Class 6 and providing useable PTP time stamps after performing a Halt command

Email Keith sent to NASA: Your understanding of the Halt command is correct. With the exception of using NTP as the only input reference for the unit's synchronization (when using inputs such as either GPS or IRIG), the oscillator is still being disciplined and the rest of the timing functionality is still fully operational (the PTP card is still providing accurate and useable time) after the Halt has been performed.

Feature Instance Numbering

Q. If I remove a PTP option card, does that mean all the remaining cards will be renumbered? What if I add a PTP card?

A. Per Dave Sohn (11 Mar 2014) Feature instance numbering is always done consistently starting from the lowest numbered slot and moving up. See examples below:

Initial State

Slot 1: PTP 0
Slot 2: empty
Slot 3: PTP 1
Slot 4: empty
Slot 5: PTP 2
Slot 6: empty

Remove PTP from Slot 1

Slot 1: empty
Slot 2: empty
Slot 3: PTP 0
Slot 4: empty
Slot 5: PTP 1
Slot 6: empty

Add PTP to Slot 2

Slot 1: empty
Slot 2: PTP 0
Slot 3: PTP 1
Slot 4: empty
Slot 5: PTP 2
Slot 6: empty

Add PTP to Slot 4

Slot 1: empty
Slot 2: PTP 0
Slot 3: PTP 1
Slot 4: PTP 2
Slot 5: PTP 3
Slot 6: empty

API calls associated with the various Option Cards

- Refer to Tim Tetreault's "cheat sheet" at: <..\EQUIPMENT\SPECTRACOM EQUIPMENT\Timing boards\TSync family\Tsync driver calls cheat sheet>

**LVTTTL (low voltage TTL)

- Standard TTL circuits operate with a 5-volt power supply. A TTL input signal is defined as "low" when between 0 V and 0.8 V with respect to the ground terminal, and "high" when between 2.2 V and V_{CC} (5 V)
- Low-voltage TTL (LVTTTL) is 3.3-volt power supplies and memory interfacing (instead of 5v like TTL)
- As of at least Dec 2014, none of our SecureSync Option Cards is LVTTTL compatible.

**LVDS (Low-voltage differential signaling) TIA/EIA-644

Note (Per Ron Dries, March 2023 for Salesforce Case 295071) as of at least March 2023, we do not support LVDS (in the base 1200/2400 SecureSyncs or via Option Cards.

- Per https://en.wikipedia.org/wiki/Low-voltage_differential_signaling

Low-voltage differential signaling, or **LVDS**, also known as **TIA/EIA-644**, is a technical standard that specifies electrical characteristics of a [differential](#), [serial](#) signaling standard, but it is not a protocol. LVDS operates at low power and can run at very high speeds using inexpensive [twisted-pair](#) copper cables. LVDS is a physical layer specification only; many data communication standards and applications use it and add a data link layer as defined in the [OSI model](#) on top of it.

LVDS was introduced in 1994, and has become popular in products such as LCD-TVs, [automotive infotainment](#) systems, industrial cameras and machine vision, notebook and tablet [computers](#), and communications systems. The typical applications are high-speed video, graphics, video camera data transfers, and general purpose [computer buses](#).

Early on, the notebook computer and LCD display vendors commonly used the term LVDS instead of [FPD-Link](#) when referring to their protocol, and the term *LVDS* has mistakenly become synonymous with [Flat Panel Display Link](#) in the video-display engineering vocabulary.

- Per <https://www.google.com/search?client=firefox-b-1-d&q=lvds>

Low-voltage differential signaling, or **LVDS**, also known as TIA/EIA-644, is a technical standard that specifies electrical characteristics of a differential, serial signaling standard, but it is not a protocol. **LVDS** operates at low power and can run at very high speeds using inexpensive twisted-pair copper cables.

**FPGA used on several Option Cards (U1)

- **Lattice Semiconductor P/N:** LFE2-12E-6QN208I
- Used on Option Cards such as 1PPS, IRIG, RS-232, HaveQuick, Simulcast card, PTP, SAASM GPS and NENA Option cards.

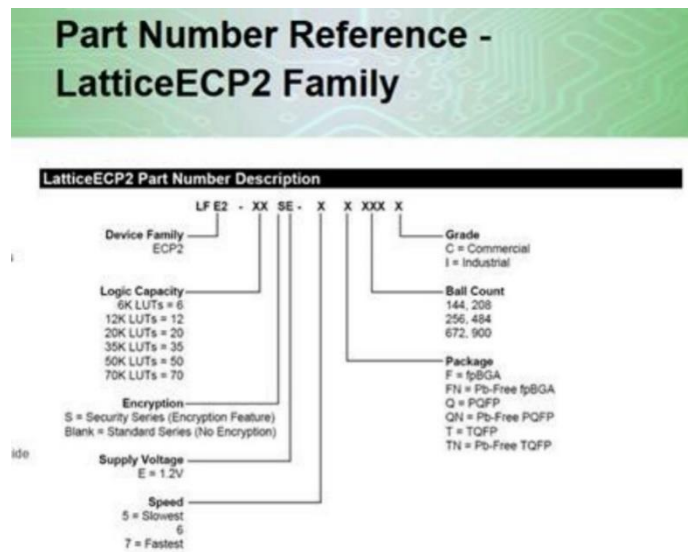
Here is a link to technical information on this component:

Datasheet: <http://www.datasheets360.com/pdf/3718008716948197434>

MFG Part Number breakdown:

<http://www.latticesemi.com/Support/PartNumberReferenceGuide/LatticeECP2.aspx>

LFE2-12E-6QN208I =



<http://www.latticestore.com/products/tabid/417/categoryid/9/productid/2637/searchid/1/searchvalue/lfe2-12e-6qn208i/default.aspx>

No Image

FPGA - Field Programmable Gate Array
12K LUTs 131 I/O DSP 1.2V -6 Spd I

Part: LFE2-12E-6QN208I
Category: FPGA - Field Programmable Gate Array
Stock: No
On Order: No
Factory Lead-Time: 0 weeks

Product Attributes

| | |
|-------------------------------------|--------------|
| Package / Case | PQFP-208 |
| Packaging | Tray |
| Product | ECP2 |
| Series | LFE2-12E-6QN |
| Mounting Style | SMD/SMT |
| Number of I/Os | 131 |
| Distributed RAM | 24 kbit |
| Embedded Block RAM - EBR | 221 kbit |
| Maximum Operating Temperature | + 100 C |
| Minimum Operating Temperature | - 40 C |
| Number of Logic Array Blocks - LABs | 1500 |
| Number of Logic Elements | 12000 |
| Operating Supply Voltage | 1.2 V |
| Standard Pack Qty | 24 |
| Total Memory | 245 kbit |
| RoHS | Y |

Issues which affect more than one particular Model Option Card

1) One of more Option Card happens to mis-identify itself (a 1204-05 reports it's actually a 1204-15 card)

- First, try rebooting the SecureSync to see if it automatically corrects itself
 - Try the affected Option Card in a different slot to see if it still occurs.
 - if it continues to occur, even while in a different slot, issue is likely with resistors installed on the card to identify it (bad solder joint, broken resistor, etc)
-

A) IRIG In/Out configurations not correct during system boot-up (IRIG AM is always initially outputted, even if output has been reconfigured for IRIG DCLS)

- Refer to more recent Salesforce Case 260040 (March 2021)
- Applicable to at least software versions 5.9.1 and below
- IRIG DCLS normally starts out as IRIG AM until system has initialized.
- Test Procedure **1200-9129-0601** (for 1204-15 cards) calls out an "IRIG Hotpatch" be installed by Manufacturing

Q "We have a SecureSync with several IRIG add-on cards (add on cards 05 and 15). We noticed that even though an output has been configured for IRIG-B DCLS, it outputs IRIG-B AM when the unit first powers up and does so for a minute. Is there a way to change these cards to output DCLS after power-up? We intend to have this output drive a TTL gate which can only take -0.5 volts and I observed -2.5 volts when the unit was first powered."

A. **per Dave Sohn to Morgan (9 Oct 15)** "That is correct. The outputs are defaulted until the processor comes up to set the persisted configuration."

Associated hot patch sent to TOYO for IRIG DCLS immediately on start-up

- Refer to (TOYO- JAXA) patches in: <I:\Customer Service\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Specials\software patches>
- **Special 1200 SecureSync P/N created for JAXA to have the IRIG hotpatch installed at the factory: 1200-9129-0601** (this is a 1200-003 with just one 1204-15 IRIG card)
- TOYO reported the patch was initially designed for 5.8.4, and now want it available for 5.9.1? (refer to Salesforce Case 260040)

Conclusion of this case: issue was an out of box failure. A patch normally applied in Manufacturing (called out on a BOM) had not been installed. This patch worked just fine on v5.9.1. No Engineering development was required to resolve.

Similar 1204-05 and 1204-15 hotpatch for SS2400 (converts to HW ID 02)

- Refer to "**2400-securesync-irig-oc-startup-patch**" in Arena at https://app.bom.com/items/detail-spec?item_id=1323795635&version_id=12475601088
- As of at least 9 March 2023, it doesn't appear that any special 2400 P/Ns have yet been created for TOYO/JAXA to purchase units having 1204-05/1204-15 cards installed, along with the Hot patch installed at the factory. TOYO had inquired with a case assigned to Eric Girard if new 2400 they received had this hot patch already installed. Below is the response I sent to Eric Girard (9 March 2023) about my findings of this:

Hi Eric Girard (and Morgan Randolph) per the discussion today about the special 1204-05/1204-15 Hot Patch for TOYO/JAXA, I have some findings for you. For JAXA purchasing 1200s, a special SecureSync 1200-003 P/N was created for JAXA, which included just one Option Card (a 1204-15 IRIG output card) AND included the installation of the Hot Patch which squelches the output at initial bootup. When TOYO purchased this special 12 digit P/N, the manufacturing team knew to install the desired Hot Patch into the SecureSync. Otherwise, the Hot patch is not installed.

An equivalent Hot Patch has been created for the 2400s. However, I do not see that Engineering has created any special 2400 SecureSync P/Ns for TOYO/JAXA to call out 1204-05/1204-15 cards being installed, along with the Hot patch. If TOYO would like to have a dedicated P/N for a 2400 SecureSync in a particular configuration (including the desired Option Cards to be installed, along with the specific Hot patch installed at the factory), they will need to work with their Sales Account Manager - I believe this is Danny Loke. Danny can then work with the Engineering team to define the 2400 configuration they want and to create a dedicated P/N they will need to order each time, to have the patch installed at the factory. Otherwise, the patch will not be installed at the factory and they will need to install it after the equipment arrives.

Software changes which affect more than one Option Card

1) Update Version 5.2.0 (Fix for 1PPS issue in FPGA)

- Implemented a fix in the FPGA to improve 1PPS signal to the Option Cards (including IRIG cards), addressing a possible 5ns 1PPS signal jump.
- Previously occurring in SecureSync units equipped with a standard Rubidium oscillator.
- (Applicable only to SecureSyncs with a Rubidium oscillator installed) fixed an intermittent, potential issue affecting output references' 1PPS).

Per Dave Sohn (17 Sept 2014) This is resolved in 5.1.5. We found an intermittent issue in the 1PPS signal that we internally send to our option cards to synchronize timing. We intend there to be a fixed pulse width of that 1PPS that was sometimes violated in Rb SecureSyncs. Intermittently, the Rb would power up in a way that its alignment would shorten the 1PPS pulse causing issues downstream in our option cards. The condition was consistent once powered up, and would not appear later if not initially present. If it was present, a power cycle, not reboot, was required to clear the condition.

Smart Reference Monitor for PPS input references/Yellow PPS Reference status indicator

- For more info, refer to “Smart Reference Quality Monitor” in the SecureSync cust doc: <..\SecureSync CustAssist.pdf>

When the “1PPS Phase Verification” checkbox (*Management* -> *Disciplining* page) is selected/enabled and a reference is declared “not valid”, its PPS indicator will turn **yellow** (not green or red) as shown below in the example of ASCII input being declared not valid (even though it wasn't the selected reference):

The screenshot displays the Spectracom SecureSync web interface. The top navigation bar includes tabs for HOME, INTERFACES, MANAGEMENT, TOOLS, and MONITORING. The left sidebar shows System Status with various indicators like Reference, Power, Status, Minor Alarm, Board Temperature, and CPU Temperature. The main content area features the Reference Status table, which lists references and their corresponding PPS indicators. The 'ASCII Input 0' row is highlighted with a red oval, indicating a yellow PPS status. Below the table, the Performance section shows the Disciplining State as LOCK, 1PPS Phase Error as -19 ns, and 10 MHz Frequency Error as 0.000081.

| REFERENCE | PRIORITY | STATUS | PPS | PHASE |
|---------------|----------|--------|-----|----------|
| ASCII Input 0 | 1 | TIME | PPS | 3.767 ms |
| GNSS 0 | 2 | TIME | PPS | -15 ns |
| NTP 1 | 3 | TIME | PPS | 0 ns |

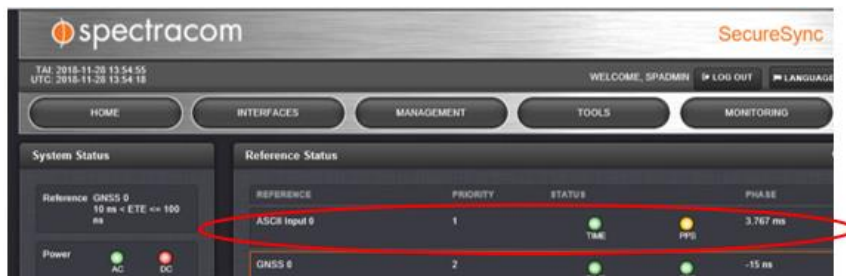
Performance

- Disciplining State: LOCK
- 1PPS Phase Error: -19 ns
- 10 MHz Frequency Error: 0.000081

****Troubleshooting Option Card input issues**

A) Is Smart Reference Phase Monitor enabled (is a Reference “PPS” indicator Yellow)?

- Refer to: [Smart Reference Monitor \(when enabled\)](#)



B) Temporarily Loop Output to Input

To help troubleshoot input reference issues on Option Cards, disconnect the desired reference from the unit and then loop a similar output back into the desired input. If SecureSync declares the input is valid, the issue is with the external reference (not with the SecureSync or the Option Card). Could be a signal level issue, impedance mis-match issue, out of sync reference, incorrectly configured reference, etc.

Email Keith sent (28 Nov 2018) Another easy test to perform is to temporarily loop the Serial cable from one of the two ASCII output ports (instead of from the eLoran) into the ASCII input port. With the ASCII output port also configure to output ZDA at 9600, 8, N, 1 and with the ASCII serial cable looped with one end connected to the ASCII in and the other end to an ASCII out, the ASCII input reference should have both the Time and PPS indicators turn green very shortly thereafter. In addition to the test I've been running with ZDA output from one unit into another v5.8.2 unit (with no issues observed), I just also ran this look-test just to confirm there are no issues with it being able to declare validity to its own output (not necessarily recommended for normal operation, but a good/simple test to verify the input port is still accepting ZDA messages and to also verify the cable.

If this loop test does allow the reference to be declared valid, we will next need to see what is going on with eLoran device.

Please let me know if the ASCII input goes valid after looping the ASCII output to the ASCII input (with the input as well as recommended both output ports- so that you don't have to worry about which port to connect with- set to ZDA, 9600., 8, N 1)

AFNOR (A European Time standard similar to IRIG B)

AFNOR is a European time standard. See link below.

http://www.meinberg.de/php/search.php?id=search&url=http://www.meinberg.de/english/glossary/afnor.htm&last_id=22714

Email from Dave Sohn (4/23/12) AFNOR is a time code very similar to IRIG B. We could probably support it with some effort, but there hasn't been a need driving it. We do not have a T1 input into our timing system yet. I don't think there is anything at this time to put forward for this requirement.

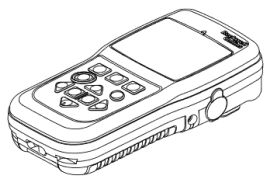
Fiber Option Cards/singlemode and multimode cable

Customer needing to use singlemode fiber with our multimode IRIG Option Cards

- Refer to Salesforce Case 224988

DAGR (DEFENSE ADVANCED GPS RECEIVER SATELLITE SIGNALS NAVIGATION SET)

AN/PSN-13A
NSN 5825-01-526-4783



- Refer to 1204-02 and HaveQuick Option Cards for more info
- Refer to: <http://wla.1-s.es/us-military-gps-manual.pdf>

“The DAGR supports RS-422, RS-232, crypto key loading, ICD-GPS-153, NMEA 0183, RTCM 104, Differential, HAVE QUICK, SINCGARS timefill, One Pulse Per Second In/Out (1PPS In/Out), and 10PPS output”

The DAGR is connected to external equipment using the applicable cable as follows:

- **SINCGARS:** PLGR/SINCGARS cable adapter connected to DAGR connector J1.
- **HAVEQUICK:** DAGR/HAVE QUICK cable connected to DAGR **connector J2**.
- **PPS:** DAGR/DAGR/PLGR cable connected to DAGR **connector J2**

(table below from: <http://wla.1-s.es/us-military-gps-manual.pdf>)

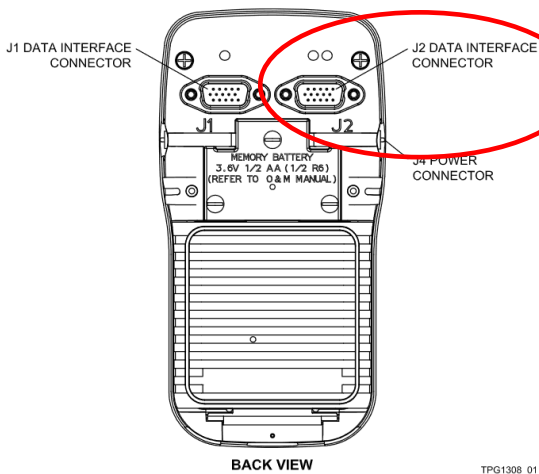


Figure 17-3. DAGR Connector Locations

TPG1308_01

| Table 20-2. J2 Pin Connections | | | |
|--------------------------------|--------|---------------------------|---------------------------------|
| PIN NO | IN/OUT | PIN NAME | PIN DESCRIPTION |
| 1 | I | 1PPS_IN_J2 (note 1) | 1 pulse per second input |
| 2 | — | 1PPS_IN_RTN | 1 pulse per second input return |
| 3 | — | GND | Signal reference |
| 4 | O | COM2_XMTB | COMPort 2 transmit B |
| 5 | O | COM2_XMTA | COMPort 2 transmit A |
| 6 | O | PPS_OUT_J2 (AN/PSN-13) | Pulse per second output |
| 6 | O | PPS_OUT_COM1 (AN/PSN-13A) | Pulse per second output |
| 7 | O | HQ_TXM | Have Quick timing output |
| 8 | I | EXT_ONF | Remote on |
| 9 | I | COM2_RCVB | COMPort 2 receive B |
| 10 | I | COM2_RCV A | COMPort 2 receive A |
| 11 | — | PPS_OUT_RTN | Pulse per second output return |
| 12 | — | NA (AN/PSN-13) | Reserved |
| 12 | O | PPS_OUT_COM2 (AN/PSN-13A) | Pulse per second output |
| 13 | — | NA | Reserved |
| 14 | O | COM1_XMT | COMPort 1 transmit |
| 15 | I | COM1_RCV | COMPort 1 receive |

Note:
1. The 1PPS inputs on the J1 and J2 connectors are connected together and cannot be used simultaneously.

Syncing SecureSync via a DAGR

- Requires either Have Quick input Option Card (such as the Model 1204-1D) or the Model 1204-02 ASCII RS-232 Input Option Card be installed.
- DAGR normally sends a once-per-second 5101 message to the SecureSync (it does not use interrogation).
- This message reports to the SecureSync the DAGR’s receiver’s current TFOM value.

DAGR's reported TFOM value requirements

The DAGR reports its TFOM value in its ASCII output. If the DAGRs TFOM (not the SecureSync's TFOM) is 3 or lower, we will sync to the ASCII input. But if the reported TFOM is greater than 3, the SecureSync will go into Holdover mode.

- If DAGR's reported TFOM is **TFOM 3 or less**, we accept the message.
- But if reported TFOM is **TFOM 4 or greater**, we deny the message and we either switch to another input reference (if present and valid) or go into Holdover alarm. Once message is **TFOM 3 or less**, we start to use the messages again - going back into sync.
 - **Note:** (7 Jan 2013) Starting in V4.8D, Paul Myers is going to allow SecureSync to accept TFOM 6 and below (it will reject messages with TFOM 7 or higher).

According to Paul Myers, if the DAGR goes to TFOM 7 or greater, the messages will stop being outputted, until TFOM drops, resulting in in Holdover/possible loss of sync.

Email Keith sent (13 May 2020) Please note that the DAGR reports/outputs its current TFOM value (an indication of receiver operation).

The SecureSync will only sync to the DAGR, if the DAGRs reported TFOM value is **TFOM 3 or less**. If its TFOM is greater than TFOM 4, the SecureSync will not sync to the DAGR

If the DAGRs TFOM happens to go to TFOM 4 or higher while the SecureSync is syncing with the DAGR, the SecureSync will declare the DAGR input not valid. If the SecureSync has any other lower priority input references present/valid, it will sync to the other refence, until the TFOM falls below 4 again. If there are no other input refences available, the SecureSync will go into Holdover mode/oscillator free-run, until the DAGRs TFOM value goes below TFOM 4 again.

A) Syncing via RS-232 input (Model 1204-02 Option Card)

INPUTS SETUP - ASCII RS-232 TIMECODE (SLOT:

| | |
|-------------|----------------------------|
| Offset | 0 |
| Time Scale | UTC |
| Local Clock | UTC |
| Format | ISO-8601 Time Transfer (S) |
| PPS Source | PPS Input |
| Read Rate | 100 |
| Read Size | 1000 bits |
| Parity | None |
| Stop Bits | 1 Stop bit |

1204-02 pinout info

Table 20-2. J2 Pin Connections

| PIN NO | IN/OUT | PIN NAME | PIN DESCRIPTION |
|--------|--------|---------------------------|---------------------------------|
| 1 | I | 1PPS_IN_J2 (note 1) | 1 pulse per second input |
| 2 | — | 1PPS_IN_RTIN | 1 pulse per second input return |
| 3 | — | GND | Signal reference |
| 4 | O | COM2_XMTB | COMPort 2 transmit B |
| 5 | O | COM2_XMTA | COMPort 2 transmit A |
| 6 | O | PPS_OUT_J2 (AN/PSN-13) | Pulse per second output |
| 6 | O | PPS_OUT_COM1 (AN/PSN-13A) | Pulse per second output |
| 7 | O | HQ_TXM | Have Quick timing output |
| 8 | I | EXT_ONF | Remote on |
| 9 | I | COM2_RCVB | COMPort 2 receive B |
| 10 | I | COM2_RCV A | COMPort 2 receive A |
| 11 | — | PPS_OUT_RTIN | Pulse per second output return |
| 12 | — | NA (AN/PSN-13) | Reserved |
| 12 | O | PPS_OUT_COM2 (AN/PSN-13A) | Pulse per second output |
| 13 | — | NA | Reserved |
| 14 | O | COM1_XMT | COMPort 1 transmit |
| 15 | I | COM1_RCV | COMPort 1 receive |

Note:

1. The 1PPS inputs on the J1 and J2 connectors are connected together and cannot be used simultaneously.

B) Syncing via Have Quick input (such as Model 1204-1D Option card)

1204-1D pin 11 HaveQuick pin attenuating HaveQuick signal completely from DAGR

- Refer to Salesforce Cases 230420 and 230514 (excerpt below)
- Don't recall ever hearing back from the customer with a "solution" or of they were ever got it to work

Subject

(SecureSync) "1204-1D pin 11 HaveQuick pin attenuating HaveQuick signal completely from DAGR" (Continued from earlier case 230420)

Description

We have a couple of symptoms.

1. We are sending HaveQuick signal (ICD-GPS-060A) from the DAGR GPS Receiver to the 1204-1D option cards. The HaveQuick signal and SGND is connected to pin 11 and pin 12 respectively. We measured the signal with an oscilloscope and discovered that by connecting the HQ to pin 11, the signal get attenuated to 314mV or so.

2. We have two (2) 1204-1D option cards, in HW Slot 4 and HW Slot 3 installed on the 1200-001 Model. The 1204-1D option card installed in HW Slot 4, attenuated the HQ signal from the GPS to about 1.2V when the signal is pinned to pin 13. When we connect the HQ and SGND to pin 13 and pin 12 respectively of the 1204-1D in HW Slot 3, the signal gets only gets attenuated to approximately 4.5V.

We also have have 1PPS signal from the DAGR to the 1PPS TTL input pin (pin 24 and pin 23).

In addition, we tested with supplying the HQ (ICD-GPS-060A) from a different time server with the 1204-11 option card installed. The signal was supplied from pin 11 of the 1204-11 option card, and was connected to pin 11 of the 1204-1D option card. There was no issue.

So we are wondering if there something that we are doing is causing this problem?

Our current connection:

HQ from DAGR --> pin 11 (TOD1 TTL input)

GND --> pin 12 (SGND)

1PPS --> pin 24 (1PPS TTL input)

1PPS GND --> pin 23 (GND)

Thank you and regards,

Ethernet Synchronization Message Channel (ESMC): SSM (Synchronization Status Message)/SyncE (Synchronous Ethernet) for synchronized Ethernet

- SSM is optionally provided by either a T1/E1 Output Option Card OR a 1204-32 GB PTP card (not 1204-12 card)

Obtaining SSM without using T1/E1 card: Use a 1204-32 GB PTP card

Per Ron Dries (5 March 2021) The 1204-32 GB PTP option card supports SyncE with an SSM code. There is more information in the online SecureSync user guide: [PTP Grandmaster 1204 32 \(spectracom.com\)](https://www.spectracom.com/PTP-Grandmaster-1204-32)

Ethernet Synchronization Message Channel (ESMC) is a logical communication channel. It transmits Synchronization Status Message (SSM) information, which is the quality level of the transmitting synchronous Ethernet equipment clock (EEC), by using ESMC protocol data units (PDUs). ESMC support is based on the ITU G.8264 specification.

Input/Output PPS Offset configurations (Cable delays/processing delays)

In general – can compensate for delays on either the input references (which moves the System PPS and all associated outputs) or in individual outputs (which only effects the particular outputs)

1. Coax delays

- The nominal cable delay for **IRIG through RG-58 cable is about 1 to 1.5ns/ foot of cable (3 to 5ns/meter)**. So, to calculate the approximate cable delay to compensate inside the SecureSync for the delay, multiply the cable distance by this value and enter the result of this equation into the “delay” field of the SecureSync.

2. Fiber delays

- Need to account for cable delays. For every 1m of fiber cable, you get about 5nsec of delay. So, for a 1km length, you get about 5usec of delay.

Note: (Per Dave Sohn) 1PPS and IRIG have the same guidelines for fiber optic.

Per Tim Tetreault 6-21-13 (For SecureSync IRIG Fiber Optic cards, such as 1204-1E)

I did all my testing using 50/125, multimode fiber cable. When I tested our option card on the 1km fiber cable, I was able to measure the drop in the signal level from a test point on our board. This showed me that we still have some head room where we could work with longer lengths. But how far will depend what is driving the signal. If the customer is using a weaker fiber optic source, 1km might be the max. If they use our option card fiber output, I am pretty sure we could do 1.5km.

One thing to keep in mind is the farther the signal goes, the larger the min pulse width will need to be to work. When I did the 1km test, the min pulse with had to be a least 20ns for it to work.

A rule of thumb to remember is for every m of fiber cable, you get about 5nsec of delay. So, for a 1km length, you get about 5usec of delay. This is something the customer needs to account for when running their cables.

Below example email from Keith is excerpted out of Case 18262

Q. I'm looking for more information regarding the use of the Offset (+/- 500 ms) feature of the IRIG module on the SecureSync Synchronization System. We desire to use this feature to compensate for propagation delays in our setup and are unsure of exactly what it does. We've attempted to measure input versus output of digital IRIG-B via o-scope and don't seem to get signal shifting that corresponds to delay adjustments made via the web interface. Information detailing the difference between delays on the Inputs versus delays on the Outputs would be helpful, as well as any insight into how to measure the delay. Also, it would be helpful to know if the delay is actually applied to the IRIG message content as opposed to the transmission time of the message. I've looked through the documentation for the SecureSync, the FAQs section of the website, and Google to attempt to find more detailed information on this feature of your product, but I can't seem to find anything useful.

To begin, IRIG input and IRIG output signals (as well as all other available outputs from the SecureSync) are not coupled together in any way. The SecureSync can have several different types of input references (such as GPS, IRIG, NTP, PTP etc) that are used to sync the "Timing System" software (referred to as the "System Time" and "System 1PPS"). The "Timing System": is the "clock" for the generation of the SecureSync's outputs., The "System Time" and "System 1PPS" are the references for the alignment and time data provided by the SecureSyncs outputs (GPS, IRIG, NTP, PTP. etc) with the System Time providing the synchronized time information and the System PPS providing the on-time point for the SecureSync's outputs. Below is a basic diagram of this operation:

Offset capabilities (for processing and cable delays) are optionally available with both the individual input references as well as the individual outputs.

- When an offset is applied to an input reference (such as IRIG input) the System PPS in the "Timing System" (the ontime point for the outputs) is either advanced or delayed by the configured delay value, to shift the Timing System/1PPS output for all the outputs by the specified amount. All outputs are inherently shifted when an input delay is configured., because the Timing System 1PPS is shifted. An input reference offset is used to help account for cable delays between the time source and the SecureSync's input (such as 500 feet of cable between an IRIG generator and the IRIG input for instance). This cable offset affects the accuracies of the Timing System and the outputs, so all of these are shifted by an input reference offset.

- When an offset is applied to an output (such as IRIG output) the 1PPS /ontime point of just that individual output is either advanced or delayed by the configured delay value, to shift just that one output by the specified amount. The timing System is not affected by an output delay being added. This allows the ability to set different delay compensations on each output for varying lengths of cable between the SecureSync and the other equipment or differences in processing delays for each device connected to the SecureSync.

An output offset is used to help account for cable delays between SecureSync and each individual device (such as 500 feet of cable between the SecureSync and the device receiving the IRIG signal as well as its offsets with its alignment to the signal its receiving from the SecureSync This cable offset affects only the accuracies of the device receiving this one output signal, so no other signals are affected by an output offset being entered.

As for measuring offsets, an input reference offset affects the System PPS for all outputs including the 1PPS BNC output on the rear panel. Comparing this 1PPS output against the 1PPS output of another time source synced to GPS will show how much offset there is between the two time sources. The offset will be any inherent offsets plus any delay values that have been applied to the input reference that the SecureSync is in sync with (such as the IRIG input). This also the compensation being applied to all of the outputs.

Output delays can be verified by comparing the individual outputs to the 1PPS output on the back of the SecureSync (or to the 1PPS output of another time source synced to UTC). Comparing the delay offsets with the IRIG signal itself (using a scope) is more difficult because of the signal modulation. If a device receiving the IRIG signal has a 1PPS output or test point available, the best test is to compare the other device's 1PPS (which should be synced by the incoming IRIG signal) to the SecureSync's rear panel 1PPS output.

The two 1PPS signals being coincident indicates good synchronization of the other device to the SecureSync. Variances between the two 1PPS signals can be accounted for by varying the delay value for either the input reference or just that one output's delay value (depending on whether its desired to shift all outputs by the same amount, or desired to adjust just the one output by a certain amount.

Positive or Negative delay values

Q (from Keith to Apps team) just a quick "sanity" check for a new Salesforce case, associated with IRIG output Offset configuration.

To confirm, accounting for output (or input) cable delays, the offset value should be entered as a positive (not negative) value? This will "advance" the PPS, so that when the delay occurs, the PPS is back where it should be - at the other end of the cable.

I suspect the likely only time a negative value would be entered as an offset, is in the case of Harris Simulcast, when aligning different sites to each other??

Thanks for confirming this for me. The user guide specifies the offsets can be positive or negative value, but provides no guidance on which value should be used.

A Reply from Ron Dries (8 March 2021) This all depends on where the delay is being measured.

If the SecureSync reference monitoring for example is showing that the IRIG reference is +24us that means the SecureSync 1PPS is behind/slower, then the reference so we would add a +24us delay.

If we are measuring a -24us, delay then that means the SecureSync 1PPS is ahead/faster than the reference and we need to put in a -24us delay.

While discussing his response with Ron Dries

Which direction to move (and whether to adjust the input reference, or just one particular output) really depends on where they are actually seeing the 27 usec offset

1PPS In-Out/FREQ Input (1204-01 and 1204-03)

LuxLink and SI TECH Fiber Optic converters for long distance 1PPS distribution

- Refer to “**LuxLink**” in the IRIG section of <..\CustomerServiceAssistance.pdf>
- Refer to “**SI Tech**” in the IRIG section of <..\CustomerServiceAssistance.pdf>

(1204-01 and 1204-03)

- Model 1204-01 is TTL (single-ended) levels
- Model 1204-03 is RS-485 (Balanced) levels

The Models 1204-01 and 1204-03 Option Cards provide:

(1) **Freq Input** (either sine or square wave, 1 MHz, 5MHz or 10MHz)

Actual range: 1 KHz - 10 MHz in 1 Hz steps

Signal level: +13dBm to -6dBm (2.825V to 316mV pp)

(1) **1PPS Input** (50 ohm)

(1) **1PPS Output** (50 ohm)

Associated with both 1204-01 and 1204-03 Option Cards

1PPS output specifications

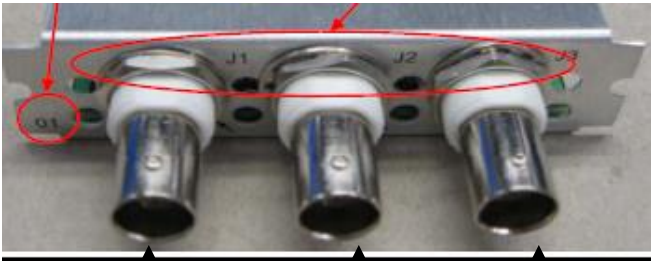
- Same as the base 1PPS output on the back of every chassis
- Refer also to 1PPS output Section in: <..\SecureSync CustAssist.pdf>

API calls associated with 1PPS inputs / 1PPS outputs

- Refer to Tim Tetreault’s “cheat sheet” at: <..\EQUIPMENT\SPECTRACOM EQUIPMENT\Timing boards\TSync family\Tsync driver calls cheat sheet>
- These API calls are primarily for internal use, but the associated “**get**” calls are available via the CLI interface (“sets” are not available to either spadmin or user accounts)
- These are examples - additional calls may have since been added

| 1PPS IN Commands | 1PPS OUT Commands |
|------------------|-------------------|
| PR_GetEdge | PP_GetEdge |
| PR_GetNumInst | PP_GetFreq |
| PR_GetOffset | PP_GetNumInst |
| PR_GetRefId | PP_GetOffset |
| PR_GetValidity | PP_GetPulseWidth |
| PR_SetEdge | PP_GetSigCtrl |
| PR_SetOffset | PP_SetEdge |
| | PP_SetOffset |
| | PP_SetPulseWidth |
| | PP_SetSigCtr |

Model 1204-01 is TTL (Single-ended) outputs

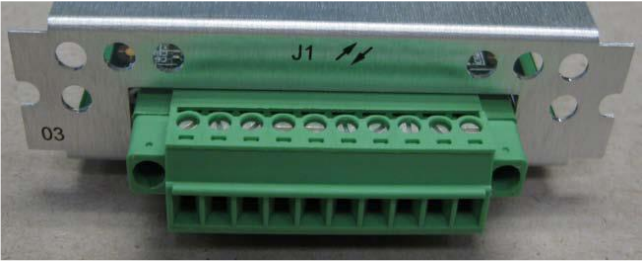


(J1) Frequency Input
1 kHz to 10 MHz (sine
or Square wave)

(J2)
1PPS
Input (50
ohm)

(J3)
1PPS
Output
(50 ohm)

Model 1204-03 is RS-485 (Balanced) outputs



| Pin Number | Signal Name | Function |
|------------|---------------|--------------------------|
| 1 | GND | Ground |
| 2 | FREQIN_RS485+ | RS-485 Frequency Input + |
| 3 | FREQIN_RS485- | RS-485 Frequency Input - |
| 4 | GND | Ground |
| 5 | PPSIN_RS485+ | RS-485 1PPS Input + |
| 6 | PPSIN_RS485- | RS-485 1PPS Input - |
| 7 | GND | Ground |
| 8 | PPSOUT_RS485+ | RS-485 1PPS Output + |
| 9 | PPSOUT_RS485- | RS-485 1PPS Output - |
| 10 | GND | Ground |

Frequency Input
1, 5, 10 MHZ
(Sine or Square)

1PPS input

1PPS output

Schematic: (pps_freq_option_400241A2.pdf) (refer to 1204-0010-F000 in Arena at:
https://app.bom.com/items/detail-sourcing?item_id=1202845080&version_id=10221211408&orb_msg_single_search_p=1&redirect_seqno=5747074429 (or I:\New Released\PCB Documentation).

These two Option Cards are derived from the “1204-0010” FOO assembly).

BOM (1204-0010-F000) In Arena: https://app.bom.com/items/detail-sourcing?item_id=1202845080&version_id=10221211408&orb_msg_single_search_p=1&redirect_seqno=5747074429

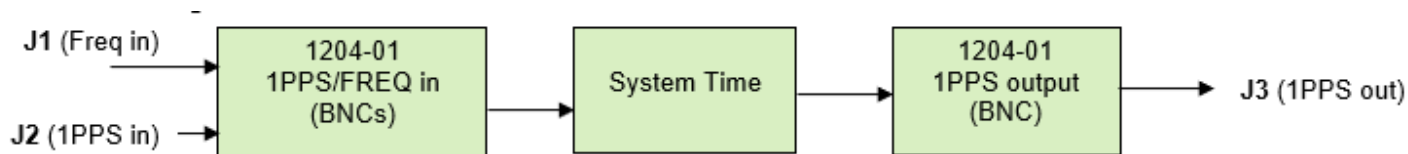
10 Pin Terminal block connector for 1204-03 card



Our P/N: J900R-0101-022J (in Arena) https://app.bom.com/items/detail-spec?item_id=1202843926&version_id=10303495198

Manufacturer and MFG P/N: Phoenix Contact 1827787 Refer to: <https://www.phoenixcontact.com/online/portal/us/?uri=pxc-oc-itemdetail:pid=1827787&library=usen&pcck=P-11-02-11&tab=1&selectedCategory=ALL>

Block Diagram

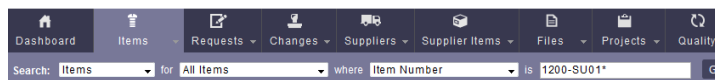


1204-01 firmware and 1204-03 Firmware version

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- **1204-01 card:** rt_oc01_hw01_fpga.bin
- **1204-03 card:** rt_oc03_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|---|---|--------------------|
| | | 1.00 | | |
| | | 1.01 | | |
| | | 1.02 | | |
| | | 1.03 (latest rev in at least version 5.8.5) | Not sure at what version 1.03 was cut-in at, but it's in at least software versions 5.2.1 through at least v5.8.5 | |

1204-01 and 1204-03 Hardware versions

For hardware assembly versions, refer to: (1204-SH12, SP12): [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |

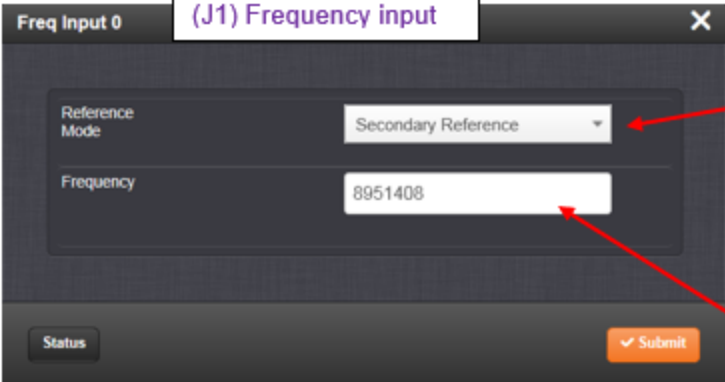
Notes:

- 1PPS input is better than 10MHz input for synchronization, due to 1PPS having faster rise-times.
- Front panel of the Spectracom **GPS-12R** can provide either 1PPS or 10 MHz signal (it can't provide both at the same time). Its outputs are 0v to 2V into 50 ohms. Its outputs are 50 ohm impedance and the Option Card inputs are also 50 ohm input, so no additional terminators are needed when using the GPS-12R as a 1PPS reference).

Note: a GPS-12R can ONLY provide 1PPS input. It cannot provide Time input, so it must be used in conjunction with another Time Reference, or the NTP server can be synced via manually set Time.

Connectors for 1204-01 and 1204-03

J1: (1 MHz, 5MHz or 10MHz Frequency input)



Reference Mode

Secondary: Requires another valid reference to synchronize the system before the frequency reference can be determined to be valid. This is used when the frequency reference is intended to operate as a backup reference to a different primary reference source.

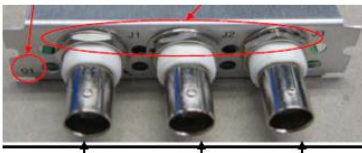
Primary: Allows the frequency reference to be valid based solely on its own presence.

Frequency

Used to configure the frequency (in Hertz) of the input signal. The available Frequency range is 1 kHz to 10 MHz in 1 Hz steps.

- **BNC connector (1204-01) or Terminal block (1204-03)**

Model 1204-01 is TTL (Single-ended) outputs



Model 1204-03 is RS-485 (Balanced) outputs



- 50 ohm input impedance
- **Either Sine wave or Square wave**, 1 MHz, 5MHz or 10MHz

Q per Salesforce Case 186000 Can the 1204-01 lock onto a 10Mbps TTL signal? I know it can lock to a 10MHz Sine Wave reference but unclear about it accepting a 10MHz TTL digital signal.

A reply from Dave L (18 Feb 2019) The 1204-01 Option card can accept 1 MHz, 5 MHz or 10 MHz sine or square (TTL) wave signal on the Frequency input. So yes, it can lock to his 10Mbps signal

- **Actual frequency range:** 1 kHz - 10 MHz in 1 Hz steps
- **Signal level:** +13dBm to -6dBm (2.825Vpp to 316mVpp)

Purpose for a 10 MHz input

Email from Dave Sohn (16 Jun 16) Generally, a 10MHz input to the system could be used if someone just wants to utilize the frequency capabilities of the SecureSync, so only a frequency reference would be required. Second, it could be used as a backup frequency to the main reference, extending holdover with a much better oscillator like a cesium.

In the end, we do have a frequency input on our 1204-01 and 1204-03 option cards, depending on whether they need a sine wave frequency input, or differential input.

On-time point/ Reference mode selection

- The input frequency does not have an on-time point.
- The Reference Mode determines if:
 - 1) **Secondary Mode** The on-time point was already determined with another reference. The on-time will be maintained when switching over to the input frequency. This mode requires the SecureSync to first have the on-time point established with another 1PPS signal, before selecting the frequency input as the reference.

Or

- 2) **Primary mode:** This mode is used if the alignment of the on-time point doesn't really matter (an arbitrary point is selected as the on-time). No other 1PPS references need to first be valid.

An example of this mode is if it's desired to just discipline the 10 MHz oscillator in the SecureSync. In this mode the alignment of the on-time point (for all the outputs) doesn't matter.

Email from Keith to RT Logic (6/18/12)

The "**Frequency Reference**" configuration (on the **Setup/Inputs** page) has a field to define the frequency of the input signal as well as a field for the "**Reference Mode**". This "**Reference Mode**" field can be set to either "**Primary Reference**" or "**Secondary Reference**". What is this field currently set to?

FYI: In **Secondary Reference** mode, the "Freq 0" reference can't be made valid before another PPS reference has been used to declare Sync status. In "Primary Reference" mode, Freq 0 reference is automatically valid as long as it is present.

If the only enabled rows in the Reference Priority table contain "Freq 0" in the PPS column, the field should be configured as "Primary Reference". Otherwise, Freq 0 should remain "not valid".

Another Email from Keith to RT Logic (6/120/12)

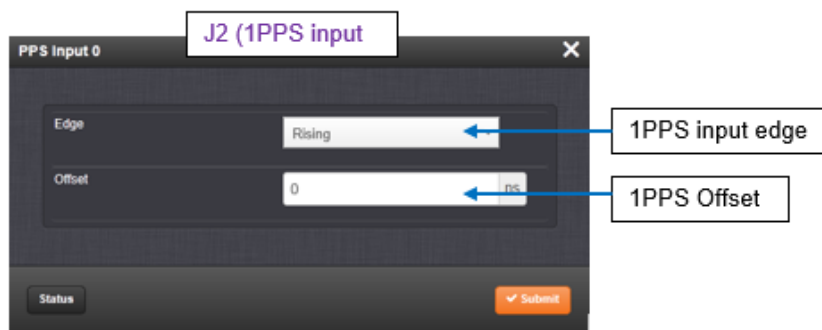
Primary mode is used when there are no other PPS references available to establish the second-rollover (in reality, the "ontime point" is the leading edge of the 1PPS outputs, so it's the very beginning of the next second. But you have the jest). Secondary mode is used when there is another PPS reference available that can accurately align the leading edge of each second to that reference's "on time point". Secondary mode is a one-time only alignment of the ontime point "to the outside world". (After that initial alignment, its cut-off from the "outside world" and from there, Secondary mode operates exactly the same as the Primary mode).

FAQs on Primary and Secondary Reference Modes

- Q. (From Andy Roalstad with RT Logic 6/20/12) What will happen if we select Primary mode first and then switch it to Secondary mode?
- A. If you start out in Primary mode but then switch to secondary mode, this transition would be transparent. But if you were to even momentarily lose either the Time Reference or the 5 MHz input, it would go "not valid" and into Holdover mode. Then, because it's now in Secondary mode, it would not go back into sync until another PPS input is provided. I believe switching between IRIG and NTP, you would remain in sync. But if both time inputs were to be lost or if the 5 MHz was ever lost, the other PPS would need to be applied again.

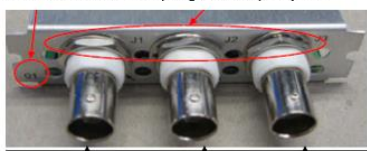
J2: (1PPS input)

INTERFACES -> OPTION CARDS page



- **BNC connector (1204-01) or Terminal block (1204-03)**

Model 1204-01 is TTL (Single-ended) outputs



Model 1204-03 is RS-485 (Balanced) outputs



- **50 ohm input impedance**

Email from Tom Richardson PPS input impedance is 50 ohms.

Using NTP with external 1PPS input for SecureSync synchronization (Acting as a dedicated “Stratum 2” server synced with external 1PPS input instead of using 1PPS from the internal oscillator)

- Refer to the Use Case examples in the SecureSync NTP peering doc: [EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\NTP\NTP peering](#)
- As discussed in this document, we highly recommend listing at least two (2) NTP Servers in the Servers tab and at least one of these Servers should be preferred. Listing only one can result in NTP periodically syncing to System Time instead of syncing to a Stratum 1 servers.

Q If the SecureSync uses a 1PPS TTL signal coming in on the 1204-01 as a backup reference to its internal SAASM Receiver and the SAASM signal is disrupted, will that 1PPS from a Cesium reference sufficiently keep all of the different outputs, to include faster rate RF analog and digital frequency outputs (these cards are included in their systems: 1204-05/27/4C/30/2F) of the SecureSync synchronized to the same level of synchronization to what a 10MHz reference would do?

A Reply from Dave L (18 Feb 2019) regarding Salesforce Case 186000 The SecureSync system time is based on whatever reference it uses. It doesn't matter if it is 10 MHz, 1PPS, IRIG or whatever.

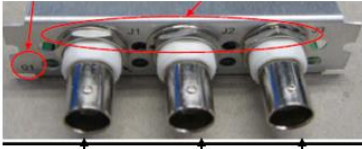
Depending on what the 10 MHz is coming from would determine if the Cesium 1PPS was a better reference or not. I don't think there is a better reference than Cesium to use for a backup in the case of lost GPS Signal. They will need to determine how accurate their 10 MHz sources are and compare against the Cesium.
If the GPS is lost, the unit will fall into Holdover mode and then switch to the next reference in the Reference Priority when holdover expires such as the Cesium or 10 MHz Inputs. Again, the Cesium is likely to be the best reference due to its extreme accuracy.

The output signals from the option cards are all based upon the internal system time and oscillator. These would all be accurate as long as the oscillator and system time were synchronized to an accurate source.

J3: (1PPS output)

- **BNC connector (1204-01) or Terminal block (1204-03)**

Model 1204-01 is TTL (Single-ended) outputs



Model 1204-03 is RS-485 (Balanced) outputs



- 50 ohm output impedance

Edited Email from Tom Richardson

PPS output impedance is low. Output is four 74ACT08 gates driving 5.6 ohm resistors in parallel. 5 ohms seems reasonable. We say we drive 50 ohm load.

A high output impedance would make it hard to drive a 50 ohm load. The output impedance and the load make a voltage divider, part in output impedance and part in load. The higher the output impedance the lower the voltage into 50 ohms.

Classic interface browser Setup/Inputs/ “1PPS/Frequency”

INPUTS SETUP - 1PPS/Frequency (SLOT3)

1PPS REFERENCE

Offset: 0
Edge: Rising

Submit Reset

FREQUENCY REFERENCE

Reference Mode: Primary Reference
Frequency (Hz): 1000000

Submit Reset

Input Frequency
Used to configure the frequency (in Hertz) of the input signal. The available Frequency range is 1 kHz - 10 MHz in 1 Hz steps.

Reference Mode
Secondary: Requires another valid reference to synchronize the system before the frequency reference can be determined to be valid. This is used when the frequency reference is intended to operate as a backup reference to a different primary reference source.
Primary: Allows the frequency reference to be valid based solely on its own presence.

Using NTP with external 1PPS input for SecureSync synchronization (Acting as a dedicated “Stratum 2” server synced with external 1PPS input instead of using 1PPS from the internal oscillator)

- Refer to the Use Case examples in the SecureSync NTP peering doc: [EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\NTP\NTP peering](#)
- As discussed in this document, we highly recommend listing at least two (2) NTP Servers in the Servers tab and at least one of these Servers should be preferred. Listing only one can result in NTP periodically syncing to System Time instead of syncing to a Stratum 1 servers.

Setup/Outputs/ “1PPS/Frequency”

OUTPUTS SETUP - 1PPS/FREQ (SLOT5)

1PPS OUTPUT

| | | |
|-------------------|----------------------|---|
| Signature Control | No Signature Control | ▼ |
| Offset (ns) | 0 | |
| Edge | Rising | |
| Pulse Width (ns) | 200000000 | |

Submit Reset

Status/Inputs page/“1PPS/Frequency”

INPUTS STATUS - 1PPS/Frequency (SLOT3)

1PPS REFERENCE

| | |
|---------------|-----------|
| Reference ID | eqp0 |
| 1PPS Validity | Not Valid |
| Offset | 0 |
| Edge | Rising |

FREQUENCY REFERENCE

| | |
|----------------|-------------------|
| Reference ID | freq |
| Reference Mode | Primary Reference |
| 1PPS Validity | Valid |
| Frequency (Hz) | 10000000 |

Status/Outputs page/“1PPS/Frequency”

OUTPUTS STATUS - 1PPS/FREQ (SLOT5)

1PPS OUTPUT

| | |
|-------------------|----------------------|
| Signature Control | No Signature Control |
| Offset (ns) | 0 |
| Frequency (Hz) | 1.00000 |
| Edge | Rising |
| Pulse Width (ns) | 200000000 |

ASCII Option Cards (1204-02 and 1204-04)

General info about ASCII signals

- Refer to “ASCII” in the “Products” Section in: <..\CustomerServiceAssistance.pdf>

For example:

- 1) Additional Information about various/ ASCII formats, such as **Spectracom** Formats, **Endrun** formats, **Cisco TOD** format or **China Mobile** format.

Available ASCII Option Cards:

- [1204-02: ASCII RS-232](#)
- [1204-04: ASCII RS-485](#)

ASCII output data while the system is initially booting-up (after power cycle or reboot)

- The ASCII outputs, like other outputs such as the front panel, will initially output the default year 2000 and the time as 00:00:00 (incrementing each second) for about the first minute or so after power -up. Then the time/date is applied.
- For more details, refer to: [System initialization after each boot-up](#) in this document
- As of at least May 2015, software versions 5.2.1 and below, the only way to prevent this is to not reboot.

Email from Sylvain to Dave Sohn

Q. The issue: When the SECURESYNC is rebooting: the IRIG output is distributing during the BOOT period many different times values.... changing.... Amazing? These false information are very unpleasant for the displays units which are connected to the outputs of the SecureSync. Version of the SecureSync: 4.8.6.

Dave Sohn responded (18 Oct 2012)

A. When KTS powers up, the default state of signals is enabled. As the NWP powers up, it performs any of the persisted settings of the user including signature control, formats, etc.

**Available ASCII input/output messages for both 1204-02 and 1204-04

C) Data Format 9 and Data Format 9S

I. Format 9: Used for Sysplex Timer

II. Format 9S: Modified Format 9 to include sync status indicator for Sysplex timer

- Ability to select Data Format 9S was added in software Version 5.4.5.

D) Epsilon TOD 1, and 3

- Added to the base SecureSync software in version 5.4.0 (no changes made in the FPGA of the 1204-02 and 1204-04 to add these new formats)

E) (3) IDC-GPS-153C messages (ICD-153) / DAGR /SINCGARS radio

Refer to (WP-031, WP-031A) <S:\Engineering\Projects\Lafayette\200 Engineering Documents\Working Papers>

- Requires a Model 1204-02 ASCII RS-232 Input/Output Option Card be installed.
- Requires a 1PPS output from either the 1204-02 Option Card or rear panel BNC connector
- (GSSIP- GPS STANDARD SERIAL INTERFACE PROTOCOL – GSSIP) messages

We support (3) ICD-CGP-153C messages. These are:

- **Buffer Box (253)** This message is sent out once-every 6 seconds
 - **Time Transfer (5101)** This message is sent out once-per-second
 - **Current Status (5040)** This message is sent out once-per-second
- The purpose of these three messages is to emulate a SINCGARS interface connection to a SAASM GPS.
- ECN 2542 for Archive software version 4.3.1 (Cut-in ~11/11/2010) added IDC-153C outputs (These were later updated/modified in ECN 2623 to support syncing a SINCGARS radio).
- Provides Time information and 1PPS only! No Position or Velocity information is provided!!!
- Refer to Section 11.15 (GSSIP Message Format) in the SecureSync manual for more info (excerpt below)

The purpose of these three messages is to emulate a SINCGARS interface connection to a SAASM GPS. The SecureSync generates these messages emulating the Time and 1PPS transfer behavior of the SINCGARS interface. An external device compatible with the SINCGARS interface can attach to an ASCII Output from the SecureSync and receive time and 1PPS as if communicating with an ICD-GPS-153C compatible SAASM GPS.

***These commands are emulated only and contain only time information.**

No Position or Velocity information is provided. No SAASM GPS receiver is required because this is emulation and no controlled data is included in the messages. Position and Velocity information is zeroed out.

The ASCII Output supports two configurations for supporting SINCGARS

Sync: **Label**

The ICD-153 output messages that are supported, are listed below:

253: buffer box, See SecureSync Instruction Manual excerpt below (Section 11.15-GSSIP)

5040: status, See SecureSync Instruction Manual excerpt below

5101: Time Message (1 PPS UTC), See below 1PPS on pin 1

The Secure Sync is a transmit only box where it puts out messages across its RS-232 interface (1204-02 RS-232 ASCII IN/OUT option card – they will need to use the output. Pin 1 has an 50 ohm PPS UTC signal.)

5030: Control, Always ACK's 5030's simply to make SINCGARS protocol startup, when programmed in the following order:

Format2: Time Transfer (5101)

Format1: Current Status (5040)

Format3: Buffer Box (253)

Please note: Format 2, is prior to format 1.

No support for the following messages at this time:

4: 24 channel status message

8: GPS start up

9: receiver status

5044: Warning Messages

5081: extended status

5404: SA/A-S Status

5031: Extended Control

In addition, we acknowledge (ACK) the following messages:

5030: Control
5040: Connect Request
5001: Command
ALL other messages are dropped on the floor and ignored.

Interface between SecureSync and SINCGARS

Note: Due to TFOM value restrictions, SecureSync must be externally synced to a reference such as GPS or IRIG. SINCGARS will not sync to hand-set time.

Signal structure (Number of bits, stop bits, parity)

Parity

- Issues observed with parity- refer to “Nokia” (case 6536 in SAP)

Questions below were from Dave Marley. Answers were from Paul Myers on or about 1 Sept, 16

What is the generated parity for each of the parity settings (odd, even, none)?

The FPGA RS-232 UART transmitted byte consists of 1-Start bit, N-Data bits, an optional parity bit, and 1-Stop bit. The user can configure 5-8 data bits and None, 1-Odd or 1-Even parity bit. Only 1-Stop bit can be selected.

The UART outputs NO parity bit resulting in a shorter byte. If using Odd or Even parity a parity bit is included on transmit.

What is checked on input for each parity setting (odd, even, none)?

A test for the parity NOT matching the expected parity bit on receive is performed.

If input parity fails, what happens? Is there a record of parity errors we can monitor?

There is no error reporting, the byte with bad parity should be dropped.

F) BBC West ASCII outputs

- ECN 2542 for Archive software version 4.3.1 (Cut-in ~11/11/2010) added four new “proprietary” BBC formats (for Spectracom UK). Refer to the SecureSync manual for the BBC ASCII formats

BBC-01
BBC 02
BBC 03
BBC 04

NMEA/NMEA 0183 outputs (GGA/GPGGA, RMC/GPRMC and GPZDA/ZDA)

Note: Also refer to [DATA FORMATS/ NMEA 0183 \(for all products\)](#)

- **For NMEA Specs:** refer to [I:\Engineering\Specs and Standards\NMEA \(National Marine Electronics Association\)](#)
- **Baud Rates=** Programmable baud rates are 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 (9600 is factory default)

ICD-GPS-153c messages (Ground speed, heading)

- Per Paul Myers (23 Jan 17) “Force 22E ICD-GPS-153C messages provide ground speed and heading values”
 - ICD-GPS-153 is apparently documentation for the DAGR:
 - Refer to (ICD-GPS): [I:\Engineering\Specs and Standards\GPS](#)
Refer also to SecureSync Option Card doc:
1. ASCII Output NMEA messages RMC, GGA, ZDA were designed for stationary applications because we don't populate all fields. The SecureSync otherwise is good for mobile applications.
 2. NRE needed to get needed values and transform/store and then add to ASCII Output message RMC
 - a. Force 22E ICD-GPS-153C messages provide ground speed and heading values
 - i. We would need to verify these values are correct and can be converted to values needed in RMC message which lacks them. And are in correct coordinate systems for RMC use.
 - ii. Message 5040 which we receive provides Ground speed
 - iii. Message 4 which we receive provides Attitude True Heading
 - iv. Check other GGA, RMC, ZDA for other issues.

Software issue with empty fields

From the version 5.8.3 (Jan 2019) Release Notes

“Fixed an issue with NMEA messages transitioning to empty fields”

NMEA 0183 formats GPGGA, GPRMC and GPZDA.

- Refer also to: <..\CustomerServiceAssistance.pdf>

A) GPGGA/GGA message (AKA Data Format 90)

FORMAT 90

Provides a position data stream in NMEA 0183 GPGGA GPS Fix data format. The Format 90 data structure is shown below:

\$GPGGA,HHMMSS.SS,ddmm.mmmm,n,dddmm.mmmm,e,Q,SS,YY.y,+AAAAA.a,M,,,*CC CR LF

CHARACTER DESCRIPTOR:

\$GP = GPS System Talker
GGA = GPS Fix Data Message
HHMMSS.SS = Latest time of Position Fix, UTC. This field is blank until a 3D fix is acquired
ddmm.mmmm,n = Latitude
 dd = degrees, 00...90 mm.mmmm = minutes, 00.0000....59.9999
 n = direction, N = North, S = South
dddmm.mmmm,e = Longitude
 ddd = degrees, 000...180
 mm.mmmm = minutes, 00.0000....59.9999
 e = direction, E = East, W = West
Q = Quality Indicator;
 0 = No 3D fix
 1 = 3D fix **SS** = Number of satellites tracked, 0...8
YY.Y = Dilution of precision, 00.0...99.9
+AAAAA.a,M = Antenna height in meters, referenced to mean sea level
 ---- = Fields for geoidal separation and differential GPS not supported
 cc = Check sum message, HEX 00...7F Check sum calculated by Xoring all bytes between \$ and *.
CR = Carriage Return
LF = Line Feed

Example: **\$GPGAA,151119.00,4307.0241,N,07729.2249,W,1,06,03.2,+00125.5,M,,,*3F**

The example data stream provides the following information:

Time of Position Fix: 15:11:19.00 UTC

Latitude: 43° 07.0241' North

Longitude: 77° 29.2249' West

Quality: 3D fix

Satellites Used: 6

Dilution of Precision: 3.2

Antenna Height: +125.5 meters above sea level

Check Sum: 3F

\$GPGGA,123519.00,4807.038,N,01131.000,E,1,08,0.9,545.4,M,46.9,M,,*47

Where:

| | | |
|----------------------|---|--|
| GGA | = | Global Positioning System Fix Data |
| 123519.00 | = | Fix taken at 12:35:19 UTC |
| 4807.038,N | = | Latitude 48 deg 07.038' N |
| 01131.000,E | = | Longitude 11 deg 31.000' E |
| 1 | = | Fix quality: 0 = Invalid 1 = GPS fix (SPS) 2 = DGPS fix 3 = PPS fix 4 = Real Time Kinematic 6 = estimated (dead reckoning) (2.3 feature) 7 = Manual input mode 8 = Simulation mode |
| 08 | = | Number of satellites being tracked |
| 0.9 | = | Horizontal dilution of position |
| 545.4,M | = | Altitude, Meters, above mean sea level |
| 46.9,M | = | Height of geoid (mean sea level) above WGS84 ellipsoid |
| (empty field) | = | Time in seconds since last DGPS update |
| (empty field) | = | DGPS station ID number |
| *47 | = | the checksum data, always begins with * |

Horizontal Dilution of Position (HDOP) field becomes a “null” (no value) upon completion of GPS survey (Trimble Res-SMT-GG receiver only, in Standard/Stationary mode)

- Refer to Salesforce case such as **206133** and **164286**
- By design (this is not a software/firmware bug) Trimble receivers populate the HDOP field with a null, once the GPS survey has completed and the receiver goes into overdetermined clock mode.
Per Ron Dries (28 Oct 2019) The customer is using the NMEA GGA message output from the ASCII card. With a Trimble GG receiver once the survey completes and the receiver is in over-determined clock mode the DOP value in the NMEA string becomes blank. With a u-blox receiver it is set to a constant value
- ublox receivers, instead populate this field with a constant value, which doesn't change.

Available work-around (if the null value after GPS survey is an issue for other devices receiving the data stream)

- Configure the Trimble receiver for Mobile mode (instead of Standard mode)

Per Dave Sohn (29 Oct 2019) If they put the receiver in Mobile mode (even though application is stationary) the DOP fields will remain populated as the system doesn't complete a survey and go into overdetermined clock mode.

Relating to Salesforce case 164286

(per Dave L 11 Sept 2018) We have done some testing and were able to duplicate the issue. This is isolated to SecureSync products equipped with the Trimble Resolution-GG receivers. The U-Blox receivers are not affected. When the Survey has completed (about 31 minutes after start) the receiver will change states and the HDOP information will not be reported to the GPGLL sentence.

We were able to switch the receiver mode to MOBILE mode and restore the missing HDOP data in the GPGLL message.

Example draft email Keith sent for changing to Mobile mode (28 Oct 2019)

Regarding our case number 206133, for the radios losing sync to SecureSyncs, the SecureSync's Senior Product Manager reminded me of a potential config change you can optionally make to SecureSyncs having a Trimble receiver installed, in lieu of the radio system vendor needing to change how they parse the GGA message.

The change to the HDOP field in the GGA output from the Trimble receivers only applies when the receiver is configured for its factory default Standard/Stationary mode. Without affecting the rest of the SecureSync's operation, SecureSync's with a Trimble receiver installed can have the receiver mode configuration changed from the default Standard mode to Mobile mode.

This simple software config change to Mobile mode prevents the GNSS receiver from performing a GPS Survey (thereby preventing the HDOP field from changing to a null). The only other change to operation upon making this config change to the receiver mode is that instead of the GNSS receiver only needing to track one satellite upon completion of the GPS survey (as is required in Standard mode) to remain in sync, because no GPS survey is performed in mobile mode to lock-in a known location, the receiver will subsequently need to track a minimum of at least four satellites to remain in sync.

Even with just the GPS satellite constellation alone (let alone if another satellite constellation is also enabled in the receiver in addition to GPS), and as long as the antenna has a good view of the sky, the antenna/receiver should have no problems tracking at least four satellites at all times. So, the change to a minimum of four satellites (instead of one minimum satellite) to remain in full sync state should not be an issue!

For info on easily changing a Trimble GNSS receiver from Standard to Mobile, please refer to the SecureSync online user guide at: http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/CONFIG/GNSS_rec_mode.htm.

Software issues/changes associated with GPGGA

3. V5.8.5 added the geoid height to the NMEA GGA output message

- Per the Version 5.8.5 (July 2019) release notes: “Added the geoid height to the NMEA GGA output message”
- Refer to JIRA SSS-593

4. V5.8.3: “Fix Quality” field of the GPGGA output with SAASM receiver installed doesn’t switch to “PPS” (applicable to versions 5.8.2 and below)

- v5.8.2 and below- “PPS” was not reported when receiver is keyed. Remains “SPS” (which is the correct value for not keyed)
- Applicable to at versions 5.8.2 and below (fixed in 5.8.3)
- Refer to Salesforce case 163026/JIRA-SSS-463

Customer report ...The GGA statement that is being outputted by the SecureSync, and in Field 6 (GPS Quality Indicator) in that statement are my concern here.

When I have no SAASM keys and the unit it fully synced it will display.

Example: \$GPGGA,172814.0,3723.46587704,N,12202.26957864,W,1,9,0.9,203.893,M,,,*,4F

Field 6 (highlighted) will show that it is operating with GPS fix with Standard Positioning service (SPS), this is expected output from the unit with no SAASM keys installed. Even in the SAASM Receiver Addendum 1200-500-0053 Rev.E it says the GPS info on LCD display will even show this. So, this NMEA output matches the info I can see in the unit.

When I have SAASM keys installed the unit should be in Precise Positioning Service (PPS), even the GPS info on LCD display will show this (per the Addendum). The NMEA GGA statement with SAASM keys seems to match the statement with no SASSM keys, even though the unit is in PPS fix.

My point is I believe we should expect a value of 3 in field 6 of the GGA message when SAASM keys are being used and the unit is in PPS fix. I am unsure if this is due to configuration and I have not enabled the change to happen either to the base unit or for the option card that is handling the output. If the 5.6 version we are running won't do this, but a different version can.

Status Change (29 Jan 2019) per the Version 5.8.3 release notes”

“GGA Fix Quality field is now based on overall sync state—not solely on GPS sync”

B) GPRMC message

\$GPRMC,123519.00,A,4807.038,N,01131.000,E,022.4,084.4,230394,003.1,W*6A

Where:

| | | |
|--------------------|---|---|
| RMC | = | Recommended Minimum Sentence C |
| 123519.00 | = | Fix taken at 12:35:19 UTC |
| A | = | Status A=active or V=Void. |
| 4807.038,N | = | Latitude 48 deg 07.038' N |
| 01131.000,E | = | Longitude 11 deg 31.000' E |
| 022.4 | = | Speed over the ground in knots |
| 084.4 | = | Track angle in degrees True |
| 230394 | = | Date - 23rd of March 1994 |
| 003.1,W | = | Magnetic Variation |
| | | |
| *6A | = | The checksum data, always begins with * |

C) GPZDA/ZDA message

The “ZDA” message provide whole second information only. It does not provide any sub-second information at all. Per the NMEA specifications, the ZDA message format does not contain an on-time point, so there is no need to define to the time to the nearest hundredth of a second (without an available on-time point to reference, a hundredth of a second would not be a definable value). Because of this fact, the NMEA spec allows the message to include just the hours, minutes and whole seconds without any sub-second information reported. The SecureSyncs ZDA message will only provide the time of the current whole second with no decimal places reported after the decimal point. For this reason, the accuracy of the time data that is reported in the ZDA message is only accurate to the nearest second.

Examples: At time 12:10:58.01, the ZDA time will be reported as "58" seconds (not as either 58.01 or as 58.00)
Less than one second later, at time 12:10:58.99, the ZDA time will still be reported as "58" seconds (not as either 58.99 or as 58.00)

In summary, no sub-second time information is provided in the ZDA output data stream. Just whole seconds only.

Note: Software Version 4.4.S (and later production versions) adds tenths and hundredths place holders “.00” to the time stamps for compatibility with other systems.

The Format ZDA Data message provides Date and Time information.

Example message:

`$GPZDA,HHMMSS.00,DD,MM,YYYY,XX,YY*CC`

Where:

| | | |
|-------------------------|---|--------------------------|
| <code>HHMMSS.00</code> | = | HrMinSec(UTC) |
| <code>DD,MM,YYYY</code> | = | Day,Month,Year |
| <code>XX</code> | = | Local zone hours -13..13 |
| <code>YY</code> | = | Local zone minutes 0..59 |
| <code>*CC</code> | = | Checksum |

EndRun Data formats

For specific info on the EndRun format strings, also refer to [EndRun data formats](#) (in custservice doc: [I:\Customer Service\1- Cust Assist documents\CustomerServiceAssistance.pdf](#))

Note: Due to various changes to EndRun formats (as mentioned below), SecureSync should be running at least version 4.8.2 software.

- EndRun formats were made available in SecureSync version 4.6.0
- These formats were improved in SecureSync versions 4.7.0 (Corrected for issues with spaces)
- Leap Second issues were fixed in 4.8.0 – 4.8.2 (Per Paul Myers “We tested for leap second testing EndRun format 1 &2”)

These are formats right from the Endrun (competitor) products
Made available starting in version 4.6.0 of SecureSync software.

T YYYY DDD HH:MM:SS zZZ m<CR><LF> Example: [9201121001:22:13+00U](#)

Where:

T is the Time Figure Of Merit (TFOM) character and is one of:

9 indicates error > +/- 10 milliseconds, **or unsynchronized condition**

8 indicates error < +/- 10 milliseconds

7 indicates error < +/- 1 millisecond

6 indicates error < +/- 100 microseconds

YYYY is the year,

DDD is the day of the year,

HH is the hour of the day,

MM is the minute of the hour,

SS is the second of the minute,

z is the sign of the offset to UTC, + implies time is ahead of UTC

ZZ is the magnitude of the offset to UTC in units of half-hours. Non-zero only when Time Mode is Local.

M is the Time Mode character and is one of:

G = GPS,

L = Local,

U = UTC

<CR> is Carriage Return control character (0x0D)

<LF> is Line Feed control character (0x0A)

Endrun Format 1

Email from Paul Myers (2/10/12)

EndRun Format 1 users:

EndRun Format 1 users using EndRun format 1 as an INPUT need to HAND-SET the leap second adjustment to occur at +1 second 183/2012 at 00:00:00 hours. (All SecureSync users using Inputs without leap second notifications should hand set the leap second)

Endrun Format 1 output users should know their receiving equipment will experience an unexpected 60th second.

Endrun Format 1 does not notify of a leap second.

So when the leap second is received it will result in a delayed time jump after the leap second is introduced.

The user can see this in the other Serial Outputs, on the Front Panel and NTP may experience a 1 second Leap Second adjustment which it recovers from because an unexpected second was detected.

An example of this is the Serial Format 2 which was output from a SecureSync showing this unexpected leap second being compensated for by duplicating second 2.

Output around time of leap second at July 1, 2012 00:00:00

Input from NetClock: End Run 1

Output through serial: Spectracom Format 2

CLEANED EVERYTHING

'L' indicator does not show, which is what is expected, since End Run Format 1 doesn't send leap second data

12 182 23:59:54.000 S

12 182 23:59:55.000 S

12 182 23:59:56.000 S

12 182 23:59:57.000 S

12 182 23:59:58.000 S

12 182 23:59:59.000 S

12 183 00:00:00.000 S Leap Second occurs...

12 183 00:00:01.000 S

12 183 00:00:02.000 S

12 183 00:00:02.000 S SecureSync has expected delayed correction. This is by design for unexpected leap seconds.

12 183 00:00:03.000 S

12 183 00:00:04.000 S

12 183 00:00:05.000 S

12 183 00:00:06.000 S

12 183 00:00:07.000 S

12 183 00:00:08.000 S

12 183 00:00:09.000 S

Front panel displayed the same thing.

Using EndRun format as an input reference to SecureSync (via RS-232):

Note: EndRun formats have no on-time point (like NMEA message). Need to use a separate 1PPS reference (internal or external)

Series of Emails from Paul Myers:

We support 2 [Endrun] formats output from the **Praecis II CDMA Timing Module**

<http://www.endruntechnologies.com/time-frequency-reference-cdma.htm>

The executive Summary is:

1. Add a Reference Priority Entry Time=ASCII Input, PPS = 1PPS input
2. Disable ASCII/ASCII Input line
3. Disable 1PPS input line
4. Do not use Frequency Input
5. Attach 1PPS input
6. Attach ASCII time Code and configure for EndRun format input
7. Start CDMA input product
8. Wait for sync on CDMA product then wait for Sync on SecureSync

I think we need to take the 1PPS output from the device as an input and make a reference line of the PPS and ASCII in the Reference table.

ALSO, the TFOM in the message must be <=6.

Also, there was a bug in the first implementation I think where my spaces were NOT correct between parts of the message.

(Check the release notes, maybe it was a different format...)

Find their version and update them to 4.8.2 or better yet 4.8.4.

[if not syncing] Get the VERSION! Get the format they are using, get the version of the CDMA device, Capture output from the device, check the output message matches what is in the manual and the TFOM is ≤ 6 , get their wiring interface and make sure the SecureSync is correctly configured.

Four (4) BBC ASCII Formats

- Four BBC outputs (BB-01 through BB-04) are OUTPUTS only (they are NOT supported as an INPUT to SecureSync).
- The four BBC outputs are only available from an RS-232 output port. They are not available for selection from an RS-485 output. See the Important Note below:

Important Note: The four BBC ASCII Formats are only available via RS-232 output (from an installed Model 1204-02 Option Card). The four BBC formats are NOT available via RS-485 (from an installed Model 1204-04 RS-485 Option Card).

- If the output BBC format is needed as an RS-485 data stream, an RS-232 to RS-485 adapter can be obtained locally for this conversion.
If the BBC output format is required to be an RS-485 data stream (cannot accept an RS-232 time stamp), an RS-232 to RS-485 converter can also be used in conjunction with the Model 1204-02 Option Card's RS-232 output. RS-232 to RS-485 converters are available through companies such as BlackBox. A Google search should allow you to find one of the adapters available locally.

Note that many ASCII RS-232 to RS-485 adapters are one-direction only. Using this style converter will require the RS-232 output port be configured for broadcast mode (no request character), resulting in the BBC ASCII format being present once-per-second. If the other device needs to interrogate for the request character (instead of it receiving data every second) either a bi-directional RS-232 to RS-485 adaptor, or two different adapters (one RS-232 to RS-485 adapter and a second RS-485 to RS-232 adapter) will be needed for this capability.

Changes to SecureSync software for BBC West (was for France/UK)

Two new ICD ASCII outputs were added to SecureSync in version 4.3.1 for the ASCII Option Cards. Email from Paul Myers on (1/31/11)

Our current ASCII card can output a 5101 message Time Transfer (1Hz), 5040 message Current Status (1Hz) and a 253 Buffer box (1/6 Hz). One or all of these messages can be selected for output. The On-Time Point of the 5101 message is the first bit of the first byte.

These messages emulate being output from a GSSIP compatible GPS receiver, but do not contain position data or any useful information other than positive tracking status and time/date information.
We cannot accept any of these messages as inputs at this time.

-
- Q. We are considering use of the RS-232 NMEA output module. Assuming it outputs data reflective of the source currently used by the SecureSync. For example, if manual coordinates were entered rather than using GPS coordinates automatically, would the NMEA sentences include the manually entered coordinates in lieu of what would normally come from GPS?
- A. NMEA outputs are reflective of the current system information including position. Assuming the position information was set manually and accepted by the GPS reference/receiver, they would be used for the NMEA data. Refer to the SecureSync manual for the specific NMEA message formats provided.

API calls associated with ASCII inputs/ASCII outputs/KTSIF file for configuring ASCII cards

- Refer to Tim Tetreault's "cheat sheet" at: <..\EQUIPMENT\SPECTRACOM EQUIPMENT\Timing boards\TSync family\Tsync driver calls cheat sheet>
- These API calls are primarily for internal use, but the associated "get" calls are available via the CLI interface ("sets" are not available to either spadmin or user accounts)
- These are examples - additional calls may have since been added

| ASCII IN Commands | ASCII OUT Commands |
|-------------------|--------------------|
| AR_GetFormat | AP_GetFormat |
| AR_GetLeapFlag | AP_GetLocal |
| AR_GetLocal | AP_GetMode |
| AR_GetNumInst | AP_GetNumInst |
| AR_GetOffset | AP_GetReqChar |
| AR_GetRefId | AP_GetSigCtrl |
| AR_GetTimeScale | AP_GetTimeScale |
| AR_GetUartCfg | AP_GetUartCfg |
| AR_GetValidity | AP_SetFormat |
| AR_SetFormat | AP_SetLocal |
| AR_SetLocal | AP_SetMode |
| AR_SetOffset | AP_SetReqChar |
| AR_SetTimeScale | AP_SetSigCtrl |
| AR_SetUartCfg | AP_SetTimeScale |
| AR_GetFormat | AP_SetUartCfg |
| AR_GetLeapFlag | |
| AR_GetLocal | |

KTSIF file for configuration of ASCII Option Cards

- Refer also the main KTSIF section in this doc: [ktsif.conf file](#)
- Located in home/spectracom/config folder

```
1,2,2,44,0,0,0,AR_SetFormat 0 0 12
1,2,2,44,0,0,0,AR_SetPpsSrc 0 0 1
0,0,0,50,0,0,0,DP_SetTimeScale 0 0 3
0,0,0,50,0,0,0,DP_SetLocal 0 0 0 0 0 0 0 0 0 0 0 0 3600
0,0,0,37,0,0,-1,SS_SetHoldoverTO 0 2419200
1,2,2,44,0,0,0,AR_SetOffset 0 0 0
1,2,2,44,0,0,0,AR_SetUartCfg 0 0 9600 0 0 0
0,0,0,35,0,0,-1,CS_SetTimeScaleOff 0 2 18
0,0,0,35,0,0,-1,CS_SetTimeScaleOff 0 1 37
```

API calls issued in the Example KTSIF file above

- **AR_SetFormat 0 0 2** to configure ASCII input Time format as NMEA GPZDA
- **AR_SetPpsSrc 0 0 1** to configure ASCII 1PPS input
- **AR_SetUartCfg 0 0 9600 0 0 0** to configure ASCII Time input as 9600 baud, 8 bit. 1 stop bit, no parity

Other possible AR calls not shown in the above example ktsif file

- **AR_SetPpsSrc 0 0 1** to change the "PPS Source" field (1PPS input) from "Message" (factory default selection) to "PPS Pin" selection

The screenshot shows a configuration window with two dropdown menus. The first dropdown, labeled 'PPS Source', has 'PPS Pin' selected. The second dropdown, labeled 'PPS Pin', has 'Message' selected. Below these, there is a 'Baud Rate' field.

Note: If the “**AR_SetPpsSrc**” Apo call is not listed in the KTSIF file, the “**PPS Source**” field is set to “**Message**”. (default value) in this configuration, the PPS input will only be **valid** if a valid ASCII Timecode message is being received on the timecode input

Log entries associated with ASCII Option Cards

A) Timing log

1. Established communication / lost communication

- Refer to Salesforce cases such as 176778 (GPZDA ASCII input issues)

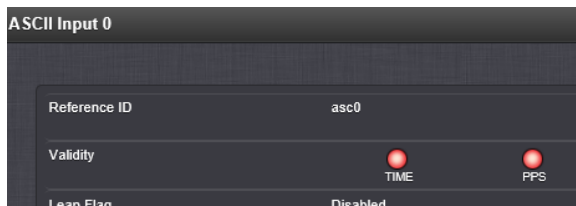
```
Nov 21 06:36:07 4 4.ntp.dks: [system] 2018 325 06:36:07 000 AR asc0 has established communication.  
Nov 21 06:40:59 4 4.ntp.dks: [system] 2018 325 06:40:59 000 AR asc0 has lost communication.  
Nov 21 06:41:16 4 4.ntp.dks: [system] 2018 325 06:41:16 000 AR asc0 has established communication.  
Nov 21 06:42:04 4 4.ntp.dks: [system] 2018 325 06:42:04 000 AR asc0 has lost communication.  
Nov 21 06:43:07 4 4.ntp.dks: [system] 2018 325 06:43:07 000 AR asc0 has established communication.  
Nov 21 07:02:29 4 4.ntp.dks: [system] 2018 325 07:02:29 000 AR asc0 has lost communication.  
Nov 21 07:03:07 4 4.ntp.dks: [system] 2018 325 07:03:07 000 AR asc0 has established communication.  
Nov 21 07:05:32 4 4.ntp.dks: [system] 2000 001 00:00:01 000 AR asc0 has established communication.
```

- **has established communication:** ASCII data is **now being detected** (data is present, port settings -such as baud rate, flow control, etc are all correct)
- **has lost communication.** ASCII data is **no long being detected** (cable is no longer attached, ports settings have changed, etc)

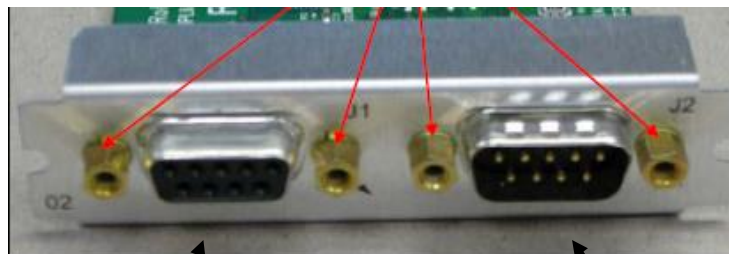
Note: An ASCII input message must be received within **TWO** seconds or “**lost communications**” message will be asserted

PPS input only (after loss of ASCII data by making baud rate incorrect)

- PPS signal after being received on pin, but ASCII input “not good because of baud rate
- BOTH PPS and Time are NOT VALID (PPS is only valid if message is also received)
334 14:52:17 000 AR asc0 has lost communication



***(1204-02) ASCII RS-232 In/Out Option Card



J1: RS-232 Output

| Pin Number | Signal Name | Function |
|----------------------|--------------|----------------------|
| Top row of 5 pins | | |
| 1 | PPS_IN | 1PPS input |
| 2 | SERIAL_IN_RX | RS-232 Receive data |
| 3 | SERIAL_IN_TX | RS-232 Transmit data |
| 4 | N.C. | No connection |
| 5 | GND | Ground |
| Bottom row of 4 pins | | |
| 6 | N.C. | No connection |
| 7 | N.C. | No connection |
| 8 | N.C. | No connection |
| 9 | N.C. | No connection |

J2: RS-232 Input

| Pin Number | Signal Name | Function |
|----------------------|---------------|----------------------|
| Top row of 5 pins | | |
| 1 | PPS_OUT | 1PPS output |
| 2 | SERIAL_OUT_TX | RS-232 Transmit data |
| 3 | SERIAL_OUT_RX | RS-232 Receive data |
| 4 | N.C. | No connection |
| 5 | GND | Ground |
| Bottom row of 4 pins | | |
| 6 | N.C. | No connection |
| 7 | N.C. | No connection |
| 8 | N.C. | No connection |
| 9 | N.C. | No connection |
| 10 | N.C. | No connection |

1204-02 in Online user guide:

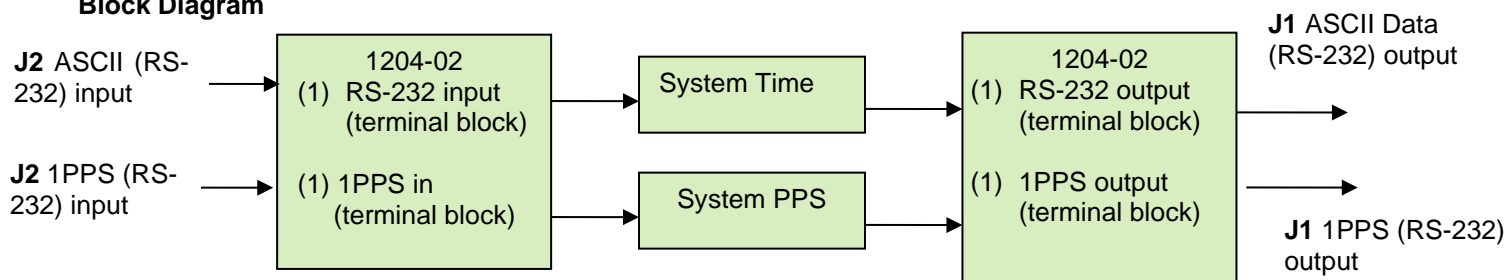
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/ASCII_TC_IO.htm

“Item” 1204-02 in Arena:

Schematic: (1204-1021-0200) In Arena: https://app.bom.com/items/detail-spec?item_id=1202845082&version_id=10221218728&orb_msg_single_search_p=1&redirect_seqno=5749350535 or <I:\New Released\PCB Documentation>

BOM: (1204-0020-F000) in Arena <https://app.bom.com/items/detail-spec> . This Option Cards is derived from the 1204-0020 FOO assembly).

Block Diagram

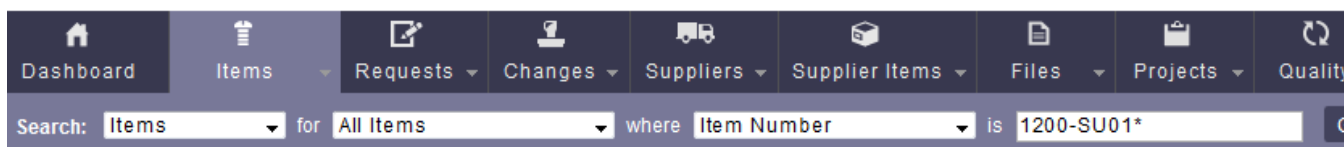


1204-02 Firmware versions

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- 1204-02 card: rt_oc02_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|---|---|--------------------|
| | | 1.0.0 | | |
| | | 1.0.1 | | |
| | | 1.0.2 | | |
| | | 1.0.3 | | |
| | | 1.14 (the current rev as of at least version 5.4.1) | Not sure at what version 1.14 was cut-in at, but it's in at least software versions 5.2.1, 5.3.0, 5.3.1 and 5.4.1 | |
| | | 1.2.1 (the current rev as of at least v5.8.5) | Not sure at what version 1.21 was cut-in at, but it's in at least software version 5.8.5 (if not even earlier) | |

1204-02 Hardware (SW0001” vs “SW0002”)

For hardware assemblies, refer to: (SP04) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |

SW0001” vs “SW0002” (Hardware configuration change)

- Refer to Salesforce Case 206133

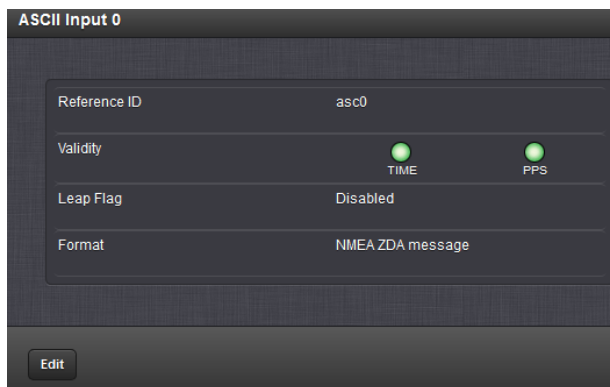
Q Keith Sent to Denis Reilly After 5.84 update, one of the 1204-02 card says SW001 while the other two say SW002 (relating to a recent ECO I saw going through. I can't find the ECO Number in Arena, at the moment) Why did it change on one card, but not the other two?

A reply from Denis Reilly (22 Aug 2019) Which ECO contains the update to the 1204-02 revision? Just to make life more complicated, **while those things show up in the UI as “SW0002”, they are really Hardware revisions.**

Inputs to 1204-02 card

ASCII Input Reference Status when using 1204-02 or 1204-04 Option Card

[Interfaces](#) -> [ASCII Input 0](#) page of browser



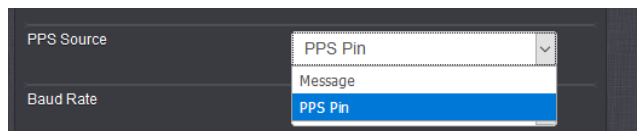
Available inputs to 1204-02 consist of both:

- 1PPS (Refer to “A” below)
- ASCII Data output timecode strings (Refer to “B” below)

A) **1PPS input reference when using 1204-02 Option Card

(“PPS Source”)

- Can be configured as either “**Message**” (default) or “**PPS Pin**”
- Configured in the [Interfaces](#) -> [ASCII Input](#) page of browser



Associated AR call in ktsif file for PPS source (for more info on KTSIF file, refer to: [ktsif.conf file](#))

- **AR_SetPpsSrc 0 0 1** to change the default “1PPS input Pin Source from “**Message**” (default selection) to “**PPS Pin**”

Note: If the “**AR_SetPpsSrc**” Apo call is not listed in the KTSIF file, the “**PPS Source**” field is set to “**Message**”. (default value) in this configuration, the PPS input will only be **valid** if a valid ASCII Timecode message is being received on the timecode input

- 1PPS input for sync can be obtained from either an external 1PPS source connected to the 1PPS input pin on the ASCII Option Card, OR from the ASCII message (As configured in the web browser’s “**PPS Source**” field, as shown below).
- The 1PPS input cannot be used without serial ASCII serial data input: **Per Dave Sohn (9 Mar 16)** The SW currently requires serial data messages to be received to utilize the 1PPS input pin. Without a serial data message being received in the UART, the reference is in a communication failure state, and doesn’t process the 1PPS, even from the physical pin.

An ASCII input message must be received within **TWO** seconds or a Comm message will be asserted

ASCII input message must also be present for PPS to be declared valid,

Until 1PPS input is either derived from the ASCII message or received on the 1PPS external input pin, ASCII PPS input will remain not valid.

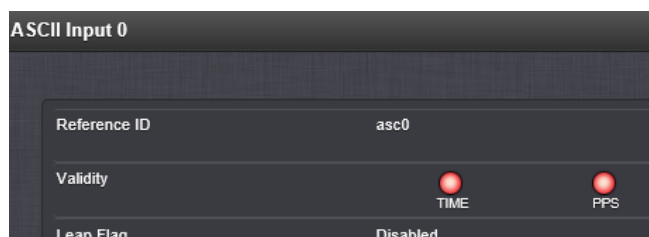
Email from Dave L (9 Mar 16) The 1204-02 1PPS input can be used for a 1PPS Source for the SecureSync. Set the ASCII Input 0, PPS Source to be = PPS Pin, then use the ASCII Input 0 in the reference priority table for the 1PPS Source.

Q Can the 1PPS Input be used as a 1PPS reference for the SecureSync by itself?

A No- The SW currently requires serial data messages to be received to utilize the 1PPS input pin. Without a serial data message being received in the UART, the reference is in a communication failure state, and doesn’t process the 1PPS, even from the physical pin. So, the 1PPS reference cannot be used on this card without the ASCII Signal present.

PPS input only (after loss of ASCII data by making baud rate incorrect, but PPS still good)

- PPS signal after being received on pin, but ASCII input “not good because of baud rate
- BOTH PPS and Time are NOT VALID (PPS is only valid if message is also received)
- 334 14:52:17 000 AR asc0 has lost communication



ASCII Input 0

Format Group: Auto

Format: Auto-Detect

Offset: 0

Timescale: UTC

PPS Source: Message

Baud Rate: 9600

Data Bits: 8 data bits

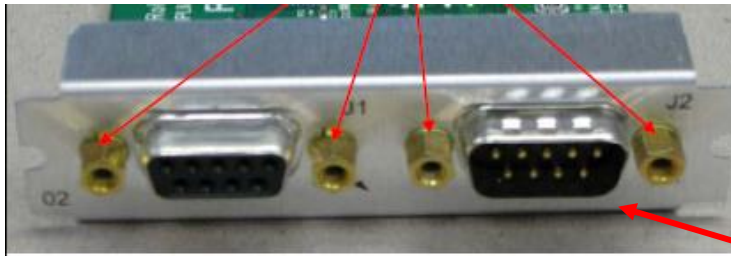
Parity: Parity none

Stop Bits: 1 Stop Bit

Source—Choices are:

- Message—The 1PPS on time point is extracted from the ASCII message received.
- PPS Pin—The 1PPS on time point is from the 1PPS input on the connector.

External 1PPS input pin



| Pin Number | Signal Name | Function |
|----------------------|--------------|----------------------|
| Top row of 5 pins | | |
| 1 | PPS_IN | 1PPS input |
| 2 | SERIAL_IN_RX | RS-232 Receive data |
| 3 | SERIAL_IN_TX | RS-232 Transmit data |
| 4 | N.C. | No connection |
| 5 | GND | Ground |
| Bottom row of 4 pins | | |

1PPS input circuit (“PPS_IN”/ (“B_PPS_IN”)

- Refer to schematic (1204-1021-0200) In Arena: https://app.bom.com/items/detail-spec?item_id=1202845082&version_id=10221218728&orb_msg_single_search_p=1&redirect_seqno=5749350535

J2 pin 1 (page 6 of schematic) -> **L5/R6/U5** (page 5 of schematic) -> **U1 pin 66** (page 3 of schematic)

U5= 74LVC1G14 (logic inverter)

U1= LFE2-12E-6QN208I (Lattice FPGA)

Per Tom Richardson (14 Jun 18)

1pps in on the 1204-02 card has a 50 ohm termination and goes to a Schmitt-trigger inverter (U5) before going to the FPGA.

Input capacitance is about 100 pF

Inputs will accept 0 to 5 volt signal but it is clamped internally at 3.3 volts and ground.

Positive input voltage threshold is 1.87 volts max

Negative input threshold voltage is 1.14 volts max

ASCII Input 0

Format Group:

Format:

Offset:

Timescale:

PPS Source:

Baud Rate:

Data Bits:

Parity:

Stop Bits:

Source—Choices are:

- Message—The 1PPS on time point is extracted from the ASCII message received.
- PPS Pin—The 1PPS on time point is from the 1PPS input on the connector.

ASCII Input 0 ✕

| | | |
|--------------|---|--|
| Reference ID | asc0 | |
| Validity | ● TIME | ● PPS |
| Leap Flag | Disabled | |
| Format | Auto-Detect | |

Classic interface web browser (versions 5.0.2 and below)

Setup /Inputs/ASCII TIMECODE

| INPUTS SETUP - ASCII TIMECODE (SLOT6) | |
|--|-------------|
| Offset | 0 |
| Time Scale | UTC |
| Local Clock | |
| Format | Auto-detect |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |
| <input type="button" value="Submit"/> <input type="button" value="Reset"/> | |

Setup/Outputs/ASCII TIMECODE

| OUTPUTS SETUP - ASCII TIMECODE (SLOT6) | |
|--|----------------------|
| Signature Control | No Signature Control |
| First Format | Spectracom Format 2 |
| Second Format | None |
| Third Format | None |
| Mode | Broadcast |
| Time Scale | UTC |
| Local Clock | |
| Request Character | T |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |
| <input type="button" value="Submit"/> <input type="button" value="Reset"/> | |

Baud Rate= Programmable baud rates are 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 (9600 is factory default)

Status/Inputs/ASCII TIMECODE

| INPUTS STATUS - ASCII TIMECODE (SLOT6) | |
|--|-------------|
| Reference ID | asc0 |
| 1PPS Validity | Not Valid |
| Time Validity | Not Valid |
| Leap Flag | Disabled |
| Offset | 0 |
| Time Scale | UTC |
| Local Clock | INVALID |
| Format | Auto-detect |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |

Status/Outputs/ASCII TIMECODE

| OUTPUTS STATUS - ASCII TIMECODE (SLOT6) | |
|---|----------------------|
| Signature Control | No Signature Control |
| First Format | NMEA GGA Message |
| Second Format | NMEA RMC Message |
| Third Format | NMEA ZDA Message |
| Mode | Broadcast |
| Time Scale | UTC |
| Local Clock | EST |
| Request Character | T |
| Baud Rate | 4800 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |

B) INPUT ASCII messages

1.DAGR / IS-GPS-154

**** ASCII 5101/DAGR GPS receiver (“Defense Advanced GPS Receiver” interface)**

Also refer to: <I:\Customer Service\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\GPS>

Reference: IS-GPS-154

Question from a customer to Tony DiFlorio

Tried a quick search and though I had looked at this before but failing to find it now. The SecureSync – does it conform to IS-GPS-154 interface specification? If so, is it called out somewhere in your documentation or datasheets?

Email from Tony to Dave Sohn

I did some more searching on the web for this spec **IS-GPS-154**. It has to do with a DAGR (Defense Advanced GPS Receiver) interface. See <http://contracting.tacom.army.mil/majorsys/jab/DAGR%20Interface%20Specification.pdf>. I believe we comply from internal past discussions, but I cannot find a reference to it in our manual or datasheet. Help!!!!

Reply from Dave Sohn (12/21)

Section 5.2.1 of ICD-GPS-154 covers the HAVE QUICK ToD interface with the message structure shown in Table 5-2. You can see the equivalent information in ICD-GPS-060 section 4.4.5 with the message structure shown in Figures 8 and 9. We support the ICD-GPS-060A HAVE QUICK format in SecureSync, which should be the same format as ICD-GPS-154.

Syncing SecureSync via a DAGR

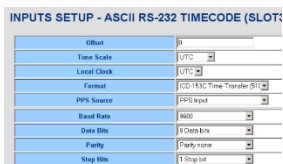
- Requires Model 1204-02 RS-232 Input/Option Card be installed.
- DAGR normally sends a once-per-second 5101 message to the SecureSync (it does not use interrogation).
- This message reports to the SecureSync the DAGR’s receiver current TFOM value.

If reported TFOM is TFOM 3 or greater, we accept the message.

But if reported TFOM is TFOM 4 or greater, we deny the message and we either switch to another input reference (if present and valid) or go into Holdover alarm. Once message is TFOM 3 or less, we start to use the messages again - going back into sync.

Note: (7 Jan 2013) Starting in V4.8D, Paul Myers is going to allow SecureSync to accept TFOM 6 and below (it will reject messages with TFOM 7 or higher).

According to Paul Myers, if the DAGR goes to TFOM 7 or greater, the messages will stop being outputted, until TFOM drops, resulting in in Holdover/possible loss of sync.



| INPUTS SETUP - ASCII RS-232 TIMECODE (SLOT) | |
|---|----------------------------|
| Offset | 0 |
| Time Scale | UTC |
| Local Clock | UTC |
| Format | CDR 15C Time Transfer (51) |
| PPS Source | PPS Input |
| Fixed Rate | None |
| Data Bits | 1 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |

DAGR reported TFOM

The DAGR reports its TFOM value in its ASCII output. If the reported TFOM (not the SecureSync’s TFOM) is 3 or lower, we will sync to the ASCII input. But if the reported TFOM is greater than 3, the SecureSync will go into Holdover mode.

Software issue with DAGR input

(Applicable to Versions 4.8.7 and below)

(12/5/12) Mark Day’s customer (Rockwell Collins UK) reported the SecureSync wasn’t syncing to the DAGR input. Paul Myers found an issue with reading the binary input data. This should be fixed in the upcoming version 4.8.8 release (scheduled for ~14 Dec 2012). Refer to Mantis Case 1914 for more info,

Troubleshooting Holdover/ Time Sync/Reference Change alarms with DAGR input (Refer to Salesforce case 6785)

Can you do us a favor and ask them to take two screenshots for us, from the web browser. We would like to see a screenshot of the Setup -> Reference Priority table and a screenshot of the Status-> Time and Frequency page of the browser. These will show us what other input references they may have available to the unit and what other references besides the DAGR that the SecureSync is configured to sync to.

Based on the logs, we have a pretty good idea on what is likely happening with the SecureSyncs. While syncing to the DAGR (via ASCII data), the SecureSync expects a data stream from the DAGR every second. If for any reason that message is not available every second, the SecureSync will assert the Holdover alarm, until the SecureSync receives the message again from the DAGR. Then, it will go back into sync and will clear the Holdover alarm. While the signal is not present, as long as there is a lower priority input reference (as configured in the Reference Priority table) that is valid, the SecureSync will automatically switch to this "backup" reference, without the Holdover alarm being asserted (resulting in a seamless transition, with the exception of a log entry being asserted that a reference change occurred.). There were a couple of these logs in the logs.

We don't suspect there are any problems with the SecureSync itself. We suspect either:

- 1) There are periods of time (sometimes even for a second or so) that the DAGR is not outputting the necessary once-per-second data stream that the SecureSync needs in order to remain fully synced to the DAGR. One reason that we know of that the DAGR will stop outputting the data stream is if its TFOM goes to 7 or greater. This may be occurring and we are not aware of this condition occurring. We just know the data is no longer present when we expect to see it.
- 2) The DAGR's TFOM value is periodically a 4 or greater, resulting in the SecureSync automatically disregarding the data that the DAGR is sending (though it's still sending the necessary message each second, the data will be ignored while it's in this state).

Our recommendation to help figure out exactly what is happening is to capture the messages from the DAGR while the SecureSync is in this alarm condition. While in this alarm condition, they should switch the DAGR over to a terminal emulator and capture the data (or loss of data) that is occurring at that time.

To help notify them on exactly when to capture the data, and if they haven't done so already and if they have an SNMP Manager available on the network, is to monitor for the SNMP Holdover trap being sent from the SecureSync. This is the indication that the DAGR is not sending useable data or is not sending data at all, resulting in the alarms being asserted. This is when they should start capturing the messages from the DAGR. Then send the logs to us so that we can review them in detail.

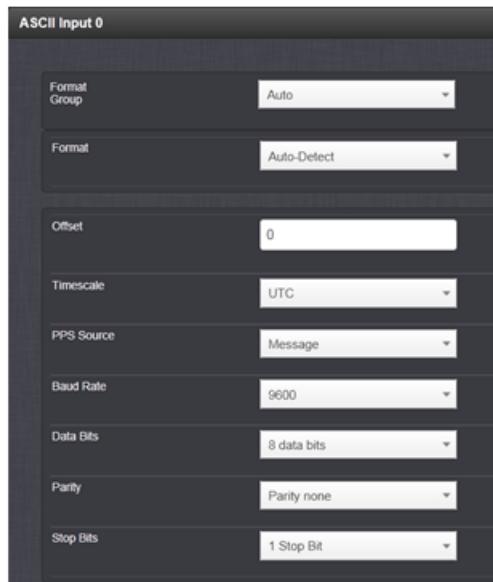
Archive version 4.8.8 (Dec 2012, ECN 3099)

Release Notes from Paul Myers: Corrected DOY processing. NOT SURE why this problem was noticed, because original code seemed valid after code inspection. NOT use of 5101 message assumes customer has some way to GURRANTEE it is always provided. SAASM GPS receivers usually are requested to output this message by the receiver. In our case we CANNOT yet request this message be output and depend on the user setting up the SAASM GPS to output the 5101 message. ALL OTHER ICD-153C messages are ignored.

RS-232/RS-485 input

A) Newer web browser (versions 5.1.2 and above)

- INTERFACES -> OPTION CARDS page of the new



ASCII Input 0

Format Group: Auto

Format: Auto-Detect

Offset: 0

Timescale: UTC

PPS Source: Message

Baud Rate: 9600

Data Bits: 8 data bits

Parity: Parity none

Stop Bits: 1 Stop Bit

➤ **Format Group:** configures the message format type. Choices are:

- Auto
- Spectracom
- NMEA
- ICD-153

➤ **Format:** Configures the format message being provided to SecureSync's input port according to the choice of format group chosen in the Format Group field.

➤ **Offset**—provides the ability to account for ASCII input cable delays or other latencies in the ASCII input. The Offset value is entered and displayed in nanoseconds (ns). The available Offset range is -500 to +500 ~~ms~~.

➤ **Source**—Choices are:

- Message: the 1PPS on time point is extracted from the ASCII message received.
- PPS Pin: The 1PPS on time point is from the 1PPS input on the connector.

➤ **Baud Rate:** Determines the speed at which the input port will operate.

➤ **Data Bits:** Defines the number of Data Bits for the input output.

➤ **Parity:** Configures the parity checking of the input port.

➤ **Stop Bits:** Defines the number of Stop Bits for the input port.

Format Group" field

- Set to "NMEA": For GGA/RMC/ZDA ASCII input

C) Classic interface web browser (versions 5.0.2 and below)

Setup -> Inputs -> ASCII RS-232

INPUTS SETUP - ASCII RS-232 TIMECODE (SLOT1)

| | |
|-------------|-------------------------------|
| Offset | 0 |
| Time Scale | UTC |
| Local Clock | UTC |
| Format | ICD-153C Time Transfer (S101) |
| PPS Source | PPS Input |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |

Choices are either "Message" or "PPS input"

Auto-detect
Spectracom Format 0
Spectracom Format 1
Spectracom Format 2
Spectracom Format 3
Spectracom Format 7
Spectracom Format 8
Spectracom Format 9
NMEA GGA Message
NMEA RMC Message
NMEA ZDA Message
ICD-153C Time Transfer (S101)
EndRun Time Format
EndRunX Extended Time Format

Setup -> Outputs -> ASCII RS-232

OUTPUTS SETUP - ASCII RS-232 TIMECODE (SLOT1)

| | |
|-------------------|-----------------------|
| Signature Control | Output Always Enabled |
| First Format | Spectracom Format 0 |
| Second Format | None |
| Third Format | None |
| Mode | Broadcast |
| Time Scale | UTC |
| Local Clock | UTC |
| Request Character | T |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |

Spectracom Format 0
None
Spectracom Format 0
Spectracom Format 1
Spectracom Format 1S
Spectracom Format 2
Spectracom Format 3
Spectracom Format 4
Spectracom Format 7
Spectracom Format 8
Spectracom Format 9
NMEA GGA Message
NMEA RMC Message
NMEA ZDA Message
BBC-01 Format
BBC-02 Format
BBC-03 Format
BBC-04 Format
BBC-05 Format (RMC)
ICD-153C Buffer Box (253)
ICD-153C Time Transfer (S101)

ICD-153C Buffer Box (253)
ICD-153C Time Transfer (S101)
ICD-153C Current Status (S046)
EndRun Time Format
EndRunX Extended Time Format

Troubleshooting ASCII input issues (ASCII input not valid)

- Refer to Salesforce cases such as 176778 (GPZDA ASCII input issues)

1. Log entries associated with ASCII Option Cards

A) Timing log

Established communication / Lost communication

```
Nov 21 06:36:07 4 4.ntp.dks: [system] 2018 325 06:36:07 000 AR asc0 has established communication.
Nov 21 06:40:59 4 4.ntp.dks: [system] 2018 325 06:40:59 000 AR asc0 has lost communication.
Nov 21 06:41:16 4 4.ntp.dks: [system] 2018 325 06:41:16 000 AR asc0 has established communication.
Nov 21 06:42:04 4 4.ntp.dks: [system] 2018 325 06:42:04 000 AR asc0 has lost communication.
Nov 21 06:43:07 4 4.ntp.dks: [system] 2018 325 06:43:07 000 AR asc0 has established communication.
Nov 21 07:02:29 4 4.ntp.dks: [system] 2018 325 07:02:29 000 AR asc0 has lost communication.
Nov 21 07:03:07 4 4.ntp.dks: [system] 2018 325 07:03:07 000 AR asc0 has established communication.
Nov 21 07:05:32 4 4.ntp.dks: [system] 2000 001 00:00:01 000 AR asc0 has established communication.
```

- **has established communication:** ASCII data is **now being detected** (data is present, port settings -such as baud rate, flow control, etc are all correct)
- **has lost communication.** ASCII data is **no longer being detected** (a “valid” ASCII message has not been received within the last TWO seconds, serial cable is no longer connected, ports settings have changed,

Note: An ASCII input message must be received within **TWO** seconds or “**lost communication**” message will be asserted (there is built-in buffer of **one** additional second added, so its **two** seconds instead of just one second before asserting this message)

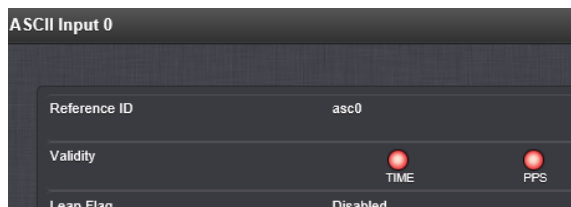
2. Is the ASCII “Time” status indicator currently RED and the “PPS” status currently YELLOW

- This indicates Phase Validation is enabled and is currently invalidating the ASCII input due to phase errors.
- Refer to (in this doc): [Smart Reference Monitor \(when enabled\)](#)

3. Are the ASCII input port configurations (baud rate, stop bits etc) configured to match the Master’s output port settings?
4. Is the corresponding input PPS being received from the “Message”? Or from a separate PPS on the ASCII “Pin”
5. Is a 1PPS input being received, on the ASCII pin, with no corresponding ASCII string also being received)?

PPS input only (after loss of ASCII data by making baud rate incorrect)

- PPS signal after being received on pin, but ASCII input “not good: because of baud rate
- BOTH PPS and Time are NOT VALID (PPS is only valid if an ASCII message is also received)
334 14:52:17 000 AR asc0 has lost communication



6. Temporarily Loop the ASCII Output to ASCII Input

To help troubleshoot input reference issues on Option Cards, disconnect the desired reference from the unit and then loop a similar output back into the desired input. If SecureSync declares the input is valid, the issue is with the external reference (not with the SecureSync or the Option Card). Could be a signal level issue, impedance mis-match issue, out of sync reference, incorrectly configured reference, etc.

Email Keith sent (28 Nov 2018) Another easy test to perform is to temporarily loop the Serial cable from one of the two ASCII output ports (instead of from the eLoran) into the ASCII input port. With the ASCII output port also configure to output ZDA at 9600, 8, N, 1 and with the ASCII serial cable looped with one end connected to the ASCII in and the other end to an ASCII out, the ASCII input reference should have both the Time and PPS indicators turn green very shortly thereafter. In addition to the test I've been running with ZDA output from one unit into another v5.8.2 unit (with no issues observed), I just also ran this look-test just to confirm there are no issues with it being able to declare validity to its own output (not necessarily recommended for normal operation, but a good/simple test to verify the input port is still accepting ZDA messages and to also verify the cable.

If this loop test does allow the reference to be declared valid, we will then need to see what is going on with eLoran device.

Please let me know if the ASCII input goes valid after looping the ASCII output to the ASCII input (with the input as well as recommended both output ports- so that you don't have to worry about which port to connect with set to ZDA, 9600., 8, N 1)

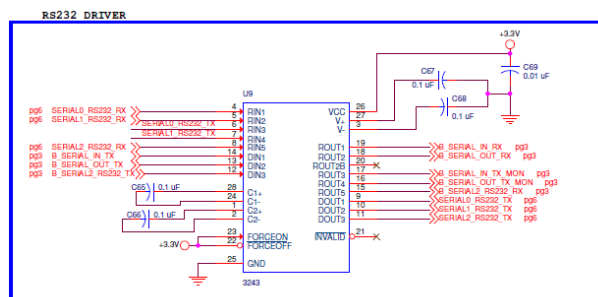
OUTPUTS from the 1204-02 card

A) Available outputs from 1204-02 consist of both:

- **1PPS** (Refer to “A” below)
- **ASCII Data** output timecode strings (Refer to “B” below)

A) 1PPS output (RS-232) signal

1. RS-232 pin-out (DCE device)



RS-232 driver (U9) U050R-3243-000P (Texas Instruments Max3243E)

In Arena: [https://app.bom.com/items/detail-](https://app.bom.com/items/detail-attach?item_id=1202847662&version_id=10228401058&orb_msg_single_search_p=1)

[attach?item_id=1202847662&version_id=10228401058&orb_msg_single_search_p=1](https://app.bom.com/items/detail-attach?item_id=1202847662&version_id=10228401058&orb_msg_single_search_p=1) or

www.ti.com/lit/ds/symlink/max3243.pdf

2. RS-232 signal levels (DCE device)

- The 1PPS output is a rising edge, 200ms pulse with no offset.

Q At the J1 output connector, there is a 1 PPS output. What is the signal level of that 1 PPS output on a (1204-02)? Is that RS-485, TTL, or other level?

A. Reply from Tom Richardson (22 Jan 16) If you are talking about pin 1 of J2 on the board it is TTL 5V signal.

Q (from Josh Goh to Dave Sohn) Do you have a specifications document that explains the differences between the different types of 1PPS cards? The customer wants to know what difference of PPS output configuration between the 04 module and other 1PPS cards 18 / 19 / 21 / 2B. **It seems there are no parameter of pulse width, offset, and polarity at the configuration menu of the 04 module.** Could you please tell us the actual specs of the 1PPS output from the module?

A Reply from Dave S (6 Mar 18) The 1204-04 is an ASCII Time Code I/O card that includes a physical connection for 1PPS input and output. The 1PPS output is a rising edge 200ms pulse with no offset.

The other cards are all 1PPS cards with individual 1PPS configurability. The difference between them is their signaling type.

1204-18 -> TTL level

1204-19 -> 10V level

1204-21 -> RS-485 level

1204-2B -> fiber-optic

Rise-time for 1PPS output: Not specified in SecureSync Option Card datasheet. But a customer indicated he was seeing rise-time of around 6 microseconds???

Intermittently no 1PPS output present

- Refer to Case 6536 (for Nokia) in SAP

B) ASCII Data (RS-232) OUTPUT signal

Q We are considering use of the RS-232 NMEA output module. Assuming it outputs data reflective of the source currently used by the SecureSync. For example, if manual coordinates were entered rather than using GPS coordinates automatically, would the NMEA sentences include the manually entered coordinates in lieu of what would normally come from GPS?

A. NMEA outputs are reflective of the current system information including position. Assuming the position information was set manually and accepted by the GPS reference/receiver, they would be used for the NMEA data. Refer to the SecureSync manual for the specific NMEA message formats provided.

BBC ASCII Formats

- The four BBC outputs (BBC-01 through BBC-02) are only available from an RS-232 output port. They are **NOT** available for selection from an RS-485 output. A Model 1204-02 (RS-232) Option Card must be installed if the BBC outputs are desired. They cannot be outputted from this Model 1204-04 (RS-485) Option Card.

See the Important Note about this below:

Important Note: The four BBC ASCII Formats are only available via RS-232 output (from an installed Model 1204-02 Option Card). The four BBC formats are NOT available via RS-485 (from an installed Model 1204-04 RS-485 Option Card).

Potential software issue with Format 2 Sync Status character not working

- Refer to Case 206133 (for Bombardier)
- I noticed the sync status is always a space (right after boot, through sync). Not indicating it's out of sync.

Their radios are seeing an issue with 1204-02 cards (outputting Format 2) which appears to be related to the completion of a GPS survey (is the issue due to position not being stored in receiver, and passed along to the output format till survey is complete?)

A) Newer web browser (versions 5.1.2 and above)

➤ INTERFACES -> OPTION CARDS page of the new

ASCII Input 0

Format Group

Auto

Format

Auto-Detect

Offset

0

Timescale

UTC

PPS Source

Message

Baud Rate

9600

Data Bits

8 data bits

Parity

Parity none

Stop Bits

1 Stop Bit

➤ **Format Group:** Configures the message format type. Choices are:

○ Auto

○ Spectracom

○ NMEA

○ ICD-153

➤ **Format**—Configures the format message being provided to SecureSync's input port according to the choice of format

➤ **Offset:** account for ASCII input cable delays or other latencies in the ASCII input. The Offset value is entered and

➤ **Timescale:** See Notes below

➤ **PPP Source**—Choices are:

○ **Message:** The 1PPS on time point is extracted from the ASCII message received.

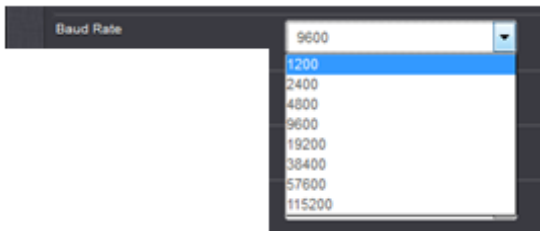
○ **PPS Pin:** The 1PPS on time point is from the 1PPS input on the connector.

➤ **Port Settings:** See additional info below

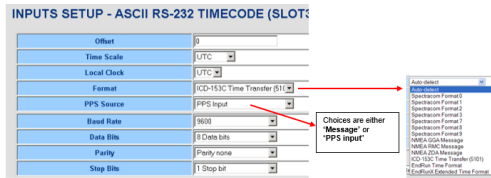
- **Timescale:** Used to select the time base for the incoming ASCII time code data. The entered Timescale is used by the system to convert the time in the incoming ASCII data stream to UTC time for use by the System Time. The available choices are:
 - **UTC:** UTC is also referred to as ZULU time.
 - **TAI:** Temps Atomique International,
 - **GPS:** the raw GPS time as transmitted by the GNSS satellites (as of September, 2013, this is currently 16 seconds ahead of UTC time).
 - A local clock set up through the Time Management Page—This option will appear under the name of the local clock you have set up. Local timescale allows a Local Clock to apply a time offset for Time Zone and DST correction.
- The incoming IRIG input time information may be provided as local time, but System Time may be configured as UTC time, so internal computations need to be performed. With the Timescale field set to "Local", select the name of a previously created Local Clock. The Time Zone and DST rules, as configured in the Local Clock will be applied to the front panel time display
- **NOTE:** The Timescale of the ASCII input (as configured in the ASCII time source) must be set correctly, especially if other input references are enabled. Failure to configure the Timescale of the ASCII input correctly could result in time jumps occurring in the System Time when input reference changes occur. These time jumps could affect NTP and normal operation of the system.

Baud Rate: Determines the speed at which the input port will operate.

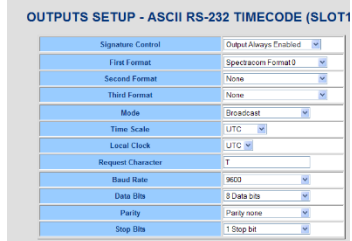
- **Data Bits:** Defines the number of Data Bits for the input output.
- **Parity:** Configures the parity checking of the input port.
- **Stop Bits:** Defines the number of Stop Bits for the input port.



A) Classic interface web browser (versions 5.0.2 and below)
Setup -> Inputs -> ASCII RS-232



Setup -> Outputs -> ASCII RS-232



Setup/Inputs

INPUTS SETUP - ASCII TIMECODE (SLOT6)

| | |
|-------------|-------------|
| Offset | 0 |
| Time Scale | UTC |
| Local Clock | |
| Format | Auto-detect |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |

Submit Reset

Setup/Outputs

OUTPUTS SETUP - ASCII TIMECODE (SLOT6)

| | |
|-------------------|----------------------|
| Signature Control | No Signature Control |
| First Format | Spectraoom Format 2 |
| Second Format | None |
| Third Format | None |
| Mode | Broadcast |
| Time Scale | UTC |
| Local Clock | |
| Request Character | T |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |

Submit Reset

Baud Rate= Programmable baud rates are 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 (9600 is factory default)

Status/Inputs

INPUTS STATUS - ASCII TIMECODE (SLOT6)

| | |
|---------------|-------------|
| Reference ID | asc0 |
| 1PPS Validity | ALARM |
| Time Validity | ALARM |
| Offset | 0 |
| Time Scale | UTC |
| Format | Auto-detect |
| Leap Flag | Disabled |

Status/Outputs

OUTPUTS STATUS - ASCII TIMECODE (SLOT6)

| | |
|-------------------|----------------------|
| Signature Control | No Signature Control |
| Format | 1 65535 65535 |
| Mode | Immediate |
| Time Scale | UTC |
| Request Character | T |

Model 1204-02 configuration FOR SINGARS

Setup -> **Outputs** page of the browser, select the 1204-02 Option Card

- **First Format field:** Select “**Current Status (5040)**”
- **Second Format field:** Select “**Time Transfer (5101)**”
- **Third Format field:** Select “**Buffer Box (253)**”
- **Mode:** Select Broadcast mode
- **9600 baud, 8 bit, 1 Stop bit, no parity**

Connect SecureSync 1PPS output to SINGARS

- Connect either the BNC 1PPS on rear panel of SecureSync or Pin 1 of the RS-232 DB port (50 ohm termination) to SINGARS

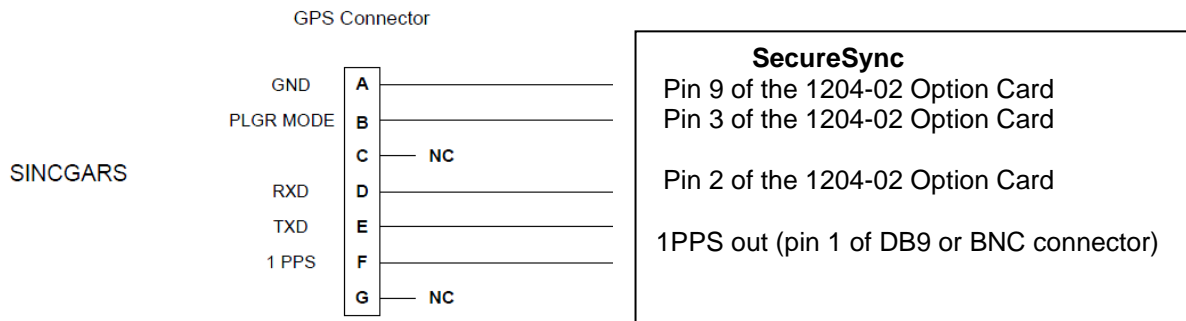


Figure 14. SINGARS-PI

Operation

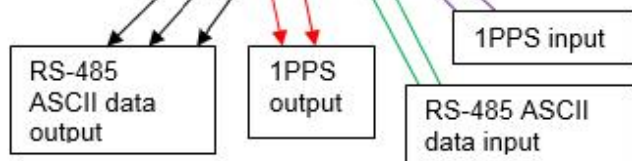
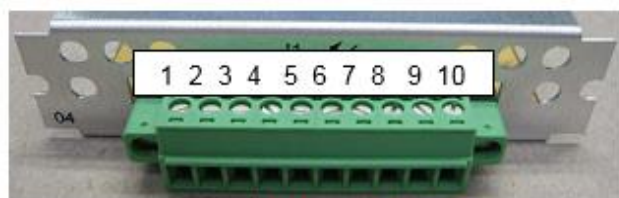
- A “**Current Status (5040)**” message will be outputted every second.
- A “**Time Transfer (5101)**” message will be outputted every second.
- A “**Buffer Box (253)**” message will be outputted every six seconds.

Troubleshooting ASCII Option cards

B) Reference Status table indicates input is not valid/not present (status indicator red or yellow- instead of green)

- Refer to: [**Troubleshooting Option Card input issues](#)

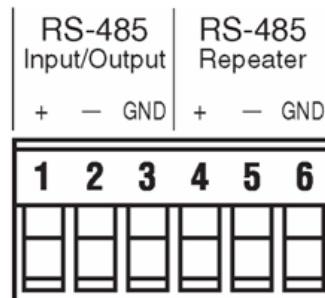
***(1204-04) ASCII RS-485 In/Out Option Card



| Pin Number | Signal Name | Function |
|------------|-----------------|----------------------|
| 1 | SERIALTX_RS485+ | + RS-485 data output |
| 2 | SERIALTX_RS485- | - RS-485 data output |
| 3 | GND | Ground |
| 4 | PPS_OUT_RS485+ | + 1PPS output |
| 5 | PPS_OUT_RS485- | - 1PPS output |
| 6 | SERIALRX_RS485+ | + RS-485 data input |
| 7 | SERIALRX_RS485- | - RS-485 data input |
| 8 | GND | Ground |
| 9 | PPS_IN_RS485+ | + 1PPS input |
| 10 | PPS_IN_RS485- | - 1PPS input |

Connection to a Spectracom TimeView (RS-485 input) display clock

Back of the TimeView display clock



Insert supplied 120 ohm resistor into holes 1 and 2 of this terminal block connector

1204-04 in Online user guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/ASCII_TC_IO.htm

“Item” 1204-04 in Arena: https://app.bom.com/items/detail-bom?item_id=1220915747&version_id=10520896308

Schematic: (1204-1021-0200) In arena: https://app.bom.com/items/detail-spec?item_id=1202845082&version_id=10221218728

BOM: (1204-0020-F000) In arena: https://app.bom.com/items/detail-spec?item_id=1202845082&version_id=10221218728

10 Pin Terminal block connector for 1204-04 card

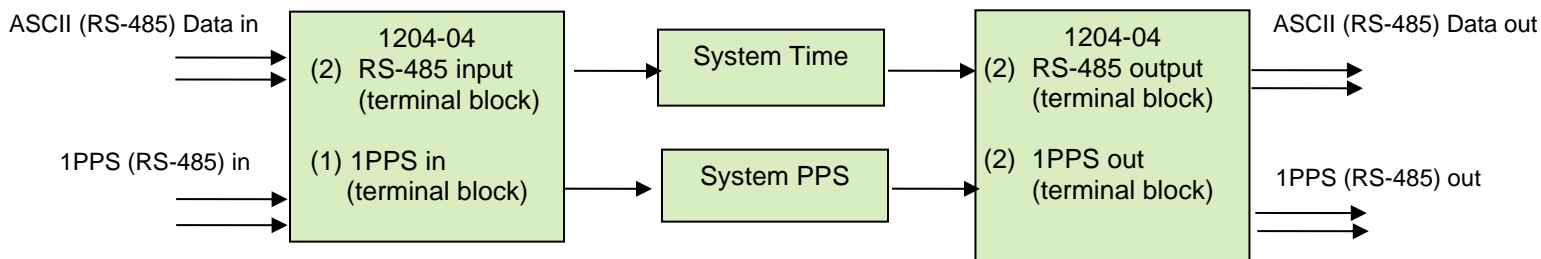


Our P/N: J900R-0101-022J (in Arena) https://app.bom.com/items/detail-spec?item_id=1202843926&version_id=10303495198

Manufacturer and MFG P/N: Phoenix Contact 1827787 Refer to:

<https://www.phoenixcontact.com/online/portal/us/?uri=pxc-oc-itemdetail:pid=1827787&library=usen&pcck=P-11-02-11&tab=1&selectedCategory=ALL>

Block Diagram



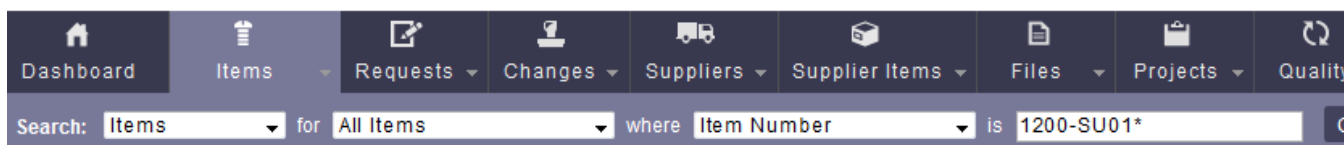
For software assembly versions, refer to: (1204-SHxx, SP1xx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

1204-04 Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- 1204-04 card: rt_oc04_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|--|--|--------------------|
| | | 1.14 (current as of at least version 5.4.1) | Not sure at what version 1.14 was cut-in at, but it's in at least software versions 5.2.1 and above | |
| | | 1.2.1 (the current rev as of at least 5.8.5) | Not sure at what version 1.21 was cut-in at, but it's in at least software version 5.8.5 (if not even earlier) | |

1204-04 hardware changes

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |
| | | | | |
| | | | | |

INPUTS to 1204-04 Cards

- Available inputs to 1204-04 consist of both:
 - **1PPS** (Refer to “A” below)
 - **ASCII Data** output timecode strings (Refer to “B” below)

ASCII Input Reference Status

Interfaces -> *ASCII Input 0* page of browser

| | |
|--------------|------------------|
| Reference ID | asc0 |
| Validity | TIME PPS |
| Leap Flag | Disabled |
| Format | NMEA ZDA message |

Edit

A) **1PPS input reference when using 1204-04 Option Card

(“PPS Source”)

- Can be configured as either “**Message**” (default) or “**PPS Pin**”
- Configured in the **Interfaces** -> **ASCII Input** page of browser

PPS Source

PPS Pin

Baud Rate

Associated AR call in ktsif file for PPS source

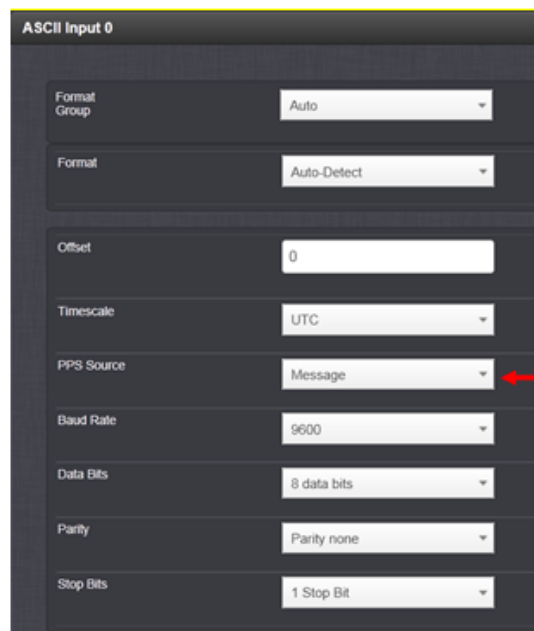
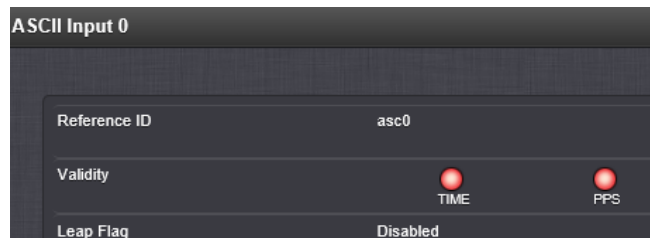
- **AR_SetPpsSrc 0 0 1** to change the default “1PPS input Pin Source from “**Message**” (default selection) to “**PPS Pin**”

Note: If the “AR_SetPpsSrc” call is NOT listed in KTSIF file, the “PPS Source” is set to “**Message**”. The PPS input will only be valid when a valid ASCII data stream is present on the Timecode input

- 1PPS input for sync can be obtained from either an external 1PPS source connected to the 1PPS input pin on the ASCII Option Card, OR from the ASCII message (As configured in the web browser’s “PPS Source” field, as shown below).
- The 1PPS input can be used without serial input: **Per Dave Sohn (9 Mar 16)** The SW currently requires serial data messages to be received to utilize the 1PPS input pin. Without a serial data message being received in the UART, the reference is in a communication failure state, and doesn’t process the 1PPS, even from the physical pin.

PPS input only (after loss of ASCII data =by making baud rate incorrect, but PPS still good)

- PPS signal after being received on pin, but ASCII input “not good because of baud rate
- BOTH PPS and Time are NOT VALID (PPS is only valid if message is also received)
- 334 14:52:17 000 AR asc0 has lost communication



Source—Choices are:

- Message—The 1PPS on time point is extracted from the ASCII message received.
- PPS Pin—The 1PPS on time point is from the 1PPS input on the connector.

External 1PPS (RS-485) input pin

1PPS input pins

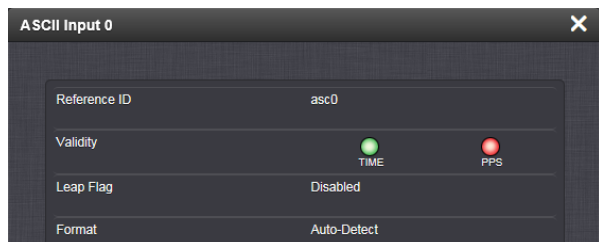


RS-485 1PPS input pins
(Pins 9 and 10)

| Pin Number | Signal Name | Function |
|------------|-----------------|----------------------|
| 1 | SERIALTX_RS485+ | + RS-485 data output |
| 2 | SERIALTX_RS485- | - RS-485 data output |
| 3 | GND | Ground |
| 4 | PPS_OUT_RS485+ | + 1PPS output |
| 5 | PPS_OUT_RS485- | - 1PPS output |
| 6 | SERIALRX_RS485+ | + RS-485 data input |
| 7 | SERIALRX_RS485- | - RS-485 data input |
| 8 | GND | Ground |
| 9 | PPS_IN_RS485+ | + 1PPS input |
| 10 | PPS_IN_RS485- | - 1PPS input |

- Until 1PPS input is either derived from the ASCII message or received on the 1PPS external input pin, ASCII PPS input will remain not valid.

1PPS input reference when using 1204-02 or 1204-04 Option Card



ASCII input message must also be present for 1PPS input to be valid

Until 1PPS input is either derived from the ASCII message or received on the 1PPS external input pin, ASCII PPS input will remain not valid.

Email from Dave L (9 Mar 16) The 1204-02 1PPS input can be used for a 1PPS Source for the SecureSync.

Set the ASCII Input 0, PPS Source to be = PPS Pin, then use the ASCII Input 0 in the reference priority table for the 1PPS Source.

Q Can the 1PPS Input be used as a 1PPS reference for the SecureSync by itself?

A No- The SW currently requires serial data messages to be received to utilize the 1PPS input pin. Without a serial data message being received in the UART, the reference is in a communication failure state, and doesn't process the 1PPS, even from the physical pin. So, the 1PPS reference cannot be used on this card without the ASCII Signal present.

ASCII Input 0

Format Group:

Format:

Offset:

Timescale:

PPS Source:

Baud Rate:

Data Bits:

Parity:

Stop Bits:

Source—Choices are:

- Message—The 1PPS on time point is extracted from the ASCII message received.
- PPS Pin—The 1PPS on time point is from the 1PPS input on the connector.

ASCII Input 0 ✕

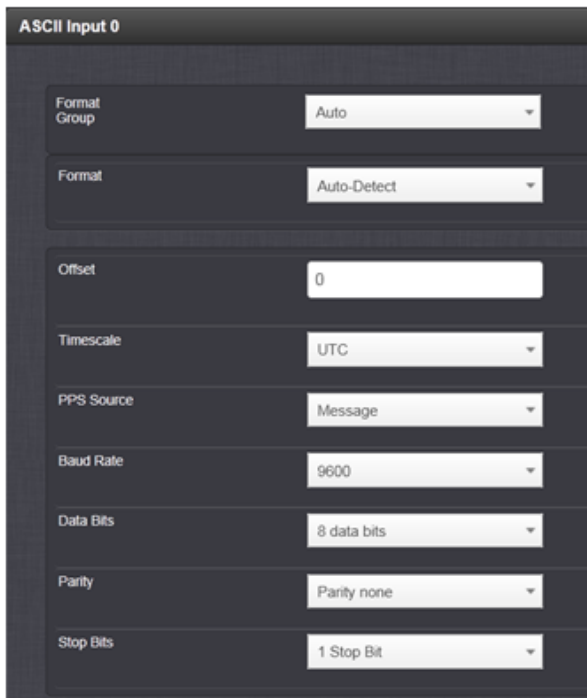
Reference ID: asc0

Validity: ● TIME ● PPS

Leap Flag: Disabled

Format: Auto-Detect

A) Newer web browser (versions 5.1.2 and above)



ASCII Input 0

Format Group: Auto

Format: Auto-Detect

Offset: 0

Timescale: UTC

PPS Source: Message

Baud Rate: 9600

Data Bits: 8 data bits

Parity: Parity none

Stop Bits: 1 Stop Bit

➤ **Format:** Configures the format message being provided to SecureSync's input port according to the choice of format group chosen in the Format Group field.

➤ **Format Group:** Configures the message format type. Choices are:

- Auto
- Spectracom
- NMEA
- ICD-153
- EndRun

NOTE: If **Auto** is chosen as the format group, the format will automatically be Auto-detect. SecureSync will attempt to identify the format of the incoming ASCII message.

➤ **Offset:** Provides the ability to account for ASCII input cable delays or other latencies in the ASCII input. The Offset value is entered and displayed in nanoseconds (ns). The available Offset range is -500 to +500 ms.

➤ **Source:** Choices are:

- Message: The 1PPS on time point is extracted from the ASCII message received.
- PPS Pin: The 1PPS on time point is from the 1PPS input on the connector.

➤ **Baud Rate:** Determines the speed at which the input port will operate.

➤ **Data Bits:** Defines the number of Data Bits for the input output.

➤ **Parity:** Configures the parity checking of the input port.

➤ **Stop Bits:** Defines the number of Stop Bits for the input port.

B) Classic interface web browser (versions 5.0.2 and below)

Setup /Inputs/ASCII TIMECODE

| INPUTS SETUP - ASCII TIMECODE (SLOT6) | |
|--|--------------------------|
| Offset | 0 |
| Time Scale | UTC |
| Local Clock | <input type="checkbox"/> |
| Format | Auto-detect |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |
| <input type="button" value="Submit"/> <input type="button" value="Reset"/> | |

Setup/Outputs/ASCII TIMECODE

| OUTPUTS SETUP - ASCII TIMECODE (SLOT6) | |
|--|--------------------------|
| Signature Control | No Signature Control |
| First Format | Spectracom Format 2 |
| Second Format | None |
| Third Format | None |
| Mode | Broadcast |
| Time Scale | UTC |
| Local Clock | <input type="checkbox"/> |
| Request Character | T |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |
| <input type="button" value="Submit"/> <input type="button" value="Reset"/> | |

Baud Rate= Programmable baud rates are 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 (9600 is factory default)

Status/Inputs/ASCII TIMECODE

| INPUTS STATUS - ASCII TIMECODE (SLOT6) | |
|--|-------------|
| Reference ID | ascii |
| 1PPS Validity | Not Valid |
| Time Validity | Not Valid |
| Leap Flag | Disabled |
| Offset | 0 |
| Time Scale | UTC |
| Local Clock | INVALID |
| Format | Auto-detect |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |

Status/Outputs/ASCII TIMECODE

| OUTPUTS STATUS - ASCII TIMECODE (SLOT6) | |
|---|----------------------|
| Signature Control | No Signature Control |
| First Format | NMEA GGA Message |
| Second Format | NMEA RMC Message |
| Third Format | NMEA ZDA Message |
| Mode | Broadcast |
| Time Scale | UTC |
| Local Clock | EST |
| Request Character | T |
| Baud Rate | 4800 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |

Troubleshooting ASCII input issues (ASCII input not valid)

A) SecureSync wont sync to ZDA: TIME input Reference is ZDA messages. 1PPS input reference is not being provided by a different reference (ZDA message doesn't provide 1PPS)

- Refer to Salesforce Cases such as 258255 (IXBlue), 256677 (OSI maritime)
- Refer to JIRA **SSS-692 (excerpted below)**

This issue was found by a Thales engineer. A person is supposed to prepare a fleet in Cherbourg but he found a bug. Setting up the SecureSync to send ZDA message does not work directly.

The customer has to use local user as a 1st reference then changes to RMC type message and then at the end he uses ZDA message to have ZDA messages workings (they use it with no 1PPS input signal).
Without this process if I restart the unit, ZDA message will be set up as 1st reference but will not work. As the engineer is using his PC to set up the fleet and knowing that no PC/laptop will be on board, Thales is afraid to see SecureSync not working after an usual reboot as an example.

The fleet in Cherbourg is using RMC message as a temporary solution and it works but as another fleet is in Saudi Arabia running 5.5.0 version (ZDA messages are working) they are asking what if one of these SecureSync does not work anymore and they have to update to 5.8.5 knowing the issue ?

- Applicable to versions 5.9.1 and below (Fixed in version 5.9.2)
- Refer to patch for 5.9.1 and below <I:\Customer Service\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Specials\software patches\ZDA ASCII input sync>

Reported issue with ZDA patch discussed above being installed: *"Patch causes lockup 47 seconds after boot"*

- Refer to Salesforce Case 267580 (OSI Maritime)
- May not be caused by the patch = may be a coincidence??

B) All other conditions/troubleshooting conditions

- Refer to Salesforce cases such as 176778 (GPZDA ASCII input issues)

1. Is the ASCII "Time" status indicator currently RED and the "PPS" status currently YELLOW

- This indicates Phase Validation is enabled and is currently invalidating the ASCII input due to phase errors.
 - Refer to (in this doc): [Smart Reference Monitor \(when enabled\)](#)

2. Log entries associated with ASCII Option Cards

A) Timing log

Established communication / Lost communication

Nov 21 06:36:07 4 4.ntp.dks: [system] 2018 325 06:36:07 000 AR asc0 has established communication.
Nov 21 06:40:59 4 4.ntp.dks: [system] 2018 325 06:40:59 000 AR asc0 has lost communication.
Nov 21 06:41:16 4 4.ntp.dks: [system] 2018 325 06:41:16 000 AR asc0 has established communication.
Nov 21 06:42:04 4 4.ntp.dks: [system] 2018 325 06:42:04 000 AR asc0 has lost communication.
Nov 21 06:43:07 4 4.ntp.dks: [system] 2018 325 06:43:07 000 AR asc0 has established communication.
Nov 21 07:02:29 4 4.ntp.dks: [system] 2018 325 07:02:29 000 AR asc0 has lost communication.
Nov 21 07:03:07 4 4.ntp.dks: [system] 2018 325 07:03:07 000 AR asc0 has established communication.
Nov 21 07:05:32 4 4.ntp.dks: [system] 2000 001 00:00:01 000 AR asc0 has established communication.

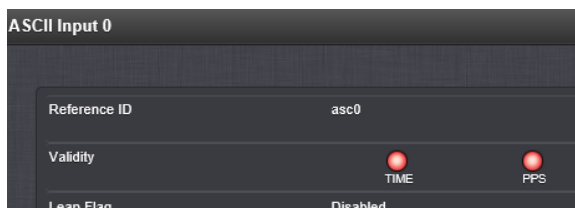
- **has established communication:** ASCII data is **now being detected** (data is present, port settings -such as baud rate, flow control, etc are all correct)
- **has lost communication.** ASCII data is **no longer being detected** (a “valid” ASCII message has not been received within the last TWO seconds, serial cable is no longer connected, ports settings have changed,

Note: An ASCII input message must be received within **TWO** seconds or “lost communication” message will be asserted (there is built-in buffer of **one** additional second added, so its **two** seconds instead of just one second before asserting this message)

3. Are the ASCII input port configurations (baud rate, stop bits etc) configure to match the Master’s output port settings?
4. Is the corresponding input PPS being received from the “Message”? Or from a separate PPS on the ASCII “Pin”
5. Is an PPS input being received, on the ASCII pin. with no corresponding ASCII string also being received)?

PPS input only (after loss of ASCII data by making baud rate incorrect)

- PPS signal after being received on pin, but ASCII input “not good: because of baud rate
 - BOTH PPS and Time are NOT VALID (PPS is only valid if an ASCII message is also received)
- 334 14:52:17 000 AR asc0 has lost communication



6. Temporarily Loop ASCII Output to ASCII Input

To help troubleshoot input reference issues on Option Cards, disconnect the desired reference from the unit and then loop a similar output back into the desired input. If SecureSync declares the input is valid, the issue is with the external reference (not with the SecureSync or the Option Card). Could be a signal level issue, impedance mis-match issue, out of sync reference, incorrectly configured reference, etc.

Email Keith sent (28 Nov 2018) Another easy test to perform is to temporarily loop the Serial cable from one of the two ASCII output ports (instead of from the eLoran) into the ASCII input port. With the ASCII output port also configure to output ZDA at 9600, 8, N, 1 and with the ASCII serial cable looped with one end connected to the ASCII in and the other end to an ASCII out, the ASCII input reference should have both the Time and PPS indicators turn green very shortly thereafter. In addition to the test I've been running with ZDA output from one unit into another v5.8.2 unit (with no issues observed), I just also ran this look-test just to confirm there are no issues with it being able to declare validity to its own output (not necessarily recommended for normal operation, but a good/simple test to verify the input port is still accepting ZDA messages and to also verify the cable.

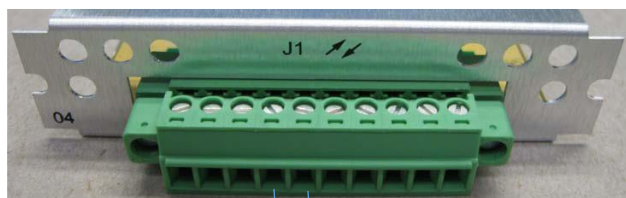
If this loop test does allow the reference to be declared valid, we will next need to see what is going on with eLoran device.

Please let me know if the ASCII input goes valid after looping the ASCII output to the ASCII input (with the input as well as recommended both output ports- so that you don't have to worry about which port to connect with- set to ZDA, 9600., 8, N 1)

OUTPUTS from the 1204-04 card

- Available outputs from 1204-04 consist of both:
 - **1PPS** (Refer to “A” below)
 - **ASCII Data** output timecode strings (Refer to “B” below)

A) 1PPS output pins



RS-485 1PPS output pins (Pins 4 and 5)

| Pin Number | Signal Name | Function |
|------------|-----------------|----------------------|
| 1 | SERIALTX_RS485+ | + RS-485 data output |
| 2 | SERIALTX_RS485- | - RS-485 data output |
| 3 | GND | Ground |
| 4 | PPS_OUT_RS485+ | + 1PPS output |
| 5 | PPS_OUT_RS485- | - 1PPS output |
| 6 | SERIALRX_RS485+ | + RS-485 data input |
| 7 | SERIALRX_RS485- | - RS-485 data input |
| 8 | GND | Ground |
| 9 | PPS_IN_RS485+ | + 1PPS input |
| 10 | PPS_IN_RS485- | - 1PPS input |

A) 1PPS (RS-485) output Signal

- The 1PPS output is a rising edge, 200ms pulse with no offset.

Q (from Josh Goh to Dave Sohn) Do you have a specifications document that explains the differences between the different types of 1PPS cards? The customer wants to know what difference of PPS output configuration between the 04 module and other 1PPS cards 18 / 19 / 21 / 2B. **It seems there are no parameter of pulse width, offset, and polarity at the configuration menu of the 04 module.** Could you please tell us the actual specs of the 1PPS output from the module?

A Reply from Dave S (6 Mar 18) The 1204-04 is an ASCII Time Code I/O card that includes a physical connection for 1PPS input and output. The 1PPS output is a rising edge 200ms pulse with no offset.

The other cards are all 1PPS cards with individual 1PPS configurability. The difference between them is their signaling type.

1204-18 -> TTL level

1204-19 -> 10V level

1204-21 -> RS-485 level

1204-2B -> fiber-optic

Rise-time for 1PPS output: Not specified in SecureSync Option Card datasheet. But a customer indicated he was seeing rise-time of around 6 microseconds???

B) ASCII (RS-485) data outputs

Q We are considering use of the RS-232 NMEA output module. Assuming it outputs data reflective of the source currently used by the SecureSync. For example, if manual coordinates were entered rather than using GPS coordinates automatically, would the NMEA sentences include the manually entered coordinates in lieu of what would normally come from GPS?

A NMEA outputs are reflective of the current system information including position. Assuming the position information was set manually and accepted by the GPS reference/receiver, they would be used for the NMEA data. Refer to the SecureSync manual for the specific NMEA message formats provided.

BBC ASCII Formats

- The four BBC outputs (BBC-01 through BBC-02) are **only available from an RS-232 output** port. They are **NOT** available for selection from an RS-485 output. A Model 1204-02 (RS-232) Option Card must be installed if the BBC outputs are desired. They cannot be outputted from this Model 1204-04 (RS-485) Option Card.

See the Important Note about this below:

Important Note: The four BBC ASCII Formats are only available via RS-232 output (from an installed Model 1204-02 Option Card). The four BBC formats are NOT available via RS-485 (from an installed Model 1204-04 RS-485 Option Card).

Troubleshooting ASCII Option cards

- A) Reference Status table indicates ASCII input is not valid/not present (status indicator red or yellow-instead of green)
- Refer to: [**Troubleshooting Option Card input issues](#)

****IRIG Option Cards /Ordering Information (1204-05, 1204-15, 1204-22, 1204-27, 1204-39, 1204-1E)**

Coax

- 1204-05: IRIG module, BNC (1 input, 2 outputs)
- 1204-15: IRIG module, BNC (4 outputs)

Twisted-pair

- 1204-22: IRIG module, RS-485 (4 outputs)

Fiber

- 1204-27: IRIG module, Fiber Optic (1 input, 2 outputs)
- 1204-1E: IRIG module, Fiber Optic (4 outputs)

IRIG IN/Out and IRIG output only Option Cards

General info about IRIG signals

- Also refer to “IRIG” in the “Products” Section of the “Customerserviceassistance” document. <I:\Customer Service\1- Cust Assist documents\CustomerServiceAssistance.pdf>

*****IRIG cabling (recommended/not recommended coax cables for IRIG signals)**

- refer to “**IRIG Cabling/max recommended cable distances**” in <I:\Customer Service\1- Cust Assist documents\CustomerServiceAssistance.pdf>

In summary of the above link:

- 1) There is no specific recommended maximum distance for an IRIG cable to be run, as many factors can affect the lengths of cable that can be run (such as types of cable used, noise sources located near the coax cable, etc).
- 2) Typically, hundreds of feet of cable can be run from an IRIG source to one (or two) IRIG input devices with no problem at all. **Based on cable loss alone, 1000 feet of cable should be fine.**
- 3) We recommend using **RG-58** coax cable
- 4) Though it's used on the breakout cables, we **DO NOT** recommend using **RG-174** cable (due to high DC voltage drop through cabling)

A) RG-58 (50 ohm cable) recommended coax cable

B) RG-174 (not recommended to run from the breakout to equipment)

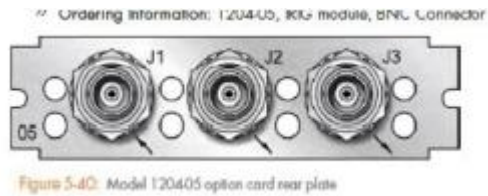
- Refer to Salesforce case 174338
- this cable is not recommended for distribution to equipment

Emails from Dave Lorah (24 Sept 2018)

I have researched the RG-174U cable you said was being used for the IRIG transmission. This may be the problem.

We usually specify an RG58 type cable for IRIG. The RG174U cable has roughly ten times the DC resistance of the RG-58 which might be attenuating the signal to the point the IRIG Slave will not recognize the waveform data. The Input will allow a wide range of signal from 500mV to 10Vp-p. If the IRIG Input signal level is below 500mV it will not recognize the signal.

The IRIG Slave SecureSync has one 1204-05 Option card installed. This card is different than the other 1204-15 IRIG Output cards as it has one IRIG Input and two outputs. This is what the card face looks like.



We use the RG-174 for this cable but it is limited to a maximum length of 15 Meters. Your RG-174 cable is approximately four times this length and would have a lot of signal attenuation. This is due to the electrical resistance of the 26 AWG wire in the RG-174 vs the 20 AWG in the RG-58 cable.

Tam is going to move the IRIG Slave unit close to the IRIG Master and check if it syncs with a shorter cable. This will prove the configuration is correct and the two units are working properly.

The RG-58 cable has about 1/10 the resistance of RG-174 and should be fine for 400 feet.

LuxLink and SI TECH Fiber Optic converters for long distance IRIG distribution

- Refer to “LuxLink” in the IRIG section of the Customerserviceassistance doc for info.
- Refer to “SI Tech” in the IRIG section of the Customerserviceassistance doc for info.

Link to doc: <..\CustomerServiceAssistance.pdf>

IRIG input sync accuracies/capabilities

IRIG

| | Input | Output |
|----------------------------|---|---|
| Quantity | 1 (1204-05) 0 (1204-15) | 2 (1204-05) 4 (1204-15) |
| Signal Type and Connector | Amplitude modulated (0 to 5 v peak-to-peak into 50 ohms) or DC level shift (unmodulated), user-selectable, on BNC | |
| Formats ¹ | IRIG A, B, G, NASA 36, IEEE 1344/C37.118 | IRIG A, B, E, G, NASA 36, IEEE 1344/C37.118 |
| Accuracy | — | ±20-200 microsec (format dependent) |
| Maximum Number of Cards: 6 | | |

¹Contact factory for details.

Ordering Information

1204-05: IRIG module (1 input, 2 outputs)

1204-15: IRIG module (4 outputs)

- IRIG DCLS input is much better than IRIG AM input because of the much faster rise-time of the DCLS signal. (the difference of one to just a few microseconds with IRIG DCLS versus 10s of microseconds with IRIG AM input)
- IRIG B AM (1kHz carrier) can provide sync accuracies in the tens of microseconds.
Our synchronization accuracy is dependent upon the accuracy of the incoming IRIG signal. Generally, DCLS is more accurate than AM, and faster carrier rates within AM are more accurate than slower rates. With a good IRIG source, accuracies can be achieved to the microsecond level.

A) IRIG DCLS input

- IRIG DCLS modulation can provide better accuracy than IRIG AM modulation, because IRIG DCLS has a much faster rise-time.
- **The accuracy of DCLS or TTL is +/- 100 nanoseconds** which is dependent upon, or in addition to, the accuracy of the IRIG source.

For example, if the accuracy of the IRIG source happens to be 200 nanoseconds, the IRIG DCLS signal would be 200 ±100 nanoseconds. Therefore, accuracy of the IRIG output would be between 100 to 300 nanoseconds.

B) IRIG AM input

- The Spec for IRIG input to TSync/SecureSync is **+/- 20 to 200 microseconds** (from the IRIG generator- not to UTC)

This is not the accuracy of System Time to UTC (accuracy to UTC can only be spec'd with GPS input). This spec is only how close the System Time can be aligned to the IRIG source's output time. Our spec has to be added to the specs of the IRIG generator, assuming it's synced to an external reference, such as GPS. If the IRIG generator is not synced to an external reference, there is NO accuracy spec available for System Time sync to UTC time. The IRIG generator has to be traceable to UTC in order for a spec to UTC to be available.

For example, if the accuracy of the source is 200 nanoseconds the DCLS or TTL would be 200nanoseconds, ± 200 microseconds. Therefore, accuracy of the IRIG output would be 20 to 200 microseconds (plus 200ns).

The Spec in the SecureSync manual ("**+/- 2 to 200 Microseconds**") encompasses all IRIG input formats (not just IRIG B, for instance). It is the "worst-case" range for all IRIG input signals. "Format dependent" is indicating whether the accuracy is closer to 2 microseconds or if it's closer to 200 microseconds depends on the IRIG carrier frequency being provided to the input and if it's an IRIG AM or IRIG DCLS modulated signal. No matter which IRIG format is provided to SecureSync, or what type of modulation is used, the System Time will be synced to within 200 microseconds of the IRIG generator's output time.

To calculate the accuracy of IRIG input to UTC:

1. The IRIG generator needs to be synced to an external reference (such as GPS).
2. You need to add the vendor's accuracy spec of its IRIG output to the IRIG input accuracy spec of:

DCLS input: +/- 100 nanoseconds

AM input: +/- 20 to 200 microseconds

We wound up spending extra time writing a time transfer algorithm for use between generic PCIe time cards and our own PCIe Network Analyzer card. This is pretty much completed so we will be testing with the Spectracom PCIe card in the next few days and into next week. We are hoping to get the absolute accuracy of packets time stamped by our Network Analyzer card close to 50 uSec or so. Obviously, with direct connection of the time card's 1PPS and 10 MHz to our board we would be able to get the accuracy closer to ~100 nSec.

One question has come up about using the Spectracom card in legacy or existing IRIG type timing networks. I have read the specs on the IRIG versions using the 1 kHz, 10 kHz, or even 100KHz carrier frequencies (and DLCS also), but have not been able to get a definitive answer on exactly what the absolute accuracy we could expect from an IRIG network. The specs talk about the resolution of the carrier being 1/frequency, but I also know that with suitable circuitry and phase locked loops you can determine the 'rising edge' of the sine wave of the nth cycle of the carrier that corresponds to the 1 PPS event. Obviously, jitter and noise of the circuits would compromise the detection, but is ~10 uSec or ~1 uSec typical absolute accuracies reasonable? What is the Spectracom specification for 1 PPS and 10 MHz output accuracy when the card is driven by an IRIG timing network?

Q Can you tell me the exact accuracy of IRIG-B DC or AC output from 1204-15?

A **Keith's response:** There is no "exact" accuracy spec for IRIG B. But the typical accuracy is +/- 20 to 200 microseconds. Note that IRIG DCLS modulation will provide better accuracy than IRIG B AM modulation, because DCLS has a much faster rise-time.

IRIG input configuration/Boot-up year value (2000) correction

- Refer to online SecureSync User guide:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/IRIG_InOut.htm

IRIG Input 0

IRIG-B121

Format: (B) IRIG B

Modulation Type: (1) IRIG AM Only

Frequency: (2) 1 KHz

Coded Expression: (1) BCD TOY, Ctrl Func

Control Function Field: Fields conform to RCC 200...

Local Clock: UTC

Offset: 0

Coded Expression selection choices

- (0) BCD TOY, Ctrl Func, Binary Seconds
- (1) BCD TOY, Ctrl Func**
- (2) BCD TOY
- (3) BCD TOY, Binary Seconds
- (4) BCD TOY/Year, Ctrl Func, Binary Seconds
- (5) BCD TOY/Year, Ctrl Func
- (6) BCD TOY/Year
- (7) BCD TOY/Year, Binary Seconds

Control Function selection choices

- Fields conform to RCC 200-04**
- Fields conform to IEEE C37.118-2005
- Fields conform to Spectracom format
- Fields conform to Spectracom FAA format
- Fields conform to Spectracom IEEE C37.118-2005

A) The first **FOUR** fields (**Format**, **Modulation Type**, **Frequency** and **Coded Expression**) define which parameters of the IRIG message will be used by the provided by the IRIG source will be used (Such as B000, B004, etc)

- **Format field**
- **Modulation Type field**
- **Coded Expression field:** *determines which portions of the received IRIG message the system will use*

- (0) BCD TOY, Ctrl Func, Binary Seconds
- (1) BCD TOY, Ctrl Func**
- (2) BCD TOY
- (3) BCD TOY, Binary Seconds
- (4) BCD TOY/Year, Ctrl Func, Binary Seconds
- (5) BCD TOY/Year, Ctrl Func
- (6) BCD TOY/Year
- (7) BCD TOY/Year, Binary Seconds

B) **Control Function Field:** *determines the parameters of the Control Function section of the received IRIG signal (if the IRIG Master's Coded Expression field contains "Control Function") to read*

Available selections for Control Function

- Fields conform to RCC 200-04**
- Fields conform to IEEE C37.118-2005
- Fields conform to Spectracom format
- Fields conform to Spectracom FAA format
- Fields conform to Spectracom IEEE C37.118-2005

Available IRIG formats (addition of IRIG H)

Support for IRIG Format IRIG H not available until it was added in update 5.8.9 (June 2020)

Changing the System's start-up default Year value (2000) to the current year with IRIG input reference

NOTE: ~~At every System boot-up, the System's YEAR value needs to be automatically corrected by the IRIG input message (IF the IRIG source provides the current year), or the year will remain at "2000" until set by a user ??~~

- Refer also to setting the year in TSync boards: <..\TimingBoardCustAssist.pdf>
- Like TSync boards, SecureSyncs do not persist the year during each power-down
 - The default year at each power-up is always "2000" and it won't change to the current year automatically, unless the system can obtain the current year from its input reference (its GPS receiver, or IRIG input if the IRIG source can provide the year)
- If the only input reference is IRIG, either the system can get the year from the IRIG Source, or a user will need to set the current year manually, after each boot-up.

Two main methods an IRIG source can provide an IRIG-input SecureSync with the current year value

- The IRIG source can provide the current Year value in its:
 - The **BCD section** (as BCD Year) of its IRIG message: Refer to "1)" below and/or
 - The **Control Function field section** of its IRIG message: Refer to "2)" further below
 - 1) Read the current year from the BCD Section of the received message
 - The selected **Coded Expression** field must contain "BCD TOY/YEAR" (not just "BCD TOY"), as highlighted in the list below:



- Examples of IRIG B messages which the system WON'T read "BCDYear" (from EITHER the **BCD section**, or even from the **Control Function Field**): **B000, B001 B002 and B003**
- Examples of IRIG B messages which the System can read "BCDYear" (from EITHER the **BCD section** or the **Control Function Field**): **B004, B005, B006 and B007**

- 2) Obtain the current year from the Control Function Field (CF)
IRIG signals have an optional section in the data stream that can be used to include additional information (such as the present year, for example). This field allows the Control Field section of the IRIG output to be defined.

- Both the **Control Function field** (“**Ctrl Func**”) and “**BCD Year**” needs to be included in the IRIG message (as defined by the “**Coded Expression field**”)
- The selected **Control Function Field** value determines what the system will try to read from the received IRIG message.

A) Required Coded expression field value to read the Control Function Field’s Year info

1. Because the current year value is provided in the **Control Function Field** as “**BCD Year**”, the selected **Coded Expression field** must contain BOTH “**Ctrl Func**” (**Control Function**) and “**BCD TOY/YEAR**”, like the yellow highlighted entries below (the Coded Expression field needs to be set to either “(4)” or “(5)”)

| | |
|---------------------|---|
| Coded Expression | (0) BCD TOY, Ctrl Func, Binary Seconds |
| | (1) BCD TOY, Ctrl Func |
| | (2) BCD TOY |
| | (3) BCD TOY, Binary Seconds |
| | (4) BCD TOY/Year, Ctrl Func, Binary Seconds |
| | (5) BCD TOY/Year, Ctrl Func |
| | (6) BCD TOY/Year |
| | (7) BCD TOY/Year, Binary Seconds |

If current year is only available from Control Function, which is configured as either of the “IEEE” values - SecureSync’s IRIG input configured as **IRIG B000** (instead of B004 or B004 for examples)

➤ refer to Salesforce Case 210918

Per Dave Sohn (31 Oct 2019) B000 doesn't have year information and even though technically the C37.118 format calls out year information, without the coded expression telling us to pull the year, we won't. They want to use B004 or B005. That should then pull the year information properly.

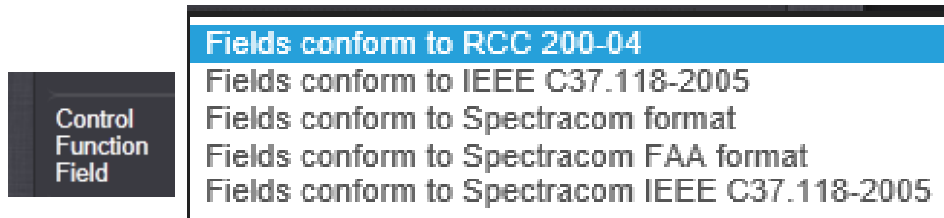
FYI:

- The coded expression for **B000** is (0) BCD TOY, Ctrl Func, Binary Seconds (no “**BCD Year**”)
- The coded expression for **B004**: coded expression “(4)” is the same as B000, plus “**BCD Year**”
- The coded expression for **B005**” coded expression “(5)” is the similar to B004 (also includes **BCD Year**”, but doesn't include SBS (Straight Binary Seconds value, which isn't necessary in this scenario).
- The IEEE extensions report the current year as “**BCD Year**”, so the selected coded expression needs to include “**BCD Year**” (therefore, the coded expressions of the Slaves should be set to either 4 or 5, which contain BCD Year, telling the system to use the BCD year its receiving from the Slave.

B) “Control Function Field”

- Refer to online user guide:

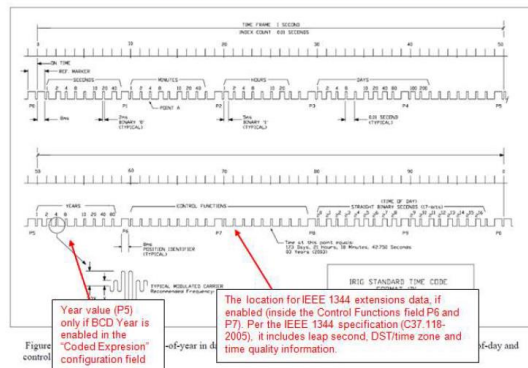
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/IRIG_InOut.htm



The available configurations for Control Function field are (Note the list below not in same order as the web browser, as shown in screenshot above)

- **RCC 200-04:** IRIG spec 200-04 specified a location for year value, if included in this field.

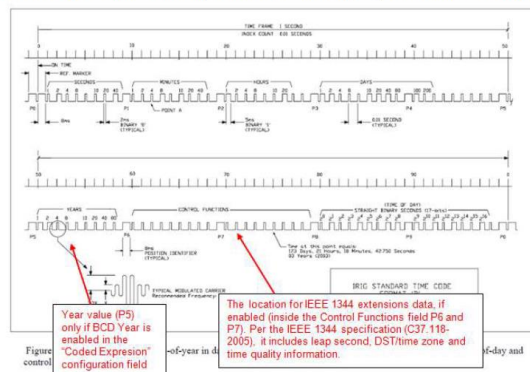
And here is the “RCC 200-04” format (available in SecureSyncs, Model 9483s and TSync-PCle):



Notice in the “Spectracom format, “Years” is located inside the “Control Functions” field, while in the RCC-2004 spec, the “Years” is located just before the “Control Functions”.

- **Spectracom Format:** Year is included in Control Field but not in the same location as RCC-2004 output (year is offset by one position). Note this selection is only available if the IRIG source is a Spectracom device!

And here is the “RCC 200-04” format (available in SecureSyncs, Model 9483s and TSync-PCle):



Notice in the “Spectracom format, “Years” is located inside the “Control Functions” field, while in the RCC-2004 spec, the “Years” is located just before the “Control Functions”.

- **Spectracom FAA Format:** A unique IRIG output Control Field that contains satellite lock status and time error flags. Note this selection is only available if the IRIG source is a Spectracom device!
- **NASA Formats:** Variants of IRIG B
- **“IEE C 37.118-2005 (IEEE 1344)” or Spectracom IEEE C37.118-2005”** (both are IEEE 1344 extensions)
 - Refer to “IEEE-1344 extensions”: [.\CustomerServiceAssistance.pdf](https://www.securesyncs.com/~/media/SecureSyncs/CustomerServiceAssistance.pdf)

Important note (refer also to Salesforce Case Number 210918) : As also discussed further above in “Required Coded Expressions”, the selected “Coded Expression” value needs to include “BCD Year” (such as B004 or B005 – not B000) when using either of these “IEEE” Control Function selections below

1. IEEE 1344 extensions (as defined by the IRIG Standards)

- **IEE C 37.118-2005 (IEEE 1344):** Also referred to as the IEEE 1344 extensions, Control Field contains year, leap second and daylight savings time information

Control bit assignments

| IRIG-B Pin ID | CTRL bit | Designation | Explanation |
|------------------|-------------|--------------------------------|--|
| P10 | 1 | Year, BCD 1 | Last 2 digits of year in BCD |
| P11 | 2 | Year, BCD 2 | BCD |
| P12 | 3 | Year, BCD 4 | BCD |
| P13 | 4 | Year, BCD 8 | BCD |
| P14 | 5 | Not used | Unassigned |
| P15 | 6 | Year, BCD 16 | Last 2 digits of year in BCD |
| P16 | 7 | Year, BCD 20 | BCD |
| P17 | 8 | Year, BCD 40 | BCD |
| P18 | 9 | Year, BCD 80 | BCD |
| P19 | — | P6 | Position identifier # 6 |
| P40 | 10 | Leap Second Pending (LSP) | Beacon: 1 up to P4 + BEFORE leap second occurs 0 = Add L.S., 1 = Delete L.S. |
| P41 | 11 | Leap Second (LS) | 0 = Add L.S., 1 = Delete L.S. |
| P42 | 12 | Daylight Savings Pending (DSP) | Beacon: 1 up to P4 + before DST change |
| P43 | 13 | Daylight Savings Time (DST) | Beacon: 1 during DST |
| P44 | 14 | Time Offset sign | Time offset sign—0 = +, 1 = - |
| P45 | 15 | Time Offset—Binary 1 | Other than coded BCD-B time to UTC time BDC coded time plus time offset (excluding sign) equals UTC time at 60 hours (after + or - change due to DST) |
| P46 | 16 | Time Offset—Binary 2 | |
| P47 | 17 | Time Offset—Binary 4 | |
| P48 | 18 | Time Offset—Binary 8 | |
| P49 | — | P7 | Position identifier # 7 |
| P70 | 19 | Time Offset—0.1 h | 0 = none, 1 = additional 0.1 h time offset |
| P71 | 20 | Time Quality | 4-bit code representing approx. clock time error 0000 = clock locked, maximum accuracy 1111 = clock failed, data unreliable |
| P72 | 21 | Time Quality | |
| P73 | 22 | Time Quality | |
| P74 | 23 | Time Quality | |
| P75 | 24 | PARITY | Parity on all preceding data bits |
| P76 | 25 | Not Used | Unassigned |
| P77 | 26 | Not Used | Unassigned |
| P78 | 27 | Not Used | Unassigned |
| P79 | — | P8 | Position identifier # 8 |

Year (BCD year)

Leap Seconds

DST pending/DST correction

Local time offset

Time quality

Parity

2. Spectracom-modified IEEE1344 extensions (IEEE-1344 extensions plus leap second info)

- **Spectracom IEEE C37.118-2005** the IEEE 1344 extensions (selection above) has been extended by Spectracom to support one-month leap second notification. Note this selection is only available if the IRIG source is a Spectracom device!

➤ New Control Function added to distribute leap second info

- Version 5.2.1 Added IRIG control field format, "Spectracom IEEE C37.118-2005", to extend leap second notification to a month.
- Intended for SecureSyncs syncing via IRIG input and outputting NTP (SecureSync acting like a Slave to another SecureSync). Without this new control field, the leap second won't be announced until just one minute before the leap second is inserted. This doesn't leave enough time for NTP on those IRIG units to read the leap second and announce it in time.
- Was primarily for Verizon, but others can benefit from this new capability

IRIG input requirements/ troubleshooting

- Refer also to: [**Troubleshooting Option Card input issues](#)

IRIG DCLS input 50 ohm load terminator requirement

Based on your report, I highly suspect you are providing the SecureSync with an IRIG-B, **DCLS**-modulated (not AM modulated) signal. DCLS modulation is recommended over AM modulation, for more accurate timing. I also highly suspect there is no 50 ohm input terminator attached to the SecureSync's IRIG input-end of the coax cable (as recommended for IRIG DCLS modulation).

Besides an intermittent cable issue, much more likely is the IRIG signal "ringing" inside the SecureSync, due to improper input termination of the IRIG input signal. This becomes a more likely condition, especially as the length of the cable between the IRIG source and IRI input increases (the longer the cable distance, the more important the termination).

Not having a 50 ohm terminator attached to the end of the IRIG cable (via the open-side of a BNC "T" connector, which is attached to the end of the cable and the SecureSync) can cause ringing/reflections of the IRIG DCLS signal. This can result in "false" timing of the

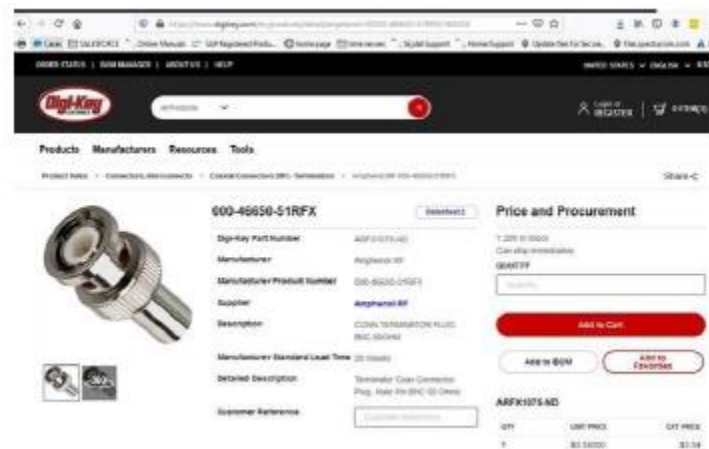
on-time marker in the IRIG signal (the on-time marker can happen too often/not when expected, which then causes internal missed ontime markers. The signal can periodically or continuously be declared not valid).

With a Model 1204-05 Option Card installed in the SecureSync, a quick-check that the issue is due to ringing of the signal is to temporarily loop one of the two IRIG outputs into the IRIG input, using a short length of coax cable. With the applicable IRIG output configured similarly to the IRIG input configuration, the SecureSync should go into/remain in sync.

“BNC” type 50 ohm load terminators can be readily found online, and can be attached to the end of the coax cable via the “open” side of a BNC “T” connector (the “T” connector attaches the end of the cable to the IRIG distribution amp, and has an additional connection that the BNC 50 ohm terminator is attached to).

Below is a good example of a recommended 50 ohm load terminator:

Amphenol P/N: 46650-51-RFX (Digi-Key P/N: ARFX1075-ND) <https://www.digikey.com/en/products/detail/amphenol-rf/000-46650-51RFX/160255>



If by chance there is already a 50 ohm load terminator at the IRIG input end of the cable, or if it's a IRIG AM modulated input signal (not DCLS), first try a different coax cable. Then, please send us the logs and configs bundles from the SecureSync, for our review.

A) SecureSync is syncing to an IRIG source (Selected reference is IRIG, but the SecureSync's year remains the boot-up value of “2000” (instead of changing to the current year)

- Refer to Salesforce Case 210918 (Oct 2019)
- Refer to the online SecureSync user guide:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/IRIG_InOut.htm?Highlight=1204-05
- If the SecureSync is syncing to an IRIG source, but the year is remaining 2000, its highly unlikely due to a hardware issue. It's likely related to the configuration of the IRIG input configuration not **exactly** matching the configuration of the IRIG Source (IRIG Master), especially the SecureSync's input Control Function field not matching/not configured correctly.
- When using an IRIG message not containing “BCDYear”, the year has to be obtained from one of a few different Control Function values. But if the IRIG source' Control Function doesn't provide the year, or its using a different selection than the SecureSync's IRIG input configured selection, it can read all the data for sync. but not be able to read the current year from the IRIUG source.
- As observed with Case 210918, the SecureSync's IRIG input Control field was set to “**Spectracom IEEE C37.118-2005**” (instead of **IEEC 37.118-2005 (IEEE 1344)**”, even though the IRIG source wasn't even a Spectracom device that could provide this Control Function. When using a non-Spectracom Master, **Spectracom IEEE C37.118-2005** can't be selected in the IRIG input configuration.

B) SecureSync not syncing at all to an IRIG source (Sync led not lit)

How to verify IRIG input signal issues

- Example **timing.log** entries if IRIG input is intermittent

```
Jun 22 15:01:40 Spectracom Spectracom: [system] 2015 173 15:01:39 021 IR irg0 Comm Lost.  
Jun 22 15:01:44 Spectracom Spectracom: [system] 2015 173 15:01:44 000 IR irg0 Comm OK.  
Jul 2 00:12:43 Spectracom Spectracom: [system] 2000 001 00:00:05 000 IR irg0 Comm OK.  
Jul 8 16:53:02 Spectracom Spectracom: [system] 2015 189 16:53:02 021 IR irg0 Comm Lost.  
Jul 8 17:06:52 Spectracom Spectracom: [system] 2015 189 17:06:52 000 IR irg0 Comm OK.  
Jul 8 17:08:30 Spectracom Spectracom: [system] 2015 189 17:08:30 021 IR irg0 Comm Lost.  
Jul 8 17:08:59 Spectracom Spectracom: [system] 2015 189 17:08:59 000 IR irg0 Comm OK.  
Jul 8 17:09:23 Spectracom Spectracom: [system] 2015 189 17:09:23 021 IR irg0 Comm Lost.  
Jul 8 17:10:28 Spectracom Spectracom: [system] 2015 189 17:10:28 000 IR irg0 Comm OK.  
Jul 8 17:20:14 Spectracom Spectracom: [system] 2015 189 17:20:14 021 IR irg0 Comm Lost.  
Jul 8 17:20:31 Spectracom Spectracom: [system] 2015 189 17:20:31 000 IR irg0 Comm OK.  
Jul 8 17:21:31 Spectracom Spectracom: [system] 2015 189 17:21:31 021 IR irg0 Comm Lost.
```

Sync status

Q Is the SecureSync's IRIG input configured to read Sync status via the IEEE extensions? If it is, is the IRIG source reporting its in sync.

Note: While performing a basic cable loopback test (output to input), it's best to make sure SecureSync's IRIG input is at least temporarily not configured to read Sync status, because the SecureSync may not be synced via another reference, and may not be synced to itself.

Example email Keith sent (24 Mar 16)

The first question I have is whether or not the IRIG E source that is connected to the SecureSync is synced to an external reference (such as GPS)? Or is it instead just a free-running reference. Please note that a very stable IRIG input needs to be provided to the SecureSync in order for the SecureSync to be able to lock/discipline its oscillator and achieve sync status. A free-running source is likely to have too much jitter on its IRIG output, preventing the SecureSync from being able to lock to it.

Some additional questions for you:

- 1) What is the specific formatting of the IRIG E Signal (such as E122, E123, etc) being provided by the source (where the three numbers after the letter "E" indicate factors such as type of IRIG modulation and the formatting of the data it's providing).
- 2) Which particular IRIG Option Card is the IRIG input being connected to on the back of the SecureSync (what are the two small numbers silkscreened in the corner of this card)?
- 3) Which connector/pins of this IRIG Option Card is the IRIG signal being applied to?
- 4) If the IRIG signal is being distributed to the SecureSync via fiber, are there fiber converters being used? Or is the output of the IRIG source and the Option Card being used in the SecureSync both fiber connectors so no converters are necessary?
- 5) Is there a direct connection from the IRIG source to the IRIG input of just this one SecureSync? Or is the IRIG signal being split to more than one IRIG input (not necessarily just other SecureSyncs but any other devices as well)? If the signal is split to any other devices, does the SecureSync sync if the signal is only applied to just this one SecureSync?
- 6) Using a scope, have you verified the IRIG signal is present at the SecureSync end of the cable?

Additional Items that may be helpful to us in determining why the SecureSync isn't able to sync to an IRIG input:

- 1) A screenshot from the SecureSync's IRIG input configuration page of the web browser.
- 2) The version of software installed in the SecureSync:

If you aren't sure what version is installed, there are a few different ways to obtain the version:

Note the software version of a SecureSync will be either a 4.x.x or 5.x.x number:

- A. With a CLI connection (telnet, ssh or front panel RS-232 cable) type: **version** <enter>. The version command will respond with the current version of software installed.
- B. With the newer black and charcoal web browser (starting in software version 5.1.2), the System version is reported in the **Tools** -> **Upgrade/Backup** page.
- C. With earlier software versions (which the web browser has a white/gray background and is now referred to as the "classic interface") the Archive software version is reported at the top of the **Tools** -> **Versions** page.

- 3) **The SecureSync's log bundle for our review:**

All of the SecureSync's logs (including those shown in the browser and also those in the background) can be easily bundled into one file and then exported from the SecureSync to send as an attachment.

Instead of copy/pasting all of the log entries into a Word document, starting in Archive software update version 5.1.2, the logs can be easily saved to single bundled file and exported into a networked PC. Earlier versions of software allowed the bundle to be created, but then the file still needed to be transferred out using an FTP/SCP connection. Now, a button in the web browser alleviates the need to create an FTP session to transfer this file out to a PC.

The log bundling and export to a PC is controlled in the "**Management**" -> "**Log Configuration**" page of the SecureSync's web browser. On the left-side of the browser, click on the "Save and download all logs" button. You can then select where to save the log bundle to. The default file name is "securesync.log".

Note this log bundle file can be rather large. If it's too large for you to email it to us, or if you prefer, please feel free to upload the file to the following sharefile site: <https://spectracom.sharefile.com/filedrop>. After entering your contact info, you will be taken to a new screen. Please select my name ("Keith Wing") from the "Send to" dropdown, drag/drop the log bundle file into the empty field and then press "Upload Files".

****IRIG Format codes

| | | | |
|---------------------------------------|---|--------------------------------------|--|
| <i>Refer to Table A below</i> | Manual or Automatic format selection | | |
| <i>Refer to Table B below</i> | First Letter: Rate Designation | A B D E G H | 1000 PPS 100 PPS 1 PPM 10 PPS 10,000 PPS 1PPS |
| <i>Refer to Table C below</i> | 1st Digit Form Designation | 0 1 2 | DC Level Shift (DCLS) width coded, no carrier Sine Wave carrier, amplitude modulated Manchester modulated |
| <i>Refer to Table D below</i> | 2nd Digit Carrier Resolution | 0 1 2 3 4 5 6 | No carrier (DCLS) 100 Hz / 10 millisecond resolution 1kHz / 1 millisecond resolution 10 kHz 100 microsecond resolution 100 kHz / 10 microsecond resolution 100 kHz / 10 microsecond resolution 1 MHz / 1 microsecond resolution |
| <i>Refer to Table E below</i> | 3rd Digit Coded expressions | 0 1 2 3 4 5 6 7 | BCD _{TOY} , CF, SBS BCD _{TOY} , CF BCD _{TOY} BCD _{TOY} , SBS BCD _{TOY} , BCD _{year} , CF, SBS BCD _{TOY} , BCD _{year} , CF BCD _{TOY} , BCD _{year} , BCD _{TOY} , BCD _{year} , SBS |
| <i>Refer to Table F below</i> | Control Field (not part of the three digits) | 0 1 2 3 4 5 | Unknown - All bits ignored Fields conform to RCC 200-04 Fields conform to IEEE C37.118-2005 (1344 extensions) Fields conform to Spectracom format Fields conform to Spectracom FAA format Fields conform to NASA formats |

Available SecureSync IRIG Input / Output Formats:

| <i>RIG Code Format Provided</i> | <i>Code Description</i> |
|--|---|
| A000 | IRIG A, DCLS, BCD, CF, SBS |
| A001 | IRIG A, DCLS, BCD, CF |
| A002 | IRIG A, DCLS, BCD |
| A003 | IRIG A, DCLS, BCD, SBS |
| A004 | IRIG A, DCLS, BCD _{TOY} , BCD _{YEAR} , CF, SBS |
| A005 | IRIG A, DCLS, BCD _{TOY} , BCD _{YEAR} , CF |
| A006 | IRIG A, DCLS, BCD _{TOY} , BCD _{YEAR} |
| A007 | IRIG A, DCLS, BCD _{TOY} , BCD _{YEAR} , SBS |
| A130 | IRIG A, AM, 10kHz, BCD, CF, SBS |
| A131 | IRIG A, AM, 10kHz, BCD, CF |
| A132 | IRIG A, AM, 10kHz, BCD |
| A133 | IRIG A, AM, 10kHz, BCD, SBS |
| A134 | IRIG A, AM, 10kHz, BCD _{TOY} , BCD _{YEAR} , CF, SBS |
| A135 | IRIG A, AM, 10kHz, BCD _{TOY} , BCD _{YEAR} , CF |
| A136 | IRIG A, AM, 10kHz, BCD _{TOY} , BCD _{YEAR} |
| A137 | IRIG A, AM, 10kHz, BCD _{TOY} , BCD _{YEAR} , SBS |
| B000 | IRIG B, DCLS, BCD, CF, SBS |
| B001 | IRIG B, DCLS, BCD, CF |
| B002 | IRIG B, DCLS, BCD |
| B003 | IRIG B, DCLS, BCD, SBS |
| B004 | IRIG B, DCLS, BCD _{TOY} , BCD _{YEAR} , CF, SBS |
| B120 | IRIG B, AM, BCD, CF, SBS |
| B121 | IRIG B, AM, BCD, CF |
| B122 | IRIG B, AM, BCD |
| B123 | IRIG B, AM, BCD, SBS |
| B124 | IRIG B, AM, BCD _{TOY} , BCD _{YEAR} , CF, SBS |
| B125 | IRIG B, AM, 1kHz, BCD _{TOY} , BCD _{YEAR} , CF |
| B126 | IRIG B, AM, 1kHz, BCD _{TOY} , BCD _{YEAR} |
| B127 | IRIG B, AM, 1kHz, BCD _{TOY} , BCD _{YEAR} , SBS |
| G001 | IRIG G, DCLS, BCD, CF |
| G002 | IRIG G, DCLS, BCD |
| G005 | IRIG G, DCLS, BCD _{TOY} , BCD _{YEAR} , CF |
| G006 | IRIG G, DCLS, BCD _{TOY} , BCD _{YEAR} |
| G141 | IRIG G, AM, 100kHz, BCD, CF |
| G142 | IRIG G, AM, 100kHz, BCD |
| G145 | IRIG G, AM, 100kHz, BCD _{TOY} , BCD _{YEAR} , CF |

IEEE C37.118-2005“ and “Spectracom IEEE C37.118-2005” (IEEE-1344)

A) “IEEE C37.118-2005” (IEEE-1344 extensions)

- Refer to “IEEE-1344 Extensions” in the custserviceassist doc: <..\CustomerServiceAssistance.pdf>
- Refer to IEE-1344 specs: [I:\Engineering\Specs and Standards\IEEE \(Institute of Electrical and Electronics Engineers\)](I:\Engineering\Specs and Standards\IEEE (Institute of Electrical and Electronics Engineers))

IEEE-1344 Extensions

Year information was not specified in the IRIG standard prior to its 2004 revision. Before 2004, the IEEE adopted a standard (IEEE-1344) which included year data as part of the IRIG-B signal. This variation came to be known as “IEEE-1344 extensions.”

IEEE-1344 extensions use extra bits of the Control Functions (CF) portion of the IRIG-B time code. Within this portion of the time code, bits are designated for additional features, including:

- Calendar Year (now called BCDYEAR)
- Leap seconds, and leap seconds pending
- Daylight Saving Time (DST), and DST pending
- Local time offset
- Time quality
- Parity
- Position identifiers

To be able to use these extra bits of information, power system devices and other equipment receiving the time code must be able to decode them. Refer to individual product manuals to determine whether IEEE-1344 extensions are supported.

Since year information is now considered part of BCD (denoted as BCDYEAR), what was formerly considered B002 and B122 (with IEEE Extensions ON) would now be denoted as B006 and B126.

B) “Spectracom IEEE C37.118-2005” (IEEE-1344 extensions plus leap second info)

- New Control Function added to distribute leap second info
 - Version 5.2.1 Added IRIG control field format, “Spectracom IEEE C37.118-2005”, to extend leap second notification to a month.
 - Intended for SecureSyncs syncing via IRIG input and outputting NTP (SecureSync acting like a Slave to another SecureSync). Without this new control field, the leap second won’t be announced until just one minute before the leap second is inserted. This doesn’t leave enough time for NTP on those IRIG units to read the leap second and announce it in time.
 - Was primarily for Verizon, but others can benefit from this new capability

Signature Control

Email from Dave Lorah to Dave Sohn (30 Jun 16) I have discovered the IRIG Coded Expression “Spectracom IEEE C37.118-2005” is not passing along the sync status. I tested it using B004 in a pair of SecureSyncs. I think when the Leap Second info was extended it may have broken sync status??? Maybe Dave can elaborate.

Reply from Dave S to Dave L: The “IEEE C 37.118-2005” coded expression does work. It will pass along GPS sync status. Are you sure you are testing it correctly? As part of the Spectracom version, it is tied to our signature control now. If you have signature control as always on, then it won’t ever report out of sync.

Reply from Dave L to Dave S: I was not aware of the Signature Control function you described. So you are saying the Status bit changes and follows Signature Control? I thought the Signature Control just killed the output signal entirely.

Dave Sohn replied: In some formats it controls special sync status features as well.

****CTQ (Continuous Time Quality) (part of IEEE C37.118.1- 2011)**

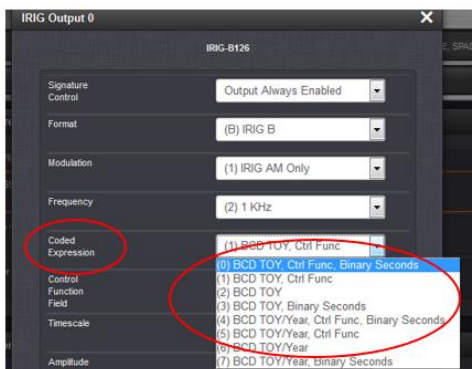
- Refer to Salesforce case 17145
- Refer to info in the “**IRIG for all products**” section: [.\CustomerServiceAssistance.pdf](#)
- This appears to be the “**Time Quality**” indicator included in the IEEE-1344 extensions.

Configuring a SecureSync’s IRIG Output Option Card to provide IEEE-1344 extensions

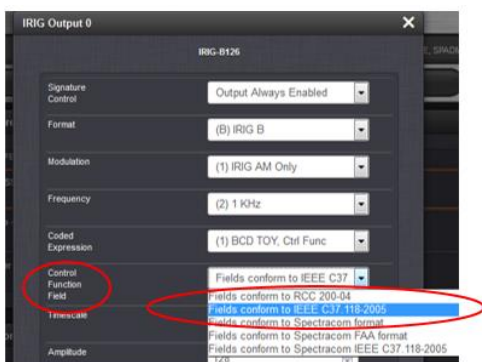
Since in this case, the IRIG output from the SecureSync is going to a Spectracom TSync board, both of these products also support the IEEE-1344 extensions in the IRIG data stream. These additional bits in the IRIG data stream can be outputted as soon as the IRIG data is started to be transmitted. And they include “Sync Status” (via “Time Quality” indicators) of the SecureSync, to report to the TSync board whether the IRIG data its receiving should be ignored or is OK to use. When the signal first starts being sent, it can tell the TSync board it’s not yet providing current data -instead, it reports the data is still initiating and not yet valid time, so that the TSync board doesn’t read the year as 2000, 1 Jan 00:00 for example.

Having the two SecureSync’s output the IEEE-1344 for extensions in their IRIG outputs and having the TSync board read the sync status it’s receiving from the SecureSyncs require enabling the 1344 extensions in the SecureSyncs’ IRIG output and the TSync’s IRIG input...

Enabling the 1344 extensions in each of the SecureSync’s IRIG output first requires the **Coded Expression** in the IRIG output configuration screen be set to any value which includes “**Ctrl Func**” in its selection (such as the values of “0”, “1”, “4” or “5”, as shown below):



And secondly, the “**Control Function Field**” drop-down needs to be sent to “**Fields Conform to IEEE C37.118-2005** (as shown below):



Note: Refer to the Timing board cust assist doc if the IRIG output with 1344 extensions is going to a TSync board:
[I:\Customer Service\1- Cust Assist documents\TimingBoardCustAssist.pdf](#)

****Time Synchronization for Secure Networks using fiber**

- Refer to: <http://www.spectracomcorp.com/Desktopmodules/Bring2Mind/DMX/Download.aspx?EntryId=1606&PortalId=0>

****Relays on the 1204-0150-F000 assembly**

From the BOM:

P/N: K001R-2200-0S0J (RELAY,SM,DPDT,2A@30VDC,SSS,12VDC COIL)

AROMAT-TXSA

Mfg/Mfg P/N: Panasonic TX2SA-12V

Mouser P/N: 769-TX2SA-12V

Relay datasheet: <http://www.mouser.com/ProductDetail/Panasonic-Industrial-Devices/TX2SA-12V/?qs=HLLy2plPwuuBcCVwky7PWw==>

How to verify IRIG input signal issues

Example Timing log entries if IRIG input is intermittent

Jun 22 15:01:40 Spectracom Spectracom: [system] 2015 173 15:01:39 021 IR irg0 Comm Lost.
Jun 22 15:01:44 Spectracom Spectracom: [system] 2015 173 15:01:44 000 IR irg0 Comm OK.
Jul 2 00:12:43 Spectracom Spectracom: [system] 2000 001 00:00:05 000 IR irg0 Comm OK.
Jul 8 16:53:02 Spectracom Spectracom: [system] 2015 189 16:53:02 021 IR irg0 Comm Lost.
Jul 8 17:06:52 Spectracom Spectracom: [system] 2015 189 17:06:52 000 IR irg0 Comm OK.
Jul 8 17:08:30 Spectracom Spectracom: [system] 2015 189 17:08:30 021 IR irg0 Comm Lost.
Jul 8 17:08:59 Spectracom Spectracom: [system] 2015 189 17:08:59 000 IR irg0 Comm OK.
Jul 8 17:09:23 Spectracom Spectracom: [system] 2015 189 17:09:23 021 IR irg0 Comm Lost.
Jul 8 17:10:28 Spectracom Spectracom: [system] 2015 189 17:10:28 000 IR irg0 Comm OK.
Jul 8 17:20:14 Spectracom Spectracom: [system] 2015 189 17:20:14 021 IR irg0 Comm Lost.
Jul 8 17:20:31 Spectracom Spectracom: [system] 2015 189 17:20:31 000 IR irg0 Comm OK.
Jul 8 17:21:31 Spectracom Spectracom: [system] 2015 189 17:21:31 021 IR irg0 Comm Lost.
Jul 8 17:30:01 Spectracom Spectracom: [system] 2015 189 17:30:00 000 IR irg0 Comm OK.

IRIG output/ input synchronization accuracies

- Refer to Knowledge base article “**What accuracy can I expect from SecureSync IRIG outputs**”
<https://na8.salesforce.com/ka0C0000000LLnY>

IRIG output/input DELAY (OFFSET) resolution

- Refer to Salesforce Case 186551
- Email from Danny Loke to TOYO (5 March 2019) “**Our resolution is 20ns on the IRIG outputs.**”

After careful verification of our delay adjustments for IRIG-B(DC) signal, we regret to inform you that :

- Our prior compliance as provided by Joshua-san was in error. We are not compliant with 1nsec resolution for the delay adjustments and it was a mistake that originated from an applications engineering staff who did not verify with our Senior Product Manager prior to sending the compliance matrix out to Joshua-san, and then from Joshua-san on to TOYO.

- We are also non-compliant with 10 nsec as our tests and documentation that was referenced to in the compliance matrix point to 20 nsec and 30 nsec for the resolution of the delay adjustments.
- We are unable to make any adjustments to make the equipment work at 10 nsec as it is technically impossible.
- In lieu of the above, we have 2 recommendations as follows :
 - Return the units to us at no cost and we shall refund you in full.
 - Consider a workaround if feasible as follows :
 - Adjust the TCGT input offset in addition to the output offset. The input offset has a resolution of 5 nsec.

The down side to the workaround above is that any adjustments on the input side will affect all outputs of the TCGT.

Whether to use positive or negative offset value (from Case 259422)

Email from Keith Adding delay (Offset) compensation on the input reference that the SecureSync is synced with (such as GPS or IRIG input) will inherently move the SecureSync's System 1PPS and all its outputs by the Offset value entered (a positive value to push the 1PPS ahead, or negative to pull the 1PPS back). But if it's desired to only offset one particular output (such as an IRIG output), the Offset should be configured for just that particular output.

A positive Offset value will "advance/forward" the 1PPS, while a "negative" Offset value will "retreat/retract" the 1PPS Offset. So, adding a positive 27000 ns Offset in the dedicated IRIG output going over to the other SecureSync will advance the 1PPS it's providing by 27 microseconds. Adding a negative "27000" ns Offset will retreat the 1PPS of the IRIG by 27 microseconds.

If the 27 microseconds of offset is due to the coax cable delay between the IRIG out of the GPS-synced SecureSync to the other SecureSync, adding a positive 27000 ns of Offset to the IRIG output ([Interfaces -> IRIG out](#) page of the web browser) will "advance" the 1PPS of the IRIG output by 27 microseconds.

When the IRIG output signal reaches the secondary SecureSync, the advancing of the PPS (inside the GPS SecureSync) will have then been negated at the input of secondary SecureSync by the actual delay through the cable, resulting in the PPS of the IRIG output and the PPS of the IRIG input coincident with each other (as if they were directly connected to each other, instead of having a cable located between them).

Number of Inputs/Outputs on each IRIG Option Card

| IRIG card | Media | I/O or Output only | Inputs | Outputs |
|----------------|-------------|--------------------|-----------------------|-----------------------------------|
| 1204-05 | Coax (BNC) | Input/output | 1 (AM or DCLS) | 2 (each can be AM or DCLS) |
| 1204-15 | Coax (BNC) | Output only | 0 | 4 (each can be AM or DCLS) |
| 1204-39 | Coax (TNC) | Output only | 0 | 4 (each can be AM or DCLS) |
| 1204-27 | Fiber Optic | Input/output | 1 (DCLS only) | 2 (DCLS only) |
| 1204-1E | Fiber Optic | Output only | 0 | 4 (DCLS only) |
| 1204-22 | RS-485 | Output only | 0 | 4 (DCLS only) |

****Hardware Issues with IRIG Option Cards/Software updates**

- **Hardware issues**

- **1204-05 and 1204-15 surge damage**
 - Refer to Salesforce Case 282695
 - Investigated by Tom Richardson and Mark McGregor

Hi Scott,

I will defer to Any Honecker on the below.

But, in engineering morning scrum today, Andy reported that he worked with Dave West yesterday to identify the issue was likely from 2017/2018, if I recall what Andy said correctly. Surmotech(?) had been damaging the C144 capacitor when depanelizing 1204-05 PCBA 1204-0050-F000, and 1204-02, 1204-04 PCBA 1204-0020-F000. Happens to be C144 on both PCBA, which is located near edge of PCBA on both.

On 1204-0050-F000, C144 is C104R-0106-WK0D, EIA 0805 sized 10uF, 16V ceramic capacitor. On 1204-0020-F000 C144 is C104R-0106-TK0D, slightly larger EIA 1206. Was damaged on both.

Regards,

Mark McGregor | Principal Engineer | mark.mcgregor@orolia.com | +1.585.321.5803

From: Scott Zmuda <Scott.Zmuda@orolia.com>

Sent: Friday, April 8, 2022 5:59 AM

To: Mark McGregor <mark.mcgregor@orolia.com>; Keith Wing <Keith.Wing@orolia.com>; Tom Ellison <Tom.Ellison@orolia.com>; Brian Hagan <Brian.Hagan@orolia.com>; Joseph Hutt <Joseph.Hutt@orolia.com>; Andrew Honecker <Andrew.Honecker@orolia.com>; Justin Velez <justin.velez@orolia.com>; Alaysia Gilbert <alaysia.gilbert@orolia.com>

Cc: Ryan Johnson <Ryan.Johnson@orolia.com>; Jill Czarniecki <jill.czarniecki@orolia.com>

Subject: RE: Failed 1204-15 and 1204-02 option cards in house?

Adding Quality.

Do we know how many of these cards were affected and how many we shipped that could be affected? Do we believe we have a potential issue in the field? Has the Service team been notified of this prior to this thread?

Scott Zmuda /Director, Global Customer Services / scott.zmuda@orolia.com / Direct 585.321.5826

From: Mark McGregor <mark.mcgregor@orolia.com>

Sent: Thursday, April 7, 2022 2:54 PM

To: Keith Wing <Keith.Wing@orolia.com>; Tom Ellison <Tom.Ellison@orolia.com>; Brian Hagan <Brian.Hagan@orolia.com>; Joseph Hutt <Joseph.Hutt@orolia.com>; Andrew Honecker <Andrew.Honecker@orolia.com>

Cc: Ryan Johnson <Ryan.Johnson@orolia.com>; Scott Zmuda <Scott.Zmuda@orolia.com>

Subject: Failed 1204-15 and 1204-02 option cards in house?

Hi All,

Does tech support have failed 1204-04 case 271696, and 1204-15 case 116677 reported below, in house? If so could engineering get them to evaluate for root cause?

Andy Honecker has been evaluating the two burnt 1204-05 cards from below and has found that it is a cracked ceramic capacitor at location C144 connected to 12V at 12V to 5V DC-DC converter failed shorted and caused high current draw from 12V which burned up the L26 ferrite bead on both the burnt 1204-05. This same capacitor is likely the fault on the 1204-04 card reported below. The 1204-15 could also be the same issue because it has the same. It can be evaluated for this issue if we have those cards.

I mentioned this to Dave West and he instantly replied, is it at the edge of the option card?, which it is on 1204-05 and 1204-02, -04 option cards. Dave mentioned the production had an issue with cracked capacitor problem with this C144 on both 1204-05 IRIG and 1204-02, -04 serial time code that required corrective action with CM. It is possible that some defective cards got out to customers.

Unsubscription • Unsubscribe message
As reported by Keith Wing

Further below (and excerpted directly below in blue) is an email report from another SecureSync customer (via Vicom, our dealer in Australia) of physical damage (burn traces/charred components) to the 1204-05 IRIG Option card PCB. I'm concerned it may be related to a design issue, either resulting in damage to the IRIG Option Cards, or somehow allowing the boards to be damaged in some fashion by external factors. I've seen enough reports now that make me suspect that this is not just a "one-time occurrence" and therefore, I believe further investigation into the actual cause is necessary.

I have received in for repair three SecureSync (two in warranty and one out of warranty). They all have the same failure mode, and its strange. The IRIG card has blown component(s). See attached photograph. I have also attached the logs for the device.

If a high voltage had been applied to the IRIG card I would of expected damaged nearer the BNC connectors, not at the main board connector. I have connected two so far of the three failing units to the GPS antenna and they are tracking Satellites.

A full picture of the report today is attached to Salesforce case 262095. But I've attached a snippet of it to this email. I have also copied in Tom E and Brian with the repair team. I know we have had at least one or two of these received in for repair in the recent past. I'm not sure if the damage was in the exact same portion of the PCB as shown in this PCB. They may be able to provide additional info on this topic. Not sure if the damaged boards are still available. Looking at other past Salesforce cases, I first thought it was only the 1204-05 card. But I also found a similar case with at least one 1204-15 (IRIG output only card, from further back). If I recall correctly, Tom R was involved with Case 271696 for LMCO, as they had requested root cause analysis.

This Case 262095: New report today (from Vicom) of three SecureSyncs with PCB damage
Case 262785 (TMCO) 1204-05 in slot 1 charred components
Case 271696 (LMCO) 1204-04 burnt traces
Case 264404 (Thymion) 1204-05 two 01005 components
Case 116677 (Susan Engineering) Older case, charred components on 1204-15

- **Software issues**

A) (Applicable to version 5.8.6 and below) IRIG AM Output Phase Adjustment is buggy at 100 Hz

- Refer to JIRA ticket SSS-751
- Fixed in update version 5.8.7

B) IRIG output Signature Control not squelching the output, as would be expected when its enabled

- Refer to SF case 120390
 - This is a direct factor of using IRIG Signature Control in combination with the Spectracom variant of the IEEE C37... (IEEE-1344 extensions). This only affects the Sync status indicator within the IRIG signal, instead of causing the IRIG output to stop.
- If an IRIG slave isn't able to read and use the Sync status indicator, the slave can still use its IRIG input, which continues to be present while the SecureSync is not in sync.
 - The fix to squelch the IRIG output instead of just changing the Sync status in the message) is to use the standard IEEE C37 as the Control Function (instead of using the "Spectracom C37" selection). See the email below for details

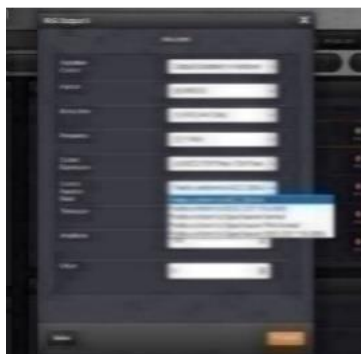
Email from Keith (23 Oct 17) I wanted to send you a quick update regarding the SecureSync IRIG Signature Control function before I left.

We were able to duplicate this condition here as well. It's actually just a minor "combination configuration" condition, relating to two different available "IEEE C37.118-2005" settings for each IRIG output, in the Control Function field.

One of the two Control Function drop-downs to add the "C37 IEEE extensions" is specific to Spectracom (the second one in the drop-down) and the first one in the list is to select the generic one.

When Signature Control is used in conjunction with the "Spectracom IEEE" selection, only the Sync bit within the IRIG output changes while in Holdover). The signal will continue being outputted (this is intentional). If an IRIG slave doesn't know how to read this Sync bit, it will continue to sync to its incoming IRIG data stream,

However, when the generic (first "IEEE C37" selection in the list) is selected, and Signature Control is enabled, the IRIG output will be squelched (as your customer is expecting to be observing). So, then it doesn't matter if the Slave can't decode the Sync bit, because there is no signal present.



In Summary, just simply switch the **Control Function** field for the IRIG output(s) from the current selected value of **"Spectracom IEEE"** to **"conforms to IEEE"** to have the output squelched after removing inputs to the SecureSync.

C) IRIG In/Out configurations not correct during system boot-up (IRIG AM is always initially outputted, even if output has been reconfigured for IRIG DCLS)

- Refer to more recent Salesforce Case 260040 (March 2021)
- Applicable to at least software versions 5.9.1 and below
- IRIG DCLS starts out as IRIG AM until system has initialized.
 - Q "We have a SecureSync with several IRIG add-on cards (add on cards 05 and 15). We noticed that even though an output has been configured for IRIG-B DCLS, it outputs IRIG-B AM when the unit first powers up and does so for a minute. Is there a way to change these cards to output DCLS after power-up? We intend to have this output drive a TTL gate which can only take -0.5 volts and I observed -2.5 volts when the unit was first powered."
 - A. **per Dave Sohn to Morgan (9 Oct 15)** "That is correct. The outputs are defaulted until the processor comes up to set the persisted configuration."

D) Issues with Local time configuration/output

1. **Issue with Local time configuration in at least Version 5.1** – new browser versus classic interface issues when trying to configure local time output. New browser works fine. Classic browser has issues.
 - Refer to **Mantis case 2855** <http://cvsmantis.int.rolia.com/mantis/view.php?id=2855>
 - Refer to Salesforce case 14695 (GE Aviation)
 - **Fix (work-around):** Configure IRIG for local clock in new web browser. Then open the classic interface and just verify the IRIG output settings.
2. **Issue with Local time configuration in at least 5.1.2** with at least the 1204-15 IRIG output Option Card- one output loses local clock setting when another output is configured
 - **Refer to Mantis case 2942** <http://cvsmantis.int.rolia.com/mantis/view.php?id=2942>
 - Fixed in version 5.2.0 update
3. **Issue with Local time configuration in Version 5.2.0** one output loses local clock setting when another output is configured
 - Refer to **Mantis case 3006** <http://cvsmantis.int.rolia.com/mantis/view.php?id=3006>
 - Refer to Salesforce case 17343 (GE Aviation)
 - **Fix (work-around):** Delete the Local Clock altogether and then recreate it using the newer browser. Then re-apply it to the IRIG outputs.
 - **This issue is fixed in version 5.2.1** (Apr 15)

E) Implemented a fix in the FPGA to improve 1PPS signal to the Option Cards (including IRIG cards), addressing a possible 5ns 1PPS signal jump.

- Fix started in version 5.2.0
- Previously occurring in SecureSync units equipped with a standard Rubidium oscillator.

Other software updates for IRIG cards

A) Leap second distribution to IRIG input slaves

Update Version 5.2.1

Mantis case 3008: Leap second pending indication added in new control field (for customers such as Verizon)

- Version 5.2.1 (Apr 2015) is adding a new custom control field to announce Leap Second 30 days prior (for NTP Slaves).

Issue- The only IRIG format that contains leap second info is the IEEE 37-118.2005. This will only enable the leap second bit 60 seconds before the leap second is to occur, making it too late to propagate through NTP Clients if an IRIG Master/Slave application is used.

Fix - “Added new control field format for Spectracom IEEE C37, which extends the leap second notification to a month.”

Fiber Optic input and output connectors/Fiber cables/Fiber converters

Multimode fiber versus Singlemode fiber

Note: The IRIG Fiber cards require multimode fiber cable and can only connect to other devices which support multimode.

The 1204-1E & 1204-27 are multi-mode **ONLY**.

- Option cards **ARE NOT** compatible with Single mode

Note: For base assemblies: 1204-0050-F000 and 1204-0150-F000

A) Fiber Optic Output connectors



- Plastic body
- **Spectracom P/N:** MP20R-0010-0001
- **Manufacturer:** Avago Technologies
- P/N: HFBR-1414TZ (Transmitter high power, 820 nm, ST connector, Threaded, RoHS compliant)
- **Digikey P/N:** HFBR-1414TZ (<http://www.digikey.com/scripts/DkSearch/dksus.dll?lang=en&keywords=hfbr-1414tz&WT.srch=1&cur=USD>)

B) Fiber Optic input connectors



- Plastic body
- **Spectracom P/N:** MP20R-0010-0002
- **Manufacturer:** Avago Technologies
- **MFG P/N:** HFBR-2416TZ (Receiver, 820 nm, 125MHz Analog output, ST connector, Threaded, RoHS compliant)
- **Digikey P/N** HFBR-2416TZ

Link to their data sheet: http://www.digikey.com/scripts/DkSearch/dksus.dll?lang=en&keywords=hfbr-2416tz&WT.mc_id=Optoelectronics&WT.medium=cpc&WT.campaign=Optoelectronics&WT.content=text&WT.srch=1&WT.source=google&cur=USD

Customer needing to use singlemode fiber with our multimode IRIG Option Cards

- Refer to Salesforce Case 224988

Link to data sheet (for both Fiber Optic input and output connectors <http://www.avagotech.com/docs/AV02-0176EN>) (includes info on recommended fiber cable.

Per the above referenced data sheet:

- **Fiber Optic Outputs:** We use connector **HFBR-1414TZ** (Transmitter high power, 820 nm, ST connector, Threaded, RoHS compliant)
- **Fiber Optic Inputs:** We use connector **HFBR-2416TZ** (Receiver, 820 nm, 125MHz Analog output, ST connector, Threaded, RoHS compliant)
- **Fiber cable:** We recommend using either 50/125 µm or 62.5/125 µm, multimode Fiber cable.
- Link Distances up to 2.7 km.

Ancillary kits/Fiber Optic Mating connectors (Per Tim Tetreault 8 APR 2013): We do not include any Fiber Optic mating connectors. The mating connector would normally be pre-installed on the Fiber Optic cable they purchase. If a customer is making their own cables, they need to supply the mating connector.

Core and cladding diameters for Fiber cable

Multi-mode fibers are described by their core and [cladding](#) diameters. Thus, 62.5/125 µm multi-mode fiber has a core size of 62.5 micrometers (µm) and a cladding diameter of 125 µm. The transition between the core and cladding can be sharp, which is called a [step-index profile](#), or a gradual transition, which is called a [graded-index profile](#). The two types have different dispersion characteristics and thus different effective propagation distance.^[5] Multi-mode fibers may be constructed with either [graded](#) or [step-index](#) profile.^[6]

OM1, OM2, OM3 and OM4 classification

- Per Tim Tetreault, OM values are for fiber cable, not the fiber transmitters/ receivers. So, we are compatible with all for OM classifications (OM1, OM2, OM3 and OM4)
- However, the better the cable, the longer that the signal can run.

From Wikipedia:

multi-mode fibers are described using a system of classification determined by the [ISO 11801](#) standard — OM1, OM2, and OM3 — which is based on the [modal bandwidth](#) of the multi-mode fiber. OM4 (defined in TIA-492-AAAD) was finalized in August 2009,^[7] and was published by the end of 2009 by the [TIA](#).^[8] OM4 cable will support 125m links at 40 and 100 Gbit/s. The letters "OM" stand for *optical multi-mode*.

Comparison [\[edit source \]](#) [\[edit beta \]](#)

| Transmission Standards | 100 Mb Ethernet | 1 Gb (1000 Mb) Ethernet | 10 Gb Ethernet | 40 Gb Ethernet | 100 Gb Ethernet |
|------------------------|---------------------------------------|---------------------------------|--------------------------------|---------------------------|---------------------------|
| OM1 (62.5/125) | up to 2000 meters (FX) ^[9] | 275 meters (SX) ^[9] | 33 meters (SR) ^[9] | Not supported | Not supported |
| OM2 (50/125) | up to 2000 meters (FX) ^[9] | 550 meters (SX) ^[2] | 82 meters (SR) ^[2] | Not supported | Not supported |
| OM3 (50/125) | up to 2000 meters (FX) | 550 meters (SX) | 300 meters (SR) ^[9] | 100 meters ^[2] | 100 meters ^[2] |
| OM4 (50/125) | up to 2000 meters (FX) | 1000 meters (SX) ^[2] | 550 meters (SR) ^[2] | 150 meters ^[2] | 150 meters ^[2] |

MAX FIBER CABLE LENGTH FOR 1PPS AND IRIG FIBER OUTPUTS

Q from Sadie Do you know the max lengths for IRIG via Fiber and RG-58 cable?

A. Reply from Dave Lorah (26 May 15) The max FO cable length is approximately 2.4km or 7900 feet with no splices. RG-58 is shorter at about 1000 feet

Actual Recommended max length depends on what is driving the signal and what the input requirements are on the receiving end.

- With our Fiber output cards, we feel comfortable with lengths up to 1.5km
- Need to account for cable delays. for every 1m of fiber cable, you get about 5nsec of delay. So, for a 1km length, you get about 5usec of delay.

Note: (Per Dave Sohn) 1PPS and IRIG have the same guidelines for fiber optic.

Per Tim Tetreault 6-21-13 (For SecureSync IRIG Fiber Optic cards, such as 1204-1E)

I did all my testing using 50/125, multimode fiber cable. When I tested our option card on the 1km fiber cable, I was able to measure the drop in the signal level from a test point on our board. This showed me that we still have some head room where we could work with longer lengths. But how far will depend what is driving the signal. If the customer is using a weaker fiber optic source, 1km might be the max. If they use our option card fiber output, I am pretty sure we could do 1.5km.

One thing to keep in mind is the farther the signal goes, the larger the min pulse width will need to be to work. When I did the 1km test, the min pulse with had to be a least 20ns for it to work.

A rule of thumb to remember is for every 1m of fiber cable, you get about 5nsec of delay. So, for a 1km length, you get about 5usec of delay. This is something the customer needs to account for when running their cables.

Fiber converters for IRIG

- Refer to “**IRIG Fiber converters**” in the custassistance document.

IR_GetMessage / IP_GetMessage example programs/API calls (decodes raw IRIG signals)

A) IR_GetMessage example programs/API calls

- Used to decode the raw IRIG input message

B) IP_GetMessage example programs/API calls

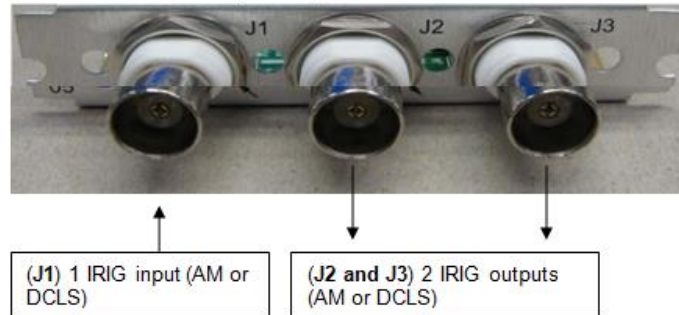
- Used to decode the raw IRIG output message

API calls associated with IRIG inputs / IRIG outputs

- Refer to Tim Tetreault's "cheat sheet" at: <..\..\EQUIPMENT\SPECTRACOM EQUIPMENT\Timing boards\TSync family\Tsync driver calls cheat sheet>
- These API calls are primarily for internal use, but the associated "**get**" calls are available via the CLI interface ("sets" are not available to either spadmin or user accounts)
- These are examples - additional calls may have since been added

| IRIG IN Commands | IRIG OUT Commands |
|------------------|-------------------|
| IR_GetCodedExp | IP_GetCfData |
| IR_GetCtrlField | IP_GetCodedExp |
| IR_GetFormat | IP_GetCtrlField |
| IR_GetFreq | IP_GetFormat |
| IR_GetMessage | IP_GetFreq |
| IR_GetMod | IP_GetLocal |
| IR_GetMode | IP_GetMessage |
| IR_GetNumInst | IP_GetMod |
| IR_GetOffset | IP_GetNumInst |
| IR_GetValidity | IP_GetOffset |
| IR_GetCfData | IP_GetPhase |
| IR_GetLocal | IP_GetPhaseErr |
| IR_GetTimeScale | IP_GetSigCtrl |
| IR_SetCodedExp | IP_GetTimeScale |
| IR_SetCtrlField | IP_SetAmp |
| IR_GetTimeScale | IP_SetCfData |
| IR_SetCodedExp | IP_SetCodedExp |
| IR_SetCtrlField | IP_SetCtrlField |
| IR_SetFreq | IP_SetFormat |
| IR_SetMessage | IP_SetFreq |
| IR_SetMod | IP_SetLocal |
| IR_SetMode | IP_SetMessage |
| IR_SetOffset | IP_SetMod |
| IR_SetLocal | IP_SetOffset |
| IR_SetTimeScale | IP_SetPhase |
| IR_GetRefId | IP_SetSigCtrl |

*** (1204-05) 1 IRIG In/2 IRIG Output Option Card



Schematic (1204-1051-0200) In Arena: https://app.bom.com/items/detail-spec?item_id=1202832971&version_id=10221307808&orb_msg_single_search_p=1&redirect_segno=5747247506

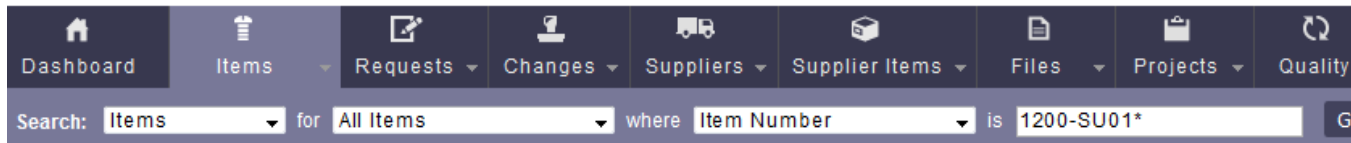
PCB (1204-0050-F000) In Arena: https://app.bom.com/items/detail-spec?item_id=1202845085&version_id=10212762888&orb_msg_single_search_p=1&redirect_segno=5747147090

1204-05 firmware versions

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- 1204-05 card: rt_oc05_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|--|--|--------------------|
| | 4.8.7 | | The IEEE 1344 Extensions, when configured to be included in the IRIG output data stream’s “Control Functions” (CF) fields, now only provide Local time (DST and Time Zone Offset) information if a Local Clock name has been selected as the output timescale. | |
| | | 1.02 (latest rev as of at least version 5.8.5) | Not sure at what version 1.02 was cut-in at, but it’s in at least software versions 5.2.1 through at least v5.8.5 | |

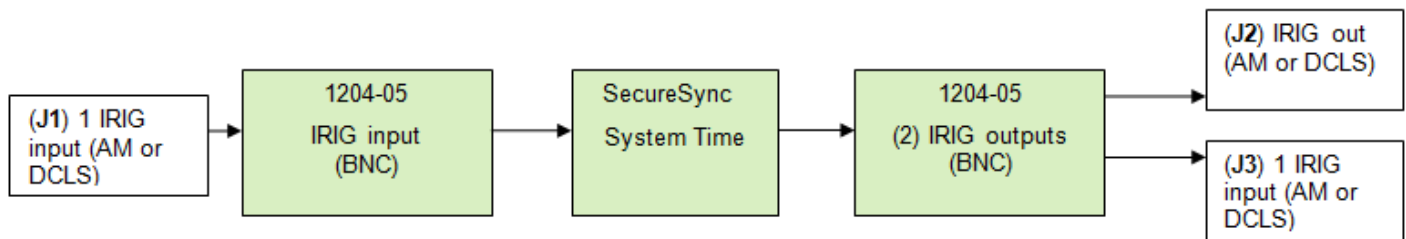
1204-05 Hardware changes

For hardware assembly versions, refer to: (1204-): I:\New Released\Firmware_Software\1204-xxxx-xxxx

For Option Card hardware versions, refer to: (SP05) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |
| | | | | |

Block Diagram



One IRIG (AM or DCLS) Input (J1)

- One BNC connector (J1) for IRIG input
- AM or DCLS modulation accepted.
- The range of the IRIG input amplitude is 0.5 to 10 Volts P-P

Input range

- **The range of the IRIG AM input amplitude** is 0.5 to 10 Volts P-P

AM Signal Level: 500 mV to 10 Vp-p (modulated 2:1 to 6:1); 50 Ω load

Input impedance

- **The IRIG DCLS input impedance** is >10k ohms. TTL with DCLS IRIG IN connected to ground

Q On our datasheet (attached), under the IRIG 1204-05 card (page 6 – two red boxes) in one part the impedance for TTL says 50 ohms, in the other it says >10k ohms. The manual refers to just 10k ohms for TTL. Which is correct?

A Reply from Dave L (22 Aug 17) Yes, that is confusing. What it means is the IRIG DCLS output impedance is TTL into 50 Ohms. The IRIG DCLS Input impedance is 10 K ohms.

NOTE: for additional info on IRIG, also refer to the various “IRIG” sections of the custserviceassist doc :

<I:\Customer Service\1- Cust Assist documents\CustomerServiceAssistance.pdf>

IRIG Input accuracy

- +/- 2 to 200 microseconds (IRIG Format dependent)

The IRIG Option Card consists of two IRIG OUTPUT connectors (BNC connectors J2 and J3) and one IRIG INPUT generator to be connected to SecureSync in order to be a time and PPS reference input for the SecureSync to be able to **synchronize with (If an IRIG time code generator is available, the IRIG input can be used in conjunction with GPS, or as an alternative to GPS, for SecureSync time synchronization).**

The **Setup/Inputs/IRIG** page of the SecureSync's web browser allows the input to be configured to match the incoming IRIG data stream's configuration.

FAQs on the IRIG input

Q. Does the IRIG Option Card support 600 ohms and 5 kohms impedance for the IRIG AM input (in addition of 50 ohms)?

A. The IRIG AM input is high impedance, so it should be able handle either 600 or 5K ohms. But you may need to externally terminate (the input impedance is 100K for AM and 33K for DCLS)

Q. Is there isolation between the IRIG B input and the IRIG B output? Or, is there is an electrical isolation or an opto-coupler on the IRIG B input circuit? If yes, what is its isolation capability, expressed as a voltage?

A. The input is not electrically isolated with a transformer or opto coupler. However, it can support common mode voltages of +/-150VDC.

IRIG outputs (2)

- IRIG AM and DCLS Outputs
- two IRIG outputs are available (connectors J2 and J3)

Power-up Default IRIG outputs (both 1200 SecureSyncs and 2400 SecureSyncs)

- Refer to Salesforce Cases 260040
- Initial hardware power-up default is IRIG B, AM modulation.
- If the IRIG output is configured in software to be DCLS (or another format besides IRIG B), IRIG will initially power-up as default IRIG B AM, and then around a minute or so later (once software kicks-in) the output changes to the software configuration (such as DCLS).
- **Workaround:** This normally isn't a problem for the other equipment connected to the IRIG output. However, refer to the IRIG out squelch patches (one for 1200 and another for 2400) discussed directly below

Special Hot patches for 1204-05 and 1204-15 cards

Desire to Squelch/Squelching the IRIG output (1204-04 and 1204-15) at initial boot-up, until sync has occurred (both Model 2400 and 1200 SecureSyncs)

- TOYO reported the IRIG cards were outputting default IRIG DCLS instead of configured IRIG AM at boot.

A) Patch for 2400 SecureSyncs

- Refer to JIRA ticket CAR-1812 and DMND-1811

B) For 1200 SecureSyncs (ECO-2266)

- Refer to JIRA tickets SSS-659, SSS-679 and SSS-699
- Patch was created for TOYO (refer to Salesforce Cases 260040 and 193810)

1204-05/1204-15 hotpatch (converts to HW ID 02 and sets the default Signature Control of all outputs to 'Disabled')

- Refer to **ECO-2266** (in Arena): https://app.bom.com/changes/detail-summary?change_id=2397600610&
- Refer to **1200-SU02-1502.tar** (in Arena): https://app.bom.com/items/detail-spec?item_id=1271297142&version_id=11413443548&

Create Rev 02 of 1200-SU02-1502 that will change both 1204-05 and 1204-15 to HW ID 02. (Prior rev only changed 1204-15).

IRIG output impedance

- **The IRIG DCLS output impedance** is TTL into 50 Ohms

Q On our datasheet (attached), under the IRIG 1204-05 card (page 6 – two red boxes) in one part the impedance for TTL says 50 ohms, in the other it says >10k ohms. The manual refers to just 10k ohms for TTL. Which is correct?

A Reply from Dave L (22 Aug 17) Yes, that is confusing. What it means is the IRIG DCLS output impedance is TTL into 50 Ohms. The IRIG DCLS Input impedance is 10 K ohms.

Current limit of the IRIG outputs

Q. What's the current limit of the TTL driver for this output?

A. Reply from Tom Richardson (31 Jan 17) 1204-05 output is four 74ACT08 ICs, each driving 4.75 ohms, clamped to 0 and 5V. Output drive current is 24 mA max for each output for 96 mA total. Into 50 ohms it would be 4.8 volts. It is really a little less than that because of the output switch but I would say 4.6 V.

- The output circuits are exactly the same on both the 1204-05 and 1204-15 IRIG option cards. So, the output drive specs are the same.

Follow-up question tied to the above question

Q If the 1204-05 has 24ma drive capability, does that mean it could drive many 10 kohm interfaces in parallel (since the 10 kohm interface draws only 0.5ma)?

A Yes, you could drive many inputs from a single IRIG output.

Output signal levels

- Each of the two outputs is user-selectable as either:
 - **Amplitude Modulated** (0.5v to 6v peak to peak into 50 Ω) or
AM Signal Level: 500 mV to 10 Vp-p (modulated 2:1 to 6:1); 50 Ω load
 - By default, the outputs are about 2.5v-p, adjustable via digital pot value from 0vp-p to about 5vp-p
 - **DC Level Shift** (unmodulated)
DCLS Signal Level: TTL; 0.8V max., 2.3V min fail.; >10 k Ω load

Amplitude of the (AM) Amplitude Modulated output:

- By default, the outputs are about 2.5v-p, adjustable via DAC value from 0vp-p to about 5vp-p

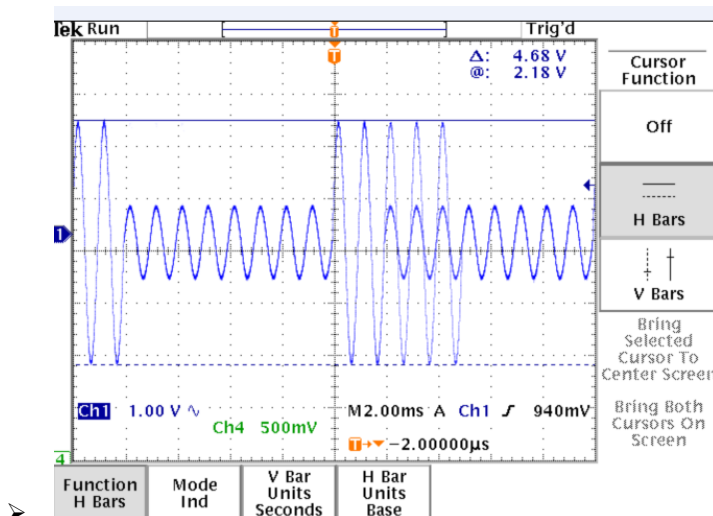
Q. I was looking at the SecureSync GPS receiver and wanted to know if you could inform me at what signal level exactly is the IRIG-B DC signal is provided? I know the AM version is up to 5Vp-p.

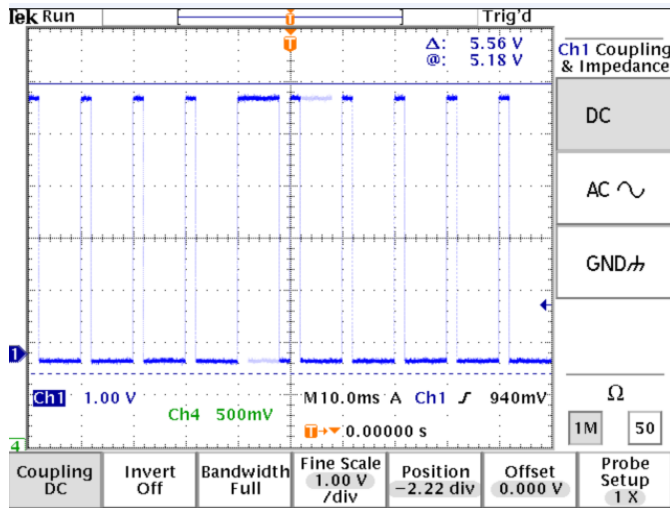
A. (From Dave Sohn) The IRIG DCLS from SecureSync is 5V TTL into 50ohms.

A Email from Dave Lorah: "I took a reading with my scope on the SecureSync IRIG B output and found with the amplitude set at default value 128, the IRIG output measures 4.6 Vp-p into 1M ohms and 2.4 Vp-p into 50 Ohms".

Q. Is there isolation between the IRIG B input and the IRIG B output? Or, is there is an electrical isolation or an opto-coupler on the IRIG B input circuit? If yes, what is its isolation capability, expressed as a voltage?

A. The input is not electrically isolated with a transformer or opto coupler. However, it can support common mode voltages of +/-150VDC.





IRIG Output level adjustment

- Users can configure the output level of **IRIG AM** output signals via the browser.
- Users cannot configure the output level of **IRIG DCLS** output signals ("The level adjustment has no effect on TTL outputs, only on AM formats")

Cable impedance/Cable distance limitations

Q I have other questions. For IRIG-B000, I assume that the DCSL out is 0 to +5 volts into a 10 kilo-Ohm load? And is it OK to use a 50 Ohm coax cable (or recommended cable, I haven't used this output before), if so has any one at your end determine a cable length limit?

A **Reply from Tom Richardson (31 Jan 17)** OK 50 ohm cable is fine. Max length would depend on the characteristics of the cable used and the input sensitivity of the receiver the signal is going into. All we can say is the output amplitude on our end. There is usually very little loss at such a low frequency and they should be able run for a long way, maybe 2000 feet. Don't forget, the rise time of the signal will be affected by the cable.

A. **Reply from Tom Richardson** OK to use a 50 Ohm coax cable (or recommended cable, I haven't used this output before), if so has any one at your end determine a cable length limit?

Output Termination

- The IRIG AM and DCLS outputs can be terminated into 50 ohms.
The IRIG output distribution from the SecureSync's IRIG Input/Output Option Card (Model 1204-05) is pretty straight-forward. To begin, we recommend using standard 50 ohm RG-58 coax cable to distribute the IRIG output signal. The Model 1204-05 Option Card has three BNC connectors. As shown in the picture below, BNC connector J1 (the left-most connector) is an IRIG input to SecureSync and BNC connectors J2 and J3 are both IRIG outputs (as indicated by the small arrow screened onto the card, next to each connector. The arrow pointing in indicates the connector is an input, while an arrow pointing out indicates the connector is an output).

The IRIG outputs ports (BNC connectors J2 and J3) can drive up to 50 ohms each. The IRIG outputs should be daisy-chained, starting from either J2 or J3 on this Option Card, from one device at the site to the next. If the other devices use BNC connectors, a BNC T connector placed on each input connector can be used to easily daisy-chain the IRIG signal. The number of devices that each IRIG output can drive is dependent upon the input impedance of the other devices.

If the IRIG input devices are all high impedance input, the IRIG output signal can be daisy-chained to many devices without the need for an IRIG distribution amplifier to be used. However, if one of more devices has a 50 ohm input impedance, we recommend each IRIG output only be connected to one device each (two devices at most, with a daisy-chain configuration from the first to the second). To drive more than four total devices (two per each IRIG output connector), we recommend using an IRIG distribution amplifier (such as the Spectracom Model 7535) to

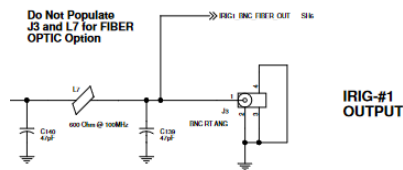
~~distribute the IRIG signals to multiple devices. The Spectracom Model 7535 has one IRIG input and up to 12 available IRIG outputs connectors, each port being able to drive up to 50 ohm devices.~~

~~I have attached a copy of the Model 7535 user manual for your reference.~~

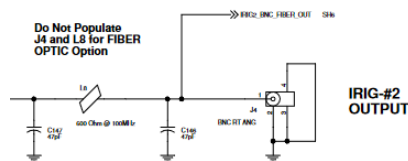
The **Setup/Outputs/IRIG** page of the SecureSync's web browser allows the two output ports to be configure, based on the input requirements of the other auxiliary equipment.

Output Port ground isolation between IRIG BNC outputs

- Metal BNC connectors share common ground
- If necessary, ground isolation needs to be added external to the Option Card



IRIG AM/DCLS BNC OUTPUTS



IRIG input configuration fields:

“Format” (set to “Automatic”)

Q. I set the SecureSync to automatic mode does this just give the best guess:

A. “Auto Detection” mode can only be used to automatically detect the IRIG **Format**. This mode is not able to automatically detect any of the other IRIG parameters other than the Format (such as Modulation, Coded Expression, Control Field, etc). If the Format is known, we recommend manually setting it the corresponding value, instead of using “automatic” mode to detect it.

FYI-The primary purpose for the “Auto Detection” mode is it can be used as quick “sanity” tool to verify if the IRIG signal is present. As long as the IRIG signal is present, when this field is set to “automatic”, the field will change from “automatic” to the detected IRIG Format, within just a couple of seconds. If it doesn’t switch, the IRIG signal is likely not being provided to the SecureSync.

“Control Field”

Q. What is the unknown for in the dropdown: “

A. “**Unknown**” is used for “internal use only”.

(Internal note), “Unknown” is listed in the drop-down list, but it’s not actually selectable as a configuration. It appears in the list because in the background, the IRIG output Status page uses the same table as the input selection list. It is not selectable as a configuration value (a validation error will be displayed, if attempting to select it).

Q. There is no option to set the control field data to none?”

A. Selecting “**RCC 200-04**” for the Control Field will operate as “None”. There is no need for a separate “none” drop-down.

A) Newer web browser (versions 5.1.2 and above)

IRIG input

IRIG Input 0

IRIG-B121

Format (B) IRIG B

Modulation Type (1) IRIG AM Only

Frequency (2) 1 KHz

Coded Expression (1) BCD TOY, Ctrl Func

Control Function Field Fields conform to RCC 200...

Local Clock UTC

Offset 0

Format: Used to configure the desired IRIG output formatting. The available choices are:

IRIG A IRIG G
IRIG B IRIG E
NASA-36

Modulation: Changes the type of output signal modulation. The available choices are:

- **IRIG DCLS**—A TTL-modulated output.
- **IRIG AM**—An amplitude modulated output. The amplitude of the output is determined by the value entered in the **Amplitude** field.

Frequency: The IRIG modulation frequency. This is determined by the configuration of Format and Modulation Type.

Coded Expression: Defines the data structure of the IRIG signal, where:

- **BCD** = Binary Coded Decimal
- **TOY** = Time of Year
- **CF** = Control Field
- **SBS** = Straight Binary Seconds

Control Function Field—IRIG signals have an optional section in the data stream that can be used to include additional information (such as the present year, for example). This field allows the Control Field section of the IRIG output to be defined. The available configurations are:

Fields Conform to RCC 200-4: IRIG spec 200-04 specified a location for year value, if included in this field.

- **Fields Conform to IEE 1344:** Control Field contains year, Leap Second and DST information.
- **Fields Conform to Spectracom Format:** Year is included in Control Field but not in the same location as RCC-2004 output (year is offset by one position).
- **Fields Conform to Spectracom FAA Format:** A unique IRIG output Control Field that contains satellite lock status and time error flags.
- **Fields Conform to NASA Formats:** Variants of IRIG B.

The available options will vary according to the configurations of Format and Modulation Type.

Signature Control: Used to control when the IRIG modulation will be present. This function allows the modulation to stop in certain situations. The options available are:

- **Output Always Enabled:** IRIG time code modulation is present, even when SecureSync is not synchronized to its references.
- **Output Enabled in Holdover:** IRIG time code modulation is present unless the SecureSync is not synchronized to its references (Modulation is present while in the Holdover mode).
- **Output Disabled in Holdover:** IRIG time code modulation is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).
- **Output Always Disabled:** No IRIG output modulation is present, even if any SecureSync input references are present and considered qualified.

The available options will vary according to the values of **Format** and **Modulation Type**.

Timescale: Used to select the time base for the incoming ASCII time code data. The entered Timescale is used by the system to convert the time in the incoming ASCII data stream to UTC time for use by the System Time. The available choices are:

- **UTC**—UTC is also referred to as ZULU time.
- **TAI**—Temps Atomique International,
- **GPS**—The raw GPS time as transmitted by the GNSS satellites (as of Sept, 2013, this is currently 16 seconds ahead of UTC time).
- **A local clock set up through the Time Management Page**—This option will appear under the name of the local clock you have set up. Local timescale allows a Local Clock to apply a time offset for Time Zone and DST correction.
- **Amplitude:** The peak-to-peak output voltage level into a 600 Ω load is adjusted by entering a digital control value in this field. The level adjustment has no effect on TTL outputs, only on AM formats. The value of 128 will cause the Mark amplitude to be about 5vp-p into high impedance. A value of 200 results in an output amplitude of about 9vp-p into high impedance

Offset: Provides the ability to account for IRIG cable delays or other latencies in the IRIG input. The Offset value is entered and displayed in nanoseconds (ns). Available Offset range is -500 to +500 ms.

Known software issues

1. Local clock configuration

- Refer to Mantis case 2855 <http://cvsmantis.int.rolia.com/mantis/view.php?id=2855>

In V 5.1.4, when configuring a Local Clock to the IRIG output, the new web UI shows the local clock is accepted. When switching to the Classic UI the "Local" setting appears in the Time Scale field but the name of the local clock does not appear in the Local Clock field. It is just blank. The IRIG output remains UTC until the Local Clock field is filled in.

IRIG outputs



The screenshot shows a configuration window titled "IRIG Output 1" with a close button (X) in the top right corner. The window contains a form for configuring IRIG output parameters. The form is divided into two main sections: "IRIG-B121" and "IRIG-A121". The "IRIG-B121" section is currently active and contains the following fields:

- Signature Control: Output Always Enabled
- Format: (B) IRIG B
- Modulation: (1) IRIG AM Only
- Frequency: (2) 1 KHz
- Coded Expression: (1) BCD TOY, Cnt Func
- Control Function Field: Fields conform to RDC 200...
- Timescale: UTC
- Amplitude: 120
- Offset: 0

At the bottom of the window, there are two buttons: "Status" and "Submit".

B) Classic interface browser (versions 5.0.2 and below)

Setup/Inputs/IRIG

INPUTS SETUP - IRIG (SLOT3)

| | |
|------------------|----------------|
| Mode | Auto Detection |
| Format | Unknown |
| Modulation | (1) IRIG AM |
| Coded Expression | Unknown |
| Control Field | Unknown |
| Time Scale | UTC |
| Local Clock | |
| Offset (ns) | 0 |

Submit Reset

Mode Manual
Auto Detection
Manual

Format Unknown
IRIG A
IRIG B
IRIG G
NASA-36
Automatic
Unknown

Modulation (1) IRIG AM
(0) IRIG DCLS
(1) IRIG AM
Unknown

Coded Expression (1) BCD TOY / CF
(0) BCD TOY / CF / SBS
(1) BCD TOY / CF
(2) BCD TOY
(3) BCD TOY / SBS
(4) BCD TOY / BCD Year / CF / SBS
(5) BCD TOY / BCD Year / CF
(6) BCD TOY / BCD Year
(7) BCD TOY / BCD Year / SBS
Unknown

Time Scale UTC
UTC
TAI
GPS
LOCAL

Control Field RCC 200-04
RCC 200-04
IEEE 1344 (C37.118-2005)
Spectracom Format
Spectracom FAA Format
NASA
Unknown

Setup/Outputs/IRIG

OUTPUTS SETUP - IRIG (SLOT3)

| Output Index | 0 | 1 |
|-------------------|----------------------|----------------------|
| Signature Control | No Signature Control | No Signature Control |
| Format | IRIG B | IRIG B |
| Modulation | (1) IRIG AM | (1) IRIG AM |
| Coded Expression | (1) BCD TOY / CF | (1) BCD TOY / CF |
| Control Field | RCC 200-04 | RCC 200-04 |
| Time Scale | UTC | UTC |
| Local Clock | | |
| Amplitude | 128 | 128 |
| Offset (ns) | 0 | 0 |

Submit Reset

Signature Control Output Always Enabled
Output Always Enabled
Output Enabled in Holdover
Output Disabled in Holdover
Output Always Disabled

Format IRIG B
IRIG A
IRIG B
IRIG G
NASA-36
IRIG E (100 Hz)
IRIG E (1 kHz)
Automatic
Unknown

Modulation (1) IRIG AM
(0) IRIG DCLS
(1) IRIG AM
Unknown

Coded Expression (1) BCD TOY / CF
(0) BCD TOY / CF / SBS
(1) BCD TOY / CF
(2) BCD TOY
(3) BCD TOY / SBS
(4) BCD TOY / BCD Year / CF / SBS
(5) BCD TOY / BCD Year / CF
(6) BCD TOY / BCD Year
(7) BCD TOY / BCD Year / SBS
Unknown

Time Scale UTC
UTC
TAI
GPS
LOCAL

Control Field RCC 200-04
RCC 200-04
IEEE 1344 (C37.118-2005)
Spectracom Format
Spectracom FAA Format
NASA
Unknown

Offset Field: Provides the ability to account for IRIG cable delays or other latencies in the IRIG input. The Offset value is entered and displayed in nanoseconds (ns).

The available Offset range is **-500ms to +500 ms**.

Status/Inputs/IRIG

| INPUTS STATUS - IRIG (SLOT3) | |
|------------------------------|-----------------|
| Reference ID | irg0 |
| 1PPS Validity | Not Valid |
| Time Validity | Not Valid |
| Mode | Auto Detection |
| Format | Unknown |
| Modulation | (1) IRIG AM |
| Frequency | Unknown |
| Coded Expression | Unknown |
| Control Field | Unknown |
| Time Scale | UTC |
| Offset | 0 |
| Message Transaction | 0 0 0 0 0 0 0 0 |

Status/Outputs/IRIG

| OUTPUTS STATUS - IRIG (SLOT3) | | |
|-------------------------------|-------------------------------------|-------------------------------------|
| Output Index | 0 | 1 |
| Signature Control | No Signature Control | No Signature Control |
| Format | IRIG B | IRIG B |
| Modulation | (1) IRIG AM | (1) IRIG AM |
| Frequency | (2) 1 kHz | (2) 1 kHz |
| Coded Expression | (1) BCD TOY / CF | (1) BCD TOY / CF |
| Control Field | RCC 200-04 | RCC 200-04 |
| Time Scale | UTC | UTC |
| Amplitude | 128 | 128 |
| Offset | 0 | 0 |
| Message | 2C1 200 228 2A9 200 200 200 200 200 | 2C1 200 228 2A9 200 200 200 200 200 |

FAQ's about the Model 1204-05, IRIG Input/Output card

Q. If the selected input reference input is IRIG-B, how long does it take before it can output valid NTP time packet (Stratum 1)?

A. With IRIG input applied and being the selected input reference, SecureSync will achieve Time Sync in just a couple of seconds. Then, NTP will be synced and Stratum 1 within about 15 minutes or so from there.

Q. If the unit is not synced to GPS, how does the IRIG-B output work? Is the IRIG-B output still available or it is stopped until resynced?

A. The IRIG output Signature Control (as defined in the Setup/Output/IRIG page of the web browser) determines whether or not the IRIG signal is present or if it's stopped until SecureSync is in sync, instead. There are four settings for IRIG Signature Control, as excerpted from Section 8 of the SecureSync manual:

Signature Control: is used to control when the IRIG modulation will be present. This function allows the modulation to stop in certain situations.

No Signature Control: IRIG time code modulation is present, even when SecureSync is not synchronized to its references.

synchronized to its references (Modulation is present while in the Holdover mode).

Ref State Signature Control: IRIG time code modulation is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).

Output disabled: No IRIG output modulation is present, even if any SecureSync input references are present and considered qualified.

Troubleshooting issues with the IRIG Option Cards

1) Front panel keys not working / Can't access the IRIG configuration menus

- Refer to Salesforce case 10215 (<https://na8.salesforce.com/500C000000Rbjyr?srPos=0&srKp=500>)
- Verify the 1200-XXX Model number has been configured correctly in the **Tools** -> **Upgrade/Backup** page (**Tools** -> **Versions** page of the classic browser). With this case, it was set to an invalid number, which affected the IRIG card. Was OK with version 4.6.0 installed but failed after update to v4.8.9

2) Periodic loss of IRIG modulation

- Refer to Salesforce Case 10410 <https://na8.salesforce.com/500C000000Rcrbc?srPos=0&srKp=500>

Front panel reset today did not clear up problem. Modulation was OK after reboot until Osc status went from Free Run to Trk/Lock then came back

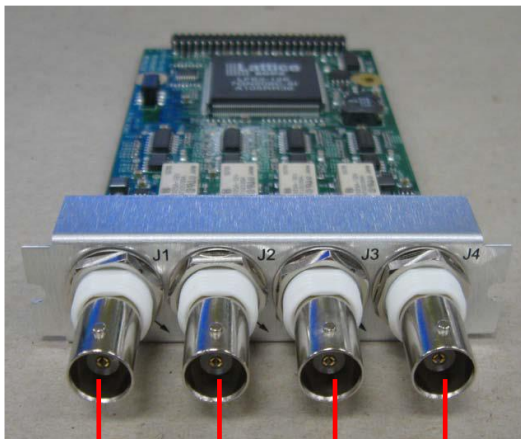
Email from Dave Sohn-If the reference to the unit is bad, or an issue in the unit isn't allowing it to track properly, the 1PPS can be jumping around trying to track it. As it jumps before the unit synchronizes, the IRIG can lose modulation if the 1PPS comes at different times.

Do we have a way to detect it?: (Dave Sohn replied) They can look in disciplining status and see if the state is in the lock state vs setup state. Can also look to see if the reference is going in and out via the event log.

***** (1204-15) Four IRIG output Option Card (BNC) and (1204-39) Four IRIG output Option Card (TNC)**

- **1204-15:** This Option card has four BNC IRIG output connectors
- **1204-39:** This Option card has four TNC IRIG output connectors

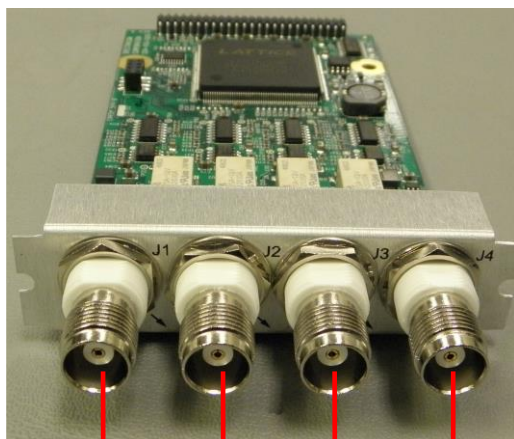
A) 1204-15 (four BNC connectors)



Connectors J1 – J4 are all IRIG outputs



B) 1204-39 (four TNC connectors)



Connectors J1 – J4 are all IRIG outputs



Inputs: None

Schematic: (refer to 1204-1151-0200) in Arena: https://app.bom.com/items/detail-spec?item_id=1202840713&version_id=10690293668&orb_msg_single_search_p=1

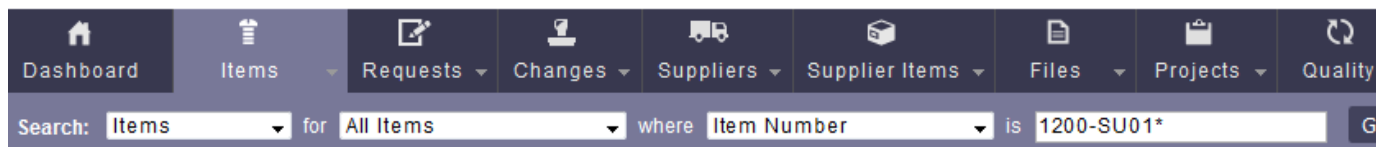
For software assembly versions, refer to: (1204-SHxx, SP1xx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

1204-15 Firmware versions

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- 1204-15 card (ascending order): rt_oc15_hw01_fpga.bin

| ECN/ECO | Archive version | FPGA version reported | Change | approximate cut-in |
|---------|-----------------|--|--|--------------------|
| | 4.5.0 | 1.00 | Added support for this Option card (first release) | |
| | 4.8.7 | | The IEEE 1344 Extensions, when configured to be included in the IRIG output data stream's "Control Functions" (CF) fields, now only provide Local time (DST and Time Zone Offset) information if a Local Clock name has been selected as the output timescale. | |
| | | 1.01 | | |
| | See note | 1.02 current rev as of at least version 5.8.5) | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software versions 5.8.5 | |
| 2647 | 5.9.0 | 1.12 | 1204-15 to version 1.12. Upgraded option card for improved system reliability | Jan 2021 |

Special Hot patch for 1204-05 and 1204-15 cards (ECO-2266)

1) 1204-05/1204-15 hotpatch (converts to HW ID 02 and sets the default Signature Control of all outputs to 'Disabled')

- Refer to **ECO-2266** (in Arena): https://app.bom.com/changes/detail-summary?change_id=2397600610&
- Refer to **1200-SU02-1502.tar** (in Arena): https://app.bom.com/items/detail-spec?item_id=1271297142&version_id=11413443548&

Create Rev 02 of 1200-SU02-1502 that will change both 1204-05 and 1204-15 to HW ID 02. (Prior rev only changed 1204-15).

create Rev 02 of 1200-SU02-1502 that will change both 1204-05 and 1204-15 to HW ID 02. (Prior rev only changed 1204-15).

This is a special for the JAXA project and is not intended to be pushed to production at this time. We anticipate no one will want to buy a card with HW ID 02. As a result, there should be no sourcing or production impact.

Customer Service should be aware that there may be 1204-05 and 1204-15 cards in the field from this one customer that have HW ID 02. Any returns should be handled with Engineering input.

This ECO is Software only and has no electrical or mechanical change to the 1204-05 or 1204-15.

The HW 02 is identical to the HW 01 versions of the cards except it sets the default signature control of all IRIG Outputs to "Output Disabled" and sets the default modulation to "DCLS".

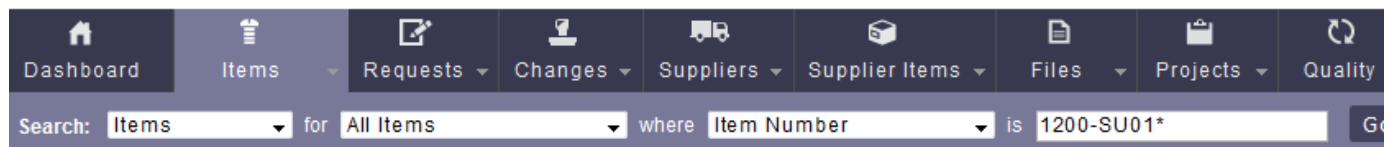
The HW02 version of the 1204-05 makes no changes to the IRIG Input feature.

1204-39 Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- **1204-15 card:** rt_oc15_hw01_fpga.bin

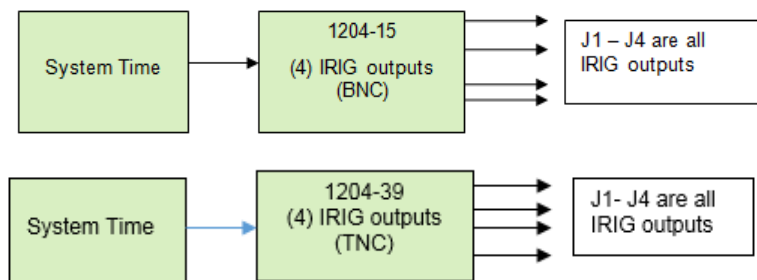
| ECN | Archive version | FPGA FPGA version reported | Change | approximate cut-in |
|-----|-----------------|---|--|--------------------|
| | 4.5.0 | 1.00 | Added support for this Option card (first release) | |
| | 4.8.7 | | The IEEE 1344 Extensions, when configured to be included in the IRIG output data stream's "Control Functions" (CF) fields, now only provide Local time (DST and Time Zone Offset) information if a Local Clock name has been selected as the output timescale. | |
| | | 1.01 | | |
| | See note | 1.02 current rev as of at least version 5.8.5) | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software versions 5.8.5 | |

1204-15 Hardware changes

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.5.0 | | Added support for this Option card (first release) | |
| | | | | |

Block Diagram



IRIG input

- The 1204-15 and 1204-39 Option Cards do not have any IRIG inputs (Outputs only)

IRIG outputs (4)

A) 1204-15

- The 1204-15 Option Card has four BNC IRIG outputs (each can be individually IRIG AM or IRIG DCLS)
 - **BNC Connectors** J1 through J4

B) 1204-39

- The 1204-39 Option Card has four **TNC** IRIG outputs (each can be individually IRIG AM or IRIG DCLS)
 - **TNC Connectors** J1 through J4

Power-up Default IRIG outputs (both 1200 SecureSyncs and 2400 SecureSyncs)

- Refer to Salesforce Cases 260040
- Initial hardware power-up default is IRIG B, AM modulation.
- If the IRIG output is configured in software to be DCLS (or another format besides IRIG B), IRIG will initially power-up as default IRIG B AM, and then around a minute or so later (once software kicks-in) the output changes to the software configuration (such as DCLS).
- **Workaround:** This normally isn't a problem for the other equipment connected to the IRIG output. However, refer to the IRIG out squelch patches (one for 1200 and another for 2400) discussed directly below

Special Hot patches for 1204-05 and 1204-15 cards

Desire to Squelch/Squelching the IRIG output (1204-04 and 1204-15) at initial boot-up, until sync has occurred (both Model 2400 and 1200 SecureSyncs)

- TOYO reported the IRIG cards were outputting default IRIG DCLS instead of configured IRIG AM at boot.

C) Patch for 2400 SecureSyncs

- Refer to JIRA ticket CAR-1812 and DMND-1811

D) For 1200 SecureSyncs (ECO-2266)

- Refer to JIRA tickets SSS-659, SSS-679 and SSS-699
- Patch was created for TOYO (refer to Salesforce Cases 260040 and 193810)

1204-05/1204-15 hotpatch (converts to HW ID 02 and sets the default Signature Control of all outputs to 'Disabled')

- Refer to **ECO-2266** (in Arena): https://app.bom.com/changes/detail-summary?change_id=2397600610&
- Refer to **1200-SU02-1502.tar** (in Arena): https://app.bom.com/items/detail-spec?item_id=1271297142&version_id=11413443548&

Create Rev 02 of 1200-SU02-1502 that will change both 1204-05 and 1204-15 to HW ID 02. (Prior rev only changed 1204-15).

Signal/Signal levels/termination

- (1204-15 and 1204-39) Each of the four IRIG outputs is user selectable as either:
- Amplitude Modulated (0.5 v to 6v peak to peak into 50 Ω) or
- DC Level Shift (unmodulated)

| | |
|--------------------------|---|
| AM Signal Level | 500mV to 10Vpp (modulated 2:1 to 6:1) |
| DCLS Signal Level | >10k ohms. TTL with DCLS IRIG IN connected to ground |

IRIG Output signal level adjustment

- Users **can configure** the output level of **IRIG AM** output signals via the browser
- User **cannot configure** the output level of **IRIG DCLS** output signals. ("The level adjustment has no effect on TTL outputs, only on AM formats")

IRIG output ground isolation

- Metal BNC connectors share common ground
- If necessary, ground isolation needs to be added external to the Option Card

Known software issues with 1204-15 Option Card

1. Local clock configuration

- **Refer to:** Mantis case 2855 <http://cvsmantis.int.rolia.com/mantis/view.php?id=2855>

In V 5.1.4, when configuring a Local Clock to the IRIG output, the new web UI shows the local clock is accepted. When switching to the Classic UI the "Local" setting appears in the Time Scale field but the name of the local clock does not appear in the Local Clock field. It is just blank. The IRIG output remains UTC until the Local Clock field is filled in.

A) Newer web browser (versions 5.1.2 and above)

Format: Used to configure the desired IRIG output formatting. The available choices are:

IRIG A, B, G, E or NASA-36

Modulation: Changes the type of output signal modulation. The available choices are:

- **IRIG DCLS:** TTL-modulated output.
- **IRIG AM:** Amplitude Modulated output. The amplitude of the output is determined by the value entered in the **Amplitude** field.

Frequency: The IRIG modulation frequency. This is determined by the 6d

Coded Expression: Defines the data structure of the IRIG signal, where:

- **BCD** = Binary Coded Decimal
- **TOY** = Time of Year
- **CF** = Control Field

Control Function Field: IRIG signals have an optional section in the data stream that can be used to include additional information (such as the present year, for example). This field allows the Control Field section of the IRIG output to be defined. The available configurations are:

- **Fields Conform to RCC 200-04:** IRIG spec 200-04 specified a location for year value, if included in this field.
- **Fields Conform to IEE 1344:** Control Field contains year, Leap Second and DST information.
- **Fields Conform to Spectracom Format:** Year is included in Control Field but not in the same location as RCC-2004 output (year is offset by one position).
- **Fields Conform to Spectracom FAA Format:** A unique IRIG output Control Field that contains satellite lock status and time error flags.
- **Fields Conform to NASA Formats:** Variants of IRIG B.

Note: The available options will vary according to the configurations of Format and Modulation Type.

Offset: Provides the ability to account for IRIG cable delays or other latencies in the IRIG input. The Offset value is entered and displayed in nanoseconds (ns).

Available Offset range is: -500ms to +500 ms.

Signature Control: Used to control when the IRIG modulation will be present. This function allows the modulation to stop in certain situations. The options available are:

- **Output Always Enabled:** IRIG time code modulation is present, even when SecureSync is not synchronized to its references.
 - **Output Enabled in Holdover:** IRIG time code modulation is present unless the SecureSync is not synchronized to its references (Modulation is present while in the Holdover mode).
 - **Output Disabled in Holdover:** IRIG time code modulation is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).
 - **Output Always Disabled:** No IRIG output modulation is present, even if any SecureSync input references are present and considered qualified.
- The available options will vary according to the values of **Format** and **Modulation Type**.

Timescale: Used to select the time base for the incoming ASCII time code data. The entered Timescale is used by the system to convert the time in the incoming ASCII data stream to UTC time for use by the System Time. The available choices are:

- **UTC:** UTC is also referred to as ZULU time.
- **TAI:** Temps Atomique International,
- **GPS:** The raw GPS time as transmitted by the GNSS satellites (as of September, 2013, this is currently 16 seconds ahead of UTC time).
- **A local clock set up through the Time Management Page:** This option will appear under the name of the local clock you have set up. Local timescale allows a Local Clock to apply a time offset for Time Zone and DST correction.

Amplitude: The peak-to-peak output voltage level into a 600 Ω load is adjusted by entering a digital control value in this field. The level adjustment has no effect on TTL outputs, only on AM formats. The value of 128 will cause the Mark amplitude to be about 5vp-p into high impedance. A value of 200 results in an output amplitude of about 9vp-p into high impedance.

Setup/Inputs

This card does not have inputs

Setup/Outputs

B) Classic Interface web browser (versions 5.0.2 and below)

OUTPUTS SETUP - 4 IRIG (SLOT1)

| Output Index | 1 | 2 | 3 | 4 |
|-------------------|----------------------|----------------------|----------------------|----------------------|
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Format | IRIG E (100 Hz) | IRIG G | IRIG G | IRIG G |
| Modulation | (1) IRIG AM | (0) IRIG DCLS | (0) IRIG DCLS | (0) IRIG DCLS |
| Coded Expression | (1) BCD TOY / CF | (1) BCD TOY / CF | (1) BCD TOY / CF | (1) BCD TOY / CF |
| Control Field | RCC 200-04 | RCC 200-04 | RCC 200-04 | RCC 200-04 |
| Time Scale | UTC | UTC | UTC | UTC |
| Local Clock | | | | |
| Amplitude | 128 | 222 | 150 | 200 |
| Offset (ns) | 0 | 0 | 0 | 0 |

Submit

Reset

Status/Inputs

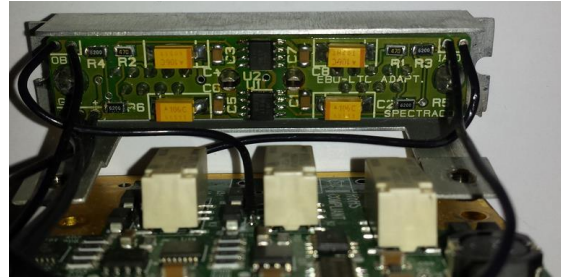
This card does not have inputs

Status/Outputs

OUTPUTS STATUS - 4 IRIG (SLOT1)

| Output Index | 1 | 2 | 3 | 4 |
|-------------------|----------------------|----------------------|----------------------|----------------------|
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Format | IRIG E (100 Hz) | IRIG G | IRIG G | IRIG G |
| Modulation | (1) IRIG AM | (0) IRIG DCLS | (0) IRIG DCLS | (0) IRIG DCLS |
| Frequency | (1) 100 Hz | (0) No carrier | (0) No carrier | (0) No carrier |
| Coded Expression | (1) BCD TOY / CF | (1) BCD TOY / CF | (1) BCD TOY / CF | (1) BCD TOY / CF |
| Control Field | RCC 200-04 | RCC 200-04 | RCC 200-04 | RCC 200-04 |
| Time Scale | UTC | UTC | UTC | UTC |
| Local Clock | INVALID | INVALID | INVALID | INVALID |
| Amplitude | 128 | 222 | 150 | 200 |
| Offset (ns) | 0 | 0 | 0 | 0 |

***(1204-20) EBU-LTC Option Card



- Special for customer of Spectracom France
- Modified Model **1204-05** IRIG Option Card with an EBU-LTC adapter board (40261-EBU-LTC)

Shortcuts/Links

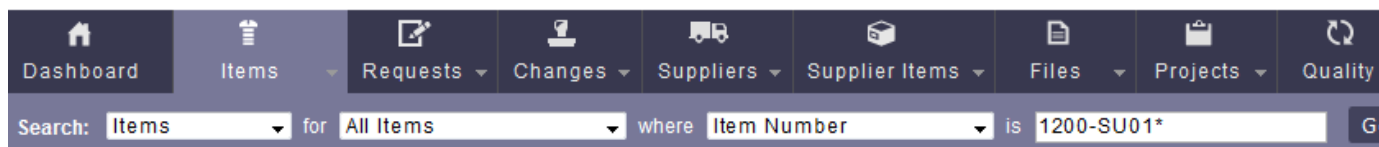
- In Arena: https://app.bom.com/items/detail-spec?item_id=1229598952&version_id=10680923538
- PD (1204-20-PD) in Arena: https://app.bom.com/items/detail-spec?item_id=1229599073&version_id=10730772038

1204-20 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



The screenshot shows the top navigation bar of the Arena software with tabs: Dashboard, Items, Requests, Changes, Suppliers, Supplier Items, Files, Projects, and Quality. Below the navigation bar is a search bar with the following text: Search: Items for All Items where Item Number is 1200-SU01*.

- **1204-20 card:** rt_oc20_hw01_fpga.bin

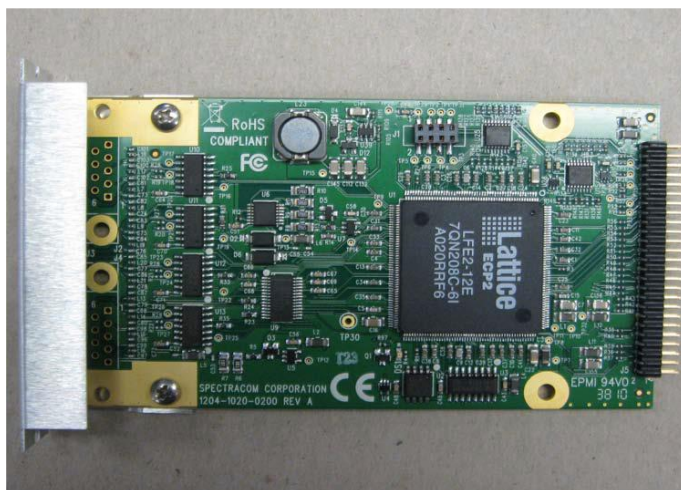
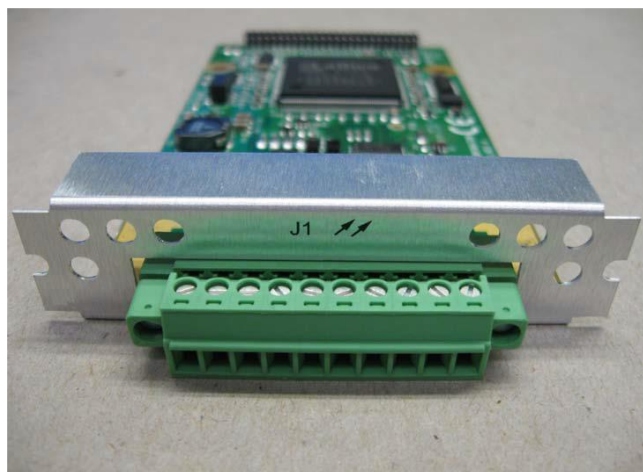
| ECN | Archive version | FPGA FPGA version reported | Change | approximate cut-in |
|-----|-----------------|---|--|--------------------|
| | | 1.00 | Added support for this Option card (first release) | |
| | | 1.01 | Not sure when 1.01 was introduced | |
| | | 1.02 current rev as of at least version 5.8.5) | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software versions 5.8.5 | |

1204-15 Hardware changes

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

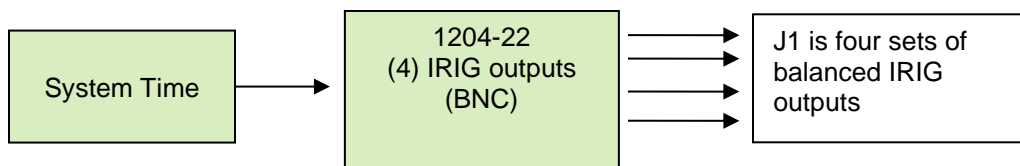
| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.5.0 | | Added support for this Option card (first release) | |
| | | | | |

** (1204-22) FAA IRIG (RS-485) 4 IRIG output



P/N: 1204-0220-0600

Block Diagram



IRIG Out (RS-485): Specifications

- » Inputs/Outputs: (4) IRIG Outputs
- » Signal: IRIG A, B, E, G or NASA-36
- » Signal Type and Connector: RS-485 levels (terminal block)
- » Output Load Impedance: 120 Ω
- » Accuracy: see "IRIG Output Accuracy Specifications" on page 493
- » Maximum Number of Cards: 6
- » Ordering Information: 1204-22 Four IRIG Output Module, RS-485

10 Pin Terminal block connector for 1204-22 card



Our P/N: J900R-0101-022J (in Arena) https://app.bom.com/items/detail-spec?item_id=1202843926&version_id=10303495198

Manufacturer and MFG P/N: Phoenix Contact 1827787 Refer to:

<https://www.phoenixcontact.com/online/portal/us/?uri=pxc-oc-itemdetail:pid=1827787&library=usen&pcck=P-11-02-11&tab=1&selectedCategory=ALL>

1204-22 Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware_Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)

The screenshot shows the top navigation bar of the Phoenix Contact Arena software. The 'Items' menu is selected. Below the navigation bar, a search bar is visible with the following text: 'Search: Items for All Items where Item Number is 1200-SU01*'. The search results are not visible in this view.

1204-22 card: rt_oc22_hw01_fpga.bin

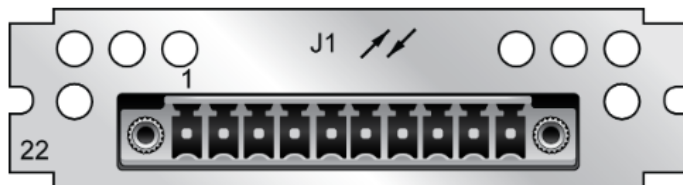
| ECN/ECO | Archive version | FPGA version reported | Change | approximate cut-in |
|----------|-----------------|---|---|--------------------|
| | | 1.0.0 | Added support for this Option Card (first release) | |
| | | 1.01 (still latest rev with at least version 5.8.5) | Not sure what main version 1.01 was released at, but its in at least 5.8.5 | |
| | | 1.02? | ? | |
| ECO-2674 | 5.9.0 | 1.0.3 | 1204-22 to version 1.03 Upgraded option card for improved system reliability | Jan 2021 |

1204-22 firmware changes

For Option Card hardware versions, refer to: (SPxx) [I:\New Released\Firmware_Software\1204-xxxx-xxxx](#)

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | | | Added support for this Option card (first release) | |
| | | | | |

Pin-outs



(four sets of outputs)

| J1 Pin No. | Function | |
|------------|-----------------|----------|
| 1 | IRIG Output 1 + | Output 1 |
| 2 | IRIG Output 1 - | |
| 3 | GND | |
| 4 | IRIG Output 2 + | Output 2 |
| 5 | IRIG Output 2 - | |
| 6 | IRIG Output 3 + | Output 3 |
| 7 | IRIG Output 3 - | |
| 8 | GND | |
| 9 | IRIG Output 4 + | Output 4 |
| 10 | IRIG Output 4 - | |

Web browser

IRIG Output 0

IRIG-B126

Signature Control

Output Always Enabled

Format

(B) IRIG B

Modulation

(1) IRIG AM Only

Frequency

(2) 1 KHz

Coded Expression

(5) BCD TOY/Year, Ctrl Func

Control Function Field

Fields conform to IEEE C37.

Timescale

London

Amplitude

128

Offset

0

Status

IRIG A, B, G, E or NASA-36

IRIG DCLS (TTL) only or IRIG AM Only

(5) BCD TOY/Year, Ctrl Func

(0) BCD TOY, Ctrl Func, Binary Seconds

(1) BCD TOY, Ctrl Func

(2) BCD TOY

(3) BCD TOY, Binary Seconds

(4) BCD TOY/Year, Ctrl Func, Binary Seconds

(5) BCD TOY/Year, Ctrl Func

(6) BCD TOY/Year

(7) BCD TOY/Year, Binary Seconds

- Fields conform to IEEE C37.118-2005
- Fields conform to Spectracom format
- Fields conform to Spectracom FAA format
- Fields conform to Spectracom IEEE C37.118-2005

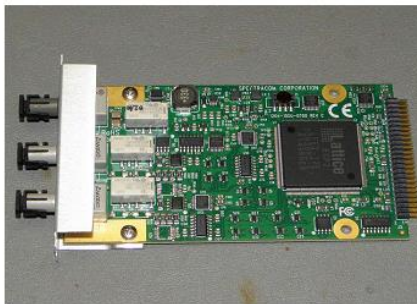
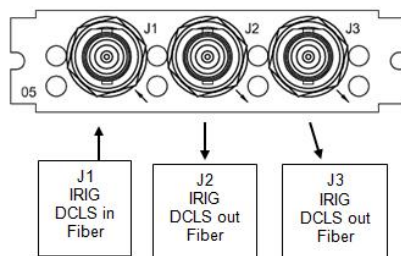
IRIG Output 1

IRIG-B121

| | |
|-------------------|--|
| Signature Control | Output Always Enabled |
| Format | (B) IRIG-B |
| Modulation | (1) IRIG-AM Only |
| Frequency | (2) 1 KHz |
| Coded Expression | (1) BCD TOY, Ch1 Func |
| Message | 303 266 226 280 263 200 200 200 200 200 |

Edit

***(1204-27) (1) IRIG Fiber In / (2) IRIG Fiber out Option Card



- Provides (1) IRIG DCLS input only (does not support IRIG AM)!!!
- Provides (2) IRIG DCLS outputs only (does not support IRIG AM)!!!

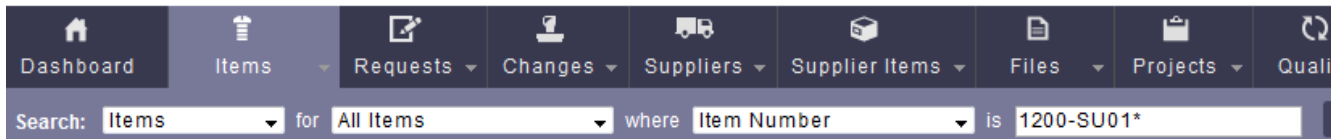
Schematic (1204-1051-0200) in Arena: https://app.bom.com/items/detail-spec?item_id=1202845085&version_id=10212762888&

1204-27 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- 1204-27 card: rt_oc27_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|------------------------|--|--|--------------------|
| | ?? | 1.00 | Added support for this Option card (first release) | |
| | ?? (See note to right) | 1.01 (current rev as of at least v5.8.5) | Note: Not sure at what version 1.01 was cut-in at, but it's in at least software versions 5.2.1 through at least version 5.8.5) | |

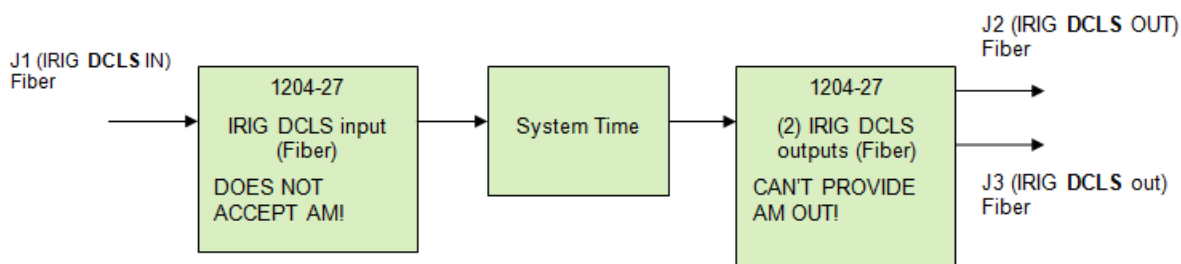
1204-27 Hardware changes

For Option Card hardware versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | ? | | Added support for this Option card (first release) | |
| | | | | |

BOM: (1204-0050-F000) in Arena: https://app.bom.com/items/detail-spec?item_id=1202845085&version_id=10212762888

Block Diagram



Fiber cable specs

| | | |
|----------------------------|---|-----------------------------------|
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable | |
| Fiber Operating Wavelength | 820/850 nm | |
| Fiber Minimum Sensitivity | -25 dBm @ 820 nm | — |
| Fiber Optical Power | — | -15 dBm average into 50/125 fiber |

Fiber IRIG Input (1)

- Connector J1 provides (1) fiber IRIG DCLS input only (**does not support IRIG AM**)!!!

Single Mode versus Multi-Mode

- IRIG F/O modules (1204-1E, -27) do not support single mode fiber/optic cabling. They are multi-mode only.

Q. For security reason, I have a customer who wants to use single-mode FO cable on IRIG input and output modules (1204-27 and 1E) and wants to be reassured on the “unidirectional physical” status of the link.

As it is written multi-mode cable for fiber optic compatibility, could you confirm if we could use these modules with single-mode FO cables (as well for our GNSS modem GPS Fiber Optic Link)?

A reply from Dave Sohn (21 Nov 16) The IRIG F/O modules (1204-1E, -27) do not support single mode fiber/optic cabling. They are multi-mode only. I can confirm that the transmit and receive fiber-optic modules are unidirectional. The GNSS modem GPS fiber Optic Link (1201-KIT-FIB2-C), however, is for single mode cabling.

Input accuracy

- +/- 2 to 200 microseconds (IRIG Format dependent) ?? (or is this only output accuracy)

8.3.2 IRIG Input Specifications (Fiber Optic Option)

| | |
|------------------------------|---|
| Signal: | IRIG A, B, E, G or NASA-36, (DCLS only) |
| Operating Wavelength: | 820/850 nm |
| Optical Minimum Sensitivity: | -25 dBm @ 820 nanometers |
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable |
| Optical Connector: | ST |

Fiber IRIG Outputs (2)

- Provides (2) Fiber IRIG DCLS outputs only (**does not support IRIG AM!!!**)

8.3.3 IRIG Output Specifications (Fiber Optic Option)

| | |
|---------------------------|---|
| Signal: | IRIG A, B, E, G or NASA-36, (DCLS only) |
| Operating Wavelength: | 820/850 nm |
| Optical Power: | -15 dBm average into 50/125 fiber |
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable |
| Optical Connector: | ST |

Single Mode versus Multi-Mode

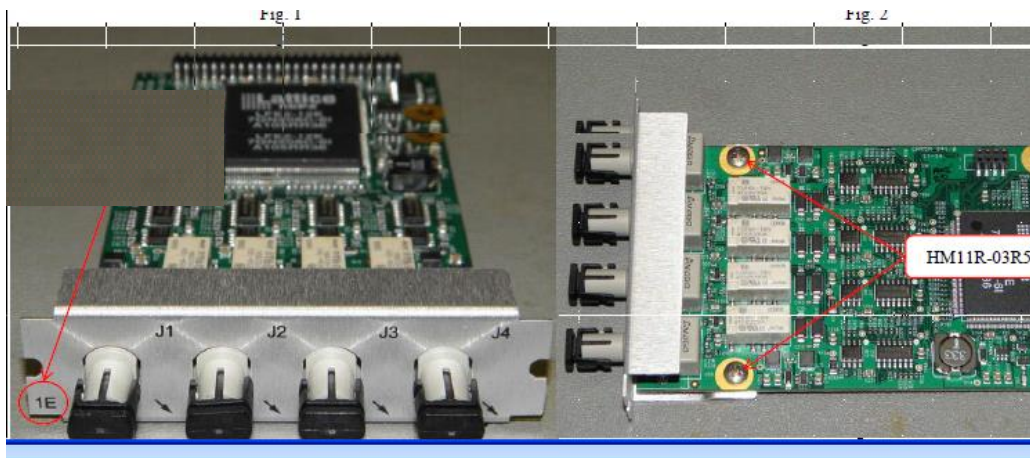
- IRIG F/O modules (1204-1E, -27) do not support single mode fiber/optic cabling. They are multi-mode only.

Q. For security reason, I have a customer who wants to use single-mode FO cable on IRIG input and output modules (1204-27 and 1E) and wants to be reassured on the “unidirectional physical” status of the link.

As it is written multi-mode cable for fiber optic compatibility, could you confirm if we could use these modules with single-mode FO cables (as well for our GNSS modem GPS Fiber Optic Link)?

A reply from Dave Sohn (21 Nov 16) The IRIG F/O modules (1204-1E, -27) do not support single mode fiber/optic cabling. They are multi-mode only. I can confirm that the transmit and receive fiber-optic modules are unidirectional. The GNSS modem GPS fiber Optic Link (1201-KIT-FIB2-C), however, is for single mode cabling.

*** (1204-1E) (4) IRIG (ST Fiber Optic) outputs



- Provides (4) IRIG DCLS outputs only (**does not support IRIG AM**)!!!

Note: As of 29 Oct 2012, this new Option Card is now available.

Schematic: (1204-1151-0200) In Arena: https://app.bom.com/items/detail-spec?item_id=1202840713&version_id=10221227028&orb_msg_single_search_p=1&redirect_seqno=5747404012

BOM: in Arena (1204-0150-F000) https://app.bom.com/items/detail-spec?item_id=1202845106&version_id=10212763098

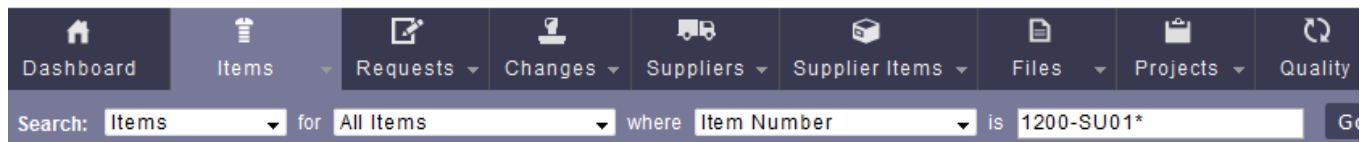
For software assembly versions, refer to: (1204-SHxx, SP1xx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

1204-1E Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the 1204-1E card (ascending version): rt_oc1E_hw01_fpga.bin 1.27

Note: Software support for the Model 1204-1E started in Archive version 4.8.7.

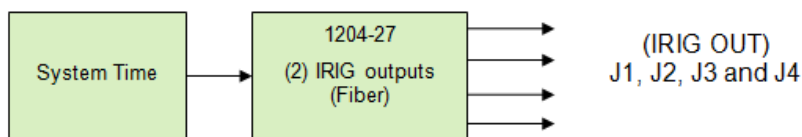
| ECN/ECO | Archive version | FPGA version reported | Change | approximate cut-in |
|-----------------|-------------------|-----------------------|---|--------------------|
| | 4.8.7 | | Added support for this Option card (first release) | |
| | See note to right | 1.01 | Note: Not sure at what version 1.01 was cut-in at, but it's in at least software version 5.2.1 | |
| | | 1.0.2? | ? | |
| ECO-2674 | 5.9.0 | 1.03 | 1204-1E to version 1.03. Upgraded option card for improved system reliability: | Jan 2021 |

1204-1E hardware changes

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.8.7 | | Added support for this Option card (first release) | |

Block Diagram



Fiber cable specs

| | | |
|-----------------------------------|---|-----------------------------------|
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable | |
| Fiber Operating Wavelength | 820/850 nm | |
| Fiber Minimum Sensitivity | -25 dBm @ 820 nm | — |
| Fiber Optical Power | — | -15 dBm average into 50/125 fiber |

IRIG Inputs:

- The Model 1204-1E Option Card has no IRIG inputs

Fiber IRIG Outputs (4):

- The Model 1204-1E Option Card has (4) Fiber Optic IRIG outputs (DCLS only)
- Fiber ST Connectors J1 through J4.

8.3.3 IRIG Output Specifications (Fiber Optic Option)

| | |
|---------------------------|---|
| Signal: | IRIG A, B, E, G or NASA-36, (DCLS only) |
| Operating Wavelength: | 820/850 nm |
| Optical Power: | -15 dBm average into 50/125 fiber |
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable |
| Optical Connector: | ST |

Q. What is Max recommended output distance for Multi-Mode fiber

A Reply from Dave Lorah (31 Aug 16) I think you are referring to the 1204-1E Fiber IRIG card. The max FO cable length is approximately 2.4km or 7900 feet with no splices.

IRIG output levels

Level is not user-configurable (“The level adjustment has no effect on TTL outputs, only on AM formats”)

Single Mode versus Multi-Mode

- IRIG F/O modules (1204-1E, -27) do not support single mode fiber/optic cabling. They are multi-mode only.

Q. For security reason, I have a customer who wants to use single-mode FO cable on IRIG input and output modules (1204-27 and 1E) and wants to be reassured on the “unidirectional physical” status of the link.

As it is written multi-mode cable for fiber optic compatibility, could you confirm if we could use these modules with single-mode FO cables (as well for our GNSS modem GPS Fiber Optic Link)?

A reply from Dave Sohn (21 Nov 16) The IRIG F/O modules (1204-1E, -27) do not support single mode fiber/optic cabling. They are multi-mode only. I can confirm that the transmit and receive fiber-optic modules are unidirectional. The GNSS modem GPS fiber Optic Link (1201-KIT-FIB2-C), however, is for single mode cabling.

A) Newer web browser (versions 5.1.2 and above)

IRIG input configuration

Format: Used to configure the desired IRIG output formatting. The available choices are: IRIG A, IRIG B, IRIG G, IRIG E and NASA-36

Modulation: Changes the type of output signal modulation. The **available choices are:**

- **IRIG DCLS**—A TTL-modulated output.
- **IRIG AM**—An amplitude modulated output. The amplitude of the output is determined by the value entered in the **Amplitude** field.

Frequency: The IRIG modulation frequency. This is determined by the configuration of Format and Modulation Type.

Coded Expression—Defines the data structure of the IRIG signal, where:

- **BCD** = Binary Coded Decimal
- **TOY** = Time of Year
- **CF** = Control Field
- **SBS** = Straight Binary Seconds

Offset: Provides the ability to account for IRIG cable delays or other latencies in the IRIG input. The Offset value is entered and displayed in nanoseconds (ns). Available Offset range is -500 to +500 ms.

Control Function Field—IRIG signals have an optional section in the data stream that can be used to include additional information (such as the present year, for example). This field allows the Control Field section of the IRIG output to be defined. The available configurations are:

Fields Conform to RCC 200-4: IRIG spec 200-04 specified a location for year value, if included in this field.

- **Fields Conform to IEE 1344:** Control Field contains year, Leap Second and DST information.
- **Fields Conform to Spectracom Format:** Year is included in Control Field but not in the same location as RCC-2004 output (year is offset by one position).
- **Fields Conform to Spectracom FAA Format:** A unique IRIG output Control Field that contains satellite lock status and time error flags.
- **Fields Conform to NASA Formats:** Variants of IRIG B.

The available options will vary according to the configurations of Format and Modulation Type.

Signature Control: Used to control when the IRIG modulation will be present. This function allows the modulation to stop in certain situations. The options available are:

- Output Always Enabled: IRIG time code modulation is present, even when SecureSync is not synchronized to its references.
 - **Output Enabled in Holdover:** IRIG time code modulation is present unless the SecureSync is not synchronized to its references (Modulation is present while in the Holdover mode).
 - **Output Disabled in Holdover:** IRIG time code modulation is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).
 - **Output Always Disabled:** No IRIG output modulation is present, even if any SecureSync input references are present and considered qualified.
- The available options will vary according to the values of **Format** and **Modulation Type**.

Timescale: Used to select the time base for the incoming ASCII time code data. The entered Timescale is used by the system to convert the time in the incoming ASCII data stream to UTC time for use by the System Time. The available choices are:

- **UTC:** UTC is also referred to as ZULU time.
- **TAI:** Temps Atomique International,
- **GPS:** The raw GPS time as transmitted by the GNSS satellites (as of September 2013, this is currently 16 seconds ahead of UTC time).

IRIG output configurations

The screenshot shows a configuration window titled "IRIG-B121". It contains several settings, each with a label and a dropdown or input field:

- Signature Control:** Output Always Enabled
- Format:** (B) IRIG B
- Modulation:** (1) IRIG AM Only
- Frequency:** (2) 1 kHz
- Coded Expression:** (1) BCD TOY, Cnt Func
- Control Function Field:** Fields conform to RCC 200...
- Timescale:** UTC
- Amplitude:** 128
- Offset:** 0

E) Classic interface browser (versions 5.0.2 and below)

Setup/Inputs

This card does not have inputs

Setup/Outputs

| OUTPUTS SETUP - 4 IRIG (SLOT1) | | | | |
|--------------------------------|----------------------|----------------------|----------------------|----------------------|
| Output Index | 1 | 2 | 3 | 4 |
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Format | IRIG E (100 Hz) | IRIG G | IRIG G | IRIG G |
| Modulation | (1) IRIG AM | (0) IRIG DCLS | (0) IRIG DCLS | (0) IRIG DCLS |
| Coded Expression | (1) BCD TOY / CF | (1) BCD TOY / CF | (1) BCD TOY / CF | (1) BCD TOY / CF |
| Control Field | RCC 200-04 | RCC 200-04 | RCC 200-04 | RCC 200-04 |
| Time Scale | UTC | UTC | UTC | UTC |
| Local Clock | | | | |
| Amplitude | 128 | 222 | 150 | 200 |
| Offset (ns) | 0 | 0 | 0 | 0 |

Submit

Reset

Status/Inputs

This card does not have inputs

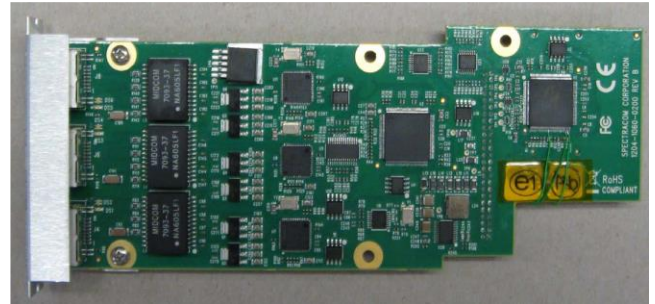
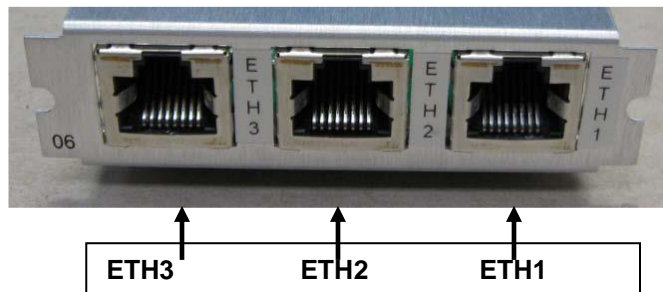
Status/Outputs

(1200 SecureSyncs) Gb Ethernet Option Card (1204-06)

1204-06 GB Ethernet Option Card

Notes:

- This Option Card is also NetClock “**Option 16: multi-port Ethernet**”
- This Option Card **is not supported for use in Model 2400 SecureSyncs!!**



Schematic: (refer to 1204-0060-F000) [I:\New Released\PCB Documentation](#)

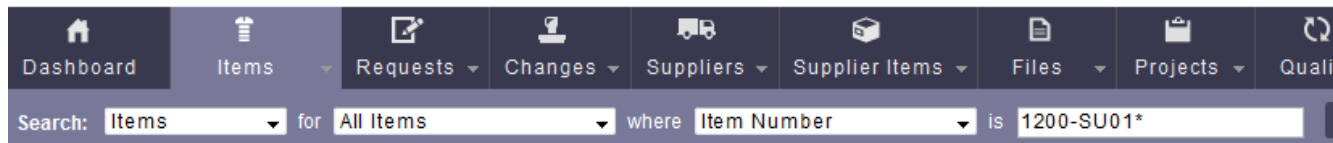
For software assembly versions, refer to: (1204-SHxx, SP1xx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

1204-06 Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “**Items**” for “**Item number**” and search for “**1200-SU01***” (as shown below)



1204-06: rt_oc06_hw01_fpga.bin

| ECN/ECO | System version | FPGA version reported | Change | approximate cut-in |
|---------|----------------|-----------------------|--|--------------------|
| ECO 486 | 5.3.0 | SW V0002 / FPGA V0000 | Updated driver for the three network processors. | ~14 Sept 2015 |

1204-06 EEPROM changes

| ECN/ECO | System version | FPGA version reported | Change | approximate cut-in |
|---------|----------------|-----------------------|--|--------------------|
| 0665 | 5.3.1 | N/A | EEPROM used to configure the Intel MAC chip was corrected to fix known issues and errata published by Intel. | ~ Dec 2015 |

1204-06 Hardware changes

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |

Field install of 1204-06 Gb Ethernet card

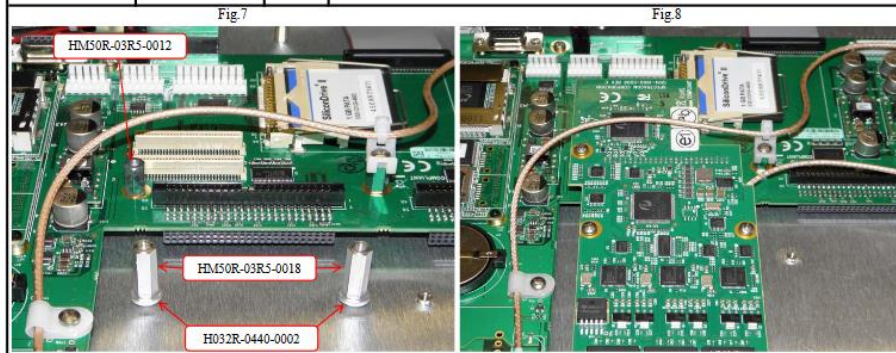
- Refer to the Option Card install doc: (1200-5000-0052) in Arena
- Excerpt below from SecureSync PD 1200-xxxx-0601 in Arena at :
<https://files.bom.com/download/AfjzvOQCRhcUFPS3P70OdIUj29ZoPtDA/bobckgoigneyggmucmeeygggjbzvs/1200-XXXX-0601-PD%20Rev%20C.pdf>

NOTE:

The Gigabit Ethernet option card must be installed in Slot 2. If there is a card already installed in Slot 2, it must be relocated to a different slot.

Ribbon cable: Though Option Card installed in the upper bays usually require the ribbon cable to connect to the main PCB board, and though the 1204-06 needs to be installed in the upper slot, this card does not use the ribbon cable. Instead, a connector on the bottom of the 1204-06 card plugs into the connector on the main PCB board.

| PD 1200-XXXX-0601 | | | PROCESS DETAIL |
|-------------------|------------------|--------|---|
| Part # | Description | Qty. | |
| 1200-XXXX-0600 | SECURESYNC, XXXX | 1 | GIGABIT ETHERNET OPTION CARD INSTALLATION: If no card install in slot 1: Place washers over the chassis screw holes, then screw standoffs into place above the washers. Remove screw next to J11 pin 1 and replace with HM50R-03R5-0012 spacer as shown in figure 7. Insert the Gigabit option card into slot 2, ensure the option card connectors are aligned properly with connectors on the main PCB, gently press down the card and secure with HM11R-03R5-0004 screws. If card gets install in slot 1: Install the appropriate option card into slot 1 using HM50R-03R5-0018 spacers, then remove screw next to J11 pin 1 and replace with HM50R-03R5-0012 spacer. Insert the Gigabit option card into slot 2, ensure the option card connectors are aligned properly with connectors on the main PCB, gently press down the card and secure with HM11R-03R5-0004 screws. Install 1200-1000-0709 blank plates where there are no option cards using HM11R-03R5-0004 screws. Secure the top cover to chassis using HM20-03R5-0406 screws. |
| 1200-1000-0709 | BLANK PLATE | AS PER | |
| 1204-0060-0600 | ETHERNET CARD | AS PER | |
| HM11R-03R5-0004 | SCREW | AS PER | |
| HM20-03R5-0406 | SCREW | 18 | |
| MP02-0003-0001 | SERIAL TAG | 1 | |
| H032R-0440-0002 | FLAT WASHER | AS PER | |
| HM50R-03R5-0012 | SPACER, M3X12 | AS PER | |
| HM50R-03R5-0018 | SPACER, M3X18 | AS PER | |



Email from Dave L (3 April 2020) It is pretty straight forward and I thought it was explained in the Option card install instructions.

Upper slots require a ribbon cable. Lower slots can plug right into the motherboard.

The one exception is the 1204-06 GB Ethernet board. This board can only be installed in upper slot #2 and does not require a ribbon cable. It has special connectors on top of the mother board it inserts into.

They must also use the standoffs included to mount the 1204-06 board.

e1000e network driver for Gb ethernet / Software patches for 1204-06 GB Card

e1000e driver (for all versions) version 5.8.5

- Jira ticket SSS-581 - Add the e1000e driver patch to the latest e1000e driver

Morgan Stanley's e1000e patch (updateGB3421.tar.gz)

- Refer to: <I:\Customer Service\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Specials\software patches>

Verification of successful patch install:

Per Dave Lorah (June 2021) spadmin CLI command `ethtool -c eth1 | grep rx-usecs`: should be 50

```
spfactory@rntp00tdc /home/spectracom $ ethtool -c eth1 | grep rx-usecs
rx-usecs: 50
rx-usecs-irq: 0
rx-usecs-low: 0
rx-usecs-high: 0
```

Email from Ron Dries to Dave L (5 March 2019) the new patch updates the e1000e driver. It should report as 3.4.2.1 in the kern.log. Things to check are the system.log and update.log to make sure there are no errors, Then the kern.log to make sure the e1000e driver is the correct version: 3.4.2.1-SPEC

Clarification of the above from Keith

- kern.log entry asserted: **"Spectracom kernel: e1000e: Intel(R) PRO/1000 Network Driver - 3.4.2.1-SPEC"**
 - kern.log can be viewed via either CLI connection (/home/spectracom/logs directory) or via the logs bundle

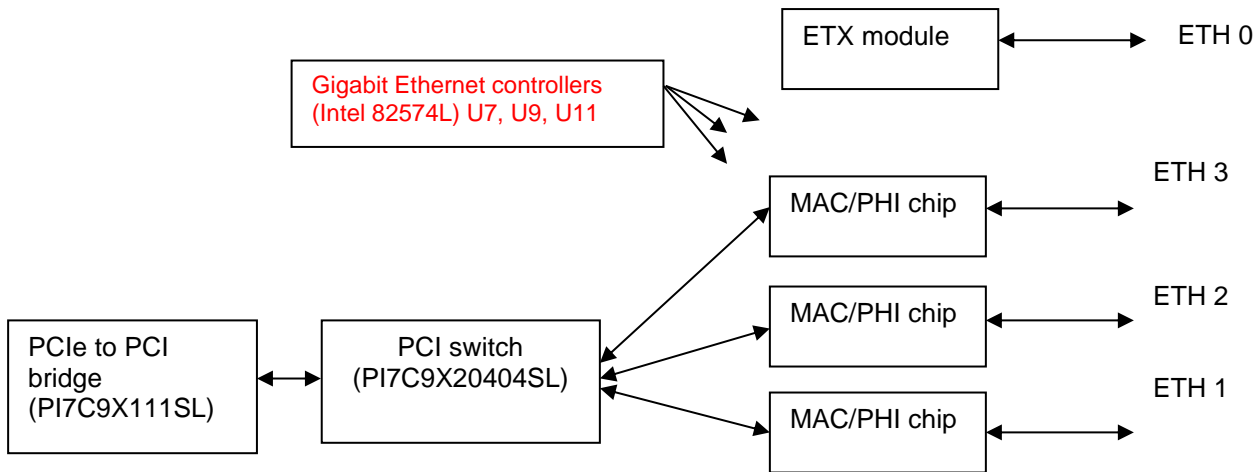
(email I sent 13 March 2019 to Ravi With Morgan Stanley) What you found in the **kernel log** (the entry below in red) is the confirmation of successful patch install (I saw this in the log, also)

```
spadmin@Spectracom /home/spectracom/log $ more kern.log | grep 3.4.2.1
Mar 13 14:30:42 Spectracom kernel: e1000e: Intel(R) PRO/1000 Network Driver - 3.4.2.1-SPEC
spadmin@Spectracom /home/spectracom/log $
```

With a quick glance, it looks like this is the only "positive" confirmation of the successful patch install (not having any error messages in the Update and System log when the patch was applied is also an indication of the install was applied).

I will forward your feedback about the desire to see a "more obvious" indication for patch install over to the SecureSync Product Manager so that he is aware (I concur with you that this would be helpful, especially since the kernel log isn't readily viewable).

Block diagram of Gigabit Ethernet ports



(3) U190R-8257-000P Gigabit controllers (Intel P/N WG8257IT)

Each of the 3 Gigabit controllers has separate 1MB SPI memory for storing the MAC address. The other network settings, such as the IP address, Subnet mask, and gateway address are stored in the main board (not in the Gigabit Option Card)

Note: Only one 1204-06 Option Card can be installed in each SecureSync.

Note: Eth0 is connected to the ETX module. It does not use this same functionality as the Gigabit ports

1204-06 card reported as “acting like a HUB (due to “Reverse Path forwarding” (“RP”) changes which had been made in the kernel)

Note: Refer also to “**known issues with 1204-06 GB card**” (further below) for more details.

- Refer to Salesforce cases such as 178238 and 180405
- Can ping another interface from one interface (such as telnet to eth1 and ping the address for eth2 for example)., But can't ping other nodes which are connected to another interface (such as telnet to eth1 and ping the address of a device connected to eth2)
- SecureSync/1204-06 Can't operate like a HUB:
 - Kernel routing is intentionally disabled in the SecureSync
 - The PCI switch between each of the MAC/PHI chips prevents two or more interfaces from being “looped together”

Email Keith sent to customer (10 Dec 2018) for cases 178238 and 180405, based on feedback from Apps

Engineering and Dave Sohn: Pertaining to Spectracom Case Number 178238, our Engineers were not unexpectedly able to see what you were specifically reporting (about being able to ping other interfaces on the SecureSync's Model 1204-06 Option Card from an interface). But they are not seeing any indication, or capability for this to happen, of the SecureSync to be operating anything like a HUB. As completely expected, we are still observing network isolation between each of the available interfaces,

To begin, the SecureSync is specifically designed to not operate as a hub/switch or router. This would require both hardware/software changes to be able to operate in this fashion. For one thing, this would require kernel routing to be enabled in the SecureSync, which it's intentionally not enabled.

In addition to routing not being enabled in the SecureSync's OS, there is also a PCI switch operating between each of the MAC/PHI interface controllers, which allows only ONE network to be communicated with at a time (the switch can't be connected to two or more networks at the same time, so traffic cannot be sent from one interface over to any other).

As the SecureSync knows the routing to each of its own interfaces, it's not surprising to see pings returned from its own interfaces (as was reported and observed here). But you can't ping any node on one network from any other interface on the SecureSync. Besides pinging an IP address of its own interface, you can't have an NTP response sent from a client to the SecureSync also be seen on any other interface, or come back on more than the one interface it was received on, because each interface is isolated from each of the others (no interfaces on the SecureSync can be looped to any other interface, as would be the case if it was configured to operate as a HUB/Router).

In summary, you can see pings returned from another interface on the same SecureSync (as long as the other interface has been enabled, of course). But beyond this ability, the SecureSync can never operate as a hub/router. Any traffic received on one interface cannot be looped over to any other interface. Kernel routing being disabled and the switch between the MAC/PHI chips both prevent this capability.

Known issues with/associated with 1204-06 Gigabit Option Card

1) (15 Feb 2022) Per Dave Lorah: The 1204-06 Card is not compatible with special Harris software versions 5.8.G or 5.8P!!!

- The 1204-06 card is recognized and properly reported in the Tools ->Update/Backup page of the browser
- However, the three individual interfaces don't work.

2) In at least version 5.8.2 (likely also versions 5.8.0 and 5.8.1) can cause SecureSync to appear its acting as a HUB This was due to "Reverse Path forwarding" ("RP") changes which had been made in the kernel

- This issue was first observed with version 5.8.2 (~Dec 2018) though it likely also applies to earlier versions 5.8.1 and 5.8.0.
- Apparently, this condition is due to a change associated with "RP" (*Reverse Path forwarding) functionality, part of "[Linux kernel rp_filter settings](#)" in the newer kernel applied in v5.8.0??, it's possible for the SecureSync to send responses to Ping or other "solicited" packets (such as NTP) back on the wrong interface (instead of being returned on the port the request packet was received on, such as eth1, it sends it back on a different interface *such as eth0)
 - It sounds to me as if this is at least partially related to the "global/main default gateway" and "main default interface" which is used to route packets that don't correlate to the routing table for each interface, causing the packet to be sent out the wrong port.

for more info on kernel "rp_filter settings"/Reverse Path filtering, refer to sites such as:

https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/6/html/security_guide/sect-security_guide-server_security-reverse_path_forwarding and

<https://www.slashroot.in/linux-kernel-rpfilter-settings-reverse-path-filtering> (info below is excerpted from here:

What is reverse path filtering?

Reverse path filtering is a mechanism adopted by the Linux kernel, as well as most of the networking devices out there to check whether a receiving packet source address is routable.

So in other words, when a machine with reverse path filtering enabled receives a packet, the machine will first check whether the source of the received packet is reachable through the interface it came in.

- *If it is routable through the interface which it came, then the machine will accept the packet*
- *If it is not routable through the interface, which it came, then the machine will drop that packet.*

Latest red hat machines will give you one more option. This option is kind of liberal in terms of accepting traffic.

If the received packet's source address is routable through any of the interfaces on the machine, the machine will accept the packet.

3) Version 5.3.1 update -EEPROM used to configure the Intel MAC chip was corrected to fix known issues and errata published by Intel.

4) Need to restart NTP (or reboot the NTP server) when Eth1, Eth 2 or Eth3 configuration changes are made.

We aren't sure why, but if the port settings are reconfigured, no NTP outputs will be present on these port, until this occurs.

5) Wrong driver installed (~ versions 5.2.0 and 5.2.1??)

- Version 5.3.0 corrected the driver installed. Appears to adversely affect heavy network

6) Dropped packets/RNBC counter (Versions 4.8.6 through ?)

- Fixes to packets being dropped:

A) The much more recent E1000E driver update made available for Morgan Stanley

("UpdateGB3421"): [\.\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Specials\software_patches\Morgan Stanley-5.8.4 NTP performance \(updateGB3421.tar.gz\)](#)

Note: refer also to "UpdateGB3421" in the SecureSync Note for more info on the patch

B) Software update Version 5.1.3 (or higher)

C) Patch update version 5.A.0

- Link to version 5.A0 patch file: [\PSB, PSP software updates\948x and SecureSync\948x and SecureSync Software updates](#)

D) Patch update v4.8S (released AFTER 5.1.2 update was released)

Patch version 5.A0 is a fix to the dropped packet issue. Instead of the work-around applied in version 4.8S checking for dropped packets every 10 seconds, this newer patch fix monitors the available memory space in the processor's buffer. If the memory value gets too high, this means the buffer is becoming too full, so we automatically reset the processor before it's buffer can become completely full of packets (which is when it usually starts to drop packets).

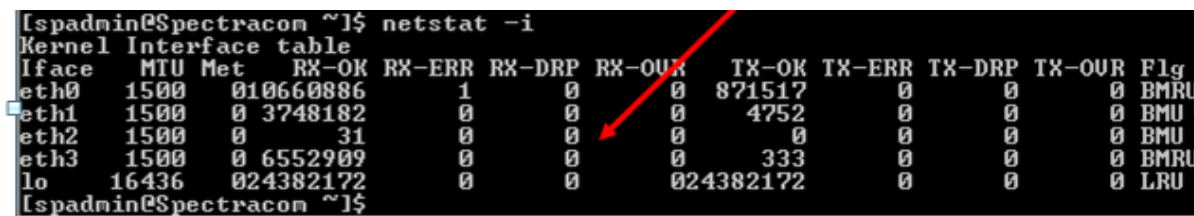
So unlike with the work-around in 4.8.S, there is no longer a potential of up to 10 seconds of packets being dropped (in between the 10 second checks). With version 5.A0 applied, the worst-case scenario is there will only be about 1 to 2 seconds of packet drops while the network processor is actually in the process of being reset. But otherwise, there will be no packets being dropped

Verifying packets are being dropped by the MAC/PHI

netstat -a (Shows Eth0, Eth1, Eth2 and Eth3, if 1204-06 card is installed)
Displays all connections and listening ports.

netstat -i (Shows Eth0, Eth1, Eth2 and Eth3, if 1204-06 card is installed)

The best way to determine if this is the issue being observed is to either telnet or SSH into any other Ethernet port that is still responding. After logging in, issue the **netstat -i** (as in the letter "eye") command. In the response, there is a counter for each Ethernet connection for all received packets that have been dropped (these counters reset after each boot-up). This value should normally always be a "0". But if this potential issue happens to occur, this number will begin to increment while that port remains unresponsive (the screenshot shows the results of this command with all Ethernet ports responding to packets).



| Iface | MTU | Met | RX-OK | RX-ERR | RX-DRP | RX-OUR | TX-OK | TX-ERR | TX-DRP | TX-OUR | Flg |
|-------|-------|-----|----------|--------|--------|--------|----------|--------|--------|--------|------|
| eth0 | 1500 | 0 | 10660886 | 1 | 0 | 0 | 871517 | 0 | 0 | 0 | BMRU |
| eth1 | 1500 | 0 | 3748182 | 0 | 0 | 0 | 4752 | 0 | 0 | 0 | BMU |
| eth2 | 1500 | 0 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | BMU |
| eth3 | 1500 | 0 | 6552909 | 0 | 0 | 0 | 333 | 0 | 0 | 0 | BMRU |
| lo | 16436 | 0 | 24382172 | 0 | 0 | 0 | 24382172 | 0 | 0 | 0 | LRU |

Netstat -i -d (Shows received and dropped packets on all four ports)

```

10 10430 024382172 0 0 024382172 0 0 0 LRU
lspadmin@Spectracom ~1$ netstat -i -d
Kernel Interface table

```

| Iface | MTU | Met | RX-OK | RX-ERR | RX-DRP | RX-OVR | TX-OK | TX-ERR | TX-DRP | TX-OVR | Flg |
|-------|-------|-----|----------|--------|--------|--------|----------|--------|--------|--------|------|
| eth0 | 1500 | 0 | 10661696 | 1 | 0 | 0 | 871605 | 0 | 0 | 0 | BMRU |
| eth1 | 1500 | 0 | 3748182 | 0 | 0 | 0 | 4752 | 0 | 0 | 0 | BMU |
| eth2 | 1500 | 0 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | BMU |
| eth3 | 1500 | 0 | 6553586 | 0 | 0 | 0 | 333 | 0 | 0 | 0 | BMRU |
| lo | 16436 | 0 | 24382982 | 0 | 0 | 0 | 24382982 | 0 | 0 | 0 | LRU |

```

lspadmin@Spectracom ~1$

```

Note: All the counters are reset upon a power cycle. They do not persist.

- Refer also to the **much more recent E1000E driver update** made available for Morgan Stanley("UpdateGB3421"): [..\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Specials\software patches\Morgan Stanley-5.8.4 NTP performance \(updateGB3421.tar.gz\)](..\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Specials\software patches\Morgan Stanley-5.8.4 NTP performance (updateGB3421.tar.gz))
- Earlier work-around (patch version v4.8S though being included in v5.1.2)**
Patch version 4.8S, as well as 5.x.x updates contain a patch to reset the network processor if it stops responding. It checks each of the processors every 10 seconds and resets any of them that stops responding to packets.
Per Dave Sohn- "The port appears to recover within a second or two". The total time that a port may not respond to packets is the 10 seconds between checks of the processor plus just a couple of seconds for the port to be restarted.

Example entries in the System log when the network processor is restarted:

```

Aug 6 12:34:41 Spectracom Spectracom: [system] GbE port eth1 event: RNBC=51
(KMOND)
Aug 6 13:31:33 Spectracom Spectracom: [system] GbE port eth1 event: RNBC=102
(KMOND)

```

Note this entry indicates which Ethernet port was restarted ("eth1" in this example)

Dropped packets (Versions 4.8.5 and below)

- Ports on this card can intermittently drop networks packets (won't respond).
- Temporarily fixed with power cycle
- Fixed in version 4.8.6 update.

Note: Versions 4.8S and above have the work-around that checks the three network processors every 10 seconds and resets any of them that stops responding to packets.

Per Dave Sohn- "The port appears to recover within a second or two". The total time that a port may not respond to packets is the 10 seconds between checks of the processor plus just a couple of seconds for the port to be restarted.

Security concerns with the Model 1204-06 Option Card installed

- Due to security concerns across Ethernet ports, version 5.1.2 disabled user-level permissions from being able to perform services such as telnet, ssh., FTP and sftp/scp from the command line interface.
- Can still SCP into the SecureSync. This change prevents scp'ing out from the box.
- Can still ping out from within the SecureSync.
- Refer to Salesforce case 13444 and Mantis 2757 for an SCP issue this changed ended up causing

Trying to FTP from the CLI

```
admin@Spectracom ~ $ ftp spadmin@10.10.201.1
bash: ftp: command not found
```

Trying to sftp from the CLI

```
admin@Spectracom ~ $ sftp spadmin@10.10.201.1
bash: /usr/bin/sftp: Permission denied
```

Email from Dave Sohn (4 March 2014) We have removed local user access to these to prevent security vulnerabilities allowing a user to login from one network and potentially have these accesses to the additional networks that may be connected to the SecureSync. They can still scp to/from the unit, but they need to run it from another machine.

Desire to know if a network port is up or down

- Refer to the **SecureSync** SNMP Tech Note: [EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\SNMP](#) (there is a Section titled “Desire to remotely monitor SecureSync’s network interface status”)

or refer to the **NetClock** SNMP tech note:
[I:\Customer Service\EQUIPMENT\SPECTRACOM EQUIPMENT\9483 and 9489\SNMP](#)
- Web browser doesn’t report the Operational state of a port (as of at least 4.8.9 anyways).
- Port state can be read using general SNMP MIB RFC 1213 (as of at least 4.8.9, a port being down is not available via a trap). We supply and support this generic MIB file.
- RFC 1213 MIB file contains an **iftable** (Interface table) with two fields that report port state. The admin field reports if the port is enabled and the Operational state field reports if the port is up or down.
- RFC 1213 MIB is not included in the SecureSync/NetClock 9483, but can be freely downloaded from sites such as: <http://tools.cisco.com/Support/SNMP/do/BrowseMIB.do?local=en&step=2&mibName=RFC1213-MIB>
- For more info on this file, refer to sites such as: <http://www.ietf.org/rfc/rfc1213.txt>

Note: There are more interfaces in the SecureSync and NetClock than just Eth0 (and Eth1-3 when the 1204-06 card is installed). The iftable sees more than just the four basic rear panel ports, but will report these other ones as being down. It was showing six ports instead of four, when I looked at this on a SecureSync with the Gigabit card installed.

The screenshot shows the iReasoning MIB Browser interface. On the left, the MIB Tree is expanded to show the ifTable. The main window displays the Result Table for 10.2.100.20 - ifTable. The table has columns: i..., ifDescr, ifPhysAddress, ifAdminStatus, ifOperStatus, and ifLastCl. The data rows are:

| i... | ifDescr | ifPhysAddress | ifAdminStatus | ifOperStatus | ifLastCl |
|------|---------|-------------------|---------------|--------------|----------|
| 1 | lo | ... | up | up | 0 milise |
| 2 | tunl0 | ... | down | down | 0 milise |
| 3 | gre0 | ... | down | down | 0 milise |
| 4 | sit0 | ... | down | down | 0 milise |
| 5 | p6tnl0 | ... | down | down | 0 milise |
| 6 | eth0 | 00-D0-C9-C5-17-E4 | up | up | 0 milise |

Red arrows point to the eth0 row, highlighting its MAC address (00-D0-C9-C5-17-E4) and operational status (up). Below the table, the OID .1.3.6.1.2.1.2.2.1.2.6 is shown, along with the Value [DISPLAYSTRING]: eth0 and Raw Value [DISPLAYSTRING]: eth0.

Note: The variables for the ifOperStatus field are as follows:

up(1), -- ready to pass packets
down(2),
testing(3), -- in some test mode
unknown(4),
dormant(5)

Isolation between the network ports

In summary: Network isolation is only via network routing/routing tables for each network interface. There is no physical/electrical/firewall isolation between each of the Gigabit Option Card ports. And Eth0 through Eth3 all go to the same network processor (directly with Eth0, indirectly with Eth1, Eth2 and Eth3).

Note: If the internal 3 port module (1204-06) does not provide enough security/isolation between networks, customer can also use a Model 9388/9488 or more than one SecureSync slaved to each other to provide additional network ports with additional isolation between networks.

A) Latest information about this topic

- Refer to the "Routing of Data With Multiple Networks.pdf" document: [1204-06 Gb Ethernet Card](#)

B) Previous information about this topic

Q. Could you provide any more details on the isolation provided between ports on the 1204-06 option card.

A Reply from Dave Sohn (2 Apr 2013) Each interface is configurable independently with individual addresses, default gateways, and separate routing tables. Network traffic arriving on a given port will have response packets out the same interface routed according to that interface's routing table.

A Email Keith sent to a customer (include the email above from Dave Sohn)

At the hardware level, there is a three-way switch between separate MAC/PHIs (one for each of the network ports, Eth1 through Eth3, on the Gb card. This switch can connect to only one of three MAC/PHI chips at a time. Because of this, the system can only physically connect to one network at a time. It cannot loop one network port over to another network port, because the three-way switching can't connect to two or more networks at the same time.

Eth0, the 10/100 base network interface connector on the chassis, does not take the same path into the system. This interface communicates directly with the main microprocessor, while the other three go through bridges into the system, only one network connection at a time.

**Ethernet controllers in SecureSync

A) Gigabit Option Card (eth1, eth2, eth3)

- **Link to Ethernet Controller's e1000e driver used in the Gigabit Option Card:** (e1000e: Intel(R) PRO/1000 Network Driver - 1.1.2-NAPI) <http://sourceforge.net/projects/e1000/files/e1000%20stable/>
- CLI command to see current version of E100e driver: **modinfo e1000e**

```
Telnet 10.2.100.112

Linux 3.8.13-gentoo <Spectracom> (1)

Spectracom login: spadmin
Password:
Spectracom SecureSync Version 5.0.0
spadmin@Spectracom ~ $ modinfo
modinfo: ERROR: missing module or filename.
spadmin@Spectracom ~ $ modinfo e1000e
filename:       /lib/modules/3.8.13-gentoo/kernel/drivers/net/ethernet/intel/e1000e/e1000e.ko
version:        2.1.4-k
license:        GPL
description:     Intel(R) PRO/1000 Network Driver
author:         Intel Corporation, <linux.nics@intel.com>
srcversion:     70E6653BA1595F95B1A8575
alias:          pci:v00008086d00001559sv*sd*hc*sc*i*
alias:          pci:v00008086d0000155Asv*sd*hc*sc*i*
alias:          pci:v00008086d0000153Bsv*sd*hc*sc*i*
alias:          pci:v00008086d0000153Asv*sd*hc*sc*i*
alias:          pci:v00008086d00001503sv*sd*hc*sc*i*
alias:          pci:v00008086d00001502sv*sd*hc*sc*i*
```

List of e1000e bugs: <http://sourceforge.net/p/e1000/bugs/>

- **Note:** Archive version 4.8.6 is adding a very important update (new version and EPOM change) to the Gigabit Option Cards. A power saver mode requires the chip we use to have a bit set in the EEPROM. Otherwise, it will result in packets being dropped. Update version 4.8.6 sets this bit and updates the associated driver from v1 to v2.

E1000e driver versions we use

Version 5.0.0 release – uses e1000e driver version “2.1.4-k”

Version 4.8.9 release – uses e1000e driver version “2.2.14-NAPI”

Version 4.8E release – uses E1000e version “ko”

Post 4.8.8 release- we intended to update to this version.

B) ETX module (Eth0)

E100 and 8139T Ethernet drivers (Drivers for the ETX module)

Note: As shown with cat proc, two additional Ethernet drivers are also loaded. These are for the ETX/Eth0 driver. They are E100 and a Realtek 8139TOO (or 8139T00). They are both installed because one is for one type of ETX and the other is for a different type of ETX module.

Retaining of settings, if Gigabit Option Card is swapped out

Q. He is asking if ever a faulty GIGABIT Ethernet option card were to be replaced, will that affect/remove the IP addresses that had been assigned to the faulty card / SecureSync? I believe all the settings are stored on main PCB, correct?

So it doesn't matter how many times the card is changed, the unit can still be access through the newly installed card, correct?

A. (Keith's response. after confirming with Dave Sohn 11/19/12) Your understanding is correct! To answer your customer's question, all of the network settings for the Gigabit Option Card ARE stored on the main SecureSync board (not in the Gigabit Option Card).

Replacing the Gigabit board does not result in the network settings/configurations being lost. The only item that is lost (changed) is the MAC address for each port. The MAC addresses are hard-coded into the Gigabit Option Card itself, so the MC addresses will be the only items that are different, after swapping out this module.

**** Need to restart NTP after changing the Gigabit card configs**

- Refer to Mantis case 1986 <http://cvsmantis.int.rolia.com/mantis/view.php?id=1986>

NTP needs to be restarted (or the unit rebooted), if the 1204-06 Gigabit Option Card (if installed) network port settings are changed. Otherwise, no NTP outputs on the ports.

We aren't sure why this is. NTP must have some memory for storing this port info.

Potential condition of dropped network packets in version 4.8.5 and below

- Potential for all three ports on the Gigabit OC to start simultaneously dropping all network packets
- Potential issue affects all three ports at the same time (not just one port only)
- Temporary fix was to reboot.
- Version 4.8.6 update runs a script that updates the EEPROM (details below)

Email from Mark Goodlein (9/13/12)

The GbE chips (Ethernet controllers) used on our Gigabit Option Cards is the Intel 82574L parts. These parts were identified as needing the power down feature disabled via a bit in the EEPROM.

Our 4.8.6 release includes the `fixeep-82574_83.sh` script found in the driver downloads area of SourceForge for the Intel e1000e driver that we use in the SecureSync.

https://sourceforge.net/projects/e1000/files/e1000e%20stable/eeeprom_fix_82574_or_82583/

My email to Masataka-san with TOYO (9/13/12)

Per our discussion today and per your request for detailed information on the fix that was applied to the Spectracom Gigabit Option Cards, I am happy to forward you information about this software change that was incorporated in the version 4.8.6 update.

To begin, all of the Spectracom Model 1204-06 Gigabit Option Cards use an Intel 82574L Gigabit Ethernet Controller IC for interfacing with the three available Ethernet ports on the SecureSync's Gigabit Option Card. This particular controller uses a software driver for its operation (the driver is named e1000e)

We identified that there was a potential issue that is associated with a particular feature that is available for this Ethernet controller. This available feature is a "power down" mode (not needed for use in the SecureSync). With information we obtained on the Internet about this Ethernet controller, we learned that if this power down feature isn't intentionally configured to be disabled (via a specific bit in the EEPROM), the controller can go into this power down mode. The controller going into this power down mode can potentially result in all three network ports simultaneously dropping all network packets that it receives. The temporary solution, if this potential issue was to occur, power cycling or rebooting the SecureSync restores full operation to all three network ports.

In order to alleviate the potential need to reboot or power cycle the SecureSync (if this potential issue happened to occur), a permanent fix was applied in the SecureSync version 4.8.6 software update. Starting with the version 4.8.6 software update, the fix consists of a specified script that is run during the software update process. This script detects whether this particular IC is installed in the Gigabit Option Card (currently, all Gigabit Option Cards use this IC, but this may not always be the case in the future). If this particular IC is installed on the Option Card, the script next detects the status of a Gigabit Option Card EEPROM bit to determine whether or not the power down feature for this IC has already been disabled. If the bit has not yet been configured to disable this feature, the script updates the bit. Thereafter, the power down feature is completely disabled, so it cannot be activated inside of this IC.

This specific script that is run during the SecureSync's software update process to disable the 82574L power down feature is named "**fixeep-82574_83.sh**". This script was found in the "**driver downloads**" area of the SourceForge website, for the Intel e1000e driver that is used in the SecureSync.

The following is a link to the SourceForge website that provides this driver update script (Note that we use this specified script as displayed on this website page, without any modifications to it). to view this update script, please visit: <https://sourceforge.net/projects/e1000/files/e1000e%20stable/EEPROM%20fix%2082574%20or%2082583/>.

Network bridging/load balancing

- The Gigabit Option Card does not support bridging/load balancing.

Per Wikipedia:

Network bridging describes the action taken by [network equipment](#) to allow two or more [communication networks](#), or two or more [network segments](#),^[1] to create an aggregate network. Bridging is distinct from [routing](#) which allows the networks to communicate independently as separate networks.^[2] A **network bridge** is a network device that connects more than one network segment. In the [OSI model](#) bridging acts in the first two layers.^[citation needed]

Email from Keith to Sunforce (8 July 13)

I'm sorry to say that the SecureSyncs with the Gigabit Option Cards do not support the desired capability by itself. All of the IP addresses of the SecureSync can be on the same subnet, but CANNOT be the same as any other interface port. This desired functionality is called network bridging/load balancing. SecureSync does not support this.

However, each interface can be on the same subnet, so that each network connector can be connected to the same network. Then, the NTP client software can be configured to get NTP from any of the ports on the SecureSync that are configured to be on the same network.

The only difference with this configuration is instead of configuring the NTP client software to get time from just one IP address and having the interface ports change addresses, the NTP client software handles the switching between interface ports. If the software requests NTP packets from an interface that can't respond, the software can then automatically request time from another IP address. Instead of having 4 separate time servers, each with its own IP address, the Gigabit card enables one NTP server to provide the functionality of up to four separate NTP servers, via the four interfaces.

Network/General Setup page

Purpose: Configures the IP addresses for each of the Ethernet ports.

The screenshot shows the 'NETWORK SETUP' page with the 'General' tab selected. The page contains a table for configuring network settings. Below the table is a note about strict IP checking.

| NETWORK SETUP | |
|--|--|
| Hostname | Spectracore |
| Primary DNS Server | 13.1.1.30 |
| Secondary DNS Server | 13.1.1.30 |
| Enable IPv4 Gateway | Enabled <input checked="" type="checkbox"/> |
| IPv4 Gateway Address | 13.1.1.1 |
| Enable IPv6 Gateway | Disabled <input checked="" type="checkbox"/> |
| IPv6 Default Gateway | |
| Web Session, Strict IP Check <input checked="" type="checkbox"/> | |

If strict IP checking is enabled, a web UI session will be restricted to a client (web browser) using a IP address. Complex networks using address translation and/or load sharing can prevent multiple address for a single web client. In those situations strict IP checking must be disabled.

Network/ General Setup page of the browser, Services tab

The Services tab defines what management capabilities that all subnets (with management capability) are allowed on those subnets. Changing these values affects all subnets with management capabilities allowed.

Important Note: As of versions of at least 4.4.x (and all versions prior), there is only one default gateway address and no individual routing tables for each of the gigabit Ethernet ports. It is one “network connection” with one routing table only. The one routing table starts at Eth0 to find the best port to respond on. If Eth0 isn’t valid, it then tries Eth1, etc. If it hasn’t found a valid port by Eth3, it responds to the default gateway address via Eth 0.

- 1) If you ping an Eth1-Eth 3 port and it’s on the same subnet as Eth 0’s IP address, it will respond on Eth0 and not on the Gigabit port that you are connected to and trying to ping (the PC will get a “no reply” message on that port, unless the PC is also connected to Eth0).
- 2) No routers can be used on Eth1-Eth3 networks unless Eth0 is also connected to that same subnet as Eth1-Eth3, because the input will be from the Eth1, Eth2 or Eth3 port, but the reply will then go out to the default gateway on Eth0. If Eth0 is not connected to that same subnet, the packets will be lost.

The screenshot shows the 'NETWORK SETUP' page with the 'Services' tab selected. The page contains a table for configuring network services. Below the table are 'Submit' and 'Reset' buttons.

| NETWORK SETUP | |
|--------------------------|--|
| Daytime Protocol Service | Disabled <input checked="" type="checkbox"/> |
| Time Protocol Service | Disabled <input checked="" type="checkbox"/> |
| Telnet Service | Enabled <input checked="" type="checkbox"/> |
| FTP Service | Enabled <input checked="" type="checkbox"/> |
| SSH Service | Enabled <input checked="" type="checkbox"/> |
| HTTP Service | Enabled <input checked="" type="checkbox"/> |
| HTTPS Service | Enabled <input checked="" type="checkbox"/> |

Submit Reset

Network/ General Setup page of the browser, Access tab:

By default, all subnets have management capability (Telnet, HTTPs, etc). The “Access table” on the Network/General Setup page determines what subnets have management capabilities. By default, all subnets that are connected to Eth 0, 1, 2, 3 have management. If one or more entries are added to the table to allow a subnet to have access, all other subnets will no longer be allowed management access to the appliance. The Access table is configured by IP scheme, not by Ethernet port number. Values configured are allowed and everything else is blocked.

NETWORK INTERFACE SETUP

eth0 eth1 eth2 eth3

MAC Address08:00:c3:b2:b1:17

DHCP Setup

DHCPv4OnOn/OffReleaseRenew

IP Address Setup

| IP Version | IP Address | Prefix | Delete | Info |
|------------|-----------------------|--------|--------------------------|----------------------------|
| IPv4 | 10.10.128.28 | 16 | na | net mask = 255.255.0.0 |
| IPv6 | fe80:2af:c9f:fe2:b117 | 64 | <input type="checkbox"/> | link-local unicast address |
| IPv6 | | 0 | <input type="checkbox"/> | unknown address type |
| IPv6 | | 0 | <input type="checkbox"/> | unknown address type |
| IPv6 | | 0 | <input type="checkbox"/> | unknown address type |
| IPv6 | | 0 | <input type="checkbox"/> | unknown address type |
| IPv6 | | 0 | <input type="checkbox"/> | unknown address type |
| IPv6 | | 0 | <input type="checkbox"/> | unknown address type |

SubmitReset

NETWORK SETUP

GeneralServicesAccessBanner

If no networks/nodes are defined in the table below, then access is allowed from all networks/nodes. If any networks/nodes are defined in the table below, then access is restricted to only those networks/nodes.

| | IPv4/IPv6 CIDR | Delete |
|-------------|----------------|--------------------------|
| Allow from: | | <input type="checkbox"/> |
| Allow from: | | <input type="checkbox"/> |
| Allow from: | | <input type="checkbox"/> |
| Allow from: | | <input type="checkbox"/> |
| Allow from: | | <input type="checkbox"/> |
| Allow from: | | <input type="checkbox"/> |
| Allow from: | | <input type="checkbox"/> |
| Allow from: | | <input type="checkbox"/> |
| Allow from: | | <input type="checkbox"/> |
| Allow from: | | <input type="checkbox"/> |
| Allow from: | | <input type="checkbox"/> |
| Allow from: | | <input type="checkbox"/> |

SubmitReset

NETWORK SETUP

GeneralServicesAccessBanner

Network Access Banner

Clear☐

SubmitReset

Network/Interfaces page

When selecting each of the tabs at the top (eth0, eth1, etc), the specific settings for that network port (such as the MAC address, IP address, etc) will be displayed and can also be configured.

Prefix values

(Enter the corresponding “Network Bits” for the desired network as the Prefix).

| Network Bits | Equivalent Netmask | Network Bits | Equivalent Netmask |
|--------------|--------------------|--------------|--------------------|
| 30 | 255.255.255.252 | 18 | 255.255.192.0 |
| 29 | 255.255.255.248 | 17 | 255.255.128.0 |
| 28 | 255.255.255.240 | 16 | 255.255.0.0 |
| 27 | 255.255.255.224 | 15 | 255.254.0.0 |
| 26 | 255.255.255.192 | 14 | 255.252.0.0 |
| 25 | 255.255.255.128 | 13 | 255.248.0.0 |
| 24 | 255.255.255.0 | 12 | 255.240.0.0 |
| 23 | 255.255.254.0 | 11 | 255.224.0.0 |
| 22 | 255.255.252.0 | 10 | 255.192.0.0 |
| 21 | 255.255.248.0 | 9 | 255.128.0.0 |
| 20 | 255.255.240.0 | 8 | 255.0.0.0 |
| 19 | 255.255.224.0 | | |

Table 2.3: Subnet mask values

Setup/Inputs/GB Ethernet

This card is not configurable

Setup/Outputs/GB Ethernet

This card is not configurable

Status/Inputs

This card is not configurable

Status/Outputs

This card is not configurable

FAQs

- Q. For setting up the add-on network card and setting up static IP addresses for them can it be done through the serial port or is it just done through the web browser?
- A. The static address for Eth0 (the Network port that is located on the SecureSync appliance itself – not on Gigabit Ethernet card) can be initially configured via DHCP, or if a DHCP server is not available, it can also be configured using the front panel LCD/keypad or the front panel SERIAL port.

The Gigabit Option Card ports (Eth1, Eth2 and Eth3) can only be configured via the Network/Interfaces page of the SecureSync web browser. This page contains a tab for each of the Ethernet ports (the Eth0 network port can also be configured via this page of the browser). Each tab allows DHCP to be enabled disabled and also displays the MAC address for each port, and the IP address (IPv4 and IPv6) addresses for each port. However, the Eth1-Eth3 settings can be viewed from the front panel, if desired.

- Q. Can the web browser setup portion be disabled?
- A. HTTP and HTTPS (web browser) functionality can be disabled on either the desired or all network ports (i.e. one port has HTTPS capability and all other ports have only NTP capability without web browser access). The functions other than NTP time data are known as “management protocols” (management protocols also include, SNMP, telnet and SSH capabilities which can all be enabled or disabled, as desired).

By factory default, all management protocols (except the rarely, if ever, used Time and Daytime protocols which are somewhat similar to NTP) are enabled and all network ports have management capabilities enabled. The Network/General Setup page of the browser, "Services" tab lists each of the available management protocols (such as telnet, SSH and the web browser protocols of HTTP and HTTPS). Each of these services, when disabled, prevents these protocols from being available on any of the Ethernet ports they are global settings for the appliance). When enabled, these services are available on all network ports, unless management has been disabled for each port (as described in the next paragraph).

Management capabilities for each network port are enabled or disabled in the Network/General Setup page of the browser, "Access" tab. By factory default, all ports have management capabilities enabled. To disable management protocols on one or more ports (thereby allowing access on the others) in the Network/General Setup page of the browser, "Access" tab, you configure the subnets that you wish to allow management access, thereby blocking access from those subnets that are not listed as allowed. If at least one subnet is listed, the ones that are listed have access and all other unlisted subnets therefore have only NTP access to the SecureSync.

Known software issues

1. Local clock configuration

- Refer to Mantis case 2855 <http://cvsmantis.int.rolia.com/mantis/view.php?id=2855>

In Version 5.1.4, when configuring a Local Clock to the IRIG output, the new web UI shows the local clock is accepted. When switching to the Classic UI the "Local" setting appears in the Time Scale field but the name of the local clock does not appear in the Local Clock field. It is just blank. The IRIG output remains UTC until the Local Clock field is filled in.

A) Newer web browser (versions 5.1.2 and above)



Format—Used to configure the desired IRIG output formatting. The available choices are:

- IRIG A
- IRIG B
- IRIG G
- IRIG E
- NASA-36

Modulation—Changes the type of output signal modulation. The available choices are:

- **IRIG DCLS**—A TTL-modulated output.
- **IRIG AM**—An amplitude modulated output. The amplitude of the output is determined by the value entered in the **Amplitude** field.

Frequency—The IRIG modulation frequency. This is determined by the configuration of **Format** and **Modulation** Type.

Coded Expression—Defines the data structure of the IRIG signal, where:

- **BCD** = Binary Coded Decimal
- **TOY** = Time of Year
- **CF** = Control Field
- **SBS** = Straight Binary Seconds

- **Control Function Field**—IRIG signals have an optional section in the data stream that can be used to include additional information (such as the present year, for example). This field allows the Control Field section of the IRIG output to be defined. The available configurations are:
- **Fields Conform to RCC 200-4:** IRIG spec 200-04 specified a location for year value, if included in this field.
 - **Fields Conform to IEE 1344:** Control Field contains year, Leap Second and DST information.
 - **Fields Conform to Spectracom Format:** Year is included in Control Field but not in the same location as RCC-2004 output (year is offset by one position).
 - **Fields Conform to Spectracom FAA Format:** A unique IRIG output Control Field that contains satellite lock status and time error flags.
- Fields Conform to NASA Formats: Variants of IRIG B.

The available options will vary according to the configurations of Format and Modulation Type.

- **Offset:** Provides the ability to account for IRIG cable delays or other latencies in the IRIG input. The Offset value is entered and displayed in nanoseconds (ns). Available Offset range is -500 to +500 ms.

- **Signature Control**—Used to control when the IRIG modulation will be present. This function allows the modulation to stop in certain situations. The options available are:
 - **Output Always Enabled:** IRIG time code modulation is present, even when SecureSync is not synchronized to its references.
 - **Output Enabled in Holdover:** IRIG time code modulation is present unless the SecureSync is not synchronized to its references (Modulation is present while in the Holdover mode).
 - **Output Disabled in Holdover:** IRIG time code modulation is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).
 - **Output Always Disabled:** No IRIG output modulation is present, even if any SecureSync input references are present and considered qualified.
- The available options will vary according to the values of **Format** and **Modulation** Type.
- **Timescale**—Used to select the time base for the incoming ASCII time code data. The entered Timescale is used by the system to convert the time in the incoming ASCII data stream to UTC time for use by the System Time. The available choices are:
 - **UTC**—UTC is also referred to as ZULU time.
 - **TAI**—Temps Atomique International,
 - **GPS**—The raw GPS time as transmitted by the GNSS satellites (as of September, 2013, this is currently 16 seconds ahead of UTC time).
 - **A local clock set up through the Time Management Page**—This option will appear under the name of the local clock you have set up. More information. Local timescale allows a Local Clock to apply a time offset for Time Zone and DST correction.
- **Amplitude**—The peak-to-peak output voltage level into a 600 Ω load is adjusted by entering a digital control value in this field. The level adjustment has no effect on TTL outputs, only on AM formats. The value of 128 will cause the Mark amplitude to be about 5vp-p into high impedance. A value of 200 results in an output amplitude of about 9vp-p into high impedance

SAASM GPS receivers (1204-07 1204-50 1204-1A)

*** (1204-07) Trimble Force-22 SAASM GPS receiver Option Card

Refer to: <U:\Engineering\SAASM-FOUO\CustomerService\SecureSync>

1204-07 hardware changes

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECO | Archive version | New Version | Change | approximate cut-in |
|------|-----------------|-------------|--|--------------------|
| 1101 | POST 5.5.0 | N/A | Added a hole in the edge of this Option Card in order for users to be able to access the battery enable switch | After S/N 14326 |

Block Diagram

FPGA (firmware) for the 1204-07 card:

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|-----------------------|--------------------------------------|--------------------|
| | | 2.11 | Latest version as of at least v5.8.5 | |

***1204-1A) GB-GRAM SAASM GPS receiver Option Card

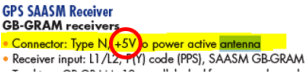
Refer to: <U:\Engineering\SAASM-FOUO\CustomerService\SecureSync> for details

Desire to upgrade to 1204-1A GB-Gram receiver in the field after purchasing/installed SecureSyncs.

Due to zeroize switch/cables and battery cable, we recommend purchasing 1204-1A Option minus just the receiver. The cables, zeroize switch and key fill will then be installed. Otherwise, they will likely need to be returned for retrofit to add this option/accessories.

The alternate approach is to install 1204-02 RS-232 card and interface with an external DAGR receiver.

+3.3vdc Output voltage (to power the SAASM antenna)/ not using our Model 8225S SAASM antenna

- Minor error found in SAASM SecureSync datasheet (refer to Salesforce Case 253514, Dec 2020)
 - Indicates +5v out, instead of +3.3v out
- 
- (as confirmed by Dave Sohn, 4 Dec 2020) The GB-Gram SAASM receiver outputs **3.3 dc** (+2.75 to +3.5 VDC) on its antenna jack (**not 5vdc**) to power the antenna
 - GNSS antennas designed to operate at 5vdc (and not down to 3.3vdc) are not able to be powered by the SAASM receiver's supply voltage (a Bias T could potentially be installed in-line, to inject external 5vdc up to a 5vdc GNSS antenna, while making sure to block this voltage from going back down, into the SAASM receiver).
 - Make sure that any other GNSS antenna used with the SecureSync (besides our Model 8225S SAASM antenna) is designed to operate at both L1 and L2 GPS bands, in order for the antenna to be fully compatible with the SAASM receiver.
 - (per Dave Sohn) Our SAASM SecureSync datasheet will need to be amended, to better indicate the output voltage of the SAASM receivers.

*****1204-50 (HDB15, SWITCH SAASM x2)**



- In Arena: https://app.bom.com/items/detail-spec?item_id=1256084824&version_id=11693022378
https://app.bom.com/items/detail-spec?item_id=1282628706&version_id=11693022328
- Process detail 1204-50 (in Arena): https://app.bom.com/items/detail-spec?item_id=1282628706&version_id=11693022328

(July 2019) update version 5.8.5 added support for the 1204-50 Option Card

10MHz 5MHz 1MHz Fixed Frequency Distribution Option Cards (Sine wave out)

**Various Models

10 MHz out

***[\(1204-1C\) \(3\) 10MHz sine wave output Option Card](#)

5 MHz out

[1204-08: 5 MHz output module \(3 outputs\)](#) (BNC connectors)

[1204-38: 5 MHz output module \(3 outputs\)](#) (TNC connectors)

1 MHz out

[1204-26: 1 MHz output module \(3 outputs\)](#)

PCB board: 1204-0080-F000 (In Arena) https://app.bom.com/items/detail-spec?item_id=1202845089&version_id=10221211498&orb_msg_single_search_p=1&redirect_segno=5742531112

Schematic for all three Option Cards (1204-1081-0200) (Note: though labeled 5MHz, it's the same for all three cards): https://app.bom.com/items/detail-spec?item_id=1202845089&version_id=10221211498

Phase noise Specs for the various frequency outputs (10MHz 5MHz and 1MHz)

The Phase noise specs in the SecureSync data sheet only apply to the base 10MHz output and the (3) 10 MHz outputs on the 1204-0C / 1204-1C Option Cards. Because of how the 5 MHz and 1MHz outputs are derived from the oscillator's 10 MHz output, the phase noise of the 5MHz and 1MHz outputs is inherently much higher! We do not publish phase noise specs for the 5MHz and 1MHz outputs.

Even if the LPN OCXO is installed, the 5MHz or 1MHz outputs phase noise will be much higher than the 10 MHz phase noise!

API calls associated with fixed Frequency output cards (such as 10MHz, 5MHz, 1MHz, etc)

- Refer to Tim Tetreault's "cheat sheet" at: [..\..\EQUIPMENT\SPECTRACOM EQUIPMENT\Timing boards\TSync family\Tsync driver calls cheat sheet](#)
- These API calls are primarily for internal use, but the associated "get" calls are available via the CLI interface ("sets" are not available to either spadmin or user accounts)
- These are examples - additional calls may have since been added

| FREQ IN Commands | FREQ OUT Commands |
|---------------------|----------------------|
| FR_GetFreq | FP_GetFreq |
| FR_GetNumInst | FP_GetNumInst |
| FR_GetOffset | FP_GetSigCtrl |
| FR_GetRefId | FP_SetSigCtrl |
| FR_GetValidity | |
| FR_SetFreq | |
| FR_SetOffset | |

*****(1204-08 and 1204-38): (3) 5 MHz output Option Cards**

- **1204-08:** 3 BNC outputs
- **1204-38:** 3 TNC outputs

FAQs for the 5 MHz outputs

Phase Noise

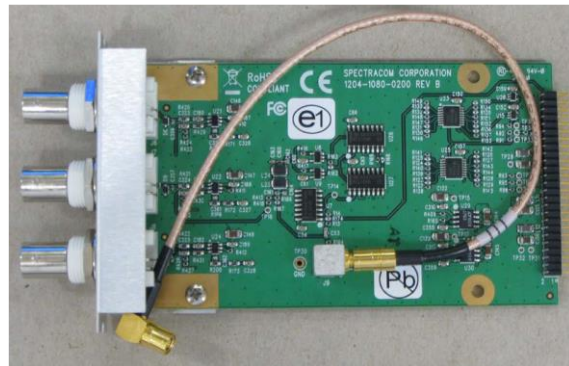
Q. With the 5MHz module, is the phase noise the same as that of the “main” 10MHz signal?

A. Keith’s response (per Mark McGregor) for the Model 1204-08(5 MHz outputs), the phase noise for the outputs is worse than the “main” 10 MHz output phase noise.

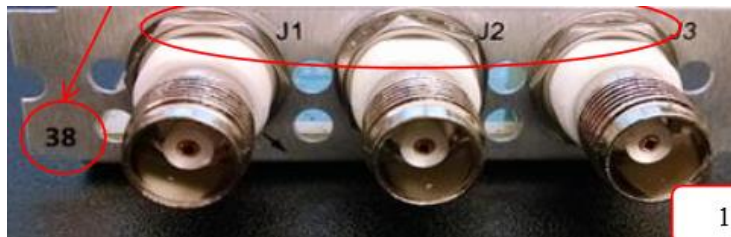
1204-08 (BNC connectors)



(J1, J2, J3) 5 MHz Sine wave outputs (50 ohms)



1204-38 (TNC connectors)

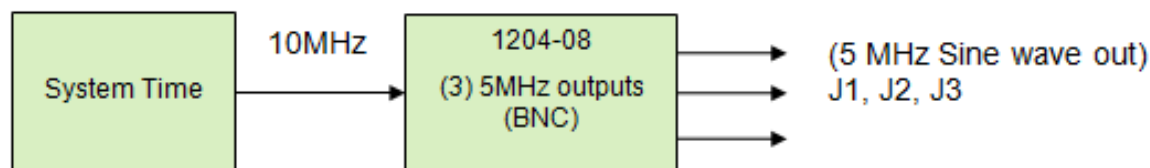


(J1, J2, J3) 5 MHz Sine wave outputs (50 ohms)



Note: 1204-38 Option Card was introduced with version 5.3.0 upgrade (~Jul 2015)

Block Diagram



Schematic:

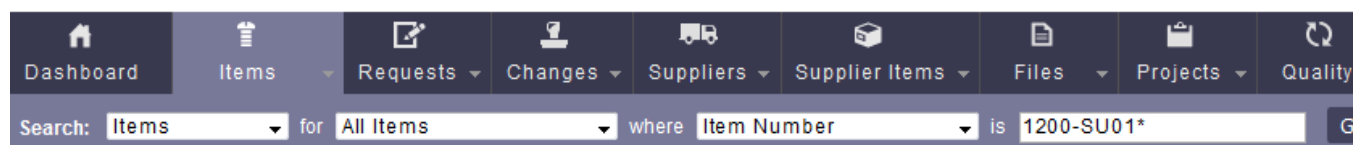
- **1204-08:** refer to 1204-0080-F000 in Arena: https://app.bom.com/items/detail-spec?item_id=1202845089&version_id=10241793988&orb_msg_single_search_p=1&redirect_segno=6973405455
- **1204-38:** refer to 1204-0080-F001 in Arena: https://app.bom.com/items/detail-spec?item_id=1212255831&version_id=10373577018&orb_msg_single_search_p=1&redirect_segno=6973408653

1204-08 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for Model 1204-08:

- The Model 1204-08 Option Card does not have an FPGA. Software for this card is only in the main SecureSync board.

1204-08 Hardware changes

- For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

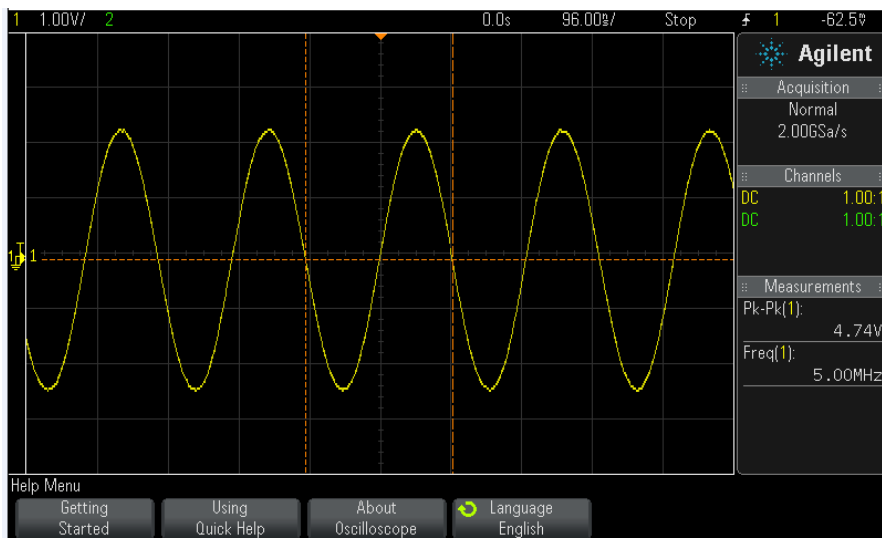
| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |
| | | | | |

Outputs:

- **1204-08:** 3 BNC outputs
- **1204-38:** 3 TNC outputs

Note: Sine wave outputs only.

Example output (5 MHz sine-wave)



Phase noise Specs for the various frequency outputs (10MHz 5MHz and 1MHz)

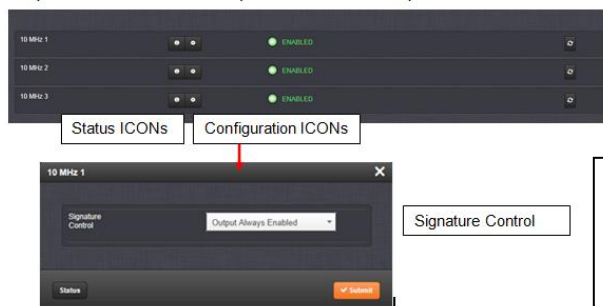
The Phase noise specs in the SecureSync data sheet only apply to the base 10MHz output and the (3) 10 MHz outputs on the 1204-0C / 1204-1C Option Cards. Because of how the 5 MHz and 1MHz outputs are derived from the oscillator's 10 MHz output, the phase noise of the 5MHz and 1MHz outputs is inherently much higher! We do not publish phase noise specs for the 5MHz and 1MHz outputs.

Even if the LPN OCXO is installed, the 5MHz or 1MHz outputs phase noise will be much higher than the 10 MHz phase noise!

Configuration

The Freq Output ports on the same Option Card are NOT independently configurable (such as for Signature Control, for instance)

- All three outputs on the 1st 10 MHz Option Card are configured as “10 MHz 1” (the base output is “10 MHz 0”)



Same pop-up window (such as “10 MHz 1” for instance) configures all three output ports at the same time. Individual frequency outputs on the same Option Card are not independently configurable!

- Refer to online user guide (excerpted below) at:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/Frequency_Out.htm?Highlight=1204-08

“The Frequency Out option cards each have 3 outputs, distributing a 1MHz signal, 5MHz or 10 MHz signal (depending on the card model). **All 3 outputs are configured as a single output and will appear as such in the SecureSync Web UI, numbered sequentially by card instance, starting with 0** (except the 10 MHz option card, which starts with no.1 because of the built-in 10 MHz output.)”

Q (from Keith to Apps) For the 1204-08: 5 MHz output Option Card (and other Freq output cards) is the following statement from the online SecureSync user guide still true

A) New web browser interface (versions 5.1.2 and above)



A Reply from Keith (4 June 2020) Regarding our Case Number 233350 and your reported observation, please disregard my previous email!

Your observation of there only being one configuration menu available for all the outputs on the 5 MHz output Option Card (as well as 10MHz and 1MHz output option cards as well), is actually valid/as expected.

Though the design reasons behind there only being one configuration menu for each Option Card (instead of one for each output) make sense now, even I didn't realize -until today- that these frequency outputs aren't independently configurable (as they say, you learn something new, each day). Instead, each Frequency Output Option Card has only one configuration menu, which controls the configurations for all the outputs from that particular Option Card.

The label at the top of the pop-up configuration window (such as "5 MHz 0") is referring to all the 5MHz outputs on that particular 5 MHz Output Option Card (its not referring to only one particular output, on that Option Card). So, enabling Signature Control for instance, on "5 MHz 0" will enable Signature Control on all three 5 MHz outputs on that particular Option Card.

With only one 5 MHz output card installed, there will only be the single pop-up menu labeled "5MHz 0". If an additional 5 MHz card is installed, the settings for its outputs would be in the single pop-up window labeled as "5 MHz 1".

I hope this information helps explain what you observed (and thanks for helping me even learn something that I wasn't previously aware of)!

B) Classic interface browser (versions 5.0.2 and below)

Setup/Inputs/5 MHZ

This card does not have inputs

Setup/Outputs/5 MHZ

OUTPUTS SETUP - 5 MHZ (SLOT1)

| | |
|-------------------|----------------------|
| Signature Control | No Signature Control |
|-------------------|----------------------|

Submit Reset

Status/Inputs/5 MHZ

This card does not have inputs

Status/Outputs/5 MHZ

| OUTPUTS STATUS - 5 MHZ (SLOT1) | |
|--------------------------------|----------------------|
| Signature Control | No Signature Control |
| Frequency (Hz) | 5000000.000000 |

FAQs for the 1204-08 (5 MHz out)

- If even one of the three 5MHz sine wave outputs is working normally, if there any problems with either of the other two ports, the issue is with the Option Card itself- not with the SecureSync itself.
Email from Dave Sohn (10/7/11), regarding one output (J2) being distorted while other two outputs were normal: "There isn't any configuration for this per channel, so there must be an issue with the one channel on the board."

***(1204-46) (4) 5MHZ = Bracket & Mounting plate for QEWR Special

- Refer to ECO-001607 (in Arena): https://app.bom.com/changes/detail-affected?change_id=2393194020
- Bracket & Mounting plate for QEWR Special
- (4) 5MHz outputs

Description: This ECO (1607) will release a new Option Card "46" to be used in the QEWR special. it also releases a new Oscillator mounting plate to go inside the QEWR 20" chassis.

The new option card is mostly passive. It passes 4 5MHz signals from a Wenzel module to 4 BNC connectors on the rear of the card.

ECO-001607

0

0

Open

Submit

Approval

Effective

Complete

1204-46 OC, Bracket & Mounting plate for QEWR Special

Completed

Summary

Files

Items

Requests

Approvals

Implementation

Alerts

Notifications

Supplier Access

Projects

Quality

History

Modifications

Inventory Disposition

BOM Redline

Affected Assemblies

Items with 30 requested modifications

| # | | | | | | Item Number ... | Item Name | Phase | New Phase | Rev | New Rev | Spec |
|---|--|--|--|--|--|-----------------------------------|--|------------|------------------|-----|---------|------|
| 1 | | | | | | 1200-1000-0784 | PLATE, QEWR | Unreleased | Specials Prod... | | 1 | |
| 2 | | | | | | 1204-0460-0600-PD | 5MHz, 4 BNC Option Card PROCESS D... | In Design | In Production | 1 | 1 | |
| 3 | | | | | | 1204-0460-0600-TP | 5MHz, 4 BNC Option Card TEST PROC | In Design | In Production | 1 | 1 | |
| 4 | | | | | | 1204-0460-F000 | PCB ASSY, 5MHz, 4 BNC Option Card, ... | In Design | Specials Prod... | 1 | 1 | |
| 5 | | | | | | 1204-1460-0200 | BARE PCB, 5MHz, 4 BNC Option Card | In Design | In Production | 1 | 1 | |
| 6 | | | | | | 1204-1460-0719 | PLATE, 5MHz, 4 BNC | Unreleased | In Production | | 1 | |
| 7 | | | | | | 1204-1461-0200 | Schematic, 5MHz, 4 BNC Option Card | In Design | In Production | 1 | 1 | |
| 8 | | | | | | 1204-46 | 5MHz, 4 BNC Option Card | In Design | Specials Prod... | 1 | 1 | |

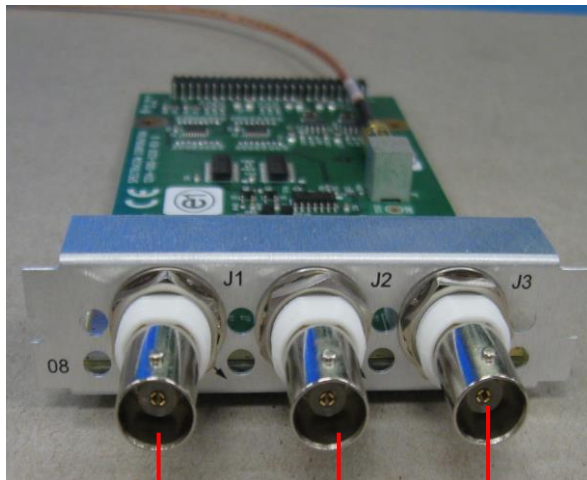
*****(1204-26) (3) 1MHz Sine wave OUT, 3-BNC Option Card**

FAQs for the 1 MHz outputs

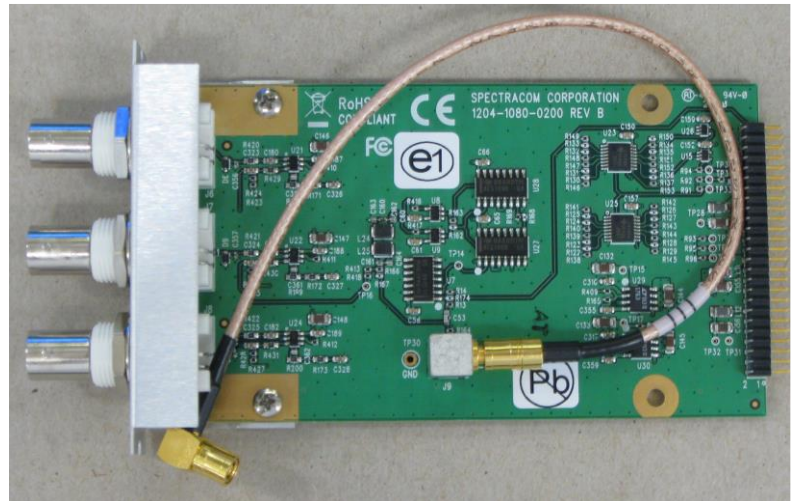
Phase Noise

Q. With the 1MHz module, is the phase noise the same as that of the “main” 10MHz signal?

A. Keith’s response (per Mark McGregor) for the Model 1204-26 (1 MHz outputs), the phase noise for the outputs is worse than the “main” 10 MHz output phase noise.

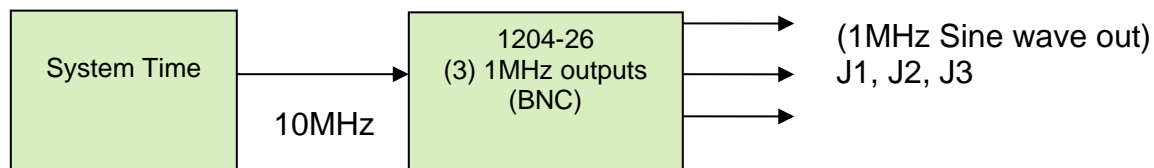


J1 J2 J3
(All three are outputs)



Schematic: (refer to 1204-0080-F000) [I:\New Released\PCB Documentation](#)

Block Diagram



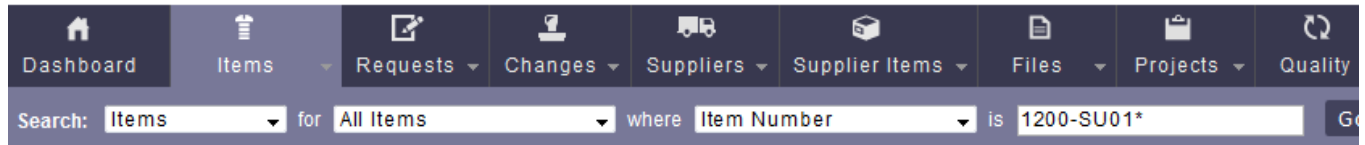
For software assembly versions, refer to: (1204-SHxx, SP1xx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

Firmware

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “**Items**” for “**Item number**” and search for “**1200-SU01**” (as shown below):



FPGA (firmware) for Model 1204-26:

- The Model 1204-26 Option Card does not have an FPGA. Software for this card is only in the main SecureSync board.

Hardware

For Option Card hardware versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.8.2 | 1.0.0 | Added support for this Option card (first release) | |
| | | | | |
| | | | | |

Note: Software support for the Model 1204-26 started in Archive version 4.8.2.

Outputs

Note: Sine wave outputs only.

Phase noise Specs for the various frequency outputs (10MHz 5MHz and 1MHz)

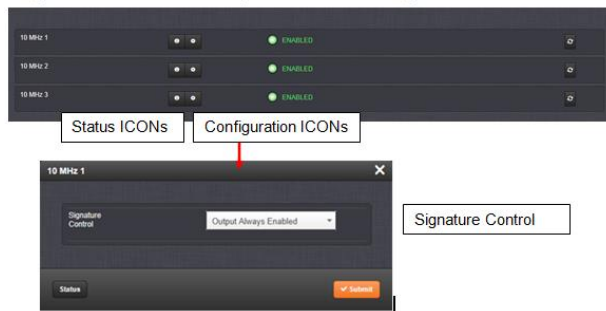
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Even if the LPN OCXO is installed, the 5MHz or 1MHz outputs phase noise will be much higher than the 10 MHz phase noise!

Configuration

The Freq Output ports on the same Option Card are NOT independently configurable (such as for Signature Control, for instance)

- All three outputs on the 1st 10 MHz Option Card are configured as “10 MHz 1” (the base output is “10 MHz 0”)



Same pop-up window (such as “10 MHz 1” for instance) configures all three output ports at the same time. Individual frequency outputs on the same Option Card are not independently configurable!

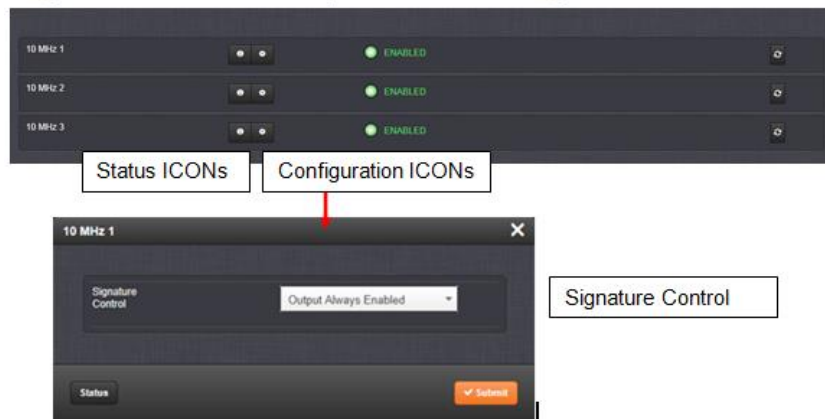
- Refer to online user guide (excerpted below) at:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/Frequency_Out.htm?Highlight=1204-08

“The Frequency Out option cards each have 3 outputs, distributing a 1MHz signal, 5MHz or 10 MHz signal (depending on the card model). **All 3 outputs are configured as a single output and will appear as such in the SecureSync Web UI, numbered sequentially by card instance, starting with 0** (except the 10 MHz option card, which starts with no.1 because of the built-in 10 MHz output.)”

Q (from Keith to Apps) For the 1204-08: 5 MHz output Option Card (and other Freq output cards) is the following statement from the online SecureSync user guide still true

C) New web browser interface (versions 5.1.2 and above)



A Reply from Keith (4 June 2020) Regarding our Case Number 233350 and your reported observation, please disregard my previous email!

Your observation of there only being one configuration menu available for all the outputs on the 5 MHz output Option Card (as well as 10MHz and 1MHZ output option cards as well), is actually valid/as expected.

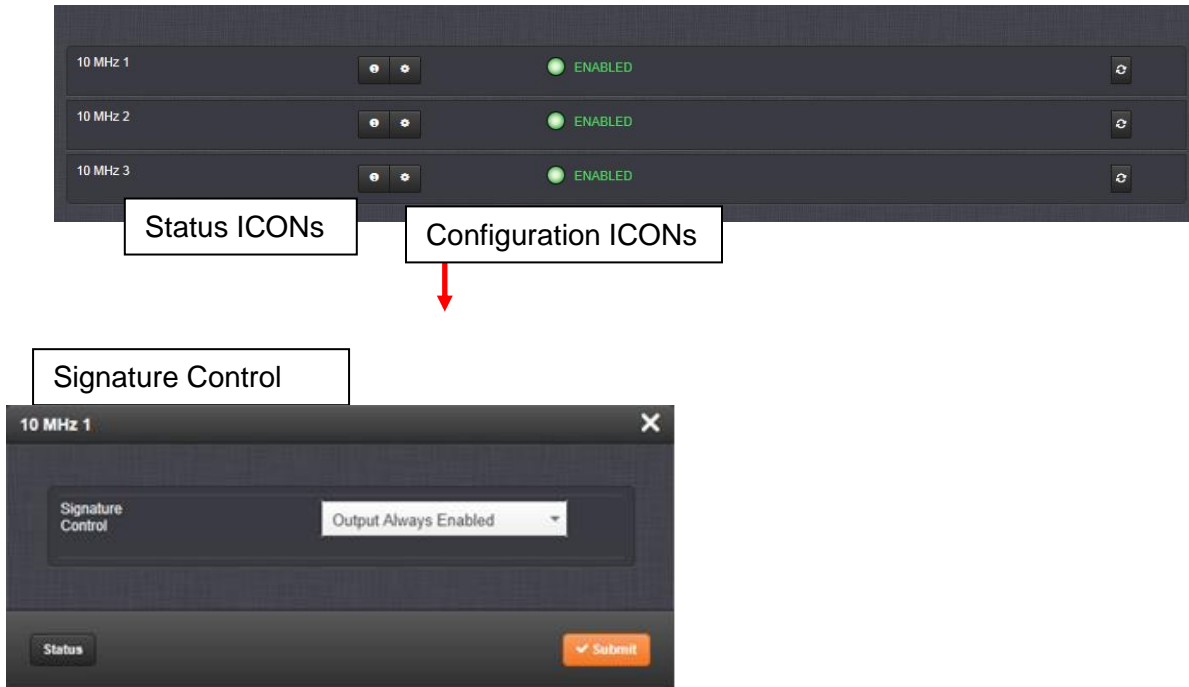
Though the design reasons behind there only being one configuration menu for each Option Card (instead of one for each output) make sense now, even I didn't realize -until today- that these frequency outputs aren't independently configurable (as they say, you learn something new, each day). Instead, each Frequency Output Option Card has only one configuration menu, which controls the configurations for all the outputs from that particular Option Card.

The label at the top of the pop-up configuration window (such as “5 MHz 0”) is referring to all the 5MHz outputs on that particular 5 MHz Output Option Card (its not referring to only one particular output, on that Option Card). So, enabling Signature Control for instance, on “5 MHz 0” will enable Signature Control on all three 5 MHz outputs on that particular Option Card.

With only one 5 MHZ output card installed, there will only be the single pop-up menu labeled “5MHz 0”. If an additional 5 MHz card is installed, the settings for its outputs would be in the single pop-up window labeled as “5 MHz 1”.

I hope this information helps explain what you observed (and thanks for helping me even learn something that I wasn't previously aware of)!

A) New web browser interface (versions 5.1.2 and above)



Signature Control: Signature Control is used to control when the 1 MHz output is present.

No Signature Control: 1 MHz output is present, even when SecureSync is not synchronized to its reference (modulation is present while in the Holdover mode).

Sync State Signature Control: 1 MHz output is present unless the SecureSync is not synchronized to its references (1 MHz output is present while in the Holdover mode).

Ref State Signature Control: 1 MHz output is present unless the SecureSync references are not considered qualified and valid (modulation is not present while in the Holdover mode).

Output disabled: No 1 MHz output is present, even if the SecureSync references are present and considered qualified.

B) Classic interface browser (versions 5.0.2 and below)

Setup/Inputs

This card does not have inputs

Setup/Outputs

Signature Control: Signature Control is used to control when the 1 MHz output is present.

No Signature Control: 1 MHz output is present, even when SecureSync is not synchronized to its reference (modulation is present while in the Holdover mode).

Sync State Signature Control: 1 MHz output is present unless the SecureSync is not synchronized to its references (1 MHz output is present while in the Holdover mode).

Ref State Signature Control: 1 MHz output is present unless the SecureSync references are not considered qualified and valid (modulation is not present while in the Holdover mode).

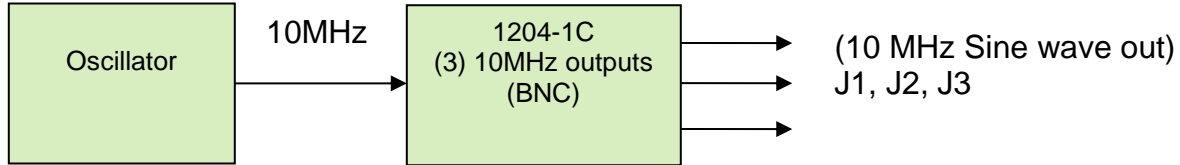
Output disabled: No 1 MHz output is present, even if the SecureSync references are present and considered qualified.

***1204-1C (3) 10MHz sine wave output Option Card

FAQ's for 10 MHz output

Link to schematic (1204-1081-0200) in Arena: https://app.bom.com/items/detail-spec?item_id=1202845089&version_id=10241793988

Block Diagram

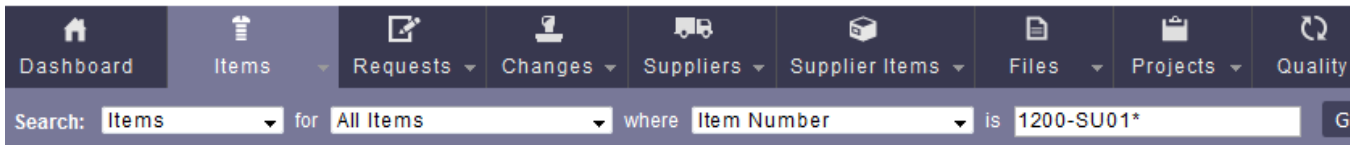


Firmware

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for Model 1204-0C and 1204-1C:

- The Models 1204-1C (and 1204-0C) Option Cards do not have an FPGA. Software for this card is only in the main SecureSync board.

Hardware

For Option Card hardware versions, refer to: (SP21) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.5.0 | | Added support for this Option card (first release) | |
| | | | | |

1204-1C Option Card install (cable to main PCB board)

- refer to Option Card install document
- note 10 MHz cables must be connected in ascending order (starting at J1)
- Refer to the 10 MHz signature control section for info on attaching 10 MHz coax cable from the 1204-1C Card to the main PCB board (coax cables have to be installed in ascending order -starting with J1- for Signature Control to work)

Output Connectors

(3) Outputs: three 10MHz outputs (**BNC Female 50 ohm**)



- **Our PN for the four BNC jacks:** J047R-0040-051Q (CONN,BNC,PLASTIC BODY,TH,HORIZ,.272" CENTER)
 - **Bomar P/N** 364A595BL
- Mating connector:** BNC Male (50 ohm)

10 MHz Output signal levels/amplitude/impedance (base unit and 1204-1C option card)

Output signal: Sinewave only

- **Amplitude (From SecureSync data sheet):** +13 dBm +/- 2dB into 50 ohm, BNC (11 dBm= 2.85vpp 15 dBm=4.5vpp)
- Output level/gain is not adjustable inside the SecureSync.
 - Use external line attenuators, if amplitude into 50 ohm input impedance is too high.

Output impedance: 50 ohms

10 MHz phase alignment to 1PPS input reference

1PPS generation

- Except after boot-up, there are always 10,000,000 frequency counts between each 1PPS.

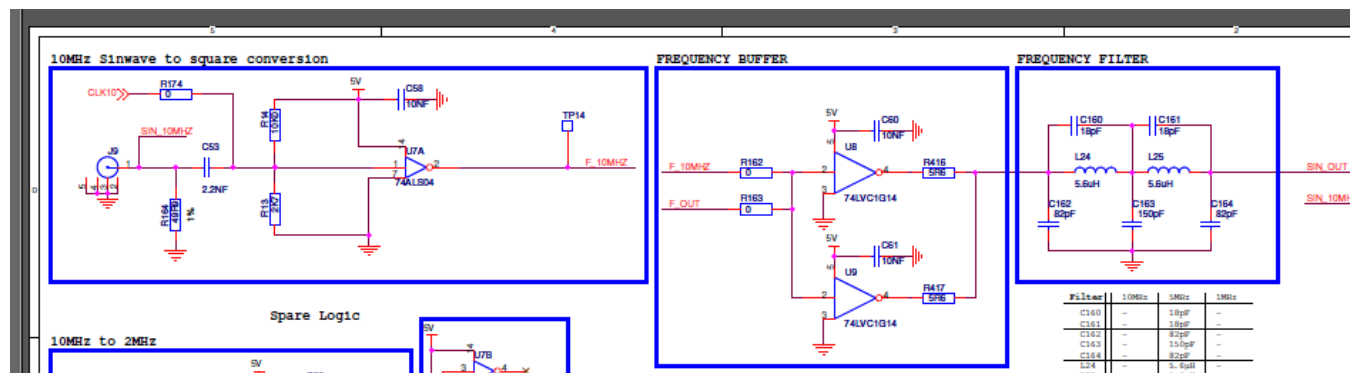
Note: (2 Jan 2014) Curtis Somers reported they observed an extra count, especially when going into Holdover mode. (Refer to Salesforce case 12863)

1PPS / 10 MHz alignment at the base 10 MHz output port versus all 1204-1C Option Card outputs

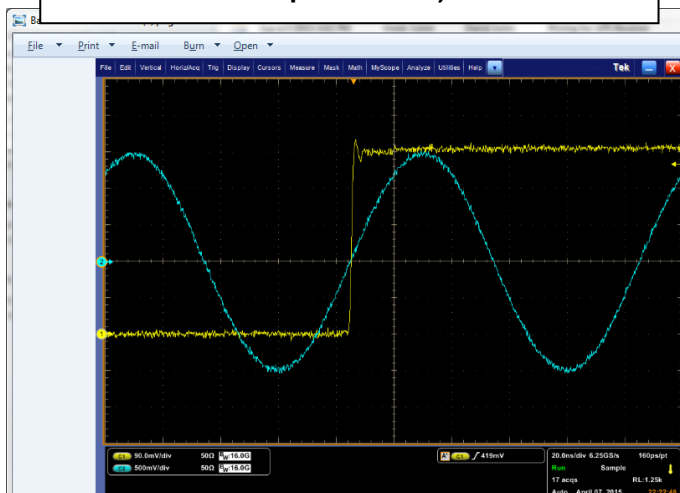
- Refer to Salesforce case 17618.
- 1PPS /10 MHz alignment at the base 10 MHz output port is slightly different on the 1204-1C 10MHz Option Cards
- 1PPS /10 MHz alignment at the base 10 MHz output port is the same as the outputs of the earlier 2204-0C 10 MHz Option Cards.
- This is due to the 10 MHz distribution for the front base output port being different than the 1204-1C Cards (the

1204-1C outputs get 10 MHz from the main board through a buffer and filter and shown below)

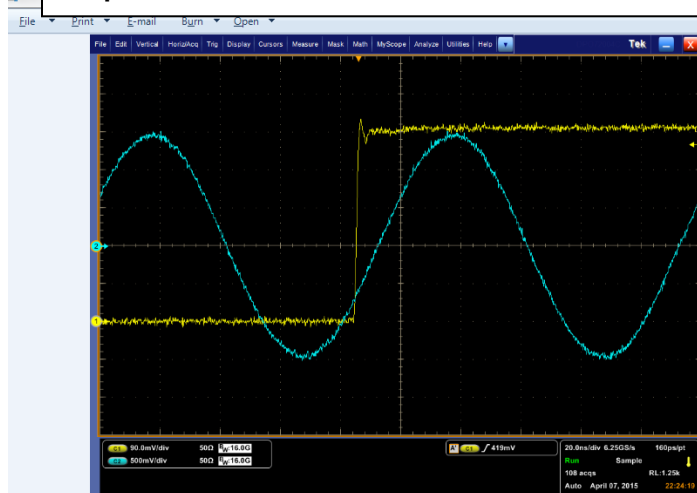
Note: Schematic for 1204-1C 10MHz Output distribution below is for internal use only.



1PPS/10MHz alignment for base output (and 1204-0C 10 MHz Option Cards)



1PPS/10MHz alignment for all 1204-1C option Card outputs



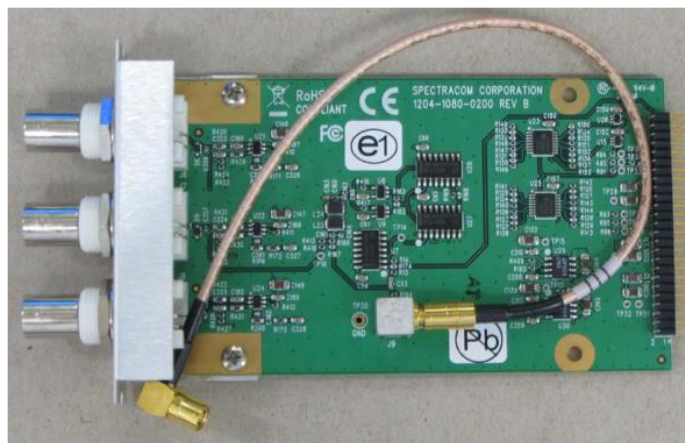
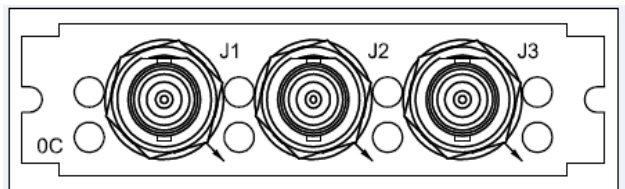
Per Dave Sohn (7 Apr 2015) This is what I would expect from the system. There is no HW issue. The phase relationship on a 10MHz output is fixed with the 1PPS, but there is a difference between the outputs on the option card versus the main unit. If they need multiple outputs that have the same phase relationship, then they can just use the 1C option card outputs.

Because KTS disciplining performs phase alignment of the 10 MHz output, unlike earlier NetClocks which only perform Frequency adjustments, if more than one TSync or SecureSync are synced to the same IRIG or GPS signal, the 10 MHz outputs will be in phase with each other (not just corrected for frequency).

10MHz output Phase Noise

Q. With the 10MHz module, is the phase noise the same as that of the “main” 10MHz signal?

A. Keith's response (per Mark McGregor) for the Model 1204-1C (10 MHz), the phase noise for the outputs is similar to the “main” 10 MHz output. This isn't the case with 1MHz and 5MHz out Option Cards, but is the case for 10 MHz out.



Function: Provides three 10 MHz outputs

Inputs: None

For additional software update info, refer to Release Notes: [PSB, PSP software updates\948x and SecureSync\948x and SecureSync Software updates](#)

Harmonics and Spurs of the 10 MHz output

- Refer to the 10 MHz section of the SecureSync assist doc [I:\Customer Service\1- Cust Assist documents\SecureSync-VersaSync CustAssist.pdf](#)

10 MHz Signature Control

Signature Control for these Option Cards is simultaneously for all three output ports (not for each individual output port). Either all three ports have it enabled or none of the three ports have it enabled.

Because the 1204-1C Option Cards have no FPGA installed, Signature Control is handled by the main PCB board. There are four connectors reserved for 10 MHz output to each installed frequency distribution Option cards (J1 through J4). When Signature Control is enabled for a particular frequency (such as 10MHz), just the connector that provides 10MHz output to the particular Option Card is squelched. The other connectors remain active and continue to output 10MHz.

If the 10 MHz output has Signature Control enabled and a condition that causes Signature Control to be actively squelching "J0" (which provides the 10 MHz output to the base 10MHz out connector) is also squelched.

Note: Connector "J0" is reserved for the 10 MHz output to the base 10 MHz out connector (which is available on all units).

The coax cable from each Frequency Distribution Option Card (1204-1C) must be connected to each of these connectors on the main PCB, in ascending order, starting with J1)(this is important). Refer to the figure below, from the Option Card install guide.

- Install the coax cable(s) onto the main PCB, connecting them to the first available open connectors, from J1 - J4. Refer to figure below:

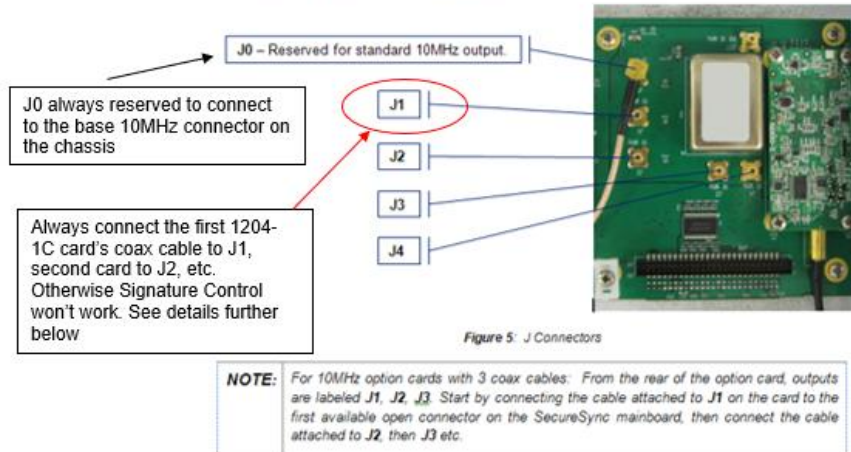


Figure 5: J Connectors

10MHz Signature Control not working: If 10 MHz output is still present from the three output ports of an Option Card, but not present on the base unit's 10 MHz output, because Signature Control is currently active

- Refer to Salesforce cases 186391 and 6117 for more info

With Signature Control enabled, if the Frequency outputs are still present on an Option Card, but not on the Base 10 MHz out (because it's squelched for a Signature Control condition), the Option Card's 10MHz coax cable may not be connected to the first J1 through J4 connector on the main PCB, in ascending order. If it's connected to the wrong connector, since Signature Control is applied to each of these ports individually based on what's connected to each slot, if it's not on the right connector, the 10MHz input to the Option Card won't be squelched by Signature Control. So, the ports on the card will still be present.

Configuration

The Freq Output ports on the same Option Card are NOT independently configurable (such as for Signature Control, for instance)

- All three outputs on the 1st 10 MHz Option Card are configured as “10 MHz 1” (the base output is “10 MHz 0”)



Same pop-up window (such as “10 MHz 1” for instance) configures all three output ports at the same time. Individual frequency outputs on the same Option Card are not independently configurable!

- Refer to online user guide (excerpted below) at:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/Frequency_Out.htm?Highlight=1204-08

“The Frequency Out option cards each have 3 outputs, distributing a 1MHz signal, 5MHz or 10 MHz signal (depending on the card model). **All 3 outputs are configured as a single output and will appear as such in the SecureSync Web UI, numbered sequentially by card instance, starting with 0** (except the 10 MHz option card, which starts with no.1 because of the built-in 10 MHz output.)”

Q (from Keith to Apps) For the 1204-08: 5 MHz output Option Card (and other Freq output cards) is the following statement from the online SecureSync user guide still true

A) New web browser interface (versions 5.1.2 and above)



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Your observation of there being only one configuration menu available for all the outputs on the 5 MHz output Option Card (as well as 10MHz and 1MHZ output option cards as well), is actually valid/as expected.

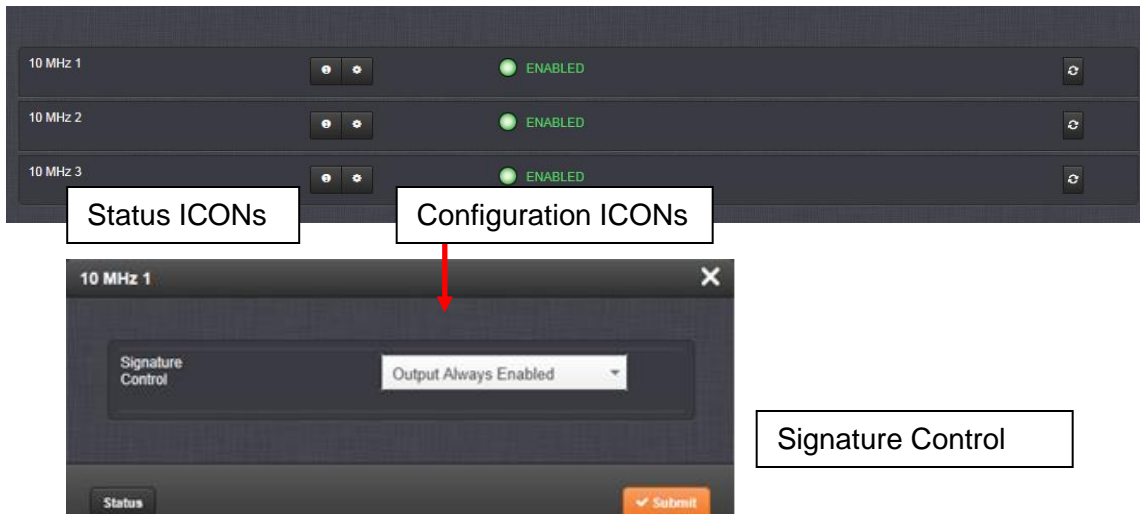
Though the design reasons behind there only being one configuration menu for each Option Card (instead of one for each output) make sense now, even I didn't realize -until today- that these frequency outputs aren't independently configurable (as they say, you learn something new, each day). Instead, each Frequency Output Option Card has only one configuration menu, which controls the configurations for all the outputs from that particular Option Card.

The label at the top of the pop-up configuration window (such as "5 MHz 0") is referring to all the 5MHz outputs on that particular 5 MHz Output Option Card (its not referring to only one particular output, on that Option Card). So, enabling Signature Control for instance, on "5 MHz 0" will enable Signature Control on all three 5 MHz outputs on that particular Option Card.

With only one 5 MHZ output card installed, there will only be the single pop-up menu labeled "5MHz 0". If an additional 5 MHz card is installed, the settings for its outputs would be in the single pop-up window labeled as "5 MHz 1".

I hope this information helps explain what you observed (and thanks for helping me even learn something that I wasn't previously aware of)!

New web browser interface (versions 5.1.2 and above)



Signature Control: **Signature** Control is used to control when the 10 MHz output is present.

No Signature Control: 10 MHz output is present, even when SecureSync is not synchronized to its reference (Modulation is present while in the Holdover mode).

Sync State Signature Control: 10 MHz output is present unless the SecureSync is not synchronized to its references (5 MHz output is present while in the Holdover mode).

Ref State Signature Control: 10 MHz output is present unless the SecureSync references are not considered qualified and valid. (Modulation is not present while in the Holdover mode).

Output disabled: No 10 MHz output is present, even if the SecureSync references are present and considered qualified.

Classic interface browser (versions 5.0.2 and below)

Setup/Inputs

This card does not have inputs

Setup/Outputs

Signature Control: **Signature** Control is used to control when the 10 MHz output is present.

No Signature Control: 10 MHz output is present, even when SecureSync is not synchronized to its reference (Modulation is present while in the Holdover mode).

Sync State Signature Control: 10 MHz output is present unless the SecureSync is not synchronized to its references (5 MHz output is present while in the Holdover mode).

Ref State Signature Control: 10 MHz output is present unless the SecureSync references are not considered qualified and valid. (Modulation is not present while in the Holdover mode).

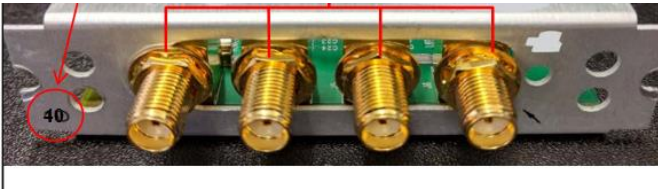
Output disabled: No 10 MHz output is present, even if the SecureSync references are present and considered qualified.

Status/Inputs

Status/Outputs

*** (1204-40) (4 SMA) LPN 100MHz sine wave output Option Card

- Refer to EC0 1480 (in Arena): https://app.bom.com/items/detail-spec?item_id=1237577826&version_id=10820510398



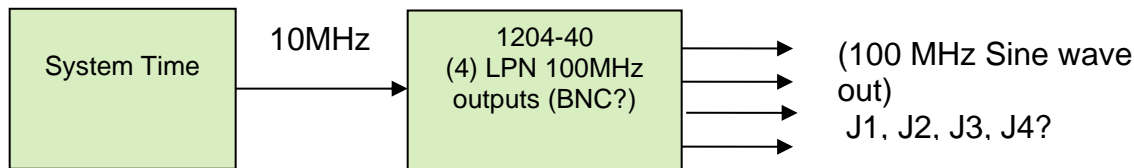
Shortcuts/links

Link to schematic (1204-1401-0200) in Arena: https://app.bom.com/items/detail-spec?item_id=1234410083&version_id=10961324798

links to Parts List (in Arena) https://app.bom.com/changes/detail-affected?change_id=2391171526

links to PD (in Arena): https://app.bom.com/items/detail-spec?item_id=1237577940&version_id=10820511828

Block Diagram

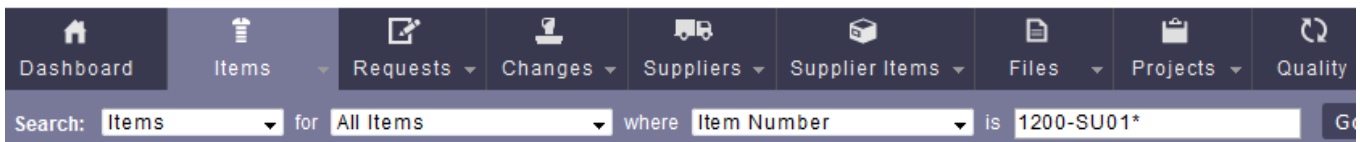


Firmware

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for Model 1204-40:

- The Model 1204-40 Option Card does not have an FPGA. Software for this card is only in the main SecureSync board. (??? TBD)

Hardware

For Option Card hardware versions, refer to: (

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 5.8.0 | | Added support for this Option Card (first release) | May, 2018 |
| | | | | |

Outputs

Note: 100 MHz LCD Sine wave outputs only.

Function: Provides four 100 MHz LPN outputs

Inputs:

None

Note- info below from 10 MHz outputs. Not sure if it applies to this card

100 MHz phase alignment to 1PPS input reference

1PPS generation

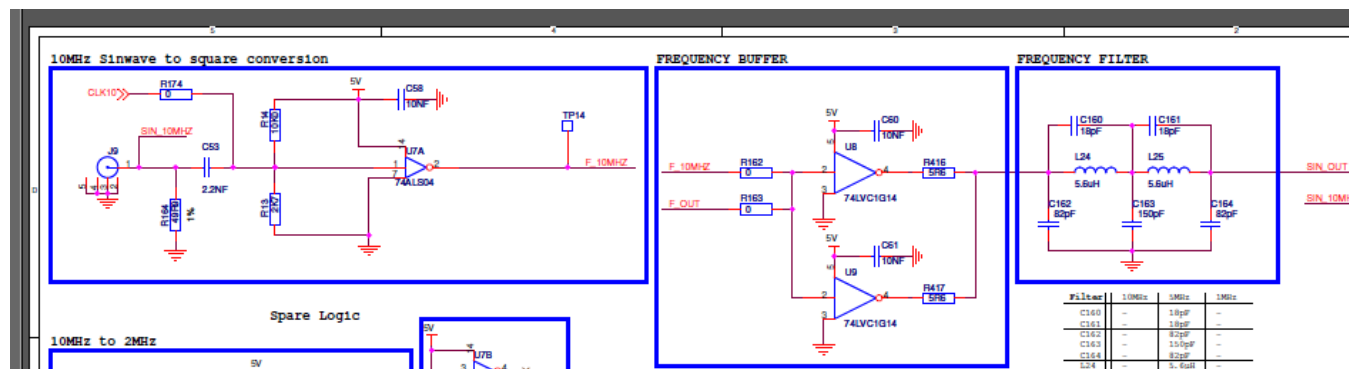
- Except after boot-up, there are always 10,000,000 frequency counts between each 1PPS.

Note: (2 Jan 2014) Curtis Somers reported they observed an extra count, especially when going into Holdover mode. (Refer to Salesforce case 12863)

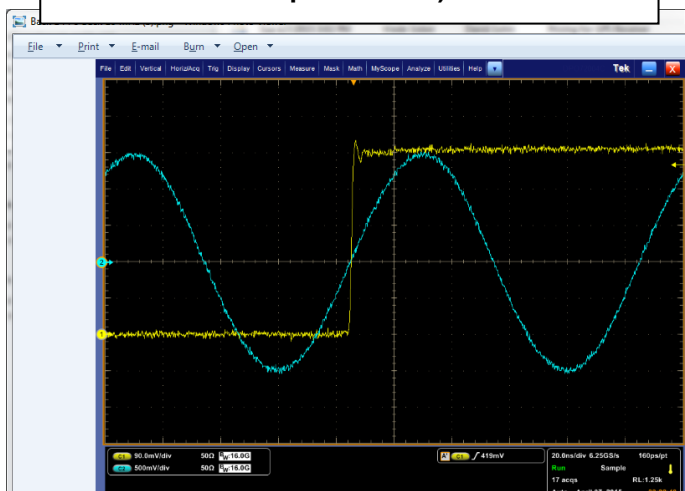
1PPS / 10 MHz alignment at the base 10 MHz output port versus all the 1204-1C Option Card outputs

- Refer to Salesforce case 17618.
- 1PPS /10 MHz alignment at the base 10 MHz output port is slightly different on the 1204-1C 10MHz Option Cards
- 1PPS /10 MHz alignment at the base 10 MHz output port is the same as the outputs of the earlier 2204-0C 10 MHz Option Cards.
- This is due to the 10 MHz distribution for the front base output port being different than the 1204-1C Cards (the 1204-1C outputs get 10 MHz from the main board through a buffer and filter and shown below)

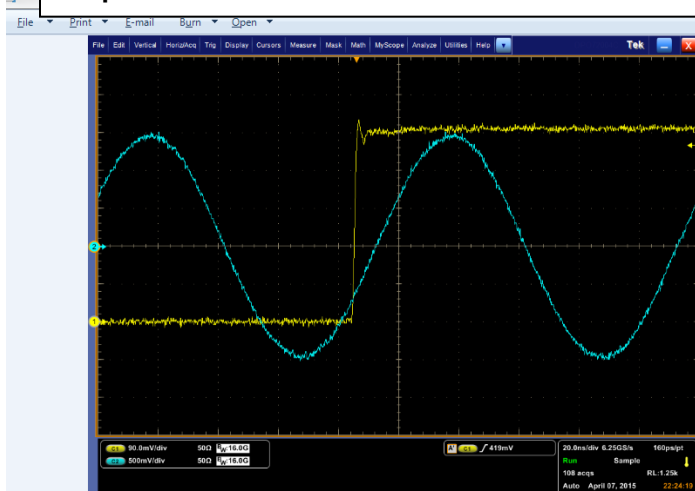
Note: Schematic for 1204-1C 10MHz Output distribution below is for internal use only.



1PPS/10MHz alignment for base output (and 1204-0C 10 MHz Option Cards)



1PPS/10MHz alignment for all 1204-1C option Card outputs



Per Dave Sohn (7 Apr 2015) This is what I would expect from the system. There is no HW issue. The phase relationship on a 10MHz output is fixed with the 1PPS, but there is a difference between the outputs on the option card versus the main unit. If they need multiple outputs that have the same phase relationship, then they can just use the 1C option-card outputs.

Because KTS disciplining performs phase alignment of the 10 MHz output, unlike earlier NetClocks which only perform Frequency adjustments, if more than one TSync or SecureSync are synced to the same IRIG or GPS signal, the 10 MHz outputs will be in phase with each other (not just corrected for frequency).

100 MHz output Phase Noise

Q, With the 100MHz module, is the phase noise the same as that of the “main” 10MHz signal?

A Keith’s response (per Mark McGregor) for the Model 1204-1C (10 MHz), the phase noise for the outputs is similar to the “main” 10 MHz output. This isn’t the case with 1MHz and 5MHz out Option Cards, but is the case for 10 MHz out.

For additional software update info, refer to Release Notes: [PSB, PSP software updates\948x](#) and [SecureSync\948x and SecureSync Software updates](#)

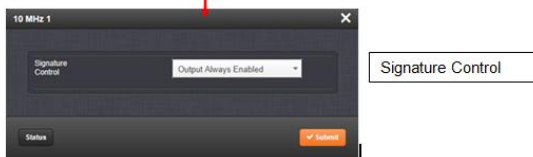
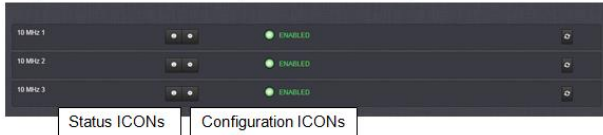
Harmonics and Spurs of the 10 MHz output

- Refer to the 10 MHz section of the SecureSync assist doc <I:\Customer Service\1- Cust Assist documents\SecureSync-VersaSync CustAssist.pdf>
-

Configuration

The Freq Output ports on the same Option Card are **NOT** independently configurable (such as for Signature Control, for instance)

- All three outputs on the 1st 10 MHz Option Card are configured as “10 MHz 1” (the base output is “10 MHz 0”)



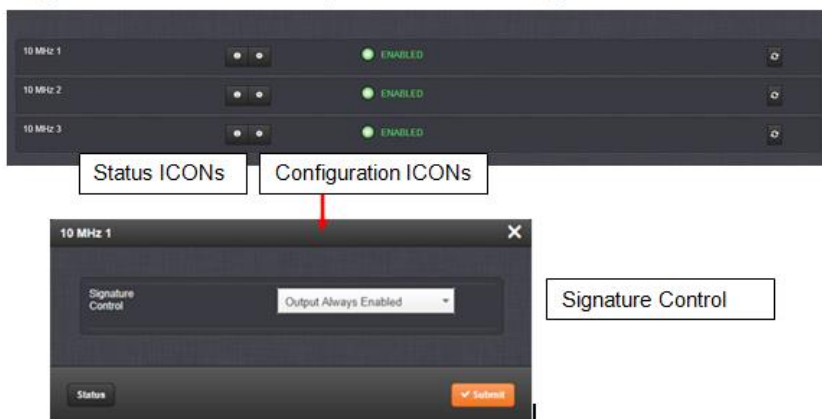
Same pop-up window (such as “10 MHz 1” for instance) configures all three output ports at the same time. Individual frequency outputs on the same Option Card are not independently configurable!

- Refer to online user guide (excerpted below) at:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/Frequency_Out.htm?Highlight=1204-08

“The Frequency Out option cards each have 3 outputs, distributing a 1MHz signal, 5MHz or 10 MHz signal (depending on the card model). **All 3 outputs are configured as a single output and will appear as such in the SecureSync Web UI, numbered sequentially by card instance, starting with 0** (except the 10 MHz option card, which starts with no.1 because of the built-in 10 MHz output.)”

Q (from Keith to Apps) For the 1204-08: 5 MHz output Option Card (and other Freq output cards) is the following statement from the online SecureSync user guide still true

A) New web browser interface (versions 5.1.2 and above)



A Reply from Keith (4 June 2020) Regarding our Case Number 233350 and your reported observation, please disregard my previous email!

Your observation of there only being one configuration menu available for all the outputs on the 5 MHz output Option Card (as well as 10MHz and 1MHz output option cards as well), is actually valid/as expected.

Though the design reasons behind there only being one configuration menu for each Option Card (instead of one for each output) make sense now, even I didn't realize -until today- that these frequency outputs aren't independently configurable (as they say, you learn something new, each day). Instead, each Frequency Output Option Card has only one configuration menu, which controls the configurations for all the outputs from that particular Option Card.

The label at the top of the pop-up configuration window (such as "5 MHz 0") is referring to all the 5MHz outputs on that particular 5 MHz Output Option Card (its not referring to only one particular output, on that Option Card). So, enabling Signature Control for instance, on "5 MHz 0" will enable Signature Control on all three 5 MHz outputs on that particular Option Card.

With only one 5 MHz output card installed, there will only be the single pop-up menu labeled "5MHz 0". If an additional 5 MHz card is installed, the settings for its outputs would be in the single pop-up window labeled as "5 MHz 1".

I hope this information helps explain what you observed (and thanks for helping me even learn something that I wasn't previously aware of)!

100 MHz Signature Control ???

Signature Control for these Option Cards is simultaneously for all three output ports (not for each individual output port). Either all three ports have it enabled or none of the three ports have it enabled.

Because these particular Option Cards have no FPGA installed, Signature Control is handled by the main PCB board. There are four connectors reserved for 10 MHZ output to each installed frequency distribution Option cards (J1 through J4). When Signature Control is enabled for a particular frequency (such as 10MHz), just the connector that provides 10MHz output to the particular Option Card is squelched. The other connectors remain active and continue to output 10MHz.

If the 10 MHz output has Signature Control enabled and a condition that causes Signature Control to be actively squelching "J0" (which provides the 10 MHz output to the base 10MHz out connector) is also squelched.

Note: Connector "J0" is reserved for the 10 MHz output to the base 10 MHz out connector (which is available on all units).

The coax cable from each Frequency Distribution Option Card should be connected to each of these connectors on the main PCB, in ascending order (this is important). Refer to the figure below, from the Option Card install guide.

- Install the coax cable(s) onto the main PCB, connecting them to the first available open connectors, from J1 - J4. Refer to figure below:

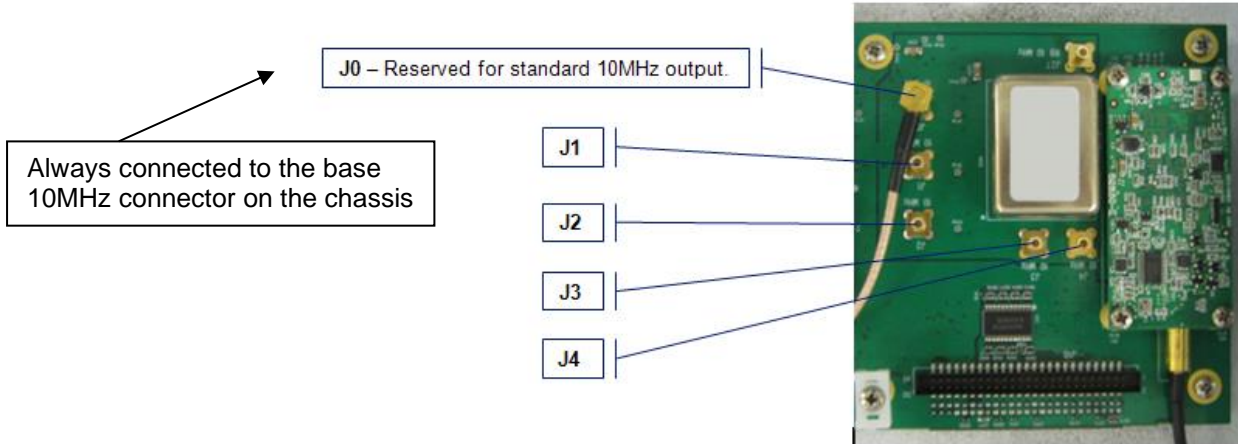


Figure 5: J Connectors

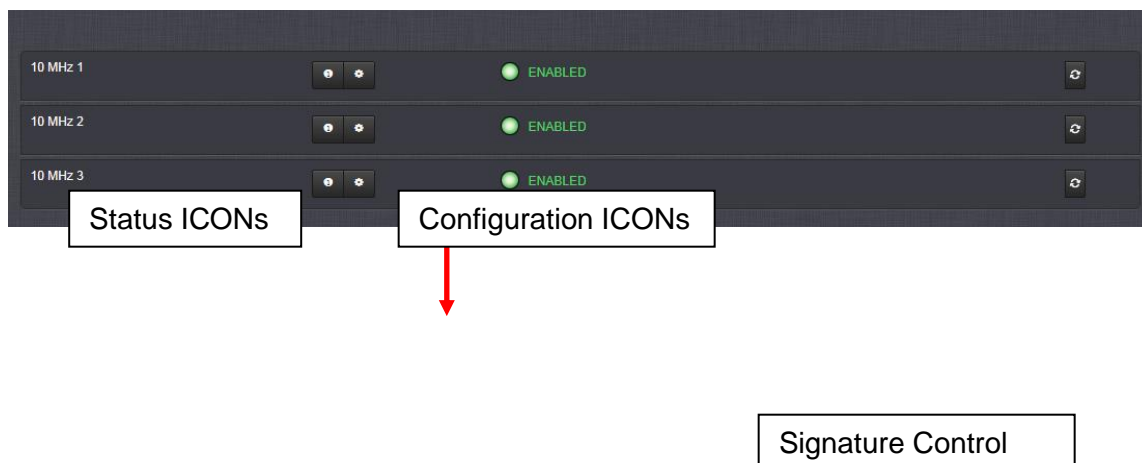
NOTE: For 10MHz option cards with 3 coax cables: From the rear of the option card, outputs are labeled J1, J2, J3. Start by connecting the cable attached to J1 on the card to the first available open connector on the SecureSync mainboard, then connect the cable attached to J2, then J3 etc.

If 10 MHz output is still present from the three output ports of an Option Card, but not present on the base unit's 10 MHz output, because Signature Control is currently active

(Note: refer to Salesforce case 6117 for Hughes Network for more info)

With Signature Control enabled, if the Frequency outputs are still present on an Option Card, but not on the Base 10 MHz out (because it's squelched for a Signature Control condition), the Option Card's 10MHz coax cable may not be connected to the first J1 through J4 connector on the main PCB, in ascending order. If it's connected to the wrong connector, since Signature Control is applied to each of these ports individually based on what's connected to each slot, if it's not on the right connector, the 10MHz input to the Option Card won't be squelched by Signature Control. So, the ports on the card will still be present.

A) New web browser interface (versions 5.1.2 and above)





Signature Control: **Signature** Control is used to control when the 10 MHz output is present.

No Signature Control: 100 MHz output is present, even when SecureSync is not synchronized to its reference (Modulation is present while in the Holdover mode).

Sync State Signature Control: 100 MHz output is present unless the SecureSync is not synchronized to its references (5 MHz output is present while in the Holdover mode).

Ref State Signature Control: 100 MHz output is present unless the SecureSync references are not considered qualified and valid. (Modulation is not present while in the Holdover mode).

Output disabled: No 100 MHz output is present, even if the SecureSync references are present and considered qualified.

B) Classic interface browser (versions 5.0.2 and below)

Setup/Inputs



Setup/Outputs

Signature Control: **Signature** Control is used to control when the 10 MHz output is present.

No Signature Control: 10 MHz output is present, even when SecureSync is not synchronized to its reference (Modulation is present while in the Holdover mode).

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Output disabled: No 10 MHz output is present, even if the SecureSync references are present and considered qualified.

Status/Inputs

Status/Outputs

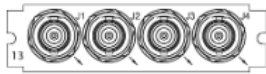
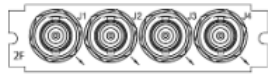

Programmable Frequency outputs (1204-13, 1204-30, 1204-2F)

**Various Models

[1204-13: Programmable Frequency Output Module \(Sine Wave\)](#)

[1204-2F: Programmable Frequency Output Module \(TTL\)](#)

[1204-30: Programmable Frequency Output Module \(RS-485\)](#)

| Model No. (Output) | 1204-13 (Sine Wave) | 1204-2F (TTL) | 1204-30 (RS-485) |
|----------------------------------|---|---|---|
| Outputs | (4) independently programmable sine wave outputs | (4) independently programmable square wave outputs | (4) independently programmable square wave outputs |
| Signal type | +13 dBm | TTL (BNC) | RS-485 |
| Wave form | sine | square | |
| Connector | BNC:  | BNC:  | Terminal block:  |
| Output load impedance | 50 Ω | 50 Ω | n/a |
| Output pulse/ frequency rates | 1 Hz to 25 MHz in 0.1-Hz increments | 1 PPS to 25 MPPS in 0.1-PPS increments | |
| Accuracy | Function of input synchronization source (GPS, IRIG, 1 PPS, etc.) | | |
| Synchronization | Output frequency locked to SecureSync disciplined 10 MHz | | |
| Jitter, cycle-to-cycle | n/a | <10 nsec. | <10 nsec. |
| Phase noise | -120 dBc/Hz @ 1-kHz | n/a | n/a |

Difference between 1204-17 (programmable Square wave generator) versus the Models 1204-13, 1204-2F, 1204-30 (programmable frequency output)

Email from Dave Sohn: They are looking to be able to generate periodic square wave outputs, which is what the 1204-17 is good for. The 1204-2F is a variable frequency generator card... and it has a range of 1Hz (1PPS) to 25MHz (25MPPS).

Email from Lisa Perdue: "Both cards would work for him. With the 1204-17 card, he can adjust the pulse width of the pulse, and with the 1204-2F card. he could adjust the phase"

Important Note: The outputs from the 1204-2F, 1204-13 and 1204-30 Option Cards are **NOT** phase-aligned with the System PPS or to each other. And each time the SecureSync is powered-up, each output will have a different phase offset from the System PPS. Instead, the frequency of each output is locked to the output frequency of the oscillator

Email from Dave Sohn (14 Jun 17) It's not possible to phase align it automatically. It is a limitation of the design. It can be done manually via measurements and then applying a phase offset to the output, but that would need to be redone on each power cycle.

- Per the SecureSync datasheet: “Each output can be phase offset between 0-360 degrees in 0.1 degree steps”

Per the online SecureSync user guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/ProgrFrequ_O.htm

“Synchronization: Output frequency locked to SecureSync disciplined 10 MHz”

Earlier email chain with a customer not being aware of this limitation

Q. from Tony DiFlorio to Dave Lorah 12/22/2014

David, what do I need to do to accommodate my customer (Chuck Jones) at Eglin AFB? Due to our spec misleading him, he wants to return the two 1204-2F cards he placed on PO# 151036 (T-43928) and have us replace them with three 1204-17 cards. It is almost an

A Reply from Dave Lorah i 12/19/2014

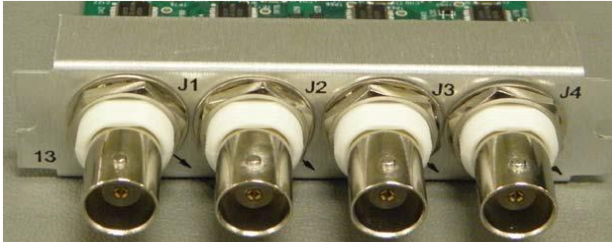
Tony, I just spoke to Chuck. He is not happy that the frequency outputs from these 1204-2F cards are not locked to 1PPS. He needs 1PPS and 30 Hz for this immediate application. Chuck ordered the 1204-2F cards because the “1204-17 cards were such a P.I.T.A.

Email from Dave Lorah to Chuck Jones, 19 Dec 2014. I confirmed the operation if the 1204-2F Programmable Frequency Option card.

The frequency output is locked to the oscillator 10 MHz frequency, not the reference 1PPS. So what is happening is the 1PPS you have programmed each output for will randomly lock the leading edge to the 10 MHz frequency reference every time the unit is initialized and the leading edge could vary every time. This option card was designed to output a frequency of any value from 1Hz to 25 MHz. It was not designed to be referenced to the SecureSync's 1PPS signal.

If you were looking for a 1PPS output card we recommend the 1204-15 1PPS output option card. This one will provide a TTL level 1PPS locked to the SecureSync's GPS based reference 1PPS.

*****(1204-13) Programmable Sine wave outputs (Sine-wave out only)**



(11 June 2014 KW) Error in the Option Card datasheet specs (at least Rev L)

The range is actually: **1Hz (1PPS) to 25MHz (25MPPS)**. The data sheet is incorrect with the range stated as being from 8kPPS(Hz) to 16384 kPPS(Hz) in 1PPS(Hz) steps

Online SecureSync user guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/ProgrFrequ_O.htm

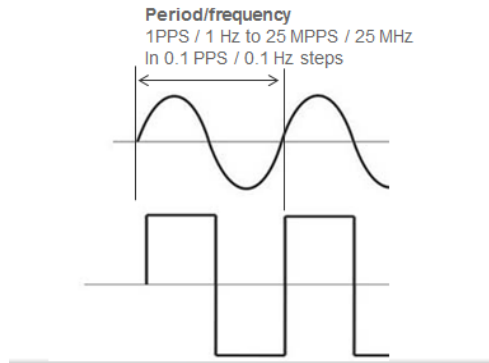
Schematic: (1204-1301-0200) In Arena https://app.bom.com/items/detail-spec?item_id=1203165573&version_id=11523459048& (located in 1204-0300-F001 assembly file)

PCB (1204-0300-F001) (in Arena) https://app.bom.com/items/detail-spec?item_id=1203165573&version_id=10221245468&orb_msg_single_search_p=1&redirect_seqno=5742588471

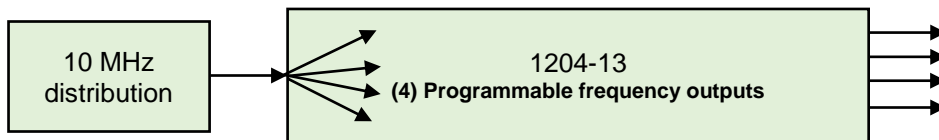
- This Option Card offers four (4) independently programmable frequency synthesizers that provide pulse rates (frequencies for sine wave) from Available range is: 1Hz (1PPS) to 25MHz (25MPPS) with the output frequency locked to the SecureSync system disciplined oscillator.
- Sine Wave outputs on BNC.
- Can adjust phase 0-260 degrees with 0.1 degree step for all versions.
 - Note:** P.S. Phase adjustment is not persistent between system reboot/power cycles and frequency setting changes
- Compatible with N.8 frequencies
- Control of period / Frequency

Programmable Frequency (1204-13/2F/30)

- 4 independently programmable outputs
TTL (BNC), RS-485 (terminal block), Sine
versions (BNC)
- Control of period / frequency
- Compatible with N.8 frequencies



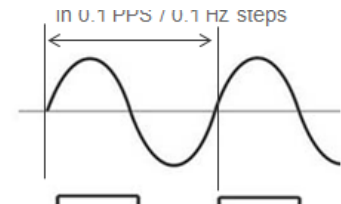
Block Diagram



Four RS-485 Square Wave
outputs (Terminal block)

Each output can be phase offset
as desired (0 to 360 degrees in
0.1 degree steps)

Important Note: The outputs are
NOT aligned to the System PPS
or to each other



Outputs (4)

Connector: BNC

Wave: Sine

Amplitude: +13dBm

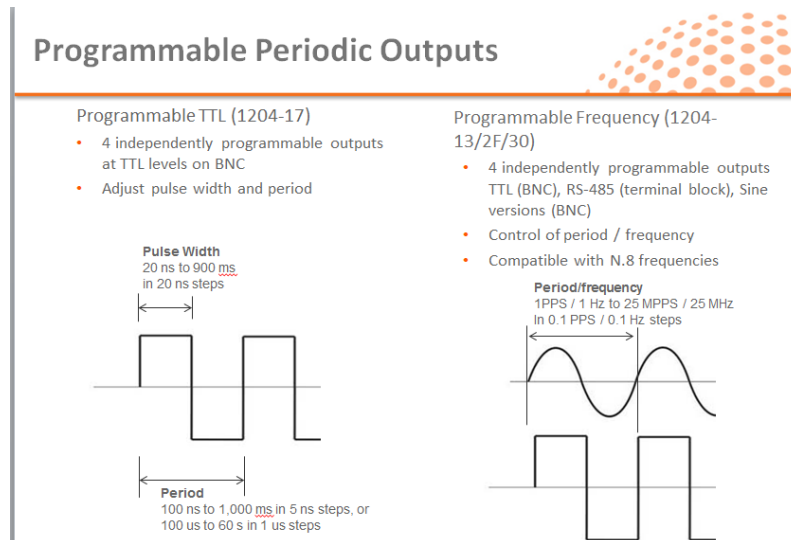
Output Impedance: 50 ohms

Outputs pulse/frequency rates: 1Hz to 25MHz (in 0.1 Hz increments)

Difference between 1204-17 versus the Models 1204-13, 1204-2F, 1204-30

Email from Dave Sohn: They are looking to be able to generate periodic square wave outputs, which is what the 1204-17 is good for. The 1204-2F is a variable frequency generator card... and it has a range of 1Hz (1PPS) to 25MHz (25MPPS).

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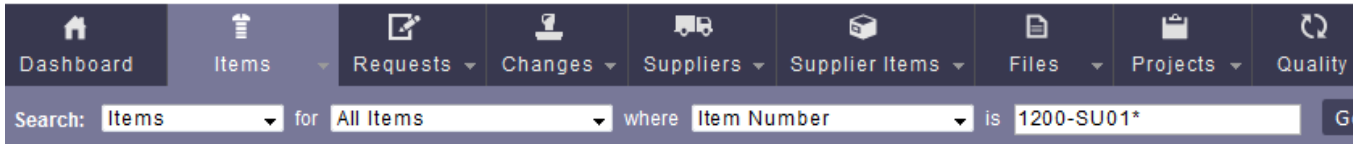
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Firmware

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for **1200-SU01*** (as shown below)



- FPGA (firmware) for the 1204-13 card: rt_oc13_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|------|-----------------|-----------------------|---|--------------------|
| 3442 | 5.1.3 | N/A | First version for release of this new Option Card | |
| | | | | |

Hardware

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |

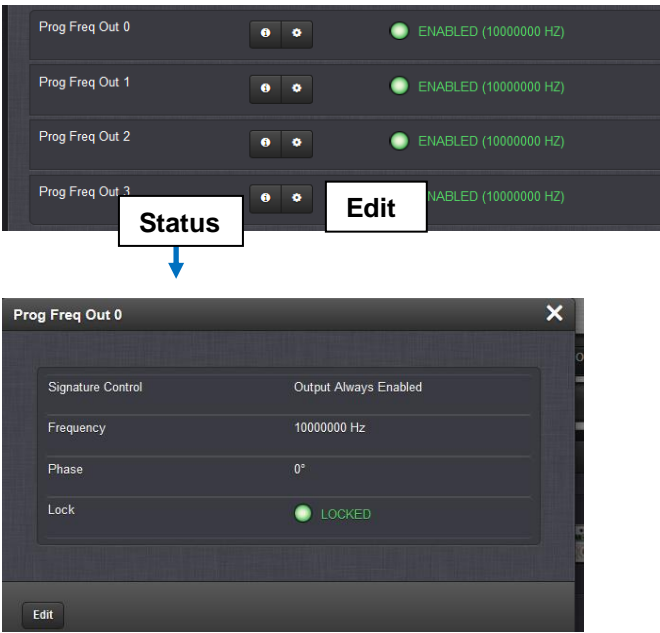
Desire to synchronize Tait radios using 12.8MHz outputs

Email from Dave Sohn (16 Feb 2015) The SecureSync 1204-13 option card can generate 12.8 MHz signals with offset frequencies. Each output is individually configurable for frequency. The 1204-13 provides sine waves at +13dBm levels. These could probably be sent through a splitter to achieve what they want, within the power loss of the splitter taken into consideration. I'm not aware of anyone using SecureSync specifically to replace the Tait T801

New web browser (versions 5.1.2 and above)

| REFERENCES | OUTPUTS | OPTION CARDS |
|---------------------|------------------------|-------------------------|
| GNSS Reference | 10 MHz Output | Main |
| GNSS 0 | 10 MHz 0 | GNSS 0 |
| PPS Reference | 10 MHz 1 | PPS Output 0 |
| PPS Input 0 | Programmable Frequency | 10 MHz 0 |
| Frequency Reference | Output | 1PPS Out 10V |
| Freq Input 0 | Prog Freq Out 0 | PPS Output 1 |
| | Prog Freq Out 1 | PPS Output 2 |
| | Prog Freq Out 2 | PPS Output 3 |
| | Prog Freq Out 3 | PPS Output 4 |
| | PPS Output 0 | 10 MHz Out |
| | PPS Output 1 | 10 MHz 1 |
| | PPS Output 2 | Sq Wv Out, BNC |
| | PPS Output 3 | Sqr Wv Output 0 |
| | PPS Output 4 | Sqr Wv Output 1 |
| | PPS Output 5 | Sqr Wv Output 2 |
| | Alarm Output | Sqr Wv Output 3 |
| | Alarm Output 4 | 1PPS / Frequency RS-485 |
| | Alarm Output 5 | Freq Input 0 |
| | Alarm Output 6 | PPS Input 0 |
| | Square Wave Output | PPS Output 6 |
| | Sqr Wv Output 0 | Prog Freq Out, Sine |
| | Sqr Wv Output 1 | Prog Freq Out 0 |
| | Sqr Wv Output 2 | Prog Freq Out 1 |
| | Sqr Wv Output 3 | Prog Freq Out 2 |
| | | Prog Freq Out 3 |
| | | Relay Output |
| | | Alarm Output 4 |

Interfaces -> Option Cards -> Prog Freq out, Sine



- **Signature Control:** Displays the current configuration of the **Signature Control**.
- **Frequency:** Indicates the configured frequency.
- **Phase:** Displays the configured phase offset (e.g., to account for delays caused by different cable lengths, or other latencies).
- **Lock:** Shows, if the output frequency is locked to the SecureSync system-disciplined oscillator.

NOTE: Even if an output frequency status is LOCKED, it will not be available at the output port, if the **Signature Control** for that port has been DISABLED.

Observed Issue: “Lock” for all outputs indicates “PLL unlocked” and is red (instead of green)

➤ Refer to Salesforce case 214442 (customer’s report below):

“All 4 outputs are reporting “PLL Unlocked” and are red. Another slot has the same card, and all 4 outputs are green. I tried disabling and enabling each port, but nothing changed. The unlocked ports occasionally switch to green and enabled, but then revert back to red and unlocked. Is there anything that I can do, or is the card bad?”

- See Mark McGregor for any questions- he designed the hardware for this Option Card.
- 10MHz squarewave is received thru the bus connector (this card doesn't receive 10 MHz Sinewave via separate coax cable to the main PCB board)
- There is a Lock LED on the Option Card (can't see if it from outside SecureSync. Need to remove cover with unit running). the Lock LED could possibly be green, even though the Browser is reporting its unlocked.

Edit settings

Signature Control

Frequency: Enter the desired sine wave output frequency. The range is: 1 to 25,000,000 Hz (25 MHz)

Phase: Adjust the phase by entering a phase offset (0.1 to 360°), if required.

Please verify your phase settings.
Phase settings are only valid until next reboot/power cycle, or if frequency change has occurred for this port.

Status Submit

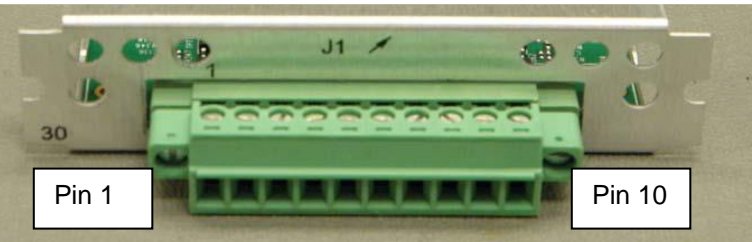
Note: Click **Submit** to confirm the changes and close the window, or press the **TAB** key to enter a phase offset value:

- **Signature Control:** Displays the current configuration of the **Signature Control**.
- **Frequency:** Indicates the configured frequency.
- **Phase:** Displays the configured phase offset (e.g., to account for delays caused by different cable lengths, or other latencies).

A) Classic interface browser (versions 5.0.2 and below)

Not available in classic interface

***(1204-30) Programmable Frequency outputs (RS-485)



| Pin No | Function | Name |
|--------|----------|--------------------|
| 1 | + | RS-485 Output #1 + |
| 2 | - | RS-485 Output #1 - |
| 3 | Ground | Ground |
| 4 | + | RS-485 Output #2 + |
| 5 | - | RS-485 Output #2 - |
| 6 | + | RS-485 Output #3 + |
| 7 | - | RS-485 Output #3 - |
| 8 | Ground | Ground |
| 9 | + | RS-485 Output #4 + |
| 10 | - | RS-485 Output #4 - |

- RS-485 output #1
- RS-485 output #2
- RS-485 output #3
- RS-485 output #4

Schematic: (1204-1301-0200). In Arena https://app.bom.com/items/detail-spec?item_id=1203165573&version_id=10221245468&orb_msg_single_search_p=1&redirect_seqno=5742588471

PCB (1204-0300-F001) (in Arena) https://app.bom.com/items/detail-spec?item_id=1203165573&version_id=10221245468&orb_msg_single_search_p=1&redirect_seqno=5742588471

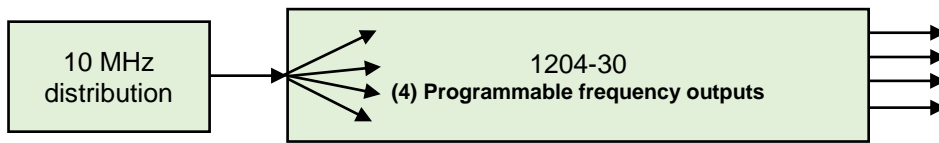
10 Pin Terminal block connector for 1204-30 card



Our P/N: J900R-0101-022J (in Arena) https://app.bom.com/items/detail-spec?item_id=1202843926&version_id=10303495198

Manufacturer and MFG P/N: Phoenix Contact 1827787 Refer to:
<https://www.phoenixcontact.com/online/portal/us/?uri=pxc-oc-itemdetail;pid=1827787&library=usen&pcck=P-11-02-11&tab=1&selectedCategory=ALL>

Block Diagram



Four RS-485 Square Wave outputs (Terminal block)

Each output can be phase offset as desired (0 to 360 degrees in 0.1 degree steps)

Important Note: The outputs are NOT aligned to the System PPS or to each other

Outputs (4)

Connector: Terminal Block

Wave: Square Wave

Output Impedance: N/A

Outputs pulse/frequency rates: 1PPS (1Hz) to 25MPPS in 0.1-PPS increments

(11 June 2014 KW) Error in the Option Card datasheet specs (at least Rev L)

The range is actually: 1Hz (1PPS) to 25MHz (25MPPS). The data sheet is incorrect with the range stated as being from 8kPPS(Hz) to 16384 kPPS(Hz) in 1PPS(Hz) steps

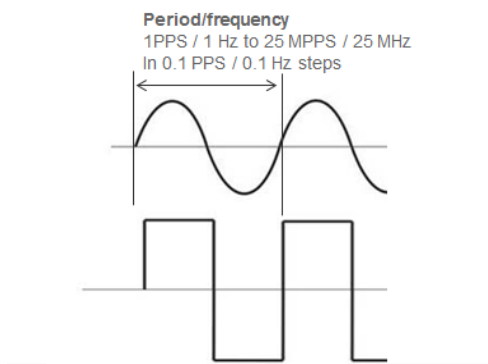
- Can adjust phase 0-260 degrees with 0.1 degree step for all versions.

Note: Phase adjustment is not persistent between system reboot/power cycles and frequency setting changes

- Compatible with N.8 frequencies
- Control of period / Frequency

Programmable Frequency (1204-13/2F/30)

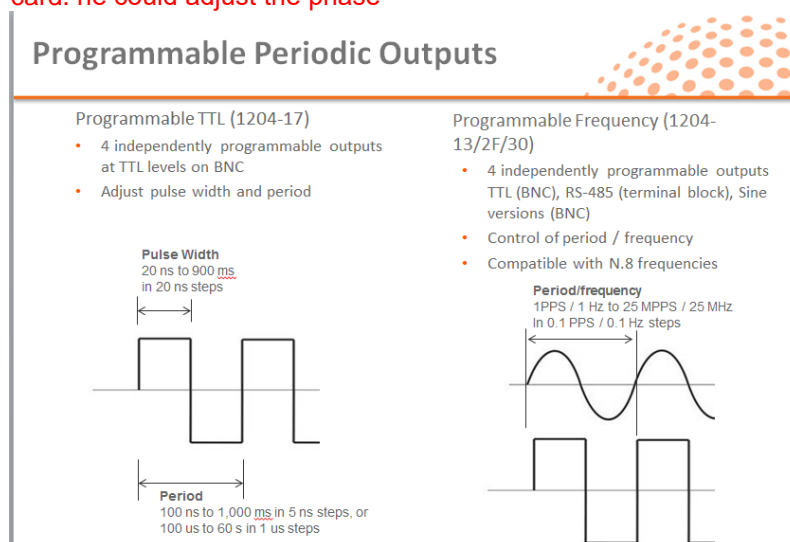
- 4 independently programmable outputs
TTL (BNC), RS-485 (terminal block), Sine versions (BNC)
- Control of period / frequency
- Compatible with N.8 frequencies



Difference between 1204-17 versus the Models 1204-13, 1204-2F, 1204-30

Email from Dave Sohn: They are looking to be able to generate periodic square wave outputs, which is what the 1204-17 is good for. The 1204-2F is a variable frequency generator card... and it has a range of 1Hz (1PPS) to 25MHz (25MPPS).

Email from Lisa Perdue: "Both cards would work for him. With the 1204-17 card, he can adjust the pulse width of the pulse, and with the 1204-2F card, he could adjust the phase"



Important Note: The outputs from the 1204-2F, 1204-13 and 1204-30 Option Cards are **NOT** phase-aligned with the System PPS or to each other. And each time the SecureSync is powered-up, each output will have a different phase offset from the System PPS. Instead, the frequency of each output is locked to the output frequency of the oscillator

Email from Dave Sohn (14 Jun 17) It's not possible to phase align it automatically. It is a limitation of the design. It can be done manually via measurements and then applying a phase offset to the output, but that would need to be redone on each power cycle.

- Per the SecureSync datasheet: "Each output can be phase offset between 0-360 degrees in 0.1 degree steps"

Per the online SecureSync user guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/ProgrFrequ_O.htm

"Synchronization: Output frequency locked to SecureSync disciplined 10 MHz"

Earlier email chain with a customer not being aware of this limitation

Q. from Tony DiFlorio to Dave Lorah 12/22/2014

David, what do I need to do to accommodate my customer (Chuck Jones) at Eglin AFB? Due to our spec misleading him, he wants to return the two 1204-2F cards he placed on PO# 151036 (T-43928) and have us replace them with three 1204-17 cards. It is almost an

A Reply from Dave Lorah 12/19/2014

Tony, I just spoke to Chuck. He is not happy that the frequency outputs from these 1204-2F cards are not locked to 1PPS. He needs 1PPS and 30 Hz for this immediate application. Chuck ordered the 1204-2F cards because the "1204-17 cards were such a P.I.T.A.

Email from Dave Lorah to Chuck Jones, 19 Dec 2014. I confirmed the operation of the 1204-2F Programmable Frequency Option card.

The frequency output is locked to the oscillator 10 MHz frequency, not the reference 1PPS. So what is happening is the 1PPS you have programmed each output for will randomly lock the leading edge to the 10 MHz frequency reference every time the unit is initialized and the leading edge could vary every time. This option card was designed to output a frequency of any value from 1Hz to 25 MHz. It was not designed to be referenced to the SecureSync's 1PPS signal.

If you were looking for a 1PPS output card we recommend the 1204-15 1PPS output option card. This one will provide a TTL level 1PPS locked to the SecureSync's GPS based reference 1PPS.

For software assembly versions, refer to: (1204-SHxx, SP1xx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>
Specs

Specifications

| | RS-485 Output | TTL Output | Sine Wave Output |
|--------------------------------|--|------------------------|--|
| Quantity | 4, independently programmable | | |
| Signal Type and Connector | RS-485 (terminal block) | TTL (BNC into 50 ohms) | +13dBm (BNC into 50 ohms) |
| Output Pulse (frequency) Rates | 8kPPS to 16384 kPPS in 1PPS steps | | 8 kHz to 16384 kHz in 1 Hz steps |
| Accuracy | Function of input sync source (GPS, IRIG, 1PPS, etc.) | | |
| Wave Form | Square Wave | Square Wave | Sine Wave |
| Synchronization | Output Frequency locked to SecureSync disciplined 10 MHz | | |
| Jitter Cycle to Cycle | <10 nsec. | <10 nsec. | — |
| Phase Noise | — | — | -120 dBc/Hz @ 1kHz offset -130 dBc/Hz @ 10kHz offset -140 dBc/Hz @ 100kHz offset |
| Harmonics | — | — | <-30 dBc |
| Spurious | — | — | <-60 dBc |
| Maximum Number of Cards: 6 | | | |

1204-30 Firmware versions

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)

Dashboard Items Requests Changes Suppliers Supplier Items Files Projects Quality

Search: Items for All Items where Item Number is 1200-SU01* G

- 1204-30 card: rt_oc30_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|------|-----------------|-----------------------|---|--------------------|
| 3442 | 5.1.3 | N/A | First version for release of this new Option Card | |
| | | | | |

1204-30 Hardware changes

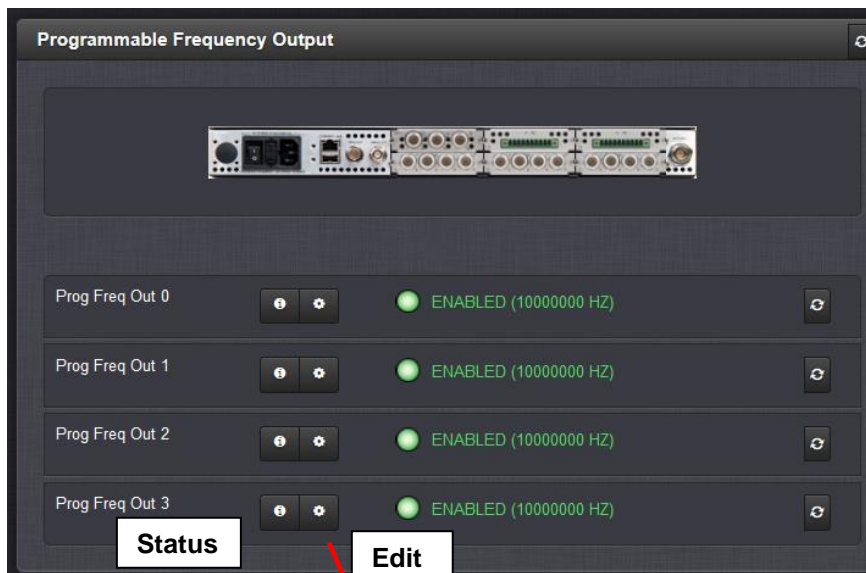
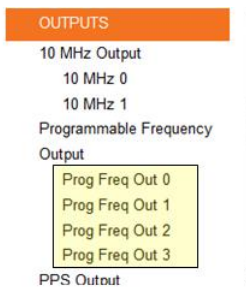
- For Option Card hardware versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.8.2 | | Added support for this Option card (first release) | |

- (4) RS-485 outputs on a pluggable terminal block
- This RS-485 model of the programmable frequency output option card can be operated as an N.8 frequency synthesizer if frequencies are restricted to be from 8 kPPS to 8192 kPPS in 8 kPPS steps.

A) New web browser (versions 5.1.2 and above)

Interfaces -> Option Cards -> Prog Freq out, RS-485



Prog Freq Out 0 ✕

| | |
|-------------------|-----------------------|
| Signature Control | Output Always Enabled |
| Frequency | 10000000 Hz |
| Phase | 0 |

Please verify your phase settings.
Phase settings are only valid until next reboot/power cycle, or if frequency change has occurred for this port.

Status ✓ Submit

Signature Control

Frequency: Enter the desired output frequency. Pulse rate output in Hertz 1 to 25,000,000 PPS (25MPPS)

Phase: Adjust the phase by entering a phase offset (0.1 to 360°), if required.

Note: Click **Submit** to confirm the changes and close the window, or press the **TAB** key to enter a phase offset value.

Prog Freq Out 3 Status

| | |
|-------------------|-----------------------|
| Signature Control | Output Always Enabled |
| Frequency | 10000000 Hz |
| Phase | 0° |
| Lock | ● LOCKED |

Edit

- **Signature Control:** Displays the current configuration of the **Signature Control**.
- **Frequency:** Indicates the configured frequency.
- **Phase:** Displays the configured phase offset (e.g., to account for delays caused by different cable lengths, or other latencies).
- **Lock:** Shows, if the output frequency is locked to the SecureSync system-disciplined oscillator.

NOTE: Even if an output frequency status is LOCKED, it will not be available at the output port, if the **Signature Control** for that port has been DISABLED.

Potential Conditon: “Lock” indicates “PLL unlocked” and is red (instead of green)

- Refer to “**Observed Issue: Lock indicates “PLL unlocked”** in the **1204-13** Option Card section of this same document for details

Status

B) Classic interface browser (versions 5.0.2 and below)

Not available in classic interface

*** (1204-2F) (3) Programmable Frequency output (TTL)



Schematic: (1204-1301-0200) In Arena: https://app.bom.com/items/detail-spec?item_id=1203165573&version_id=10221245468&orb_msg_single_search_p=1&redirect_seqno=5742588471

PCB (1204-0300-F001)(in Arena): https://app.bom.com/items/detail-spec?item_id=1203165573&version_id=10221245468&orb_msg_single_search_p=1&redirect_seqno=5742588471

Phase alignment of the outputs to the System PPS

Important Note: The outputs from the 1204-2F, 1204-13 and 1204-30 Option Cards are **NOT** phase-aligned with the System PPS or to each other. And each time the SecureSync is powered-up, each output will have a different phase offset from the System PPS. Instead, the frequency of each output is locked to the output frequency of the oscillator

Email from Dave Sohn (14 Jun 17) It's not possible to phase align it automatically. It is a limitation of the design. It can be done manually via measurements and then applying a phase offset to the output, but that would need to be redone on each power cycle.

- Per the SecureSync datasheet: "Each output can be phase offset between 0-360 degrees in 0.1 degree steps"

Per the online SecureSync user guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/ProgrFrequ_O.htm

"Synchronization: Output frequency locked to SecureSync disciplined 10 MHz"

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The frequency output is locked to the oscillator 10 MHz frequency, not the reference 1PPS. So what is happening is the 1PPS you have programmed each output for will randomly lock the leading edge to the 10 MHz frequency reference every time the unit is initialized and the leading edge could vary every time. This option card was designed to output a frequency of any value from 1Hz to 25 MHz. It was not designed to be referenced to the SecureSync's 1PPS signal.

If you were looking for a 1PPS output card we recommend the 1204-15 1PPS output option card. This one will provide a TTL level 1PPS locked to the SecureSync's GPS based reference 1PPS.

➤ (4) TTL Square wave outputs on BNC connectors

Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

➤ Available range is: 1Hz (1PPS) to 25MHz (25MPPS)

➤ Can adjust phase 0-260 degrees with 0.1 degree step for all versions.

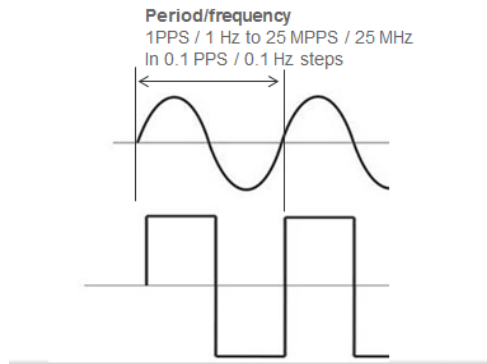
Note: Phase adjustment is not persistent between system reboot/power cycles and frequency setting changes.

➤ Compatible with N.8 frequencies

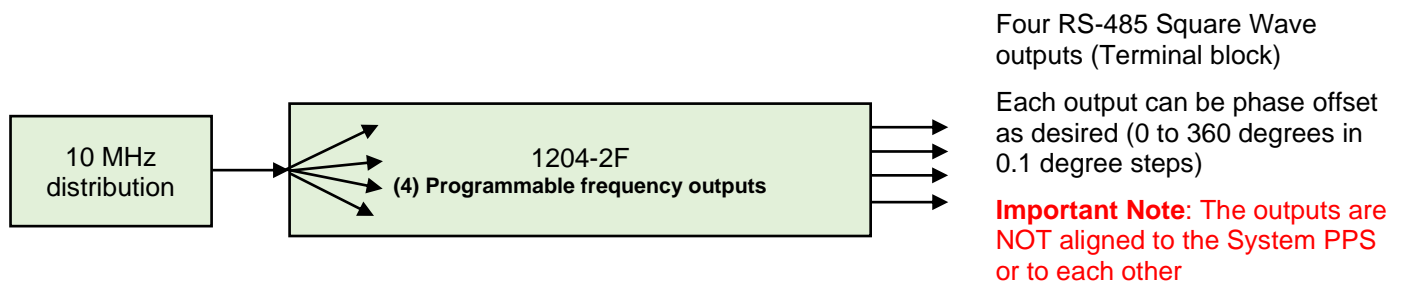
➤ Control of period / Frequency

Programmable Frequency (1204-13/2F/30)

- 4 independently programmable outputs
TTL (BNC), RS-485 (terminal block), Sine versions (BNC)
- Control of period / frequency
- Compatible with N.8 frequencies



Block Diagram



Outputs (4)

Known Issue with enabling/disabling output ports (applicable to versions prior to v5.8.0)

- Refer to Known issues with 1204-2F further below for more info.

Important Note: The outputs from the 1204-2F, 1204-13 and 1204-30 Option Cards are **NOT** phase-aligned with the System PPS or to each other. And each time the SecureSync is powered-up, each output will have a different phase offset from the System PPS. Instead, the frequency of each output is locked to the output frequency of the oscillator

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The frequency output is locked to the oscillator 10 MHz frequency, not the reference 1PPS. So what is happening is the 1PPS you have programmed each output for will randomly lock the leading edge to the 10 MHz frequency reference every time the unit is initialized and the leading edge could vary every time. This option card was designed to output a frequency of any value from 1Hz to 25 MHz. It was not designed to be referenced to the SecureSync's 1PPS signal.

If you were looking for a 1PPS output card we recommend the 1204-15 1PPS output option card. This one will provide a TTL level 1PPS locked to the SecureSync's GPS based reference 1PPS.

Connector: BNC

Wave: Square

Signal type: TTL

Note: 1204-17's outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Output Impedance: 50 ohms

Outputs pulse/frequency rates: 1PPS to 25 MPPS in 0.1-PPS increments

(11 June 2014 KW) Error in at least Rev L of the Option Card datasheet specs

The range is actually: **1Hz (1PPS) to 25MHz (25MPPS)**. The data sheet is incorrect with the range stated as being from 8kPPS(Hz) to 16384 kPPS(Hz) in 1PPS(Hz) steps

Provides output square wave at pulse rates (frequencies for square wave) from 8kPPS(Hz) to 16384 kPPS(Hz) in 1PPS(Hz) steps, with the output frequency locked to the SecureSync system disciplined oscillator. Output configuration is via web browser. This option card offers four (4) independently programmable frequency synthesizers that provide pulse rates (frequencies for sine wave) from 8kPPS(Hz) to 16384 kPPS(Hz) in 1PPS(Hz) steps.

Difference between 1204-17 versus the Models 1204-13, 1204-2F, 1204-30

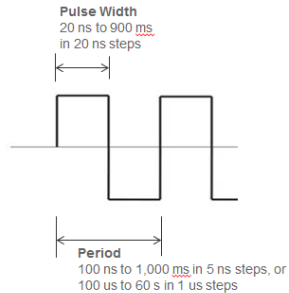
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Email from Lisa Perdue: “Both cards would work for him. With the 1204-17 card, he can adjust the pulse width of the pulse, and with the 1204-2F card. He could adjust the phase”

Programmable Periodic Outputs

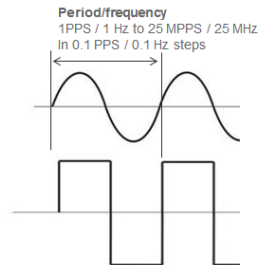
Programmable TTL (1204-17)

- 4 independently programmable outputs at TTL levels on BNC
- Adjust pulse width and period



Programmable Frequency (1204-13/2F/30)

- 4 independently programmable outputs TTL (BNC), RS-485 (terminal block), Sine versions (BNC)
- Control of period / frequency
- Compatible with N.8 frequencies



Link to schematic (Released\PCB Documentation\1204-0300-F000) in Arena: https://app.bom.com/items/detail-bom-nested?item_id=1203165571&version_id=10217102528&nested_bom_p=1

For software assembly versions, refer to: (1204-SHxx, SP1xx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

1204-2F Firmware versions

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)

Dashboard Items Requests Changes Suppliers Supplier Items Files Projects Quality

Search: Items for All Items where Item Number is 1200-SU01* Go

- 1204-2F card: I don't believe the 1204-2F card has an onboard FPGA, so it has no firmware version.

| ECN/ECO | Archive version | FPGA version reported | Change | approximate cut-in |
|----------|-----------------|-----------------------|--|--------------------|
| ECO 1686 | 5.8.0 | | Per 5.8.0 Release Notes” 1204-2F Programmable Frequency Card no longer disables all outputs” | (End of May 2018) |
| 3442 | 5.1.3 | “FPGA V0000” | V5.13 was the first version for release of this new Option Card | |

1204-2F Hardware changes

For Option Card hardware versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

| ECN | Archive version | | New Version | Change | approximate cut-in |
|-----|-----------------|--|-------------|--------|--------------------|
| | | | | | |

Known issues with 1204-2F card

FCC Emissions issue

- Refer to Salesforce case **119759**(~12 Oct, 17)
 - JIRA case SSS-174
 - Seen in version 5.7.1
-
- 1) What frequencies are failing from the 2F cable emissions? [70MHz and between 500MHz and 900MHz](#). Ferrite clamps helped the 70MHz only, [The EMI tape around the bulkheads helped the higher frequencies](#)
 - 2) What is the output frequency of the card? [10MHz](#)
 - 3) Are you seeing it on any of the harmonics? [Yes](#)
 - 4) What cables are you using? [LMR100 \(double shielded\) and added braided shield](#)
 - 5) How many of the 1204-2F cards do you have? [1](#)

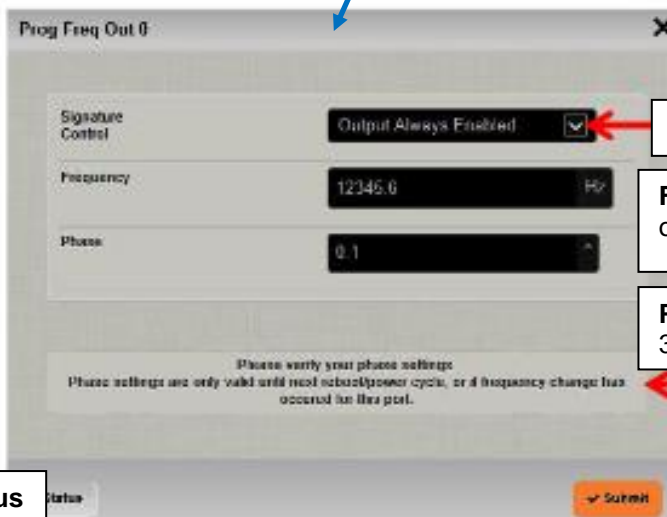
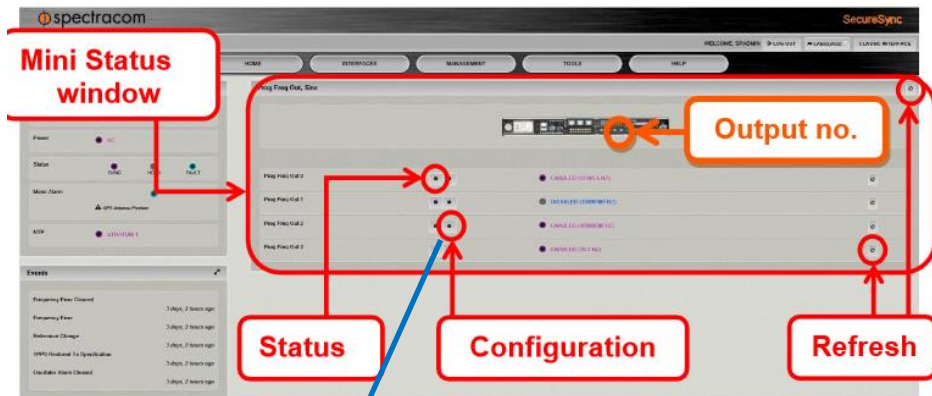
Issue with enabling/disabling output ports (fixed in update version 5.8.0)

Per Dave L Another issue: he tried disabling the other three ports and the emissions continued. Then he tried changing the frequency of the three other ports and it disabled the first port he was using. He disabled the first port and then enabled it which resulted in the first port working again. Was at version 5.6.0 and I helped him update to v 5.7.1 and he will try the test again.

- Refer to Salesforce case **119759** (~12 Oct, 17)
- JIRA case SSS-174?
- Related to the other issue reported above (card is emitting during ops)
- Seen in version 5.6.0 (tested at 5.7.1 but not sure of the results)

A) New web browser (versions 5.1.2 and above)

Interfaces -> Option Cards -> Prog Freq out, TTL



Signature Control

Frequency: Enter the desired output frequency. Pulse rate output in Hertz: 1 to 25,000,000 PPS (25MPPS)

Phase: Adjust the phase by entering a phase offset (0.1 to 360°), if required.

Status

Status

Status

Note: Click **Submit** to confirm the changes and close the window, or press the **TAB** key to enter a phase offset value:



- **Signature Control:** Displays the current configuration of the Signature Control.
- **Frequency:** Indicates the configured frequency.
- **Phase:** Displays the configured phase offset (e.g., to account for delays caused by different cable lengths, or other latencies).
- **Lock:** Shows, if the output frequency is locked to the SecureSync system-disciplined oscillator.

NOTE: Even if an output frequency status is LOCKED, it will not be available at the output port, if the Signature Control for that port has been DISABLED.

Potential Condition: “Lock” indicates “PLL unlocked” and is red (instead of green)

- Refer to “**Observed Issue: Lock indicates “PLL unlocked”** in the 1204-13 Option Card section of this same document for details

B) Classic interface browser (versions 5.0.2 and below)

This Option Card not available in classic interface.

T1/E1 outputs (1204-09 1204-0A 1204-4C)

**Various Models

Ordering Information

A) TWO ports

- [1204-09: T1-1.544 \(75 ohm\) or E1-2.048 \(75 ohm\) module](#)
- [1204-0A: T1-1.544 \(100 ohm\) or E1-2.048 \(120 ohm\) module](#)

B) FOUR ports

- [1204-4C 4 PORT E1/T1 OUT, Option Card \(Terminal Block\)](#)
- [1204-53 4 PORT 4 PORT E1/T1 OUT, Option Card \(BNC\)](#)

Shared 1204-09 1204-0A and 1204-4C information

T1 input/E1 input

- T1/1.544MHz and E1/2.048MHz are not available input reference signals

Partial Email from Dave Sohn (4/23/12) We do not have a T1 input into our timing system yet. I don't think there is anything at this time to put forward for this requirement.

email from Keith (12 Jun 18) to a customer: For your information, T1 (1.544 MHz, as well as E1 at 2.048 MHz) is not available as an input reference to synchronize a SecureSync. T1 (as well as E1) is only available as an output from SecureSyncs (via an installed Option Card).

However, SecureSync can have several other secondary inputs (such as IRIG, PTP, etc) applied as a backup for sync. Contact our Sales team for more info on available input Option Cards for SecureSyncs.

T1 frame errors/frame slips/ Stratum timing specs

- **Refer to Salesforce case 11680** (EEOF and LOS alarms from Lucent 1665 DMX and Lucent DDM-2000)
(email from Dave Sohn 27 Sept 13), The T1 is generated from a dedicated framing chip taking only frequency from us. I've never seen a framing error from our devices other than transitions between modes, AIS, etc.

Sonet/Telecom Stratum hierarchy levels for 1544/2048 kHz, T1/DS1 and E1 outputs

- References: Bellcore "GR-1244-Core" and ANSI-T1-101
https://telecom-info.telcordia.com/ido/AUX/GR_1244_TOC.i04.pdf
Refer to sites such as" <http://www.infocellar.com/networks/Telecom101/stratum.htm>
- These are Telecom specs for stability of "clocking" output signals (1544/2048 kHz, T1/DS1 and E1)
Stratum levels are based on the oscillator specs- how much over time that the clock outputs will "shift" resulting in a frame slip.

Stratum levels

Network clocks are divided into stratum levels based on their accuracy, stability, and other parameters, according to Bellcore GR-1244-core. Stratum levels are expressed as a number, sometimes along with a letter. The better the clock, the lower the stratum level. The primary references used in the network meet the Stratum 1 requirements. As a clock is distributed across a network and among equipment, impairments are introduced that reduce the stability and result in the clock being classified at a higher stratum level. SONET equipment must either be synchronized with a Stratum 3 or better clock or, if the equipment is not a digital cross-connect, clocked from an oscillator with a minimum accuracy of ± 20 parts per million.

The defined clock stratum - along with the basic accuracy requirement for that stratum - for an oscillator when it is not locked to a higher stratum level clock (free-run accuracy) is indicated in the table. The table also shows the accuracy with which the last frequency produced must be maintained if connection to the higher stratum level clock is lost (holdover stability).

Table A. Clock Strata Requirements

| Stratum | Accuracy, Adjustment Range | Pull-In-Range | Stability | Time To First Frame Slip * |
|-----------------|----------------------------|---|----------------------------------|----------------------------|
| 1 | 1×10^{-11} | N/A | N/A | 72 Days |
| 2 | 1.6×10^{-8} | Must be capable of synchronizing to clock with accuracy of $\pm 1.6 \times 10^{-8}$ | $1 \times 10^{-10}/\text{day}^1$ | 7 Days ² |
| 3E ³ | 4×10^{-7} | 4.6×10^{-6} | $5 \times 10^{-9}/\text{day}$ | 7 Hours ⁴ |
| 3E | 1.0×10^{-6} | Must be capable of synchronizing to clock with accuracy of $\pm 4.6 \times 10^{-6}$ | $1 \times 10^{-8}/\text{day}$ | 3.5 Hours |
| 3 | 4.6×10^{-6} | Must be capable of synchronizing to clock with accuracy of $\pm 4.6 \times 10^{-6}$ | $3.7 \times 10^{-7}/\text{day}$ | 6 Minutes (255 in 24 Hrs) |
| 4E | 32×10^{-6} | Must be capable of synchronizing to clock with accuracy of $\pm 32 \times 10^{-6}$ | Same as Accuracy | Not Yet Specified |
| 4 | 32×10^{-6} | Must be capable of synchronizing to clock with accuracy of $\pm 32 \times 10^{-6}$ | Same as Accuracy | N/A |

Notes:

* To calculate slip rate from drift, one assumes a frequency offset equal to the above drift in 24 hours, which accumulates bit slips until 193 bits have been accumulated. Drift rates for various atomic and crystal oscillators are well known, and are not usually linear or not necessarily continually increasing.

Stratum 1 clock system and GPS - the Stratum 1 clock is an example of a Primary Reference Source (PRS) as defined in ANSI/T1.101 [Reference 4]. Alternatively, a PRS source can be a clock system employing direct control from Coordinated Universal Time (UTC) frequency and time services, such as Global Positioning System (GPS) navigational systems. The GPS System may be used to provide high accuracy, low cost timing of Stratum 1 quality. GPS receivers are available for this application.

Stratum 2 clock system - tracks an input under normal operating conditions, and holds to the last best estimate of the input reference frequency during impaired operating conditions. **A Stratum 2 clock system requires a minimum adjustment (tracking) range of 1.6×10^{-8} . The drift of a Stratum 2 with no input reference is less than 1.6×10^{-8} in one year.** The short term drift of the system is less than 1×10^{-10} in 24 hours. If one interprets this specification as a drift of 1×10^{-10} each 24 hours, this amounts to a frame slip rate of approximately 1 slip in 7 days when the Stratum 2 clock system is in the hold mode. Larus has a Stratum 2 clock with a drift of less than 2.5×10^{-11} per day, resulting in a time to the first frame slip of more than 2 months.

Stratum 3 and Stratum 3E

From <http://www.4timing.com/stratum3.htm>

Stratum 3 and Stratum 3E oscillators have two frequency stability specifications (**Free Run** and **Holdover**). Bellcore has somewhat defined a third requirement, **Drift**. The **Drift** requirement is not per say a Bellcore specification. However Bellcore suggests that the Drift be used for calculating the **Holdover** specification and suggests **Drift** values.

Free Run (± 4.6 ppm/20 years Stratum 3 and 3E)

Holdover (± 0.37 ppm/24 hours for Stratum 3 and ± 0.01 ppm/24 hours for Stratum 3E)

Drift (in a lab environment: ± 0.04 ppm/24 hours for Stratum 3 and ± 0.001 ppm/24 hours for Stratum 3E)

Free Run

The **Free Run** requirement is easily obtainable for any precision oscillator. However part of the system requirement is that any Stratum 3 and 3E system must be able to lock to any other stratum 3 or 3E system. The reference signal into the system may be from an operating free running system that can be off as much as ± 4.6 ppm. Further clarifying the lock requirement, a Stratum 3E system must be able to lock to a Stratum 3 system. This means that a system where the VCO input of the oscillator is used to lock

the frequency in the system, the oscillator in that system must be able to adjust ± 4.6 ppm plus the stability of the oscillator. It is very difficult to design and build a Stratum 3 oscillator to pull ± 9.2 ppm (± 4.6 ppm for the oscillator in the system plus ± 4.6 ppm for the reference signal into that system).

Holdover

Holdover is the next easiest requirement. The **Holdover** requirement is defined to be over all possible conditions. These conditions include aging, temperature, voltage, and initial offset. Initial offset is how close the unit was locked to the reference signal at the time the signal was lost; not the initial frequency accuracy of the oscillator. Bellcore break down the **Holdover** requirement into 3 major components: Initial offset, Temperature, and **Drift**. **Drift** is explained in the next section. Bellcore suggests adding the Initial offset, Temperature and **Drift** to obtain the **Holdover** requirement. Their suggestion does not account for voltage changes, but alludes to it in the **Drift** calculation. If one is not concerned about the recommended **Drift** requirement and the temperature range is limited, then a **TCXO** could be used the Stratum 3 requirement. System designers have some flexibility in this area because:

The temperature range is not fully defined. They can specify it in their system specification.

The designer can choose a power supply circuit to reduce voltage effects.

The designer can control the lock accuracy (initial offset) by careful design.

Drift

The suggested **Drift** value is the most difficult to satisfy but is not a requirement. The temperature range is pseudo defined (Bell core suggest the temperature change in a lab environment of $\pm 5^{\circ}\text{F}$). The voltage change is alluded to because the **Drift** value is to include other effects along with aging and temperature. Since **Drift** is the tightest specification; aging, temperature, and voltage characteristics of the oscillator are large factors in this stability value. Usually TCXOs will not meet this value, because they usually do not have a frequency versus temperature characteristic that is as linear as an oven oscillator. Like the **Holdover** requirement, the system designer has some flexibility:

In controlling the oscillator voltage by choice of power supply.

Specifying the temperature change for the **Drift**.

Conclusions

The system manufacturer has some flexibility in specifying the conditions of the **Holdover** and **Drift** values. Since **Drift** is not a requirement, it can be overlooked in the system specification. A limited temperature range for the **Holdover** could also be specified. The purchaser of system for end use should take into account the conditions of **Holdover** and **Drift** to determine the best value that will meet their requirements.

Stratum 3 clock system - tracks an input as in Stratum 2, but over a wider range. **A Stratum 3 clock system requires a minimum adjustment (tracking) range of 4.6×10^{-6} . The short term drift of the system is less than 3.7×10^{-7} in 24 hours.** This amounts to approximately 255 frame slips in 24 hours while the system is holding. Some Stratum 3 clock equipment is not adequate to time SONET network elements.

Stratum 3E - defined in Bellcore documents [References 3, 7 and 8], is a new standard created as a result of SONET equipment requirements. Stratum 3E tracks input signals within 7.1 Hz of 1.544 MHz from a Stratum 3 or better source. The drift with no input reference is less than 1×10^{-8} in 24 hours. Larus provides a Stratum 3E Enhanced clock that provides a drift of less than 5×10^{-9} in 24 hours, which is better than the 3E designation. This is less than four frame slips in 24 hours, compared to 255 slips for Stratum 3. Typical performance of the Larus 3E Enhanced clock is less than one slip in 36 hours or 9×10^{-10} /day.

Stratum 4 - defined as a clock system which tracks an input as in Stratum 2 or 3, except that the adjustment and drift range is 3.2×10^{-5} . Also, a Stratum 4 clock has no holdover capability and, in the absence of a reference, free runs within the adjustment range limits. The time between frame slips can be as little as 4 seconds.

Stratum 4E - a proposed new customer premises clock standard which allows a holdover characteristic that is not free running. This new level, intended for use by customer provided equipment in extending their networks, is not yet standardized.

SSM Protocol (Sync Status Messaging)/ Signature Control

- SSM is a quality indication for DS1/T1 and E1
- SSM can be used for Signature Control
- SSM is supported in software versions 4.8.8 and above
- SSM is not available in software versions 4.8.7 and below
- SSM can be enabled or disabled as desired.

SSM and Holdover/Signature Control

Q. Does the T-1 SSM level change if GPS is lost and the SecureSync goes into Holdover? Does it change when Holdover expires? OR, is it always the same level?

A from Dave Sohn (17 Mar 16) The SSM operation is dependent on how signature control is configured. If output is always enabled, then the output value is always the configured SSM value. If output is enabled during holdover, then the SSM will only change when out of sync. If output is disabled during holdover, then the SSM will change when entering holdover.

Q So, the question/issue I have is with the SSM output on the T1 option card (section 5.3). If SSM is enabled, it then says the SSM value option" selects the SSM quality level transmitted when SSM is enabled."

So, we have a rubidium with GPS discipline. If GPS fails, the SSM level needs to change from G.811 to G.812 level. I would expect the Secure Sync to do this since only the unit knows when GPS is available or not. Please confirm that the SecureSync will change the outgoing SSM upon loss and lock to GPS.

A Per Dave Sohn (17 Mar 16) The SSM operation is dependent on how signature control is configured. If output is always enabled, then the output value is always the configured SSM value. If output is enabled during holdover, then the SSM will only change when out of sync. If output is disabled during holdover, then the SSM will change when entering holdover.

A Reply from Dave L to customer (17 Mar 16) The T-1 option card has a feature called Signature Control. This allows you to select the sync operation of the card.

The SSM operation is dependent on how signature control is configured. If Signature Control is set to: output is always enabled, then the output value is always the configured SSM value. If Signature Control is set to: output is enabled during holdover, then the SSM will only change when out of sync. If Signature Control is set to: output is disabled during holdover, then the SSM will change when entering holdover.

Holdover is entered when GPS is lost and the unit is timing off the Rb oscillator.

DS1 (T1 outputs on a scope)

Screenshot of DS1 output from a SecureSync DS1 output Option card



**G812 specs

- Refer to the G812 specs: [EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Option Cards\T1 and E1 output cards](#)

Email from Sylvain Dessapt (6 June 2013)

The G812 is a ITU standard used for Telecom product that provides 2.048MHz or 2.048MB/s telecom signals (PRC and SSU) and set some compliance criteria regarding MTIE, TDEV and T&F specification for the good Quality Of Service to apply to a reference clock. The requirement can change if you configure the reference clock as a PRC (Primary Reference Clock = Cesium) r SSU-STNe or SSU-STN

Quickly, for the moment for a PSEUDO-PRC configuration, the G812 criteria can be warranted on the securesync only with a Rubidium option. (this is given in the Datasheet of SecureSync).

E1 Unbalanced Output*

| | Frequency Output | Data Rate Output |
|----------------------------|-----------------------|--|
| Frequency | 2.048 MHz | 2.048 Mb/sec |
| Quantity | 1 | 2 |
| Signal Type and Connector | TTL, BNC into 50 ohms | Per ITU-T G703 single ended signalling, BNC into 75 ohms |
| Maximum Number of Cards: 6 | | |

*Compliant with G.811 with Rubidium option while locked to GPS. Compliant to G812 Type I with Rubidium option.

Ordering Information

1204-09: E1 – 2.048 (75 ohm) module

I have attached the datasheet and the extract of the ITU G812 standard for your information.

LBO (Line Build Out) capabilities (compensation for line loss)

Line Buildout (LBO): *Synonym* building out.: The process of adding a combination of inductance, capacitance, and resistance to a cable pair so that its electrical length may be increased by a desired amount to control impedance and loss characteristics.

Q. Question on the Option Card 1204-0A, do you know if it has any LBO (Line Build Out) capabilities? Just trying to see what the T1 output reach is like

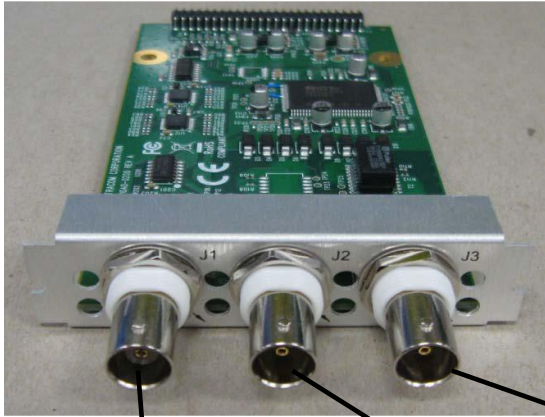
A Reply from Dave Lorah (10 May 16) The 1204-0A card has no line build out feature. A line build out will allow a T1 signal generator to compensate for line loss. The card is spec'ed at a 100 Ohm output impedance

API calls associated with T1/E1 Option Cards

- Refer to Tim Tetreault's "cheat sheet" at: <..\..\EQUIPMENT\SPECTRACOM EQUIPMENT\Timing boards\TSync family\Tsync driver calls cheat sheet>
- These API calls are primarily for internal use, but the associated "get" calls are available via the CLI interface ("sets" are not available to either spadmin or user accounts)
- These are examples - additional calls may have since been added

| T1/E1 Commands |
|-----------------------|
| ETP_GetFormat |
| ETP_GetMode |
| ETP_GetNumInst |
| ETP_GetOffset |
| ETP_GetSigCtrl |
| ETP_SetFormat |
| ETP_SetMode |
| ETP_SetOffset |
| ETP_SetSigCtrl |

1204-09 E1/T1 - 75 Ohm, 3 BNC Option Card



(J1) 1.544MHz/2.048MHz
square wave output
(see note below about T1)
TTL levels into 50 ohms

(J2) E1/T1 output
(see note below
about T1)
2.37v into 75 ohms

(J3) E1/T1 output
(see note below
about T1)
2.37v into 75 ohms

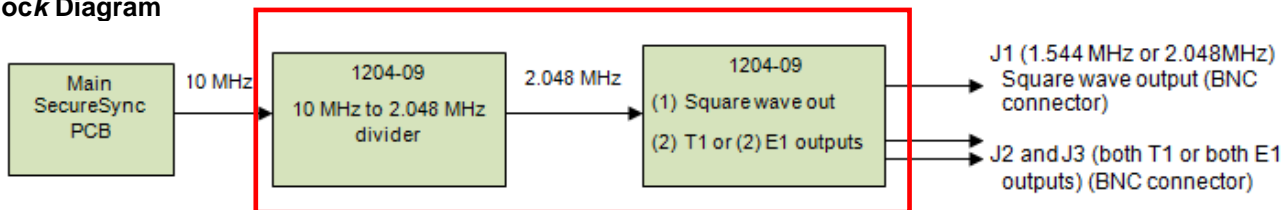
Purpose: The 1204-09 provides one 2.048 MHz square wave out (J1) and two T1/ E1 unbalanced outputs. (J2 and J3)

Option Card P/N: 1204-0090-0600

Schematic ("1204-10A1-0200 = located in "1204-00A0-F000" ->) in Arena: https://app.bom.com/files/detail-summary?file_master_id=1233575411&file_id=1744604130 **Schematics**

BOM (1204-00A0-F000) in Arena: https://app.bom.com/items/detail-bom?item_id=1202845092&version_id=10241794018

Block Diagram

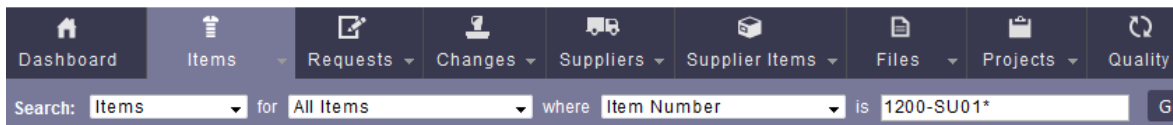


1204-09 firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search "Items" for "Item number" and search for "1200-SU01*" (as shown below)



- FPGA (firmware) for the 1204-09 card: `rt_oc09_hw01_fpga.bin`

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|------|-----------------|-----------------------|--|--------------------|
| 3157 | | V1.05 | Update T1 setting call in config for new SSM capability (Harris SecureSync) | Feb 2013 |
| 3099 | Version 4.8.8 | | Added SSM (Sync Status Messaging) Add 75ohm T1 (DS1) output capability This Option Card can now provide either 1.544 MHz / DS1 outputs OR 2.048MHz / E1 outputs. | Dec 2012 |

1204-09 hardware changes

For Option Card hardware versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

| ECN | New Version | Change | approximate cut-in |
|------|-------------|--|--------------------|
| 3099 | 4.8.8 | This Option Card can now output either E1 or T1. Versions 4.8.7 and prior can provide only 2.048MHz /E1 output only. | Dec 2012 |

Outputs (3)

- J1 (1.544MHz or 2.048 MHz Square wave (BNC)
- J2 and J3 (T1 or E1 outputs) (BNC) (ITU-G.703, 75 ohm)

Alignment to System PPS

- The System PPS is not used to align the outputs to a selected reference, so there is no phase relation on the outputs from one SecureSync to another
- 10 MHz from the main board is just divided down to 2.048 MHz to generate either T1 or E1

Lock Status/Alarm monitoring

- As of at least versions 5.3.0 and below, there is no monitoring / alarming capability for the outputs from this Option Card

Output impedance

Output Impedances:

Email from Dave Sohn (9/7/11)

The 1204-09 Option Card is E1 75ohm

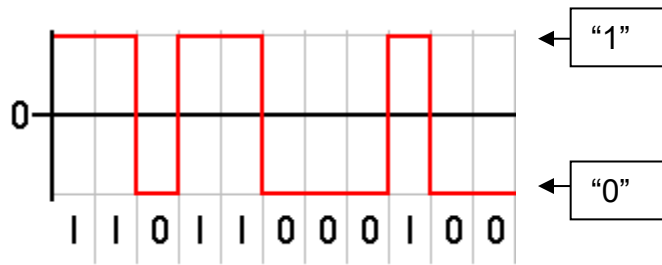
- T1 output impedance: 120 ohm
- We currently do not support 75 ohm T1. Per an email from Tom Richardson (9/25/12 KW) "Dave Sohn says we could do T1 at 75 ohms, we just don't".

- Model 1204-09: 75 ohm (T1/E1 out Option Card): 2.048 MHZ out is 50 ohms, E1 outputs is 75 ohm.
- Model 1204-0A: 120 ohm (T1/E1 out Option Card): 1.544/2.048 MHZ out is 50 ohms ??? E1 outputs is 120 ohm???

NRZ: ("non-return to zero")

Note KW: As of 7/16/12, we do not support NRZ

Summary: A "1" is above 0vdc. A "0" is below 0vdc.



Email from Tom Richardson (7/16/12)

NRZ means "non-return to zero" see this article. It is electrical, not Coding. Helps maintain zero DC bias.

<http://en.wikipedia.org/wiki/Non-return-to-zero>

This is not RS-422 or RS-485 which is a differential signaling (balanced) where one goes high as the other goes low.

Use with 75 ohm T1

Q. Apparently, T1 75Ohm unbalanced is preferred. Can the 1204-0A be used for this?

A. (9/25/12) Per Tom Richardson, the 1204-0A is not compatible with 75 ohm T1.

A) Newer web browser (versions 5.1.2 and above)



SSM configuration (versions 4.8.8 and above only)

- **SSM-** (Enabled or Disabled)
 - See the “**SSM and Holdover**” note further below about how Signature Control setting is associated with SSM (when SSM is enabled).
- **Signature Control**—Controls when the output will be present. Options include:
 - **Output Always Enabled:** The output is present, even when SecureSync is not synchronized to its references.
 - **Output Enabled in Holdover:** The output uses the current framing mode unless SecureSync is not synchronized to its references (the output is present while in the Holdover mode). While not synchronized, the output will change SSM states if SSM is enabled, or transition to AIS.
 - **Output Disabled in Holdover:** The output uses the current framing mode unless the SecureSync references are considered not qualified and invalid (the output is not present while in the Holdover mode). While references are invalid, the output will change SSM states if SSM is enabled, or transition to AIS.
 - **Output Always Disabled:** The output is not present, even if any SecureSync references are present and considered qualified.

SSM and Holdover/Signature Control

Q. So, the question/issue I have is with the SSM output on the T1 option card (section 5.3). If SSM is enabled, it then says the SSM value option “selects the SSM quality level transmitted when SSM is enabled.”

So, we have a rubidium with GPS discipline. If GPS fails, the SSM level needs to change from G.811 to G.812 level. I would expect the Secure Sync to do this since only the unit knows when GPS is available or not. Please confirm that the SecureSync will change the outgoing SSM upon loss and lock to GPS.

A from Dave Sohn (17 Mar 16) The SSM operation is dependent on how signature control is configured. If output is always enabled, then the output value is always the configured SSM value. If output is enabled during holdover, then the SSM will only change when out of sync. If output is disabled during holdover, then the SSM will change when entering holdover.

B) Classic interface web browser (versions 5.0.2 and below) Setup/Inputs/75 OHM E1

This card does not have inputs

Setup/Outputs/75 OHM E1

Note: (There are no outputs present until the Option Card has been reconfigured): The factory default configuration for this Option Card is “**Outputs disabled**”. By default, there will be no outputs until the Option Card has been reconfigured in the **Setup -> Outputs** page of the browser.

Signature Control: Controls when the output will be present. Options include the following:

No Signature Control: The output is present, even when SecureSync is not synchronized to its references.

Sync State Signature Control: The output uses the current framing mode unless SecureSync is not synchronized to its references (the output is present while in the Holdover mode). While not synchronized, the output will transition to AIS.

Ref State Signature Control: The output uses the current framing mode unless the SecureSync references are considered not qualified and invalid (the output is not present while in the Holdover mode). While references are invalid, the output will transition to AIS.

Output disabled: The output is not present, even if any SecureSync references are present and considered qualified.

Mode: This option selects either E1, or disabled mode. For E1 mode, the clock output will be 2.048 MHz.

E1 Configuration

Encoding: HDB3 only

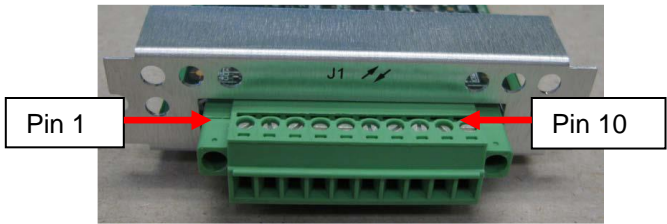
Framing: This option selects the framing standard (**CRC-4**, **No CRC-4**, or **AIS**).

Status/Inputs/75 OHM E1

Status/Outputs/75 OHM E1

*** (1204-0A) (2) T1/E1 outputs 1.544/2.048 MHz output (120 ohm)

Note: This card is also NetClock “Option 13: T1/E1 output”



Pin-out:

| Pin No | Function | Name | Spec |
|--------|------------------------|----------------------|--------------------------------|
| 1 | Ground | Gnd | |
| 2 | 1.544MHz/2.048 MHz | RS-485 A termination | GR-499-core (100 ohm) |
| 3 | 1.544MHz/2.048 MHz | RS-485 B termination | GR-499-core (100 ohm) |
| 4 | Ground | Gnd | |
| 5 | T1/E1 output A1 (Tip) | | ITU-T G703 (120 ohm impedance) |
| 6 | T1/E1 output B1 (Ring) | | ITU-T G703 (120 ohm impedance) |
| 7 | Ground | Gnd | |
| 8 | T1/E1 output A2 (Tip) | | ITU-T G703 (120 ohm impedance) |
| 9 | T1/E1 output B2 (Tip) | | ITU-T G703 (120 ohm impedance) |
| 10 | Ground | Gnd | |

1.544MHz or 2.048MHz squarewave outputs

Two differential T1 or E1 outputs

Links:

Schematic (“1204-10A1-0200 = located in “1204-00A0-F000” -> **Schematics**) in Arena: https://app.bom.com/files/detail-summary?file_master_id=1233575411&file_id=1744604130

BOM (1204-00A0-F000) in Arena: https://app.bom.com/items/detail-bom?item_id=1202845092&version_id=10241794018

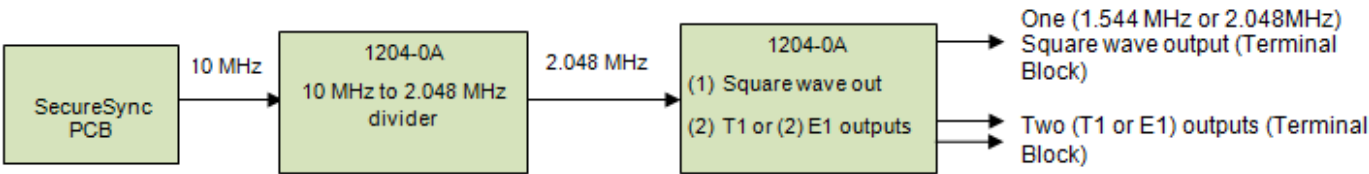
10 Pin Terminal block connector for 1204-03 card



Our P/N: J900R-0101-022J (in Arena) https://app.bom.com/items/detail-spec?item_id=1202843926&version_id=10303495198

Manufacturer and MFG P/N: Phoenix Contact 1827787 Refer to: <https://www.phoenixcontact.com/online/portal/us/?uri=pxc-oc-itemdetail:pid=1827787&library=usen&pcck=P-11-02-11&tab=1&selectedCategory=ALL>

Block Diagram

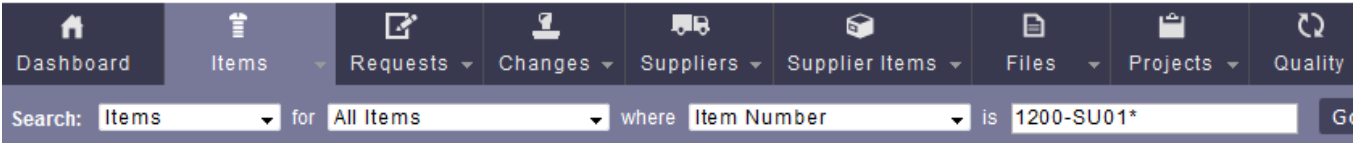


1204-0A Firmware versions

- For software assembly versions, refer to: (1204-SHxx, SP1xx)
- For older Option Card software versions, refer to: (SPxx) [\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- FPGA (Firmware) for 1204-0A card: rt_oc0A_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|-----------------------|-----------------------------------|--------------------|
| | 4.8.8 | | Added SSM (Sync Status Messaging) | |
| | | | | |

Hardware changes

For Option Card hardware versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |
| | | | | |

Inputs: None

Outputs



| Pin No | Function | Name | Spec | |
|--------|------------------------|----------------------|--------------------------------|---|
| 1 | Ground | <u>Gnd</u> | | |
| 2 | 1.544MHz/2.048 MHz | RS-485 A termination | GR-499-core (100 ohm) | → 1.544MHz or 2.048MHz squarewave outputs |
| 3 | 1.544MHz/2.048 MHz | RS-485 B termination | GR-499-core (100 ohm) | |
| 4 | Ground | <u>Gnd</u> | | |
| 5 | T1/E1 output A1 (Tip) | | ITU-T G703 (120 ohm impedance) | ↙ Two differential T1 or E1 outputs ↘ |
| 6 | T1/E1 output B1 (Ring) | | ITU-T G703 (120 ohm impedance) | |
| 7 | Ground | <u>Gnd</u> | | |
| 8 | T1/E1 output A2 (Tip) | | ITU-T G703 (120 ohm impedance) | |
| 9 | T1/E1 output B2 (Tip) | | ITU-T G703 (120 ohm impedance) | |
| 10 | Ground | <u>Gnd</u> | | |

User selectable (2) DS1 (100 ohm) or (2) E1 outputs (120 ohms)

Note: can't mix with one being T1 and the other being E1

- **ITU-T G.703 specs** (120 ohms) <https://en.wikipedia.org/wiki/G.703> (Note: G.703 is a CCITT standard for transmitting voice over digital carriers such as T1 and E1. G.703 provides the specifications for pulse code modulation (PCM) at data rates from 64 Kbps to 2.048 Mbps.)

(1) 1.544MHz or (1) 2.048 MHz square wave outputs (1.544MHz output if DS1 selected or 2.048MHz output if E1 is selected) - 100 ohm output impedance.

- Telcordia GR-499-CORE specs (100 ohms)

Q. Are the T1/E1 Option Card outputs transformer-coupled?

A. Yes. The outputs are transformer-coupled.

Alignment to System PPS

- System PPS is not used to align the outputs to a selected reference, so there is no phase relation on the outputs from one SecureSync to another
- 10 MHz from the main board is just divided down to 2.048 MHz to generate either clock/T1 or E1 outputs

Lock Status/Alarm monitoring

- As of at least versions 5.3.0 and below, there is no monitoring / alarming capability for the outputs from this Option Card

Notes:

- The Factory default configuration is T1 output (1.544 MHz square wave and two DS1 outputs)
- The T1 /E1 Option Card can be configured to be either a T1 card or as an E1 card. The card has two "Data" outputs and one "Clock" output.
- When the card is configured as T1 mode, the two "Data" outputs will be T1 (DS1) and the "Clock" output will be a 1.544MHz square-wave.
- When the card is configured as E1 mode, the same two "Data" outputs will be E1 output and the same "Clock" output will be 2.048 MHz square-wave.

HDB3

(Email from Dave Sohn on 9/7/11)

The E1 2.048 Mbps output is only HDB3. There is no E1 2.048 Mbps HDB3 input available on SecureSync. A 2.048 MHz sine wave clock can be used with the 1204-01 1PPS In/Out / Frequency input card.

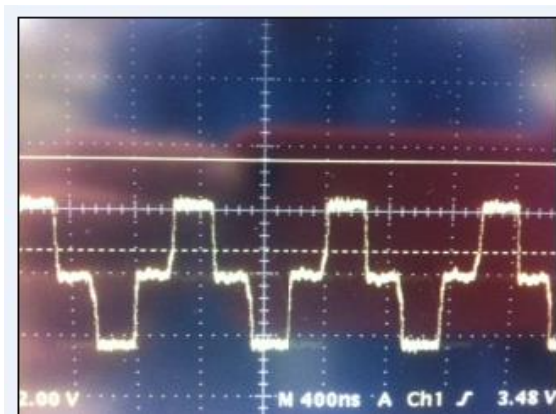
Mode: Selects **T1** (1.544 MHz), **E1** (2.048 MHz) or **Disabled** mode

Output Impedances:

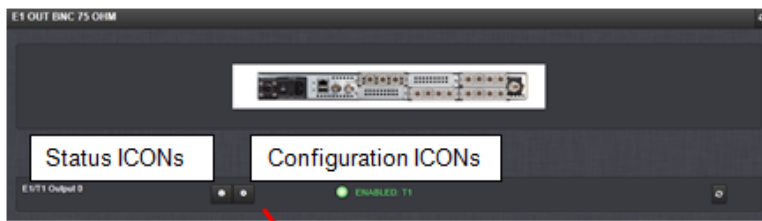
- Square wave output (1.544 is or 2.048 MHz) is 100 ohms.
- Both DS1/E1 outputs are 120 ohms.

Email from Dave Sohn:

The 1204-0A Option Card is T1 100ohm and E1 is 120ohm. The 1204-09 Option Card is E1 75ohm.



A) Newer web browser (versions 5.1.2 and above)



SSM configuration (versions 4.8.8 and above only)

| | | |
|-------------------|------------------------------|--|
| Signature Control | Output Always Enabled | Signature Control (see below) |
| Mode | Disabled | Mode: Select T1, E1 or Disabled |
| SSM Enabled | Disabled | SSM Enabled: Enables or Disables SSM |
| E1 Encode | HD83 | |
| E1 Framing | CRC-4 | E1 Framing: selects the framing standard (CRC-4, No CRC-4, or AIS). |
| T1 Framing | D4/Superframe | T1 Framing: selects the framing standard (D4/Superframe, Extended Superframe [CRC-6/no CRC-6], or AIS). |
| T1 Encoding | B8ZS | T1 Encoding: selects the encoding method (B8ZS or AMI). |
| T1 SSM Value | (PRS) Primary Reference... | T1 SSM value: selects the SSM quality level transmitted when SSM is enabled (not valid with D4/Superframe or |
| E1 SSM Value | (Unk) Synchronized - Trac... | E1 SSM value: selects the SSM quality level transmitted when SSM is enabled (not valid with AIS framing) |

- **Signature Control**—Controls when the output will be present. Options include:
 - **Output Always Enabled**—The output is present, even when SecureSync is not synchronized to its references.
 - **Output Enabled in Holdover**—The output uses the current framing mode unless SecureSync is not synchronized to its references (the output is present while in the Holdover mode). While not synchronized, the output will change SSM states if SSM is enabled, or transition to AIS.
 - **Output Disabled in Holdover**—The output uses the current framing mode unless the SecureSync references are considered not qualified and invalid (the output is not present while in the Holdover mode). While references are invalid, the output will change SSM states if SSM is enabled, or transition to AIS.
 - **Output Always Disabled**—The output is not present, even if any SecureSync references are present and considered qualified.
- **Mode:** This option selects T1, E1, or disabled mode. For T1 mode, the clock output (on the -09 and -0A cards) will be 1.544 MHz, and for E1 the clock output will be 2.048 MHz.
- **SSM Enabled:** Enables or disables Sync Status Messaging (SSM). T1 SSM is not valid with D4/Superframe or AIS framing. E1 SSM is not valid with AIS framing.
- **E1 Encode:** HD83 only.
- **E1 Framing:** This option selects the framing standard (CRC-4, No CRC-4, or AIS).
- **T1 Framing:** This option selects the framing standard (D4/Superframe, Extended Superframe [CRC-6/no CRC-6], or AIS).
- **T1 Encoding:** This option selects the encoding method (B8ZS or AMI).
- **T1 SSM Value:** This option selects the SSM quality level transmitted when SSM is enabled.
- **E1 SSM Value:** This option selects the SSM quality level transmitted when SSM is enabled.

B) Classic Interface browser (versions 5.0.2 and below)

Setup/Inputs/120 ohm

This card does not have inputs

Setup/Outputs/120 ohm

Fields for T1:

Encoding: Either “B8ZS” or “AMI”

Framing:

D4/Superframe

Extended Superframe [CRC-6 / no CRC-6]

AIS

Fields for E1:

Encoding: fixed as a value of “HDB3”

Mode: “E1” or “Disabled”

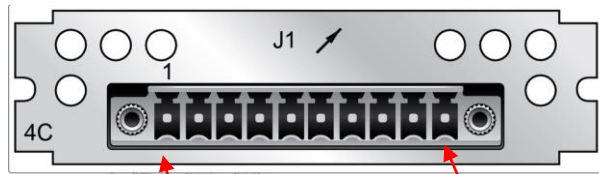
Encoding: “CRC-4”, “No CRC-4” or “AIS”

Status/Inputs/120 ohm E1 page

This card does not have inputs

Status/Outputs/120 ohm E1 page

1204-4C 4-PORT E1/T1 OUT (100/120 Ω) TERMINAL Block



1204-4C option card pin assignments

| Pin Assignments | | | |
|-----------------|-----------------|--------------|-------------|
| Pin No. | Signal | Function | Description |
| 1 | GND | Ground | Ground |
| 2 | T1/E1 output A1 | GR-499/G.703 | Tip |
| 3 | T1/E1 output B1 | GR-499/G.703 | Ring |
| 4 | T1/E1 output A2 | GR-499/G.703 | Tip |
| 5 | T1/E1 output B2 | GR-499/G.703 | Ring |
| 6 | T1/E1 output A3 | GR-499/G.703 | Tip |
| 7 | T1/E1 output B3 | GR-499/G.703 | Ring |
| 8 | T1/E1 output A4 | GR-499/G.703 | Tip |
| 9 | T1/E1 output B4 | GR-499/G.703 | Ring |
| 10 | GND | Ground | Ground |

- This newer card is a 4-port version of the original 2-port E1/T1 cards (Terminal block)
- Refer to (in SAP) ECO-FAI-2381 (Dec 2019): https://app.bom.com/changes/detail-summary?change_id=2399435792&

Part Number of Option Card: 1204-4C (in SAP): https://app.bom.com/items/detail-spec?item_id=1275191339&version_id=11501820378

Process detail ("1204-4C-PD") in Arena: https://app.bom.com/items/detail-spec?item_id=1277850616&version_id=11529003548

Link to 1204-4C card in 2400 SecureSync user guide: https://safran-navigation-timing.com/manuals/2400/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/T1E1.htm?Highlight=1204-53

Model 1204-4C E1/T1 (100/120 Ω): Specifications

- **Outputs:**
 - (4) Balanced E1 or T1 Outputs
- **T1 mode:**
 - (4) 1.544 Mb/sec data rate outputs:
 - Outputs are DS1 framed all ones
 - Supports Super Frame (SF or D4) and Extended Super Frame (ESF)
 - SSM support
- **E1 mode:**
 - (4) 2.048 Mb/sec data rate outputs:
 - Outputs are E1 frame all ones
 - Supports CRC4 and CAS Multiframe
 - SSM support
- **Connector and Signal Type:** Terminal block
 - T1 according to GR-499-CORE (100 Ω)
 - **T1 according to ITU-T G703 (120 Ω)**
- **Maximum Number of Cards:** 6
- **Ordering Information:** 1204-4C: T1/E1 (100/120 Ω) module

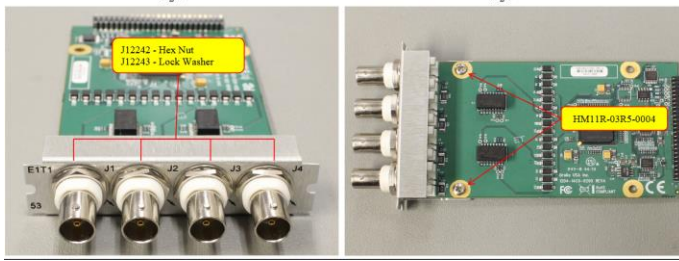


Software support for 1204-4C Option Card

- Software support added in update **version 5.8.7** (not supported in v5.8.6 and below)

Note: Refer also to 1204-0A Option Card in this document for more information on config/operation of the 1204-4C card

1204-53 Quad (4 port) (75 Ω) E1/T1 OUT, 4-BNC Option Card



- This newer card is a 4-port version of the original 2-port E1/T1 cards (BNC outputs)
- Refer to (in SAP) ECO-FAI-2381 (Dec 2019): https://app.bom.com/changes/detail-summary?change_id=2399435792&

Part Number of Option Card: 1204-53 (in SAP): https://app.bom.com/items/detail-spec?item_id=1275946074&version_id=11490639858

Process detail (“1204-53-PD”) in Arena: https://app.bom.com/items/detail-spec?item_id=1275946074&version_id=11490639858

Link to 1204-53 card in 2400 SecureSync user guide: https://safran-navigation-timing.com/manuals/2400/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/T1E1.htm?Highlight=1204-53

Model **1204-53** E1/T1 (75 Ω): Specifications

- **Outputs:**
 - (4) Unbalanced E1 or T1 Outputs
- **T1 mode:**
 - (4) 1.544 Mb/sec data rate outputs:
 - Outputs are DS1 framed all ones
 - Supports Super Frame (SF or D4) and Extended Super Frame (ESF)
 - SSM support
- **E1 mode:**
 - (4) 2.048 Mb/sec data rate outputs:
 - Outputs are E1 frame all ones
 - Supports CRC4 and CAS Multiframe
 - SSM support
- **Connector and Signal Type:** BNC
 - T1 according to GR-499-CORE (75 Ω)
 - E1 according to ITU-T G703 (75 Ω)
- **Maximum Number of Cards:** 6
- **Ordering Information:** **1204-53** T1/E1 (75 Ω) module



Software support for 1204-53 Option Card

- Software support added in update **version 5.8.7** (not supported in v5.8.6 and below)

Note: Refer also to 1204-0A Option Card in this document for more information on config/operation of the 1204-53 card

Havequick/Stanag (1204-10, 1204-1B, 1204-1D, 1204-11, 1204-24, 1204-25)

Various Models:

| Module Ref | Description |
|------------|---|
| 1204-10 | 4 HaveQuick ToD TTL outputs –BNC 50ohms |
| 1204-1B | 4 HaveQuick ToD RS485 outputs –terminal block |
| 1204-1D | 1 PPS, STANAG ToD input module (supports RS485, TTL and 10 V) on one DB25 connector |
| 1204-11 | 1 PPS, STANAG ToD, 5 MHz output module (supports RS485, TTL and 10 V) on one DB25 connector |
| 1204-24 | 1 PPS, STANAG ToD isolated input module (supports RS485, TTL and 10 V) on one DB25 connector |
| 1204-25 | 1 PPS, STANAG ToD, isolated output module (supports RS485, TTL and 10 V) on one DB25 connector |

Comparative Module Interface Table

Output option modules provide the following configurable interfaces as outputs:

| Stanag/ Havequick Output Option cards | Module | 1 PPS Outputs | Time of Day Outputs | | Other Output Signals |
|---|---------|---|---|--|--|
| | 1204-10 | — | 4 x TTL | HQ, HQII, HQIIA, XHQ, ICD-GPS-060A | — |
| | 1204-1B | — | 4 x RS485 | HQ, HQII, HQIIA, XHQ, ICD-GPS-060A | — |
| | 1204-11 | 1 x TTL or RS485 | 2 x TTL or RS485 | HQ, HQII, HQIIA, XHQ, STM, BCD, ICD-GPS-060A | Time Fault Discrete 5 MHz sine wave 1V Rms |
| | 1204-25 | 1 x TTL or RS485 with galvanic isolation | 2 x TTL or RS485 with galvanic isolation | HQ, HQII, HQIIA, XHQ, STM, BCD, ICD-GPS-060A | Time Fault Discrete |

Input option modules provide the following configurable interfaces as synchronization reference inputs.

| Stanag/ Havequick Input Option | Module | 1 PPS Input | Time of Day Input | | Other Input Signals |
|---|---------|---|---|--|---------------------|
| | 1204-1D | 1 x TTL or RS485 | 1 x TTL or RS485 | HQ, HQII, HQIIA, XHQ, STM, BCD, ICD-GPS-060A | Time Fault Discrete |
| | 1204-24 | 1 x TTL or RS485 with galvanic isolation | 1 x TTL or RS485 with galvanic isolation | HQ, HQII, HQIIA, XHQ, STM, BCD, ICD-GPS-060A | Time Fault Discrete |

Schematics (1204-01D0-F000) in Arena:

https://app.bom.com/items/detail-spec?item_id=1202846036&version_id=10299091428&orb_msg_single_search_p=1&redirect_seqno=7891465529

Spectracom's Havequick/Stanag Application Note:

<http://www.spectracomcorp.com/Desktopmodules/Bring2Mind/DMX/Download.aspx?EntryId=919&PortalId=0>

GPS standard: ICD-GPS-060 (design document for Havequick/Stanag)

- **Located in:** [I:\Customer Service\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Option Cards\Stanag-Havequick cards](#)
- **First rev of this document:** Rev A (includes HaveQuick ToD signal definition)
- **Second Rev:** Rev B (pulled out the HaveQuick signal definitions)
- Our ICD-GPS-060 HaveQuick signal was developed in accordance with ICD-GPS-060 Rev A.

Email from Dave Sohn to Tony Diflorio (4/26/12) Our ICD-GPS-060 HAVE QUICK signal was developed in accordance with ICD-GPS-060 Rev A (see attached starting at sheet 25).

Email from Dave Sohn (1 Nov 15) There are two revisions of ICD-GPS-060. The first was revision A, which includes the HAVE QUICK ToD signal definition. Revision B of the standard pulled out the HAVE QUICK signal definitions. We say ICD-GPS-060A, indicating the

revision A of the standard, which includes the ToD definition. In addition to the HAVE QUICK signal, the spec also defines a BCD timecode, a timing fault discrete signal, and a 10V 1PPS.

The 1204-11 STANAG option card should support their need with the ICD-GPS-060 Rev A and includes all of the signals defined in the spec.

If they want separate cards supporting the ToD and 1PPS, they could use the 1204-10 HAVE QUICK option card, which can provide either the ICD-GPS-060 HAVE QUICK timecode or the BCD timecode. The 1204-19 option card can provide the 10V 1PPS outputs required.

Hardware changes

For Option Card hardware versions, refer to: (SP1B) [\New Released\Firmware_Software\1204-xxxx-xxxx](#)

Havequick Message format

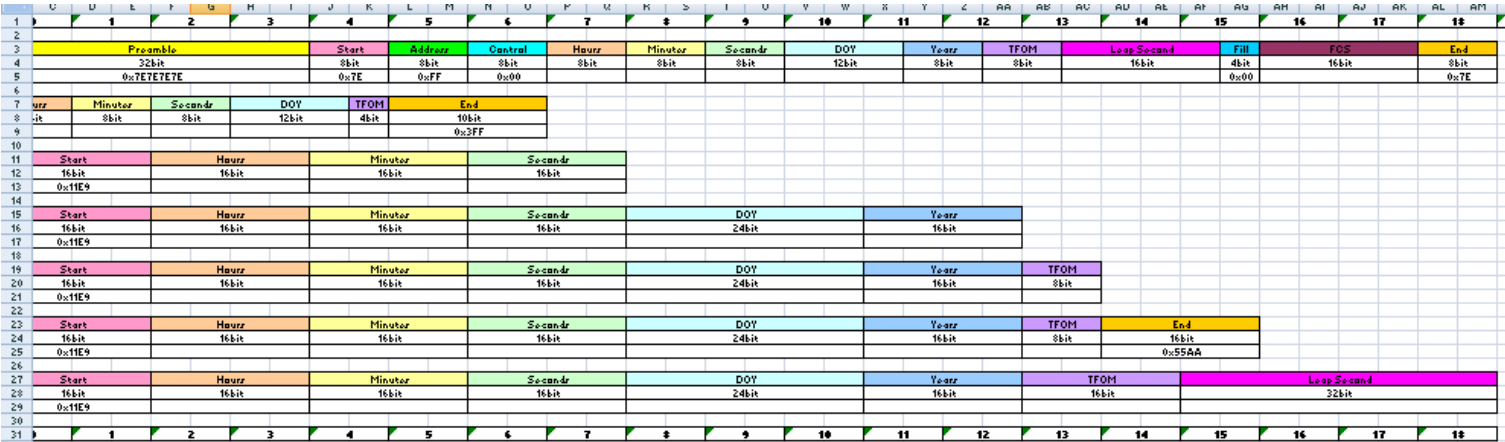
Refer to:
Choices are:

| |
|--------------------|
| STANAG 4246 HQ I |
| STANAG 4246 HQ I |
| STANAG 4246 HQ II |
| STANAG 4372 HQ IIA |
| STANAG 4430 STM |
| STANAG 4430 Ext HQ |
| ICD-GPS-060A BCD |
| ICD-GPS-060A HQ |

STANAG Principles

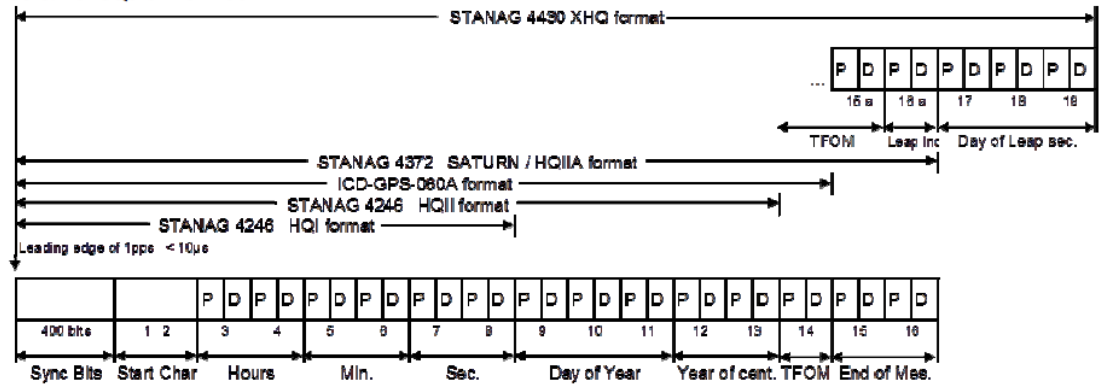
- The main Time & Frequency STANAGs are:
- STANAG 4246 for HaveQuick UHF radio (second release)
 - STANAG 4372 for SATURN UHF radio,
 - ICD-GPS-060 timing interface for GPS User Equipments
 - STANAG 4430 interface for precise time and frequency transfer (generic)

Stanag/HaveQuick formats



From our PDF document at the link above to our website

STANAG 4430 & HaveQuick Format

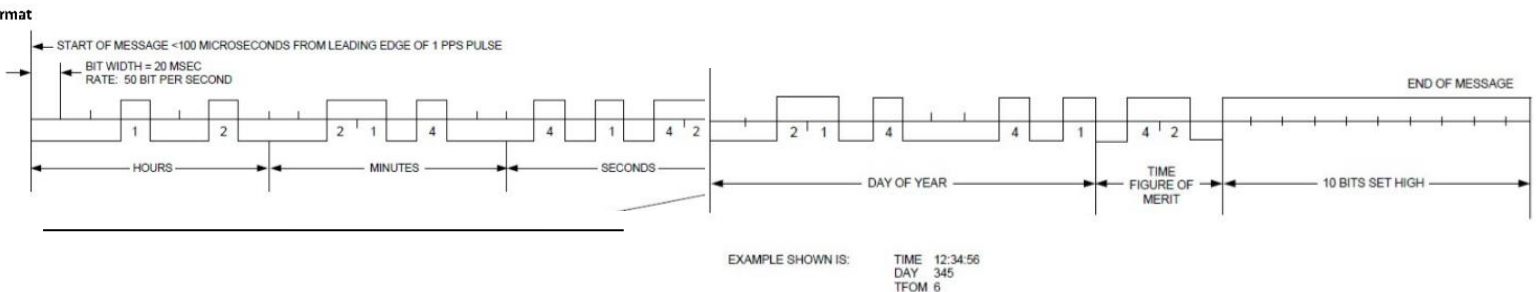


Time scale is UTC

Each character is one octet of Hamming code: 4 bits of parity preceeding 4 bits of data except for specific Start character

| Character | Meaning | Character | Meaning |
|-----------|------------------------------------|-----------|--|
| 1 | Lead Ind. (00010001) | 9 | Day of Year 100's digit |
| 2 | Lead Ind. (11101001) | 10 | Day of Year 10's digit |
| 3 | Hours MSD | 11 | Day of Year 1's digit |
| 4 | Hours LSD | 12 | Year of century MSD |
| 5 | Minutes MSD | 13 | Year of century LSD |
| 6 | Minutes LSD | 14 | Time Figure of Merit, power of 10 ⁻¹⁰ |
| 7 | Seconds MSD | 15 | End of Message |
| 8 | Seconds LSD | 16 | End of Message |
| 15a | Time Figure of Merit, scale factor | 17 | Leap sec. Day of Year 100's digit |
| 15b | Leap activity indicators | 18 | Leap sec. Day of Year 10's digit |
| | | 19 | Leap sec. Day of Year 1's digit |

BCD Format



Timing Fault Discrete (TFD): (From ICD-GPS-060 <http://www.navcen.uscg.gov/pdf/gps/ICD-GPS-060B.pdf>):

The interfacing equipment which supplies the 1PPS and BCD data provides a timing fault discrete which informs the UE if the transmitting equipment is functioning properly. In the event that the BCD time code information is provided to the GPS UE receiver without a Timing Fault Discrete signal (hard wire), the UE receiver recognizes this condition and assumes the Timing Fault Discrete signal line to be set high, thus accepting any data that is input to the GPS receiver via the PTTI port.

- Enabled: The TFD signal uses the "Threshold to activate" value to provide the level of TFD.
- Disabled: The TFD signal is always valid.

Threshold to activate TFD: If the TFD is activated, the user can select the TFOM value threshold. Below this value, the TFD is high, otherwise the TFD is low.

TFD is red

If the TFD input is disabled, the TFD state will be red. TFD being red can be ignored if the TFD input is not enabled.

Impedances/ impedance matching

Balun (Baluns) for 120 ohm output to 75 ohm output conversion

Email from Dave Lorah to a customer (5/30/12) We don't sell these, but they are available pretty cheap. Here is a link: <http://datainterfaces.com/e1baluns.aspx>

Output impedances were changed from 50 ohms to 270 ohms (May 2012)

- ECN 2947 (May 2012) incorporated Output impedance change (from 50 ohms to 270 ohms)
- This ECN was to prevent ringing of the Stanag signal when connected to 1K input impedance.

Email from Keith W to Sylvain based on info from Tom Richardson (10/11/12)

An Engineering change (ECN Number 2947) was implemented back in May to change the output impedances of the Model 1204-10 Option card from 50 ohms to 270 ohms. Per the Stanag specs, the input impedance of the Stanag devices should be 1k ohms (not 50 ohms).

The output voltages you are observing are consistent with what the output levels should be, if you were to terminate the outputs into 50 ohms. However, the Stanag device the Option card is being connected to shouldn't have 50 ohm input impedance (if its following the Stanag specs). It should have a much higher input impedance of 1k ohms, which will provide it with a larger input signal.

It appears the SecureSync manual hasn't been updated yet to reflect this Engineering Change. It still indicates 50 ohm output impedance. I have requested our tech writer include this change in the next manual update and hope this wasn't a "source of confusion".

Earlier Email from Tom Richardson

1204-10 card output impedance should be in the 2ohm range. 74ACT08s driving 5.8 ohms in parallel. Outputs should be properly terminated into 50 ohms. You will get significant ringing without proper termination.

Email from Sylvain (9/27/12)

There are 2 issues on this board:

- 1) It seems to present a strong ringing for each front (higher than 8V with a 200ns period): question: is it normal (design issue) or can it be linked to a defective component (failure)
 - 2) The output signals are influenced if you enable or not many of them: If you have only 1 output enable (J1 for example) , the signal J1 can change if you enable J2, J3 etc....(see pictures attached – “4voies actives”)
- Is it a failure or a design issue?

Reply from Dave Sohn (9/27/12)

The original 1204-10 board shipped was intended to drive a 50ohm load. The images you sent with the ringing is indicative of un-terminated signals. If the signal was terminated into 50ohms, you would see a nice, crisp signal.

Newer versions of the 1204-10 board are now intended to drive a high impedance load, and will not show the ringing when un-terminated. They will not drive a 50ohm load.

Setup -> Outputs -> Stanag Output

(Option Cards with Stanag/Havequick outputs, such as 1204-10, 1204-1B, 1204-11 and 1204-25)

A) General Settings Section

- **Level of Single-ended Signals:** 10V or 5V can be selected for the TOD 1 and 1PPS Output.

Generate Timing Fault Discrete (TFD): (From ICD-GPS-060 <http://www.navcen.uscg.gov/pdf/gps/ICD-GPS-060B.pdf>) The interfacing equipment which supplies the 1PPS and BCD data provides a timing fault discrete which informs the UE if the transmitting equipment is functioning properly. In the event that the BCD time code information is provided to the GPS UE receiver without a Timing Fault Discrete signal (hard wire), the UE receiver recognizes this condition and assumes the Timing Fault Discrete signal line to be set high, thus accepting any data that is input to the GPS receiver via the PTTI port.

- Enabled: The TFD signal uses the "Threshold to activate" value to provide the level of TFD.
- Disabled: The TFD signal is always valid.

Threshold to activate TFD: If the TFD is activated, the user can select the TFOM value threshold. Below this value, the TFD is high, otherwise the TFD is low.

Generate Bit Synchronization (BS): From ICD-GPS-060 <http://www.navcen.uscg.gov/pdf/gps/ICD-GPS-060B.pdf>

Enabled: The second STANAG signal (TOD 2) is used to send the BS (Bit Stream) signal used with STANAG 4430-STM. When BS is active, the configuration of TOD 2 is superseded and only used for BS.

Disabled: The second STANAG signal (TOD 2) can be used to send an independent TOD.

B) Time of Day Output Settings Section

TOD 1 & TOD 2: STANAG columns 1 and 2

Signature Control: Used to control when the signal will be present. This function allows the modulation to stop in certain situations.

Output Always Enabled: STANAG signal is present, even when SecureSync is not synchronized to its references.

Output Enabled in Holdover: STANAG signal is present unless the SecureSync is not synchronized to its references (Modulation is present while in the Holdover mode).

Output Disabled in Holdover: STANAG signal is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).

Output Always Disabled: No STANAG signal is present, even if any SecureSync input references are present and considered qualified.

TOD Format: The user-selectable format to be used. Available formats include:

- STANAG 4246 HQI
- STANAG 4246 HQII
- STANAG 4372 HQIIA
- STANAG 4430 STM
- STANAG 4430 XHQ
- ICD-GPS-060A BCD (refer to <http://www.navcen.uscg.gov/pdf/gps/ICD-GPS-060B.pdf>)
- ICD-GPS-060A HQ (refer to <http://www.navcen.uscg.gov/pdf/gps/ICD-GPS-060B.pdf>)

Electrical Format: Selects signaling on either RS-485 or TTL (supporting up to 10V levels) signal lines.

Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Time Scale: Used to set the desired time scale (**UTC**, **TAI**, **GPS**, or **Local**).

Offset (ns): Provides the ability to account for STANAG Line (TOD1 and TOD2 independently) cable delays or other latencies in the STANAG output. Available Offset range is -500 to +500ms in 5ns steps.

Status Change (29 Jan 2019) per the Version 5.8.3 release notes"

Added support for STANAG 4430 (Extended HaveQuick Edition 1)

C) 1PPS Output Settings Section

Signature Control: Used to control when the signal will be present. This function allows the modulation to stop in certain situations.

Output Always Enabled: STANAG signal is present, even when SecureSync is not synchronized to its references.

Output Enabled in Holdover: STANAG signal is present unless the SecureSync is not synchronized to its references (Modulation is present while in the Holdover mode).

Output Disabled in Holdover: STANAG signal is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).

Output Always Disabled: No STANAG signal is present, even if any SecureSync input references are present and considered qualified.

Offset (ns): Used to account for 1PPS cable delays or other latencies in the 1PPS output. Available Offset range is -500 to +500ms in 5ns steps.

Edge: The operator can select if the output signal is a rising or falling edge pulse.

Pulse Width: Configures the Pulse Width of the 1PPS output. The Pulse Width is entered and displayed in nanoseconds (the default Pulse Width is 200 milliseconds).

Electrical Format: Selects signaling on either RS-485 or TTL (supporting up to 10V levels) signal lines.

Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

| OUTPUTS STATUS - STANAG/HAVEQUICK (SLOT1) | |
|---|----------------------------|
| Card Type | Non-Isolated Stanag Output |
| Level of Single-ended Signals | 5V |
| Generate Time Fault Discrete | Disabled |
| Time Fault Discrete State | OK |
| Generate Bit Synchronization (BS) | Disabled |

| Time Of Day Output | | |
|--------------------|-----------------------|-----------------------|
| | TOD 1 | TOD 2 |
| Signature Control | Output Always Enabled | Output Always Enabled |
| Offset (ns) | 0 | 0 |
| TOD Format | STANAG 4246 HQ I | STANAG 4246 HQ I |
| Electrical Format | RS485 | RS485 |
| Timescale | UTC | UTC |
| Stanag TFOM | 0 | 0 |

| 1PPS Output | |
|-------------------|------------------------|
| Signature Control | Output Always Disabled |
| Offset (ns) | 0 |
| Edge | Rising |
| Pulse Width (ns) | 200000000 |
| Electrical Format | RS485 |

SOE1 Connector Pinout

The diagram illustrates the pinout for the SOE1 connector, which is a 26-pin connector. The pins are numbered 1 through 26, and the signals are as follows:

- Pin 1: GND
- Pin 2: TOD1*
- Pin 3: X
- Pin 4: TOD2+ / BS*
- Pin 5: X
- Pin 6: GND
- Pin 7: GND
- Pin 8: X
- Pin 9: PPS*
- Pin 10: TFD
- Pin 11: TOD1 (TTL)
- Pin 12: GND
- Pin 13: TOD2 / BS (TTL)
- Pin 14: TOD1-
- Pin 15: X
- Pin 16: X
- Pin 17: TOD2- / BS-
- Pin 18: X
- Pin 19: 5 MHz
- Pin 20: X
- Pin 21: PPS-
- Pin 22: X
- Pin 23: GND
- Pin 24: PPS (TTL)
- Pin 25: GND
- Pin 26: GND

Notice that if the Bit Synchronization (BS) is used, the TOD 2 reference cannot be selected.

Setup -> Inputs -> Stanag Input
(Option Cards with Stanag/Havequick inputs, such as 1204-1D and 1204-24)

SLOT3
STANAG INPUT

INPUTS SETUP - STANAG/HAVEQUICK (SLOT3)

Setup

Configuration Examples

SMB-D Connector Pinout

General Settings

Reference ID

Use of Time Fault Discrete

Use of Bit Synchronization (BS)

Reference Selection

1204

Disabled

Disabled

TOD 1

Time Of Day Reference Settings

TOD 1

TOD 2

TOD Format

Electrical Format

Time Scale

Offset (ns)

ICD-GPS-060A BCD

RS485

UTC

0

ICD-GPS-060A BCD

RS485

UTC

0

1PPS Reference Settings

Offset (ns)

Edge

Electrical Format

0

Rising

RS485

Choices are "TOD 1" or "TOD 2"

STANAG 4246 HQ I

STANAG 4246 HQ II

STANAG 4372 HQ IIA

STANAG 4430 STM

STANAG 4430 ExtHQ

ICD-GPS-060A BCD

ICD-GPS-060A HQ

TTL

RS485

API calls associated with Have Quick STANAG Option Cards

- Refer to Tim Tetreault's "cheat sheet" at: <..\EQUIPMENT\SPECTRACOM EQUIPMENT\Timing boards\TSync family\Tsync driver calls cheat sheet>
- These API calls are primarily for internal use, but the associated "get" calls are available via the CLI interface ("sets" are not available to either spadmin or user accounts)
- These are examples - additional calls may have since been added

| Have Quick output commands | Have Quick input Commands |
|----------------------------|---------------------------|
| QP_GetFormat | QR_GetFormat |
| QP_GetLocal | QR_GetLocal |
| QP_GetNumInst | QR_GetNumInst |
| QP_GetOffset | QR_GetOffset |
| QP_GetSigCtrl | QR_GetRefId |
| QP_GetTimeScale | QR_GetTimeScale |
| QP_SetFormat | QR_GetValidity |
| QP_SetLocal | QR_SetFormat |
| QP_SetOffset | QR_SetLocal |
| QP_SetSigCtrl | QR_SetOffset |
| QP_SetTimeScale | QR_SetTimeScale |

Stanag/Have Quick issues associated with more than one Stanag/Have Quick Option Card

A) Report of Signature Control not working in 1204-25 card

- Refer to Salesforce Case 292487 and JIRA Ticket DMND-1947 (Jan 2023)
- Issue confirmed by Dave West, as also being in the 1204-11 card (likely in all Stanag/HaveQuick Cards.
- Applicable to at least versions 1.6.0 and below

B) HAVE QUICK input offset settings for option cards 1204-10 and 1204-29 are not currently functional" (reported with 1200 SecureSync version 5.4.5)

- Refer to Salesforce Case 24196 and JIRA ticket SSS-206 (excerpted below)
- Note this was ultimately determined to be a documentation error. 20ns resolution instead of 5ns resolutions, Manual and Data sheet were updated.

David Lorah reports on Sales Force Case 24196 that a user cannot set the offset value for the 1204-10 STANAG/HaveQuick card. It is NOT clear if this is a Web UI issue or a KTS issue. (Question for Denis or the card designer is it possible the clock used is 20nsec and the resolution is limiting the value?)

David Lorah received a report from a customer JT3 that was trying to set an offset on the 1204-10 Stanag/Havequick card. It would not save the offset configuration.

This is in version 5.4.5 firmware.

He was able to duplicate the problem on a 5.4.5 unit in Rochester customer service. If he tries to save the offset it sometimes does not save at all and sometimes saves as a different value. For example if I set offset to 50, it says it saves at 50 but then checking status it shows 40. If I set it to 80, it saves and status says 80. If I set offset to 30 it saves as 20. 150 saves as 140, 160 saves as 160.

David Lorah states "Something is not correct. The specs say the card can save offsets in 5 nS resolution. Looks like the resolution is 20nS steps. Please enter a Jira case for this one."

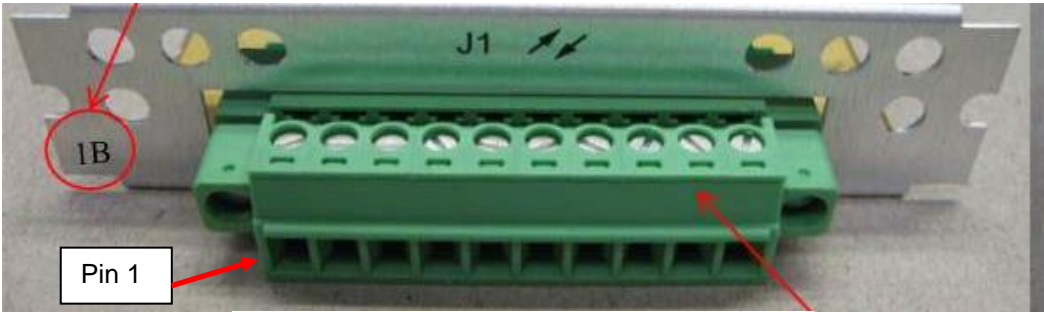
***(1204-10) (4) Havequick (TTL single-ended) outputs and (1204-1B) (4 RS-485/differential) outputs

Note: Model 1204-10 is four (single-ended) havequick TTL outputs on BNC connectors



(J1 – J4) Four separate outputs (270 ohm termination)

Model 1204-1B is four RS-485 (differential) havequick outputs on terminal block connector



| Pin. No. | Function |
|----------|-----------------------|
| 1 | HAVE QUICK Output 1 + |
| 2 | HAVE QUICK Output 1 - |
| 3 | GND |
| 4 | HAVE QUICK Output 2 + |
| 5 | HAVE QUICK Output 2 - |
| 6 | HAVE QUICK Output 3 + |
| 7 | HAVE QUICK Output 3 - |
| 8 | GND |
| 9 | HAVE QUICK Output 4 + |
| 10 | HAVE QUICK Output 4 - |

Model 1204-1B HAVE QUICK Card Pin Assignments

10 Pin Terminal block connector for 1204-1B card

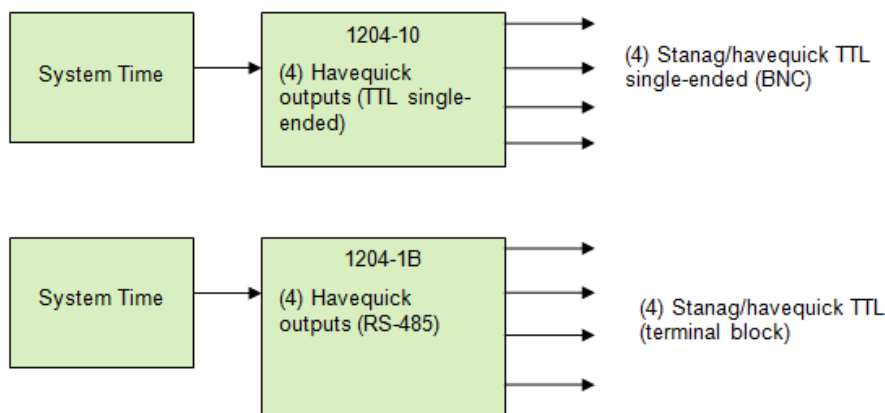


Our P/N: J900R-0101-022J (in Arena) https://app.bom.com/items/detail-spec?item_id=1202843926&version_id=10303495198

Manufacturer and MFG P/N: Phoenix Contact 1827787 Refer to:
<https://www.phoenixcontact.com/online/portal/us/?uri=pxc-oc-itemdetail:pid=1827787&library=usen&pcck=P-11-02-11&tab=1&selectedCategory=ALL>

Schematic: (refer to 1204-0100-F000) <I:\New Released\PCB Documentation>

Block Diagram



1204-10 firmware versions

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “**Items**” for “**Item number**” and search for “**1200-SU01***” (as shown below)

Dashboard Items Requests Changes Suppliers Supplier Items Files Projects Quality

Search: Items for All Items where Item Number is 1200-SU01*

- FGPA (firmware) for the 1204-10 card: `rt_oc10_hw01_fpga.bin`

| ECN | Archive version | FPGA version reported | Change | Approximate cut-in |
|-----|-------------------|--|---|--------------------|
| | 4.8.0 | 1.00 | Added support for this Option card (first release) | |
| | See note to right | 1.02 (still current rev as of at least v5.8.5) | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software versions 5.2.1 and above, till at least 5.8.5 | |

- FGPA (firmware) for the 1204-1B card (ascending version): `rt_oc1b_hw01_fpga.bin`

| ECN/ECO | Archive version | FPGA version reported | Change | Approximate cut-in |
|----------|-----------------|-----------------------|--|--------------------|
| | 4.8.0 | 1.00 | Added support for this Option card (first release) ?? | |
| | | 1.01 | ? | |
| | | 1.02 | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software versions 5.2.1 | |
| | | 1.03 | Note: Not sure at what version 1.03 was cut-in at, but it's in at least software version 5.8.5 | |
| ECO-2674 | 5.9.0 | 1.04 | 1204-1B to version 1.04. Upgraded option card for improved system reliability: | Jan 2021 |

****Firmware/software**

For Option Card software versions, refer to: (SP1B) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

Known firmware issues / Software updates

A) Software updates/issues associated with Stanag Option Cards

- **1204-10 Stanag/Havequick fails to set nsec offset value correctly (observed in version 5.4.5)**
- Refer to Salesforce case 24196 and JIRA case SSS-206
- **Final finding:** Initial Specs were incorrect. Actually 20ns resolution instead of 5ns.

From: Dave Lorah. **Sent:** Thursday, January 19, 2017 2:58 PM

Subject: Support case 24196 - 1204-10 Offset errors

I received a report from a customer JT3 that was trying to set an offset on the 1204-10 Stanag/Havequick card. It would not save the offset configuration. This is in version 5.4.5 firmware. I was able to duplicate the problem on a 5.4.5 unit here.

If I try to save the offset. it sometimes does not save at all and sometimes saves as a different value. For example, if I set offset to 50, it says it saves at 50 but then checking status it shows 40. If I set it to 80, it saves and status says 80. If I set offset to 30 it saves as 20. 150 saves as 140, 160 saves as 160.

Something is not correct. The specs say the card can save offsets in 5 nS resolution. Looks like the resolution is 20nS steps. Please enter a Jira case for this one.

F/U email from Dave L (19 Jan 17) The User Manual states the offset (phase shift) is programmable from 0 to +/- 500mS in 5 nS steps. Actually it turns out the offset is configurable but only in **20nS steps**. So anything else will not save correctly, If you enter 50nS it will save as 40nS etc. Anything below 20 will save as 0.

(excerpted from JIRA SSS-206) Per Denis Reilly (2 Dec 2017) "I conclude that the specs are wrong and the card was designed for **20 ns** resolution." User guide and data sheet were updated accordingly.

➤ **Version 5.2.1**

1. Access UI in STANAG 1204-24, 1204-25, 1204-11, 1204-1D Option cards. Change configuration parameters and click submit. UI will display "**error saving**"
 - Fixed issue with saving configurations for STANAG option cards
 - Refer to Mantis case 2990
2. "When he disconnects the antenna, he picks up the binary external time code. Everything works perfectly with SecureSync version 5.1.7. However, when he tries it with version 5.2.1, the STANAG modules no longer work"
 - Refer to Salesforce case 18634 for Walt Washington/Elotek.

➤ **Version 5.2.0**

- Enhanced functionality, addressing a reported issue.

Issues

A) 5.2.0 version cannot change configuration to after clicking submit UI will display "error saving

- Refer to **Mantis case 2990**
- Affects 1204-11, 204-24, 1204-25 and 1204-1D Option cards.

- Will be fixed in version 5.2.1
- Potential work-around- configure them via the classic interface??

B) RAYTHEON issue: Timeserver jumps into the future (NTP distribution and PPS)

- Refer to **Mantis case 2909**:

B) Software updates associated with Havequick Option Cards

➤ Version 5.2.0

- Refer to **Mantis case 2813**: Fixed Havequick output display in web browser Status Summary panel, now correctly reporting the configured format and state
- Refer to **Mantis case 2942**: One output loses local clock setting when another output is configured.

➤ Version 5.1.3

1 second time error on output (found ~March 2014, in v5.1.2 software)

- Refer to Salesforce Case Number 13167 (<https://na8.salesforce.com/500C000000WRpIH>)
- Refer to Mantis Case Number 2742 (<http://cvsmantis.int.rolia.com/mantis/view.php?id=2742>)
- We were able to duplicate this here, with only one output.
- Fixed in the version 5.1.3 software update.

Havequick input (no GPS input)

- Loss/regain of GPS reception causes "QR hvq0" log entries to be asserted.

Sep 20 15:10:14 Timeserver2 Timeserver2: [system] 2013 263 15:10:14 000 QR hvq0 has lost communication.

Sep 20 15:10:15 Timeserver2 Timeserver2: [system] 2013 263 15:10:15 000 QR hvq0 has established communication.

Email from Dave Sohn (21 Jan 2014) If the GPS signal is disconnected or lost, these messages will appear and return. This is not a system alarm.

1204-10 hardware changes

- For Option Card hardware versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

| ECN/ECO | Archive version | New Version | Change | approximate cut-in |
|-----------------|-----------------|-------------|---|--------------------|
| | 4.8.0 | 1.0.0 | Added support for this Option card (first release) | |
| ECO 0117 | N/A | N/A | Update SecureSync option card 10, HQ Out, 4 BNC to change Q4, Q11, Q15, and Q19 10V output transistors from SOT23 to SOT223 package. Change soldering to no clean. PCB layout changes for DFM also | Sept 2014 |

Terminal block connector for the Model 1204-1B

- **Our P/N:** J900R-0101-022J
- **Mfg:** Phoenix

- **Phoenix P/N:** 1827787
 - **Refer to sites such as mouser:** <http://www.mouser.com/ProductDetail/Phoenix-Contact/1827787/?qs=UV0HhPI4yOE%252b2ewyLbDZJg==>
-

Outputs: (4) Havequick (TTL single-ended)

Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Output connectors (4): J1, 2, J3 and J4

Output termination for all four ports: Was 5.6 ohms, but is now 270 ohms (ECN 2947 changed outputs to 270 ohms. See "ECNs" further below for more details).

10K load impedance

- Refer to case 169070

customer report: ... have you reviewed my point about the 10K load impedance on the -10 board? If you provide a ICD-GPS-060A HQ output, the spec says 5k (maybe it was 6k) and you can parallel inputs as long as you do not go below 500 ohm. It seems you cannot be compliant to 060A with the 10K load spec. I estimated what I thought the -10 card would do with a 500 ohm load using the 1V at 50 ohm Jean observed. If my calculations were somewhat close, the it would likely drive 500 ohms but I would test it first. This concern is based purely on the spec as I do not have experience with what client systems typically present at their HQ input.

Per Dave Sohn (10 Sept 2019) Some more investigation.

The 1204-10 (and 1204-29) outputs cannot drive 50 ohms. They essentially have a 275 ohm series resistance on their output. Driving that through a 50 ohm will generate a significant drop in voltage. However, that isn't to say that it is really a 10 kohm impedance load driver. It will successfully drive lower impedance signals, but not to 50 ohms.

Inputs: None

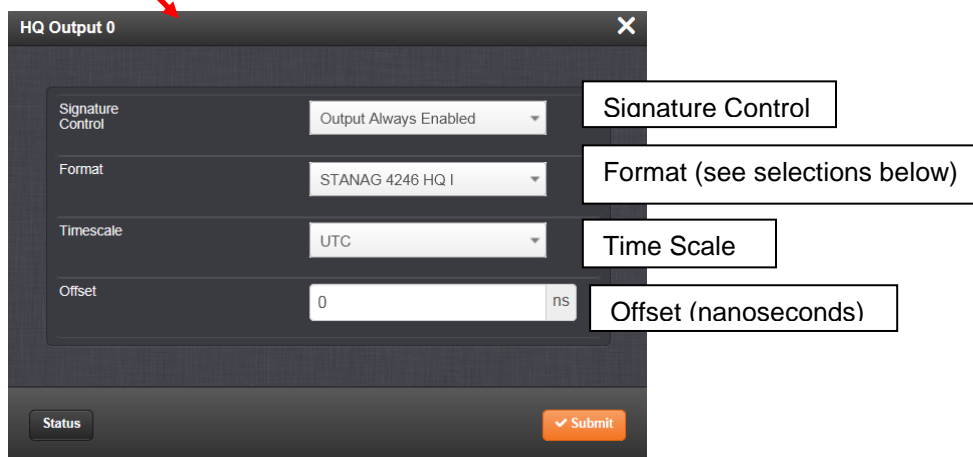
ECN Changes incorporated

ECN 2947 (June 2012):

- 1) Changes the Havequick output impedances from 5.6 ohms to 270 ohms.

A) Newer web browser (versions 5.1.2 and above)

Interfaces -> Option Cards page



Format—Used to configure the formatting of the four available HAVE QUICK outputs. The available output formats are as follows:

B) Classic Interface browser

Setup/Inputs/HAVEQUICK

This card does not have inputs

Setup/Outputs/HAVEQUICK

OUTPUTS SETUP - HAVEQUICK (SLOT1)

| Output Index | Signal Control | Format | Time Scale | Local Clock | Offset |
|--------------|----------------------|--------------------------------|------------|-------------|--------|
| 1 | No Signature Control | Extended HaveQuick STANAG 4430 | UTC | | 0 |
| 2 | No Signature Control | Extended HaveQuick STANAG 4430 | UTC | | 0 |
| 3 | No Signature Control | Extended HaveQuick STANAG 4430 | UTC | | 0 |
| 4 | No Signature Control | Extended HaveQuick STANAG 4430 | UTC | | 0 |

HaveQuick I STANAG 4246

HaveQuick II STANAG 4246

HaveQuick IIA STANAG 4372

Extended HaveQuick STANAG 4430

ICD-GPS-060A HaveQuick

Status/Inputs/HAVEQUICK

This card does not have inputs

Status/Outputs/HAVEQUICK

OUTPUTS STATUS - HAVEQUICK (SLOT1)

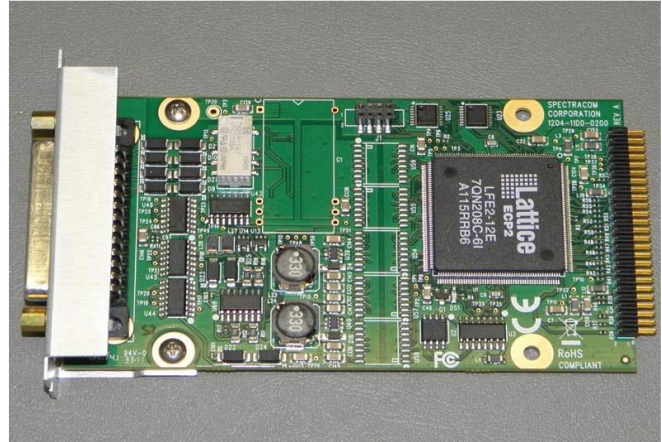
| Output Index | Signature Control | Offset | Format | Timescale |
|--------------|----------------------|--------|--------------------------------|-----------|
| 1 | No Signature Control | 0 | Extended HaveQuick STANAG 4430 | UTC |
| 2 | No Signature Control | 0 | Extended HaveQuick STANAG 4430 | UTC |
| 3 | No Signature Control | 0 | Extended HaveQuick STANAG 4430 | UTC |
| 4 | No Signature Control | 0 | Extended HaveQuick STANAG 4430 | UTC |

*** (1204-11 and 1204-25) Stanag output (DB25) Option Card

Note:

Model 1204-11 is four (single-ended) havequick non-isolated outputs on BNC connectors

Model 1204-25 is four RS-485 (differential) havequick galvanically isolated outputs on terminal block connector). Offers same Stanag functionality as Epsilon Clock EC2S)



in SecureSync online user guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/Stanag_Out.htm?Highlight=1204-25

1204-11 Firmware versions

- For software assembly versions, refer to: (1204-SHxx, SP1xx)
- For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)

The screenshot shows the Arena software interface with a search bar at the top. The search bar contains the text "Search: Items" followed by a dropdown menu set to "All Items", then "where Item Number" followed by a dropdown menu set to "is", and finally the search term "1200-SU01*" followed by a "Go" button. The interface also includes a navigation bar with icons for Dashboard, Items, Requests, Changes, Suppliers, Supplier Items, Files, Projects, and Quality.

- **FPGA (Firmware) for 1204-11 card: rt_oc11_hw01_fpga.bin**

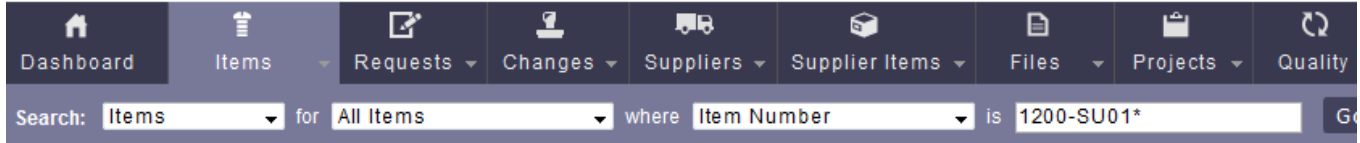
| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|----------------------------|-----------------------|---|--------------------|
| | ?? (see note to the right) | 1.00 | Note: not sure when v1.00 was cut-in | |
| | ?? (see note to the right) | 1.01 | Note: not sure when v1.01 was cut-in | |
| | ?? (see note to the right) | 1.02 | Note: not sure when v1.02 was cut-in | |
| | ?? (see note to the right) | 1.03 | Note: not sure when v1.03 was cut-in. But it's the latest rev as of at least 5.8.5 | |

1204-25 Firmware versions

- For software assembly versions, refer to: (1204-SHxx, SP1xx)
- For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- **FPGA (Firmware) for 1204-25 card: rt_oc25_hw01_fpga.bin**

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|----------------------------|-----------------------|---|--------------------|
| | ?? (see note to the right) | 1.00 | Note: not sure when v1.00 was cut-in | |
| | ?? (see note to the right) | 1.01 | Note: not sure when v1.01 was cut-in | |
| | ?? (see note to the right) | 1.02 | Note: not sure when v1.02 was cut-in | |
| | ?? (see note to the right) | 1.03 | Note: not sure when v1.03 was cut-in. But it's the latest rev as of at least 5.8.5 | |

Known firmware issues / Software updates

A) Software updates/issues associated with Stanag Option Cards

➤ Version 5.3.1

Issue with not registering BCD time (Dec, 2015)

Refer to Mantis 3190 and Salesforce cases 19816 and 19953

Fixed in update version 5.4.0 (FPGA version 1.05)

➤ Version 5.2.1

1. Access UI in STANAG 1204-24, 1204-25, 1204-11, 1204-1D Option cards. Change configuration parameters and click submit. UI will display "**error saving**"

- Fixed issue with saving configurations for STANAG option cards
- Refer to Mantis case 2990

2. "When he disconnects the antenna, he picks up the binary external time code. Everything works perfectly with SecureSync version 5.1.7. However, when he tries it with version 5.2.1, the STANAG modules no longer work"

- Refer to Salesforce case 18634 for Walt Washington/Elotek.

➤ **Version 5.2.0**

- Enhanced functionality, addressing a reported issue.

Issues

A) 5.2.0 version cannot change configuration to after clicking submit UI will display "error saving

- Refer to **Mantis case 2990**
- Affects 1204-11, 204-24, 1204-25 and 1204-1D Option cards.
- Will be fixed in version 5.2.1
- Potential work-around- configure them via the classic interface??

B) RAYTHEON issue: Timeserver jumps into the future (NTP distribution and PPS)

- Refer to **Mantis case 2909**:

B) Software updates associated with Havequick Option Cards

➤ **Version 5.2.0**

- Refer to **Mantis case 2813**: Fixed Havequick output display in web browser Status Summary panel, now correctly reporting the configured format and state
- Refer to **Mantis case 2942**: One output loses local clock setting when another output is configured.

➤ **Version 5.1.3**

1 second time error on output (found ~March 2014, in v5.1.2 software)

- Refer to Salesforce Case Number 13167 (<https://na8.salesforce.com/500C000000WRpIH>)
- Refer to Mantis Case Number 2742 (<http://cvsmantis.int.rolia.com/mantis/view.php?id=2742>)
- We were able to duplicate this here, with only one output.
- Fixed in the version 5.1.3 software update.

Havequick input (no GPS input)

- Loss/regain of GPS reception causes "QR hvq0" log entries to be asserted.

Sep 20 15:10:14 Timeserver2 Timeserver2: [system] 2013 263 15:10:14 000 QR hvq0 has lost communication.

Sep 20 15:10:15 Timeserver2 Timeserver2: [system] 2013 263 15:10:15 000 QR hvq0 has established communication.

Email from Dave Sohn (21 Jan 2014) If the GPS signal is disconnected or lost, these messages will appear and return. This is not a system alarm.

1204-11 Hardware changes

For Option Card hardware versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

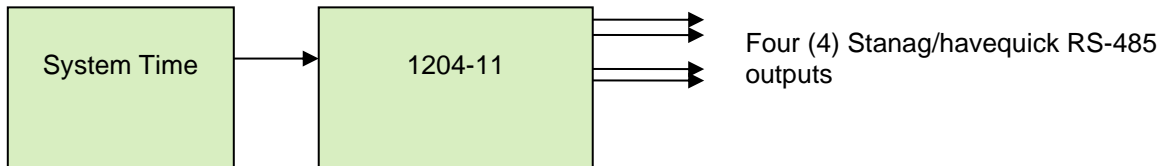
| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.8.0 | 1.0.0 | Added support for this Option card (first release) | |

Block Diagram

Schematics:

BOM: (1204-01D0-F000) https://app.bom.com/items/detail-spec?item_id=1202846036&version_id=10212763188&orb_msg_single_search_p=1&redirect_seqno=5758365917

Block Diagram



Inputs: None

Outputs

(2) Stanag/havequick (galvanically isolated outputs)

Formats:

- STANAG 4246 HQI, HQII
- STANAG 4372 HQIIA
- STANAG 4430 XHQ, STM
- ICD-GPS-060A HQ, BCD

Status Change (29 Jan 2019) per the **Version 5.8.3** release notes"

Added support for STANAG 4430 (Extended HaveQuick Edition 1)

(1) 1PPS (galvanically isolated output)

Selectable 10V/TTL or RS-485 signaling levels

Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Connector and Pin-outs

1204-11



Q (Salesforce Case 218212) We have question about the HW specification of 1204-11.

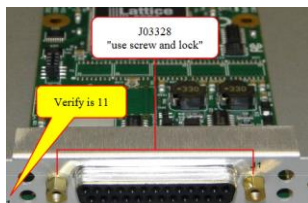
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/Stanag_Out.htm?Highlight=1204-11



1. Is this screw type inch or miri?
2. Is this connector type female?

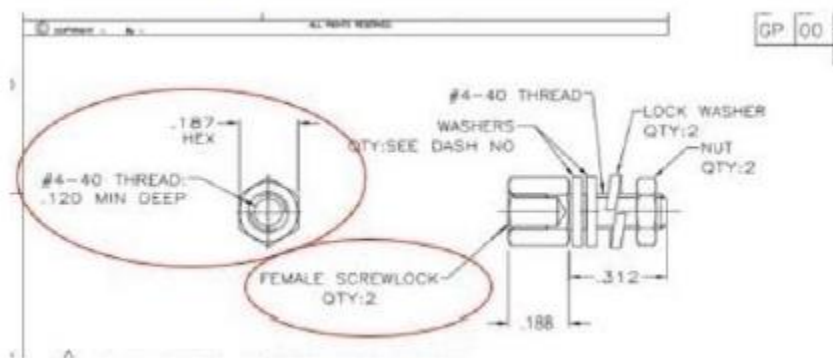
Answer:

Per PD: 1204-0110-0600-PD



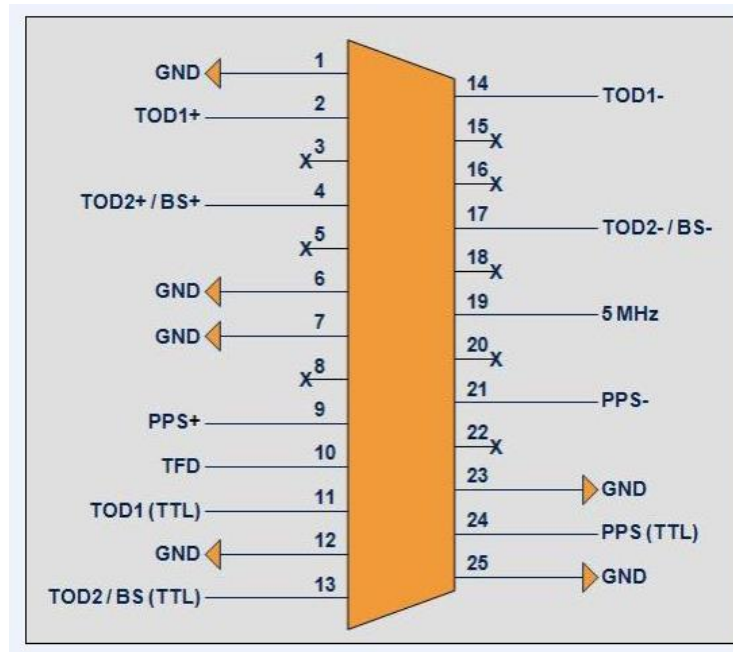
“Jack Screw”

- Our P/N J03328 (SCREWLOCK ASSY FEMALE)
- Tyco Electronics P/N 5205817-1
- MFG datasheet: https://www.mouser.com/datasheet/2/418/NG_CD_5205817_D-1252167.pdf



Pinouts

For the pin-out of this card, navigate to the **Setup-> Outputs /1204-11 Option Card** page of the browser. Then select the **"SUB-D Connector Pinout"** Tab



Output Index 1: PIN 2-14 for RS485 message (11 for TTL)

Output Index 2: PIN 4-17 for RS485 message (13 for TTL)

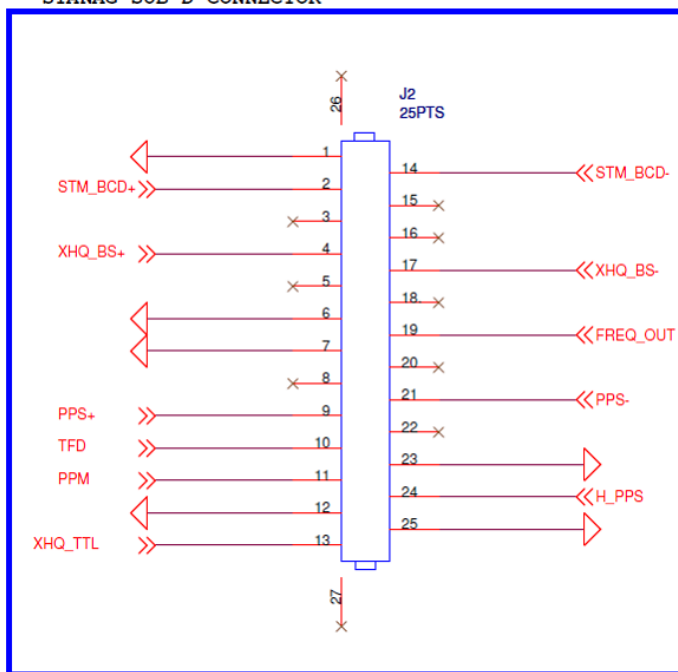
PPS Out: PIN 9-21 for RS485 (24 for TTL)

TFD: PIN 10 (TTL)

PPM: PIN 11 (TTL) (only if Output Index 1 is RS485)

GND: PIN 1, 6, 7, 12, 23 et 25. The GND is not connected to the mechanical part (isolation).

STANAG SUB-D CONNECTOR



(2) Stanag (TOD1 and TOD2) RS-485 differential outputs in **light Green** and **dark Green**

(2) Stanag (TOD1 and TOD2) TTL single-ended outputs in **light purple** and **dark purple**

(1) 1PPS (RS-485 Differential) output in **light Blue**

(1) 1PPS (TTL Single-ended) output in **dark Blue**

| Pin No. | Signal | Function | Pin No. | Signal | Function |
|---------|--------|------------------------------------|---------|--------|------------------------------------|
| 1 | GND | Ground | 14 | TOD1- | TOD1 (RS-485-) Differential Output |
| 2 | TOD1+ | TOD1 (RS-485+) Differential Output | 15 | NC | - |
| 3 | NC | - | 16 | NC | - |
| 4 | TOD2+ | TOD2 (RS-485+) Differential Output | 17 | TOD2- | TOD2 (RS-485-) Differential Output |
| 5 | NC | - | 18 | NC | - |
| 6 | GND | Ground | 19 | NC | - |
| 7 | GND | Ground | 20 | NC | - |
| 8 | NC | - | 21 | 1PPS- | 1PPS (RS-485-) Differential Output |
| 9 | 1PPS+ | 1PPS (RS-485+) Differential Output | 22 | NC | - |
| 10 | TFD | Timing Fault Discrete (TFD) | 23 | GND | Ground |
| 11 | TOD1 | TOD1 (TTL) 5Vor 10V Output | 24 | 1PPS | 1PPS (TTL) 5Vor 10V Output |
| 12 | GND | Ground | 25 | GND | Ground |
| 13 | TOD2 | TOD2 (TTL) Output 5Vor 10V Output | | | |

For software assembly versions, refer to: (1204-SHxx, SP1xx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

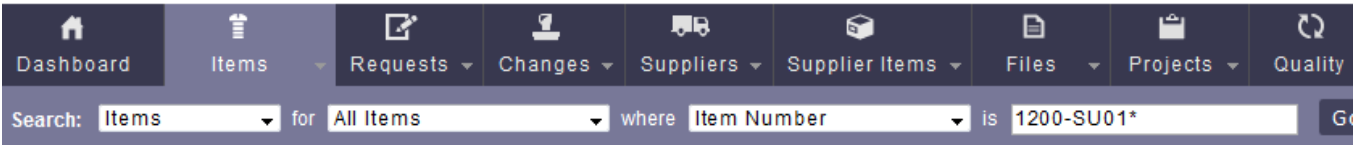
Detailed Stanag/havequick info on our website
<http://www.spectracomcorp.com/Desktopmodules/Bring2Mind/DMX/Download.aspx?EntryId=919&PortalId=0>

1204-11 Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- FPGA (firmware) for the 1204-11 card: rt_oc11_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|--------------------------------|---|--------------------|
| | 4.8.0 | 1.00 | Added support for this Option card (first release) | |
| | See note | 1.03 (current rev as of 5.8.5) | Note: Not sure at what version 1.03 was cut-in at, but it's in at least software version 5.2.1 through at least v5.8.5 | |
| | | | | |

Inputs: None
Outputs

Two (2) Stanag/havequick RS-485 differential outputs
Two (2) Stanag/havequick TTL (10V or 5V outputs)
Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

- Selectable Formats:
- STANAG 4246 HQI, HQII
 - STANAG 4372 HQIIA
 - STANAG 4430 XHQ, STM
 - ICD-GPS-060A HQ, BCD

Status Change (29 Jan 2019) per the Version 5.8.3 release notes”
[Added support for STANAG 4430 \(Extended HaveQuick Edition 1\)](#)

(1) 1PPS (non-isolated output)

Selectable TTL (10V or 5 V) OR RS-485 differential signaling levels

Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Known issues with 1204-11

1) Card reports the port is always **disabled**, even when it's really enabled

- Refer to Mantis case 2921
- Refer to Salesforce case 16075

Per Dave Sohn (10 Oct 2014) There is a resolved bug for that, which will appear in the next release. It is currently showing disabled regardless of the current state.

Timing Fault Discrete output (TFD):

Generate Timing Fault Discrete (TFD):

Enabled: The TFD signal uses the “**Threshold to activate**” value to provide the level of TFD.

Disabled: The TFD signal is always valid.

Threshold to activate TFD: If the TFD is activated, the user can select the TFOM value threshold. Below this value, the TFD is high, otherwise the TFD is low.

Bit Synchronization output (BS):

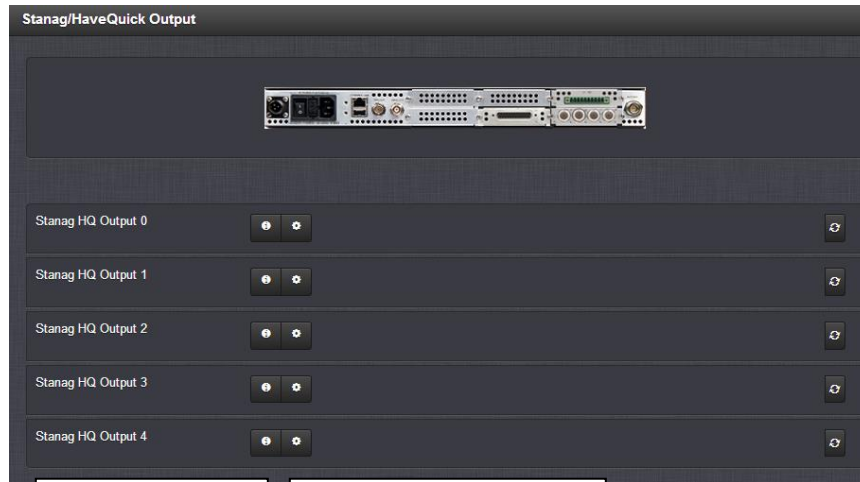
Generate Bit Synchronization (BS):

Enabled: The second STANAG signal (TOD 2) is used to send the BS (Bit Stream) signal used with STANAG 4430-STM. When BS is active, the configuration of TOD 2 is superseded and only used for BS.

Disabled: The second STANAG signal (TOD 2) can be used to send an independent TOD.

A) Newer browser (versions 5.1.2 and above)

Interfaces -> Stanag output page



Status ICONs

Configuration ICONs



Configurations
are on following
page

There are three tabs on this page: (Refer to Section 8 of the SecureSync manual for more information)

Setup tab

Configuration Examples tab: Contains configuration examples

SUB-D Connector Pin-out tab: Contains pin-out info

Setup -> Outputs -> Stanag output

Setup tab

- From the **Setup** tab page, you can access three sections:

1) General Settings Section

Level of Single-ended Signals: 10V or 5V can be selected for the TOD 1 and 1PPS Output.

Generate Timing Fault Discrete (TFD):

- Enabled: The TFD signal uses the “Threshold to activate” value to provide the level of TFD.
- Disabled: The TFD signal is always valid.

Threshold to activate TFD: If the TFD is activated, the user can select the TFOM value threshold. Below this value, the TFD is high, otherwise the TFD is low.

Generate Bit Synchronization (BS):

Enabled: The second STANAG signal (TOD 2) is used to send the BS (Bit Stream) signal used with STANAG 4430-STM. When BS is active, the configuration of TOD 2 is superseded and only used for BS.

Disabled: The second STANAG signal (TOD 2) can be used to send an independent TOD.

2) Time of Day Output Settings Section

TOD 1 & TOD 2: STANAG columns 1 and 2

Signature Control: Used to control when the signal will be present. This function allows the modulation to stop in certain situations.

Output Always Enabled: STANAG signal is present, even when SecureSync is not synchronized to its references.

Output Enabled in Holdover: STANAG signal is present unless the SecureSync is not synchronized to its references (Modulation is present while in the Holdover mode).

Output Disabled in Holdover: STANAG signal is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).

Output Always Disabled: No STANAG signal is present, even if any SecureSync input references are present and considered qualified.

TOD Format: The user-selectable format to be used. Available formats include:

- STANAG 4246 HQI
- STANAG 4246 HQII
- STANAG 4372 HQIIA
- STANAG 4430 STM
- STANAG 4430 XHQ
- ICD-GPS-060A BCD
- ICD-GPS-060A HQ

Status Change (29 Jan 2019) per the Version 5.8.3 release notes”

Added support for STANAG 4430 (Extended HaveQuick Edition 1)

Electrical Format: Selects signaling on either RS-485 or TTL (supporting up to 10V levels) signal lines.

Time Scale: Used to set the desired time scale (**UTC**, **TAI**, **GPS**, or **Local**).

Offset (ns): Provides the ability to account for STANAG Line (TOD1 and TOD2 independently) cable delays or other latencies in the STANAG output. Available Offset range is -500 to +500ms in 5ns steps.

3) 1PPS Output Settings Section

Signature Control: Used to control when the signal will be present. This function allows the modulation to stop in certain situations.

Output Always Enabled: STANAG signal is present, even when SecureSync is not synchronized to its references.

Output Enabled in Holdover: STANAG signal is present unless the SecureSync is not synchronized to its references (Modulation is present while in the Holdover mode).

Output Disabled in Holdover: STANAG signal is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).

Output Always Disabled: No STANAG signal is present, even if any SecureSync input references are present and considered qualified.

Offset (ns): Used to account for 1PPS cable delays or other latencies in the 1PPS output. Available Offset range is -500 to +500ms in 5ns steps.

Edge: The operator can select if the output signal is a rising or falling edge pulse.

Pulse Width: Configures the Pulse Width of the 1PPS output. The Pulse Width is entered and displayed in nanoseconds (the default Pulse Width is 200 milliseconds).

Electrical Format: Selects signaling on either RS-485 or TTL (supporting up to 10V levels) signal lines.

Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Classic Interface browser

Setup/Inputs

This card does not have inputs

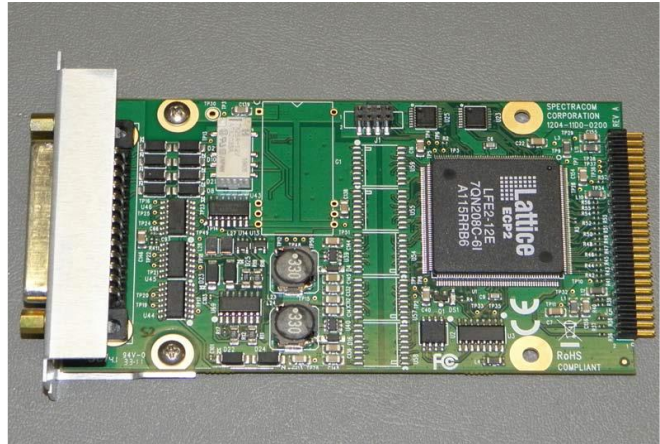
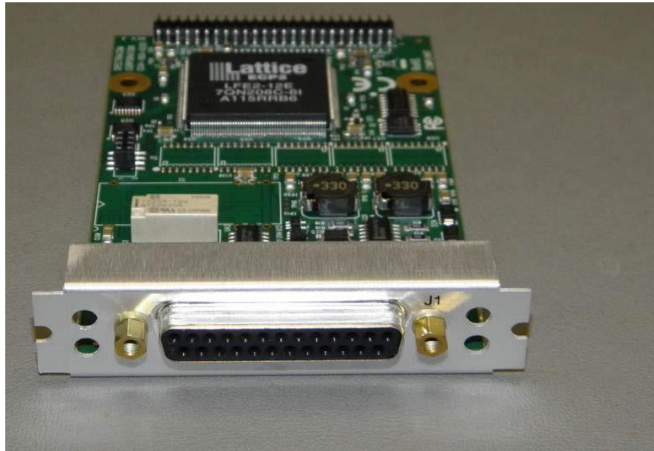
Status/Inputs

Status/Outputs

*** (1204-24 and 1204-1D) (2) Stanag input/ (1) 1PPS input

Note:

- 1204-24 is Galvanically isolated inputs
- 1204-1D is non-isolated inputs



Inputs only (no outputs)

Links

Link to good tutorial about Stanag: <I:\Marketing\ Sales Support Materials\Technical Notes & Briefs>

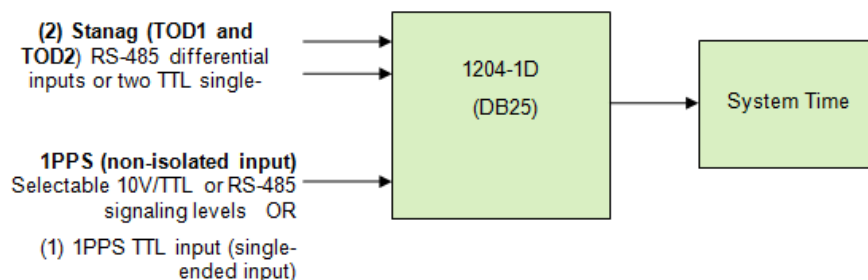
in SecureSync online user guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/Stanag_In.htm?Highlight=1204-1d

Schematic: (refer to 1204-01D0-F000) in Arena: https://app.bom.com/items/detail-spec?item_id=1202846036&version_id=10299091428&orb_msg_single_search_p=1

BOM (1204-01D0-F000): In Arena: https://app.bom.com/items/detail-spec?item_id=1202846036&version_id=10212763188&orb_msg_single_search_p=1&redirect_segno=5758374819

Block Diagram (1204-24 And 1204-1D)



Outputs: None

Inputs

(4) Stanag/havequick (non-isolated inputs)

Accepted Formats:

- STANAG 4246 HQI, HQII
- STANAG 4372 HQIIA
- STANAG 4430 XHQ, STM
- ICD-GPS-060A HQ, BCD

Status Change (29 Jan 2019) per the **Version 5.8.3** release notes”

Added support for STANAG 4430 (Extended HaveQuick Edition 1)

(1) 1PPS (non-isolated input)

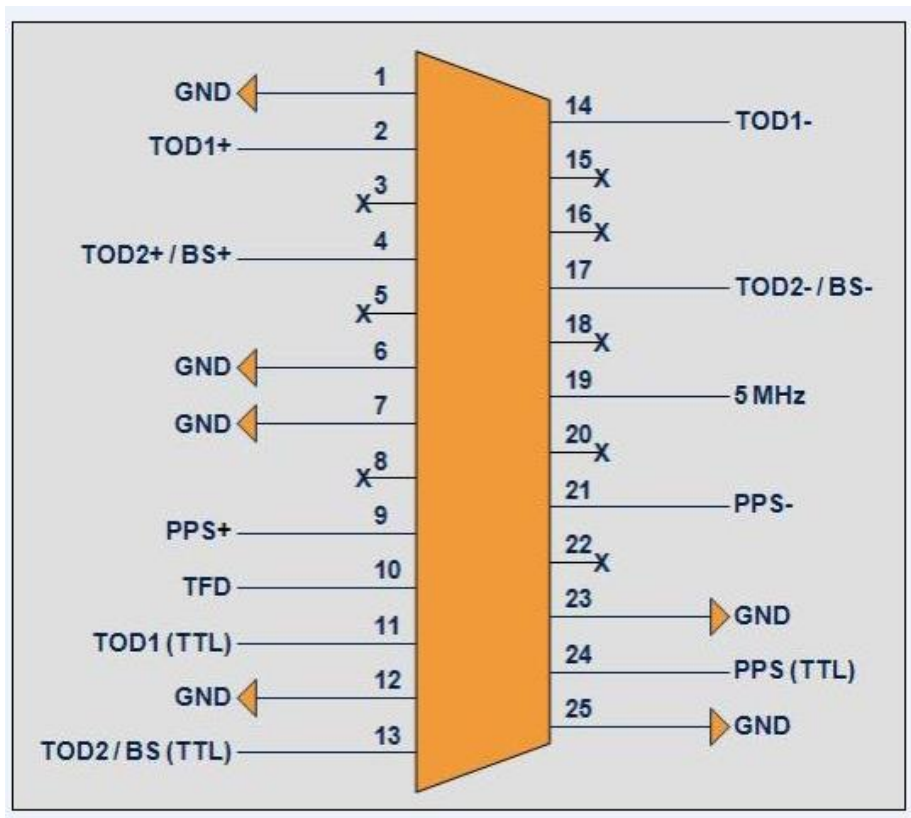
Selectable 10V/TTL or RS-485 signaling levels

Input impedance

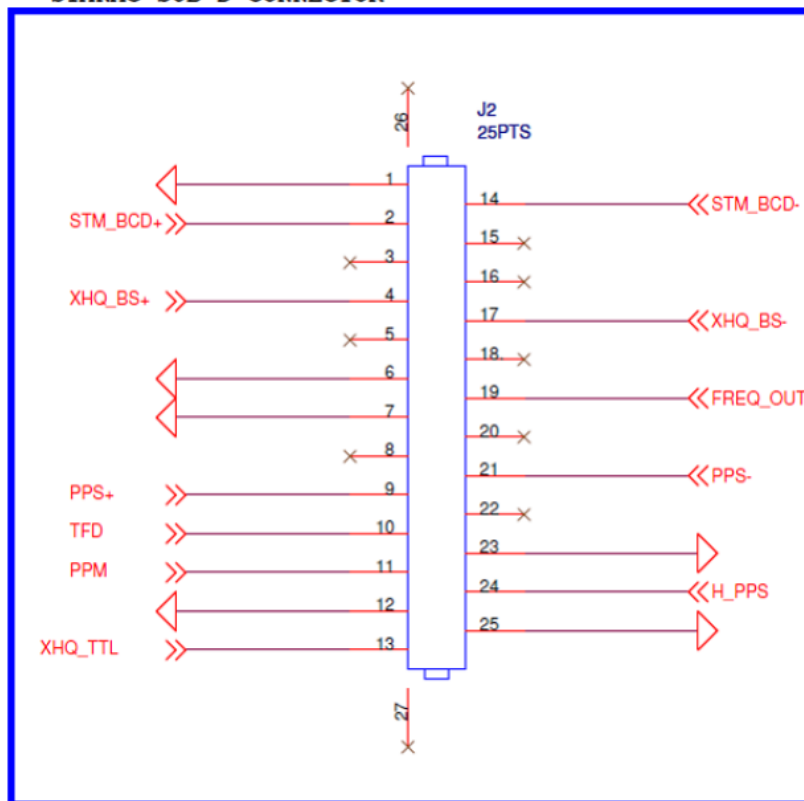
- **Per Ron Dries (13 May 2020)** Sylvain confirmed that one of the TODs is 10K Ohms and the other is 50 Ohms.

Pin-out information

Note: all input signals (no outputs available for this card)



STANAG SUB-D CONNECTOR

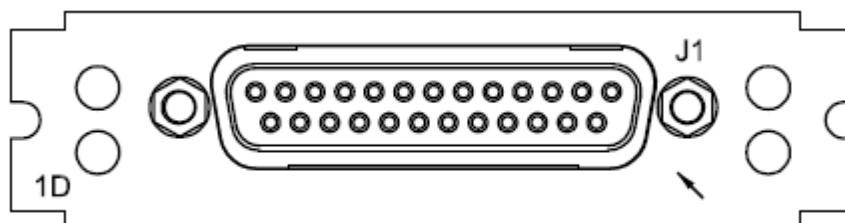


(2) Stanag (TOD1 and TOD2) RS-485 differential inputs in **light Green** and **dark Green**

(2) Stanag (TOD1 and TOD2) TTL single-ended inputs in **purple** and **dark purple**

(1) 1PPS (RS-485 Differential) input in **light Blue**

(1) 1PPS (TTL Single-ended) input in **dark Blue**



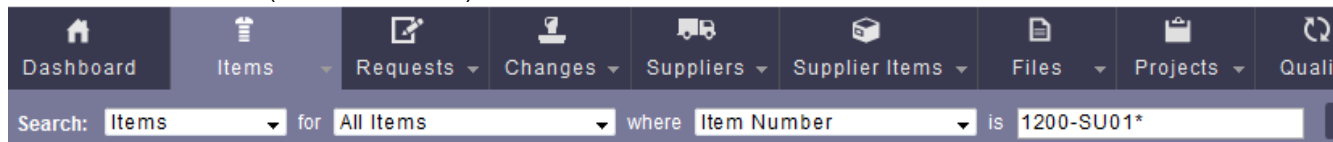
| Pin No. | Signal | Function | Pin No. | Signal | Function |
|---------|--------|-----------------------------|---------|--------|--------------------|
| 1 | GND | Ground | 14 | TOD1- | TOD1 RS-485- Input |
| 2 | TOD1+ | TOD1 RS-485+ Input | 15 | NC | - |
| 3 | NC | - | 16 | NC | - |
| 4 | TOD2+ | TOD2 RS-485+ Input | 17 | TOD2- | TOD2 RS-485- Input |
| 5 | NC | - | 18 | NC | - |
| 6 | GND | Ground | 19 | NC | - |
| 7 | GND | Ground | 20 | NC | - |
| 8 | NC | - | 21 | 1PPS- | 1PPS RS-485- Input |
| 9 | 1PPS+ | 1PPS RS-485+ Input | 22 | NC | - |
| 10 | TFD | Timing Fault Discrete (TFD) | 23 | GND | Ground |
| 11 | TOD1 | TOD1 TTL Input | 24 | 1PPS | 1PPS TTL Input |
| 12 | GND | Ground | 25 | GND | Ground |
| 13 | TOD2 | TOD2 TTL Input | | | |

1204-24 /1204-1D Firmware versions

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the 1204-24 and 1204-1B Option Card: rt_oc24_hw01_fpga.bin and rt_oc1b_hw01_fpga.bin

| ECN | System version | FPGA version reported | Change | approximate cut-in |
|-----|----------------------------|-----------------------|--|--------------------|
| | | 1.00 | Added support for this Option Card (first release) | |
| | ?? (See note to the right) | 1.04 | Note: Not sure at what version 1.04 was cut-in at, but it's in at least software version 5.2.1 | |
| | 5.4.0 | 1.05 | Fixed issue with registering BCD time (reported by SPAWAR San Diego as I recall). Note: v1.0.5 is still the latest rev, as of at least v5.8.5 | |

**Firmware/software

For Option Card software versions, refer to: (SP1B) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

Known firmware issues / Software updates

A) Software updates/issues associated with Stanag Option Cards

➤ Version 5.3.1

Issue with not registering BCD time (Dec, 2015)

Refer to Mantis 3190 and Salesforce cases 19816 and 19953

Fixed in update version 5.4.0 (FPGA version 1.05)

➤ Version 5.2.1

3. Access UI in STANAG 1204-24, 1204-25, 1204-11, 1204-1D Option cards. Change configuration parameters and click submit. UI will display "**error saving**"

- Fixed issue with saving configurations for STANAG option cards

- Refer to Mantis case 2990

4. “When he disconnects the antenna, he picks up the binary external time code. Everything works perfectly with SecureSync version 5.1.7. However, when he tries it with version 5.2.1, the STANAG modules no longer work”

- Refer to Salesforce case 18634 for Walt Washington/Elotek.

➤ **Version 5.2.0**

- Enhanced functionality, addressing a reported issue.

Issues

C) 5.2.0 version cannot change configuration to after clicking submit UI will display "error saving

- Refer to **Mantis case 2990**
- Affects 1204-11, 204-24, 1204-25 and 1204-1D Option cards.
- Will be fixed in version 5.2.1
- Potential work-around- configure them via the classic interface??

D) RAYTHEON issue: Timeserver jumps into the future (NTP distribution and PPS)

- Refer to **Mantis case 2909**:

B) Software updates associated with Havequick Option Cards

➤ **Version 5.2.0**

- Refer to **Mantis case 2813**: Fixed Havequick output display in web browser Status Summary panel, now correctly reporting the configured format and state
- Refer to **Mantis case 2942**: One output loses local clock setting when another output is configured.

➤ **Version 5.1.3**

1 second time error on output (found ~March 2014, in v5.1.2 software)

- Refer to Salesforce Case Number 13167 (<https://na8.salesforce.com/500C000000WRpIH>)
- Refer to Mantis Case Number 2742 (<http://cvsmantis.int.rolia.com/mantis/view.php?id=2742>)
- We were able to duplicate this here, with only one output.
- Fixed in the version 5.1.3 software update.

Havequick input (no GPS input)

- Loss/regain of GPS reception causes "QR hvq0" log entries to be asserted.

Sep 20 15:10:14 Timeserver2 Timeserver2: [system] 2013 263 15:10:14 000 QR hvq0 has lost communication.

Sep 20 15:10:15 Timeserver2 Timeserver2: [system] 2013 263 15:10:15 000 QR hvq0 has established communication.

Email from Dave Sohn (21 Jan 2014) If the GPS signal is disconnected or lost, these messages will appear and return. This is not a system alarm.

1204-24 Hardware changes

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |
| | | | | |

Outputs: None

Inputs

(5) Stanag/havequick (galvanically isolated inputs)

Formats:

- STANAG 4246 HQI, HQII
- STANAG 4372 HQIIA
- STANAG 4430 XHQ, STM
- ICD-GPS-060A HQ, BCD

Status Change (29 Jan 2019) per the **Version 5.8.3** release notes

“Added support for STANAG 4430 (Extended HaveQuick Edition 1)”

(1) 1PPS (non-isolated input)

Selectable 10V/TTL or RS-485 signaling levels

Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Input impedance

- **Per Ron Dries (13 May 2020)** Sylvain confirmed that one of the TODs is 10K Ohms and the other is 50 Ohms.

A) Newer web browser (versions 5.1.2 and above)

INTERFACES -> OPTION CARDS page of the browser

Three sections: (General Settings, Time of Day (TOD) input Reference Settings and 1PPS Input Configuration)

➤ **Refer to SecureSync online user guide:**

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/Stanag_In.htm?Highlight=1204-1d

The screenshot shows the STANAG In web interface. At the top, there is a header bar with the title "STANAG In". Below the header, there is a main content area. On the left side of the main content area, there is a "Status ICON" label pointing to a small icon. On the right side, there is a "Configuration ICON" label pointing to a small icon. Below these icons, there is a "Stanag HQ Input 0" label. A red arrow points from the "Configuration ICON" to a configuration window titled "Stanag HQ Input 0". This window contains three sections: "General Status", "Time of Day Inputs", and "1PPS Input".

General Status

| | |
|---------------------------------|-----------|
| Reference ID | Invq0 |
| Validity | TIME PPS |
| Use of Time Fault Discrete | Disabled |
| Time Fault Discrete State | TFD STATE |
| Use of Bit Synchronization (BS) | Disabled |
| Timescale | |
| Reference Selection | TOD 1 |

Time of Day Inputs

| | Time of Day 1 | Time of Day 2 |
|-----------------|----------------------------------|----------------------------------|
| Format | STANAG 4245 HQ I | STANAG 4246 HQ I |
| Electrical Type | RS485 | RS485 |
| Time Scale | Universal Coordinated Time (UTC) | Universal Coordinated Time (UTC) |
| Offset | 0 ns | 0 ns |
| Stanag TFCM | 0 | 0 |

1PPS Input

| | |
|-----------------------|--------|
| 1PPS Offset | 0 ns |
| PPS Edge | Rising |
| PPS Electrical Format | RS485 |

Configurations are on following page

Setup -> Inputs

Consists of three tabs:

- General settings
- Configuration tab (configuration examples)
- Sub-D Connector pin-out (pin-out info)

The screenshot shows the 'Stanag HQ Input 0' configuration window. It is divided into three main sections: General Settings, Time of Day inputs, and 1PPS Input. Annotations provide details for various fields.

General Settings

- Use of Time Fault Discrete:** Disabled
- Use of Bit Synchronization (BS):** Disabled
- Timescale:** UTC
- Reference Selection:** TOD 1
- TFD (Time Fault Discrete):** Enable/Disable
- BS (Bit Sync):** Enable/Disable
- Timescale:** for local time
- Select TOD 1 or TOD 2** (which TOD signal is used for synchronization)

Time of Day inputs

- TOD1 input** **TOD2 input**
- Time of Day 1** **Time of Day 2**
- Format:** (Dropdown menu)
- Electrical Type:** (Dropdown menu)
- Time Scale:** (Dropdown menu)
- Offset:** 0
- TOD Format:** The user-selectable format to be used. Available formats include:
 - STANAG 4246 HQI
 - STANAG 4246 HQII
 - STANAG 4372 HQIIA
 - STANAG 4430 STM
 - STANAG 4430 XHQ
 - ICD-GPS-060A BCD
 - ICD-GPS-060A HQ
 - DOD-STD-1399 BCD
- Electrical Type:** Selects synchronization to either RS-485 or TTL (supporting up to 10V levels) signal lines.

1PPS Input

- 1PPS Offset:** 0
- PPS Edge:** Rising
- PPS Electrical Format:** RS485
- 1PPS Offset:**
- PPS edge:** 1PPS Rising or Falling edge
- PPS Electrical:** Selects synchronization to either RS-485 or TTL (supporting up to 10V levels) signal lines.

Buttons: status, Submit

1) General Settings Section

0230514 (General Settings, Time of Day Reference Settings and 1PPS Reference Settings)

The following options can be managed from this section:

Reference ID: Name used to represent this input reference in the Reference Priority table

Use of Timing Fault Discrete (TFD):

Enabled: The TFD input signal is used to validate the STANAG input.

Disabled: The TFD input signal is ignored. By default, this option is **Disabled**.

Use of Bit Synchronization (BS):

Enabled: The second STANAG input (TOD 2) is used to receive the BS (Bit Stream) signal used with STANAG 4430-STM. When BS is active, the configuration of TOD2 is superseded and only used for BS.

Disabled: The second STANAG input (TOD 2) can be used to receive an independent TOD.

Reference Selection: (TOD 1 / TOD 2): Selects which TOD signal is used for synchronization.

2) Time of Day Reference Settings Section

The following options can be managed from this section:

TOD Format: The user-selectable format to be used. Available formats include:

- STANAG 4246 HAVE QUICK I
- STANAG 4246 HAVE QUICK II
- STANAG 4372 HAVE QUICK IIA
- STANAG 4430 Extended HAVE QUICK
- ICD-GPS-060A HAVE QUICK

Status Change (29 Jan 2019) per the Version 5.8.3 release notes"

Added support for STANAG 4430 (Extended HaveQuick Edition 1)

Electrical Format: Selects synchronization to either RS-485 or TTL (supporting up to 10V levels) signal lines.

Time Scale: Used to set the desired time scale (**UTC**, **TAI**, **GPS**, or **Local**).

Offset (ns): Provides the ability to account for STANAG Line (TOD1 and TOD2 independently) cable delays or other latencies in the STANAG input. Available Offset range is -500 to +500ms in 5ns steps.

3) 1PPS Reference Settings Section

Offset (ns): Used to account for 1PPS cable delays or other latencies in the 1PPS input. Available Offset range is -500 to +500ms in 5ns steps.

Edge: The operator can select if the output signal is a rising or falling edge pulse.

Electrical Format: Selects synchronization to either RS-485 or TTL (supporting up to 10V levels) signal lines.

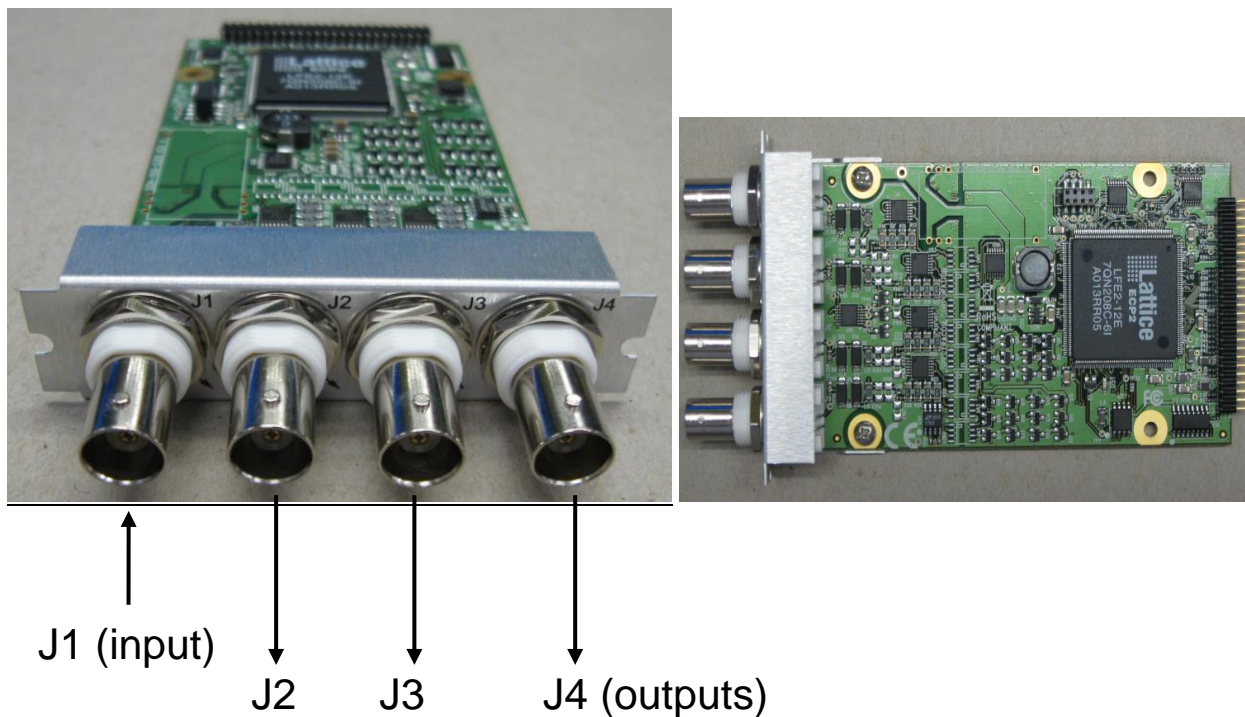
B) Classic Interface browser (versions 5.0.2 and below)

Setup/Outputs

Status/Inputs

Status/Outputs

***(1204-29) (1) input/3-output Havequick Option Card (TTL single-ended BNC)



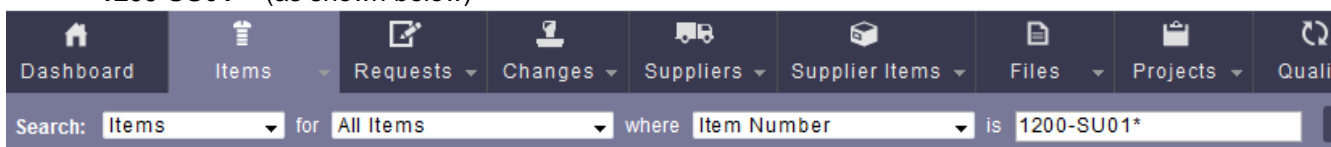
Schematic: (refer to 1204-0100-F000) [I:\New Released\PCB Documentation](#)

1204-29 Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the 1204-29 card: rt_oc29_hw01_fpga.bin

| Archive version | FPGA version reported | Change | approximate cut-in |
|-----------------|---|---|--------------------|
| 4.8.2 | 1.00 | Added support for this Option card (first release) | |
| See note | 1.02 (current rev as of at least v5.4.1) | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software version 5.2.1 | |

****Firmware/software**

For Option Card software versions, refer to: (SP1B) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

Known firmware issues / Software updates

A) Software updates/issues associated with Stanag Option Cards

➤ **Version 5.3.1**

Issue with not registering BCD time (Dec, 2015)

Refer to Mantis 3190 and Salesforce cases 19816 and 19953

➤ **Version 5.2.1**

5. Access UI in STANAG 1204-24, 1204-25, 1204-11, 1204-1D Option cards. Change configuration parameters and click submit. UI will display "**error saving**"

- Fixed issue with saving configurations for STANAG option cards
- Refer to Mantis case 2990

6. "When he disconnects the antenna, he picks up the binary external time code. Everything works perfectly with SecureSync version 5.1.7. However, when he tries it with version 5.2.1, the STANAG modules no longer work"

- Refer to Salesforce case 18634 for Walt Washington/Elotek.

➤ **Version 5.2.0**

- Enhanced functionality, addressing a reported issue.

Issues

A) 5.2.0 version cannot change configuration to after clicking submit UI will display "error saving

- Refer to **Mantis case 2990**
- Affects 1204-11, 204-24, 1204-25 and 1204-1D Option cards.
- Will be fixed in version 5.2.1
- Potential work-around- configure them via the classic interface??

B) RAYTHEON issue: Timeserver jumps into the future (NTP distribution and PPS)

- Refer to **Mantis case 2909**:

B) Software updates associated with Havequick Option Cards

➤ **Version 5.2.0**

- Refer to **Mantis case 2813**: Fixed Havequick output display in web browser Status Summary panel, now correctly reporting the configured format and state
- Refer to **Mantis case 2942**: One output loses local clock setting when another output is configured.

➤ **Version 5.1.3**

1 second time error on output (found ~March 2014, in v5.1.2 software)

- Refer to Salesforce Case Number 13167 (<https://na8.salesforce.com/500C000000WRpIH>)
- Refer to Mantis Case Number 2742 (<http://cvsmantis.int.rolia.com/mantis/view.php?id=2742>)

- We were able to duplicate this here, with only one output.
- Fixed in the version 5.1.3 software update.

Havequick input (no GPS input)

- Loss/regain of GPS reception causes “QR hvq0” log entries to be asserted.

Sep 20 15:10:14 Timeserver2 Timeserver2: [system] 2013 263 15:10:14 000 QR hvq0 has lost communication.

Sep 20 15:10:15 Timeserver2 Timeserver2: [system] 2013 263 15:10:15 000 QR hvq0 has established communication.

Email from Dave Sohn (21 Jan 2014) If the GPS signal is disconnected or lost, these messages will appear and return. This is not a system alarm.

1204-29 Hardware changes

For Option Card hardware versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.8.2 | | Added support for this Option card (first release) | |

Note: Software support for the Model 1204-29 started in Archive version 4.8.2.

Inputs

TTL compatible

Note: input is TTL compatible (it's not LVTTTL compatible for 3.3v logic)

Input connector (1): J1

Input termination: Was 50 ohms (ECN 2947 changes this to high impedance. See “ECNs” below)

Outputs

Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Output connectors (3): J2, J3 and J4

Output termination: Was 5.6 ohms (ECN 2947 changes this to 270 ohms. See “ECNs” below)

10K load impedance

- Refer to case 169070

customer report: ... have you reviewed my point about the 10K load impedance on the -10 board? If you provide a ICD-GPS-060A HQ output, the spec says 5k (maybe it was 6k) and you can parallel inputs as long as you do not go below 500 ohm. It seems you cannot be compliant to 060A with the 10K load spec. I estimated what I thought the -10

card would do with a 500 ohm load using the 1V at 50 ohm Jean observed. If my calculations were somewhat close, the it would likely drive 500 ohms but I would test it first. This concern is based purely on the spec as I do not have experience with what client systems typically present at their HQ input.

Per Dave Sohn (10 Sept 2019) Some more investigation.

The 1204-10 (and 1204-29) outputs cannot drive 50 ohms. They essentially have a 275 ohm series resistance on their output. Driving that through a 50 ohm will generate a significant drop in voltage. However, that isn't to say that it is really a 10 kohm impedance load driver. It will successfully drive lower impedance signals, but not to 50 ohms.

ECN Changes incorporated

ECN 2947 (June 2012):

- 1) Changes input impedance from 50 ohms to high impedance (10kohms).
- 2) Changes output impedance from 5.6 ohms to 270 ohms.

FAQ's if Model 1204-29 Option Card is not working:

Email from Dave Sohn (4/26/12)

Our ICD-GPS-060 HAVE QUICK signal was developed in accordance with ICD-GPS-060 Rev A (see attached starting at sheet 25). (refer to <http://www.navcen.uscg.gov/pdf/gps/ICD-GPS-060B.pdf>)

- Are you connecting to the input connector, J1 of the 1204-29 board?
- Is it a direct connection from your equipment to ours?
- Do you have extra termination on the signal? The 1204-29 input is already terminated into 50ohms.
- Can you "tee" the signal and check it on an oscilloscope before and after connection to our board? Does the signal look good?
- Can you check your output against one of our HAVE QUICK outputs set to ICD-GPS-060 HQ? Are they the same length?
- If you set the SecureSync output and input to ICD-GPS-060 HQ and connect them, Does the SecureSync go into sync against itself?

Setup/Inputs

Format: The user-selectable format to be used. Available formats include:

- STANAG 4246 HAVE QUICK I
- STANAG 4246 HAVE QUICK II
- STANAG 4372 HAVE QUICK IIA
- STANAG 4430 Extended HAVE QUICK

Status Change (29 Jan 2019) per the **Version 5.8.3** release notes"

Added support for STANAG 4430 (Extended HaveQuick Edition 1)

- ICD-GPS-060A HAVE QUICK

Time Scale: Used to set the desired time scale (UTC, TAI, GPS, or Local).

Offset (ns): Provides the ability to account for STANAG Line (TOD1 and TOD2 independently) cable delays or other latencies in the STANAG input. Available Offset range is -500 to +500ms in 5ns steps.

Setup/Outputs

Output Index: Correlates to the three BNC Output connectors on the HAVE QUICK module (left to right as viewed on the SecureSync back panel, where 1 is the left-most BNC connector).

Signature Control: Signature Control is used to control when the HAVE QUICK modulation is present.

No Signature Control: HAVE QUICK time code modulation is present, even when SecureSync is not synchronized to its reference (Modulation is present while in the Holdover mode).

Sync State Signature Control: HAVE QUICK time code modulation is present unless the SecureSync is not synchronized to its references (modulation is present while in the Holdover mode).

Ref State Signature Control: HAVE QUICK time code modulation is present unless the SecureSync references are not considered qualified and valid. (Modulation is not present while in the Holdover mode).

Output Disabled: No HAVE QUICK output modulation is present, even if the SecureSync references are present and considered qualified.

Format: Used to configure the formatting of the four available HAVE QUICK outputs. Available output formats include:

- STANAG 4246 HAVE QUICK I
- STANAG 4246 HAVE QUICK II
- STANAG 4372 HAVE QUICK IIA
- STANAG 4430 Extended HAVE QUICK
- ICD-GPS-060A HAVE QUICK

Time Scale: This option configures the time scale for the LED time display. The available options are UTC, TAI (Temps Atomique International), GPS and Local. UTC is also referred to as ZULU time. GPS is the raw GPS time as transmitted by the GPS satellites (as of April, 2011, GPS time is currently 15 seconds ahead of UTC time). If GPS or TAI time is used, then the proper timescale offsets must be set on the **Setup / Time**

Management page: Local timescale allows a Local Clock to apply a time offset for Time Zone and DST correction.

Local Clock: System Time may be configured as UTC time, but it might be desired to output the IRIG time as local time. With the Timescale field set to "Local", select the name of a previously created Local Clock. The Time Zone and DST rules, as configured in the Local Clock will be applied to the IRIG output data stream. Refer to Section " for more information on Local Clocks.

Offset: Provides the ability to account for HAVE QUICK cable delays or other latencies in the HAVE QUICK outputs. The Offset values are entered in nanoseconds (ns). The available Offset range is -500 to +500 ms.

HQ Output 0 ✕

| | |
|-------------------|-----------------------------------|
| Signature Control | Output Always Enabled ▾ |
| Format | STANAG 4246 HQ I ▾ |
| Timescale | UTC ▾ |
| Offset | <input type="text" value="0"/> ns |

Status ✓ Submit

Status ICON

HQ Output 0 ✕

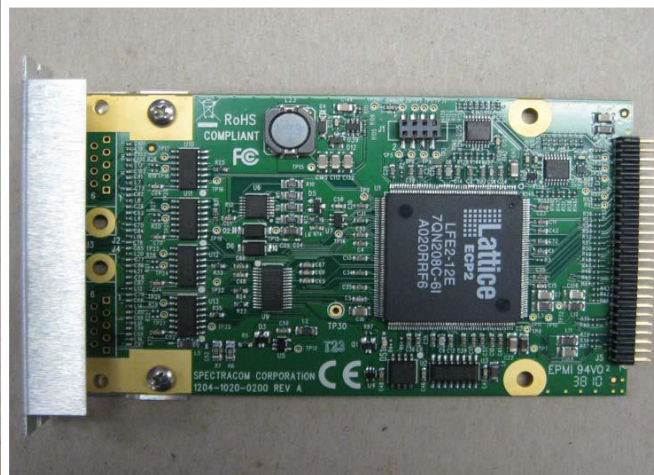
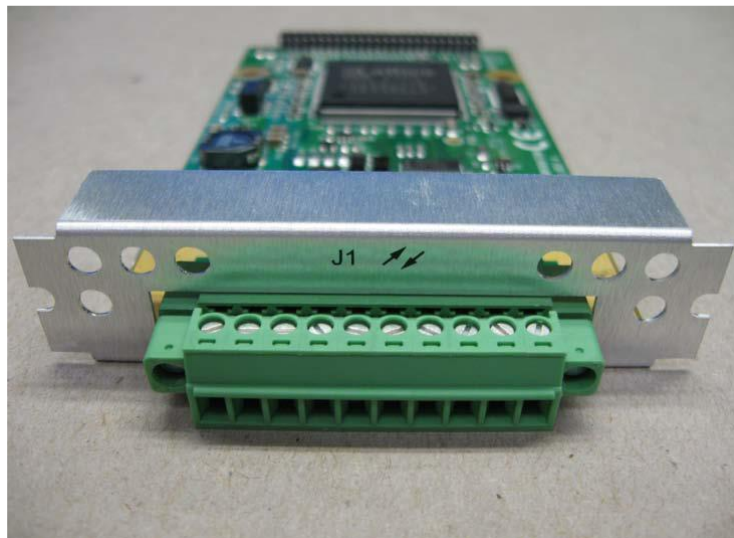
| | |
|-------------------|-----------------------|
| Signature Control | Output Always Enabled |
| Format | STANAG 4246 HQ I |
| Timescale | UTC |
| Offset | 0 ns |

Edit

***(1204-1B) (4) Havequick (RS-485 differential) outputs

Note:

- **Model 1204-10** is four (single-ended) havequick TTL outputs on BNC connectors
- **Model 1204-1B** is four RS-485 (differential) havequick outputs on terminal block connector



| Pin No. | Function | |
|---------|----------------------|----------------------|
| 1 | HaveQuick output 1 + | → Havequick output 1 |
| 2 | HaveQuick output 1 - | |
| 3 | Gnd | |
| 4 | HaveQuick output 2 + | → Havequick output 2 |
| 5 | HaveQuick output 2 - | |
| 6 | HaveQuick output 3 + | → Havequick output 3 |
| 7 | HaveQuick output 3 - | |
| 8 | Gnd | |
| 9 | HaveQuick output 4 + | → Havequick output 4 |
| 10 | HaveQuick output 4 - | |

Schematic: (refer to 1204-xxxx-F000) [!:\New Released\PCB Documentation](#)

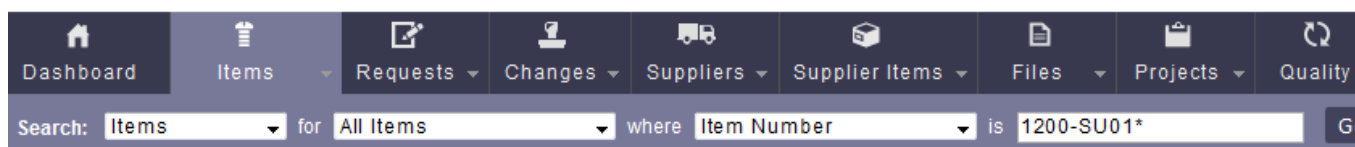
1204-1B outputs

1204-1B Firmware versions

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01**” (as shown below)



FPGA (firmware) for the 1204-1B card: rt_oc1b_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|---|---|--------------------|
| | | 1.00 | | |
| | See note | 1.03 (current rev as of at least v5.4.1) | Note: Not sure at what version 1.03 was cut-in at, but it's in at least software version 5.2.1 | |

**Firmware/software

For Option Card software versions, refer to: (SP1B) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

Known firmware issues / Software updates

A) Software updates/issues associated with Stanag Option Cards

➤ Version 5.3.1

Issue with not registering BCD time (Dec, 2015)

Refer to Mantis 3190 and Salesforce cases 19816 and 19953

➤ Version 5.2.1

7. Access UI in STANAG 1204-24, 1204-25, 1204-11, 1204-1D Option cards. Change configuration parameters and click submit. UI will display "**error saving**"

- Fixed issue with saving configurations for STANAG option cards
- Refer to Mantis case 2990

8. "When he disconnects the antenna, he picks up the binary external time code. Everything works perfectly with SecureSync version 5.1.7. However, when he tries it with version 5.2.1, the STANAG modules no longer work"
- Refer to Salesforce case 18634 for Walt Washington/Elotek.
- **Version 5.2.0**
 - Enhanced functionality, addressing a reported issue.
- Issues**
 - C) 5.2.0 version cannot change configuration to after clicking submit UI will display "error saving"**
 - Refer to **Mantis case 2990**
 - Affects 1204-11, 204-24, 1204-25 and 1204-1D Option cards.
 - Will be fixed in version 5.2.1
 - Potential work-around- configure them via the classic interface??
 - D) RAYTHEON issue: Timeserver jumps into the future (NTP distribution and PPS)**
 - Refer to **Mantis case 2909**:
- B) Software updates associated with Havequick Option Cards**
 - **Version 5.2.0**
 - Refer to **Mantis case 2813**: Fixed Havequick output display in web browser Status Summary panel, now correctly reporting the configured format and state
 - Refer to **Mantis case 2942**: One output loses local clock setting when another output is configured.
 - **Version 5.1.3**
 - 1 second time error on output (found ~March 2014, in v5.1.2 software)**
 - Refer to Salesforce Case Number 13167 (<https://na8.salesforce.com/500C00000WRpIH>)
 - Refer to Mantis Case Number 2742 (<http://cvsmantis.int.rolia.com/mantis/view.php?id=2742>)
 - We were able to duplicate this here, with only one output.
 - Fixed in the version 5.1.3 software update.

Havequick input (no GPS input)

- Loss/regain of GPS reception causes "QR hvq0" log entries to be asserted.

Sep 20 15:10:14 Timeserver2 Timeserver2: [system] 2013 263 15:10:14 000 QR hvq0 has lost communication.

Sep 20 15:10:15 Timeserver2 Timeserver2: [system] 2013 263 15:10:15 000 QR hvq0 has established communication.

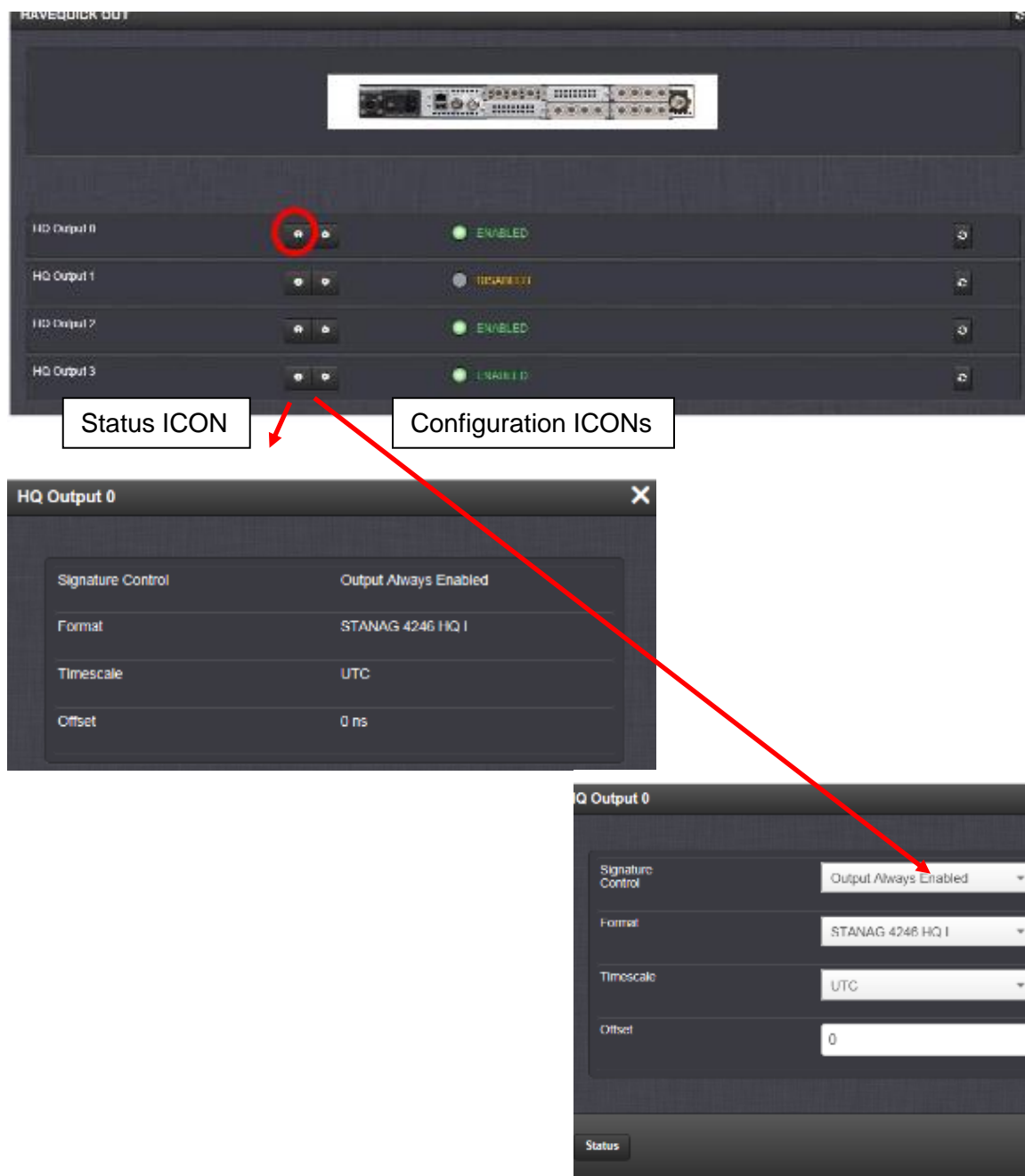
Email from Dave Sohn (21 Jan 2014) If the GPS signal is disconnected or lost, these messages will appear and return. This is not a system alarm.

1204-1B Hardware changes

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |

A) Newer browser (versions 5.2.0 and above)



Format: The user-selectable format to be used. Available formats include:

- STANAG 4246 HAVE QUICK I
- STANAG 4246 HAVE QUICK II
- STANAG 4372 HAVE QUICK IIA
- STANAG 4430 Extended HAVE QUICK

Status Change (29 Jan 2019) per the **Version 5.8.3** release notes”

Added support for STANAG 4430 (Extended HaveQuick Edition 1)

- ICD-GPS-060A HAVE QUICK

B) Classic interface browser

Setup/Inputs/HAVEQUICK

This card does not have inputs

Setup/Outputs/HAVEQUICK

OUTPUTS SETUP - HAVEQUICK (SLOT1)

| Output Index | Signal Control | Format | Time Scale | Local Clock | Offset |
|--------------|----------------------|--------------------------------|------------|-------------|--------|
| 1 | No Signature Control | Extended HaveQuick STANAG 4430 | UTC | | 0 |
| 2 | No Signature Control | Extended HaveQuick STANAG 4430 | UTC | | 0 |
| 3 | No Signature Control | Extended HaveQuick STANAG 4430 | UTC | | 0 |
| 4 | No Signature Control | Extended HaveQuick STANAG 4430 | UTC | | 0 |

HaveQuick I STANAG 4246

HaveQuick II STANAG 4246

HaveQuick IIA STANAG 4372

Extended HaveQuick STANAG 4430

ICD-GPS-060A HaveQuick

Status/Inputs/HAVEQUICK

This card does not have inputs

Status/Outputs/HAVEQUICK

OUTPUTS STATUS - HAVEQUICK (SLOT1)

| Output Index | Signature Control | Offset | Format | Timescale |
|--------------|----------------------|--------|--------------------------------|-----------|
| 1 | No Signature Control | 0 | Extended HaveQuick STANAG 4430 | UTC |
| 2 | No Signature Control | 0 | Extended HaveQuick STANAG 4430 | UTC |
| 3 | No Signature Control | 0 | Extended HaveQuick STANAG 4430 | UTC |
| 4 | No Signature Control | 0 | Extended HaveQuick STANAG 4430 | UTC |

Status/Inputs
Status/Outputs

PTP Option Cards (1204-12 1204-32 and 1204-3B)

General PTP information for all PTP Option Cards

ITU-T Standards for PTP (such as SyncE)

- Refer to **PTP** section of: <..\SecureSync Option Card information.pdf>
- Refer also to the **"ITU-T"** section of <..\CustomerServiceAssistance.pdf>

Examples

A) PTP Telecom profile

- G.826x (G.8265.1, G.8275.1/G.8275.2)

B) Frequency sync

- G.826x (G.8260, G.8261, G.8262, G.8263, G.8264, G.8265)

A) Phase/Time Sync

- G.827x (G.8271, G.8272, G.8273, G.8275)

Per Dave Sohn (6 Oct 17) Our Rb SecureSyncs with GPS and the 1204-32 cards can be configured to operate according to the G.826x specs. We do not have compatibility with the G.827x specs

PTP remains Clock Class 6 and continues being useable after a Halt command/Halt-Shutdown

Refer to Salesforce case 24195

- When a Halt or Halt/Shutdown is performed, the Network Processor Software (NPS) stops running (the web browser/CLI/ front panel display, NTP etc all stop working). However, the KTS timing system continues running after a Halt command has been performed.
- Because the Timing System continues to operate after a Halt, unless the SecureSync is using NTP as its input (NTP stops running on a Halt), the SecureSync can remain in sync and Option Cards can continue providing outputs.

For example, the PTP Option Cards can continue indicating they are Clock Class 6 and providing useable PTP time stamps after performing a Halt command,

Email Keith sent to NASA: Your understanding of the Halt command is correct. With the exception of using NTP as the only input reference for the unit's synchronization (when using inputs such as either GPS or IRIG), the oscillator is still being disciplined and the rest of the timing functionality is still fully operational (the PTP card is still providing accurate and useable time) after the Halt has been performed.

Underlying Operating system/software (IP stack) for both the 1204-12 and 1204-32 cards

Q What is the underlying PTP daemon software?

A Reply from Keith (2 Jul 15) The SecureSync has two available PTP option cards (the Model 1204-12, 10/100 card and the Model 1204-32, 10/100/1000 card). Both of these PTP Option Cards use proprietary/embedded software.

Specifically

- The Model 1204-32 PTP card uses an IP stack from Korusys in the United Kingdom (<http://www.korusys.com/>)
- The Model 1204-12 PTP card uses an IP stack from the University of Zurich, Switzerland

*PTPd, Timekeeper and other PTP clients

- Refer to the timing board assistance document

**PTP Profiles (Default, Power Profile, Telecom and SMPTE2059 profile)

- A PTP profile is a set of required options, prohibited options, and the ranges and defaults of configurable attributes.”
- **Power Profile** (C37.238-2011). Profile for the Power Industry
- Telecom Profile for frequency synchronization (recommendation ITU-T G.8265.1) (G8265.1)
Refer to: <http://www.itu.int/rec/T-REC-G.8265.1/en>

Q. Does the SecureSync-PTP support power profile and telecom profile?

A. **reply from Denis Reilly (6 May 13)** We do not fully support either Power or Telecom profile.

A) Power profile (C37.238-2011)

- Not supported with either the 1204-12 or the 1204-32 cards.

B) Telecom profile (ITU-T G.8265.1)

- Not supported with the 1204-12 10/100 PTP card.
- IS supported with the 1204-32 GB PTP card.

Q. Do we support The Telecom profile (referring to the 1204-12 10/100 card; not the 1204-32 GB PTP card)

A. **(From Sam Otto)** Our PTP configurations are not aligned with specific profiles including Telecom. Product management felt it was best and less restrictive if each customer has the capability to configuring PTP.
Email from Denis Reilly (24 July 13) We can get more specific, though, on what we do support. Our Unicast support is modeled on what is in the Telecom profile, for instance – the Unicast Negotiation comes straight out of G.8265.1.

I took a few minutes to check, and it turns out that most of the Telecom Profile bits that the 10/100 board is missing pertain to the Slave only, so the Gb Master-Only card will be better in that respect.

Your answer is fine, but I think we get this question often enough that we should prepare a more complete answer for customers who request it.

A **Second Email from Denis (31 July 2013)** We do not implement the full ITU-T G.8265.1 Telecom profile on the current 10/100 PTP Master/Slave card.

In particular, we don't support the Alternate BMCA of Section 6.7 of 8265.1, nor the Additional Protection Functions of Section 6.8. We also don't support Annex A fully.

We do support the rest of the profile, and in particular the Unicast Message Negotiation, which may be enough for some customers. But we can't claim we are fully compliant.

A Response to Denis's email above- from Gilles Boime to Klaus,

I synthesize the information about Mikhail requests.

For SecureSync 1204-12 100BaseT interface card:

We implement the Telecom profile in conformance with ITU-T G.8265.1 recommendation in Master only mode and slave only mode.

We have a restriction that we support only BMCA in conformance with IEEE1588v2 section and not the Alternate BMCA of section 6.7 of G.8265.1

The other restriction is that we support IEEE1588v2 clock class code as detailed in section 8.12.5.1 of SecureSync instruction manual and don't support the specific G.8265.1 section 6.7.3.1 table 1.

We support the G.8265.1 Appendix 1 mixed unicast/multicast mode which is an added option to the main recommendation. When master, the unit can grant up to 128 unicast contracts. That means our master can handle up to 128 unicast slaves on the same time.

For SecureSync 1204-32 1G interface card:

We implement the Telecom profile in conformance with ITU-T G.8265.1 recommendation in Master only mode.

We support the G.8265.1 Appendix 1 mixed unicast/multicast mode which is an added option to the main recommendation

As a master, the unit can grant up to 4000 unicast contracts. That means our master can handle up to 4000 unicast slaves on the same time.

I ask Bill (Glase) to deliver any complement if needed about 1204-32 unit under development.

C) ITU-T Standard G.8275.1/ G.8275.2 (PTP “Telecom profile” for phase/time synchronization with full timing support from the network)

D) IEEE 802.1AS profile (PTP Timing and Synchronization for time-sensitive applications)

- This is a PTP Standard for Timing and Synchronization of time-sensitive applications (such as for audio and video across LANS where transmission delays are symmetrical)
- As of at least Jan, 2020, we don't support this PTP standard with either of the PTP Option Cards (1204-12 or 1204-32).

Email from Dave L to a customer (3 Jan 2020) "I was able to confirm the SecureSync PTP does not support the IEEE 802.1AS Profile."

Earlier Email from Dave Sohn to Josh (18 Nov 16): We do not have support for 802.1AS with our PTP offering, and it isn't on our roadmap at this time. What is the size of the opportunity?

Per <http://www.ieee802.org/1/pages/802.1as.html>

The full title of this PAR is "Standard for Local and Metropolitan Area Networks - Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks".

This standard specifies the protocol and procedures used to ensure that the **synchronization requirements are met for time sensitive applications, such as audio and video, across Bridged and Virtual Bridged Local Area Networks consisting of LAN media where the transmission delays are fixed and symmetrical**; for example, IEEE 802.3 full duplex links. This includes the maintenance of synchronized time during normal operation and following addition, removal, or failure of network components and network reconfiguration. It specifies the use of IEEE 1588 specifications where applicable in the context of IEEE Stds 802.1D and 802.1Q. Synchronization to an externally provided timing signal (e.g., a recognized timing standard such as UTC or TAI) is not part of this standard but is not precluded.

This standard enables stations attached to bridged LANs to meet the respective jitter, wander, and time synchronization requirements for time-sensitive applications.

Email from Denis Reilly to Dave L (6 Jan 2020) I don't believe 802.1AS support will require different hardware, it's mainly a software change to support a slightly different PTP state machine and a few other messages. In order to interoperate on a 802.1 TSN network, we would also need enough knowledge of the other TSN protocols in order to know when to transmit. Our internal Masterpiece stack does not have this support. The open-source linuxptp only has support as an "end-station", which I assume means it can only be used as a slave.

I've found information on the Cisco IE-4000 switch here:

<https://www.cisco.com/c/en/us/products/collateral/switches/industrial-ethernet-4000-series-switches/datasheet-c78-733058.html>

and I see that it supports both "vanilla" IEEE1588 v2 and 802.1AS. Perhaps the customer can use the Default Profile for this switch.

E) SMPTE2059 profile

- Refer to Salesforce Case **237103** (June 2020)
- Not supported and have not heard any plans to support it.

Delay mechanisms

Peer to peer (P2P) and End to End (E2E) Delay Mechanisms

Is there a downside to using one method vs. the other (P2P versus E2E)? From your documentation, it seemed like P2P was preferred?

A. **Reply from Denis Reilly:** P2P can be better, because in theory you are measuring the delay of each path separately, which will minimize problems if packets take different paths. But this requires that all your network elements in the path know how to exchange peer delay messages. I don't think your equipment can do that.

Given your network topology, I don't think it will matter for you, but it's my experience that E2E is a bit more common, and would probably interoperate with more of the Slaves that are available right now

A) End to End (E2E) mode:

- Measures the path delay as a total value between Master and Slave
- Uses delay request and delay response messages.
- Required in 1204-32 (doesn't support p2P in any version)
- Available as a selection in 1204-12, starting in 4.8.0

B) Peer to Peer (P2P) mode (required/used in the power profile instead of using E2E)

- Measures the path delays as individual delays between each host (measures network segments individually) and then combines the values for a total. Provides additional accuracies. P2P can be better, because in theory you are measuring the delay of each path separately, which will minimize problems if packets take different paths. But this requires that all of your network elements in the path know how to exchange peer delay messages
- Instead of using delay request/delay responses, every network devices sends peer delay requests and every device receives peer delay responses

Notes from Denis, about P2P mode:

- 1) Every network device, from the PTP Master to the PTP Slave. has to support P2P mode, to use P2P mode
- 2) Every network device in P2P mode sends peer delay requests and peer delay responses (bi-directional)

Summary

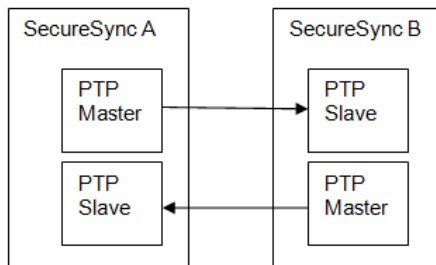
- **All Spectracom PTP products** (1204-12, 1204-32, TimeKeeper software – including the Timekeeper option for SecureSync) **support End to End delay mechanism.**
- As of at least April, 2016, the **Model 1204-12** 10/100 PTP card **is the only available product P2P (Peer to To-Peer) delay mechanism** (added in version 4.8.0, so this is the minimum version which must be installed)
 - The 1204-32 does not support P2P, and I'm not aware of any plans for it to be added to this product (it only supports the telecom profile- not the power profile which uses P2P).

*****“Peering together” of two SecureSyncs/TSync boards using PTP (using PTP as a backup reference on more than one SecureSync)**

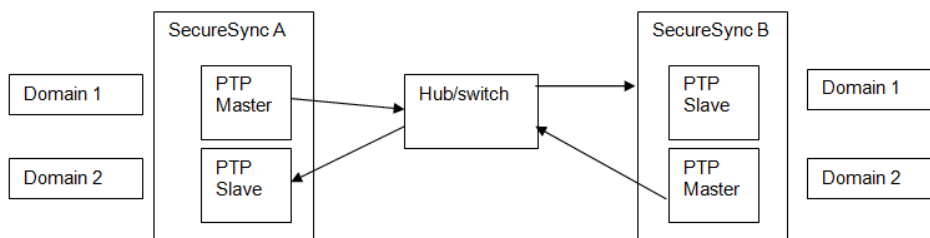
It may be desired to have a PTP Master and a PTP Slave in two or more units, with GPS or other input reference being the primary input for all devices. Then, if the primary reference happens to be lost, that particular device can then get PTP packets from the PTP module (configured as a Master) in the other unit, via the PTP Module configured as a PTP Slave in this unit. And the opposite also being the case (one can get time via PTP from the other and vice versa).

This can be done in one of two ways:

- C) Two Crossover cables:** Use a cross-over network cable from the PTP Master of one SecureSync to the PTP slave of the other SecureSync. Then use another network cross-over cable from the other PTP Master directly to the other PTP Slave card.



- D) Same network/different domains:** The multiple PTP Masters and PTP Slaves can be connected to the same network. Configure one set of PTP Master / PTP Slave to be on one PTP domain number (“1”). Then configure the other PTP Master / PTP slave pair to be on another PTP Domain number (“2”).



****Agilent LXI (PTP Management API interface- PTP Management Message packet)**

- Refer to Salesforce Case 7055.
- As of at least Aug 2017, we still do not support Management messages with any of our products. We just ignore/drop these packets.
- Agilent LXI Appears to be an API interface for Test and Measurement equipment.
- As of at least Oct 2014, we do not support LXI commands.
- Link to LXI Device Specification that Denis Reilly found (9 Jan):
<\\rocfnp01\idrivedata\Customer Service\PTP\LXI Device Specification 2011 rev 1.4.pdf>

Q I'm trying to send the unit PTP management messages, but it doesn't seem to respond. Is there somewhere that we have to enable processing of PTP management messages?

A Reply from Keith (31 Aug 17) For your reference, the Spectracom SecureSync's two PTP modules (Models 1204-12 and 1204-32) do not support management messages. So, there is no way to enable this VERY seldom requested (I recall only one other previous request from several years ago, for this functionality to be available), and often not supported in PTP slaves, function in the SecureSyncs,

I am not aware of any plans, at this time, for this functionality to be added to the 1204-32 Gb PTP card (as the 1204-12 PTP card is discontinued, I highly suspect it will never be added to this particular earlier Card). However, I will forward your desire to have this function over to our SecureSync Product Manager for his review/consideration for a possible addition sometime in the future.

In some cases (such as with very limited requests, such as this one is) we have implemented newer capabilities when the customer was willing to help fund the development via an NRE fee. If this is something that you (and our SecureSync Product Manager) is interested in possibly doing, please let Sadie know. She can then work directly with him directly to see if this would be possible (based on availability of Engineering resources, for instance) and if so, what the associated NRE fees would be for this development.

LXI

Q. I am currently working with one of your SecureSync units. I am sending PTP management packets to the unit but the unit does not seem to respond. Does the SecureSync reply to PTP management packets (for example, "GET Default Dataset")?

A. Keith's email to Denis Reilly (2 Jan 2013): From what I could gather, LXI appears to be an Agilent-based API interface for Test/Measurement devices. As far as I am aware, we do not currently support this APIU interface. I wanted to confirm this belief with you, before I respond to the customer.
From the link: <http://cp.literature.agilent.com/litweb/pdf/5989-6147EN.pdf>

LAN eXtensions for Instrumentation (LXI) is a measurement platform based on widely used standards such as Ethernet (IEEE802.3 standard), TCP/IP, Web browsers and IVI drivers. LXI combines the measurement functionality and PC-standard I/O connectivity of standalone instruments with the modularity and compact size of plug-in cards—but without the size or cost of a cardcage.

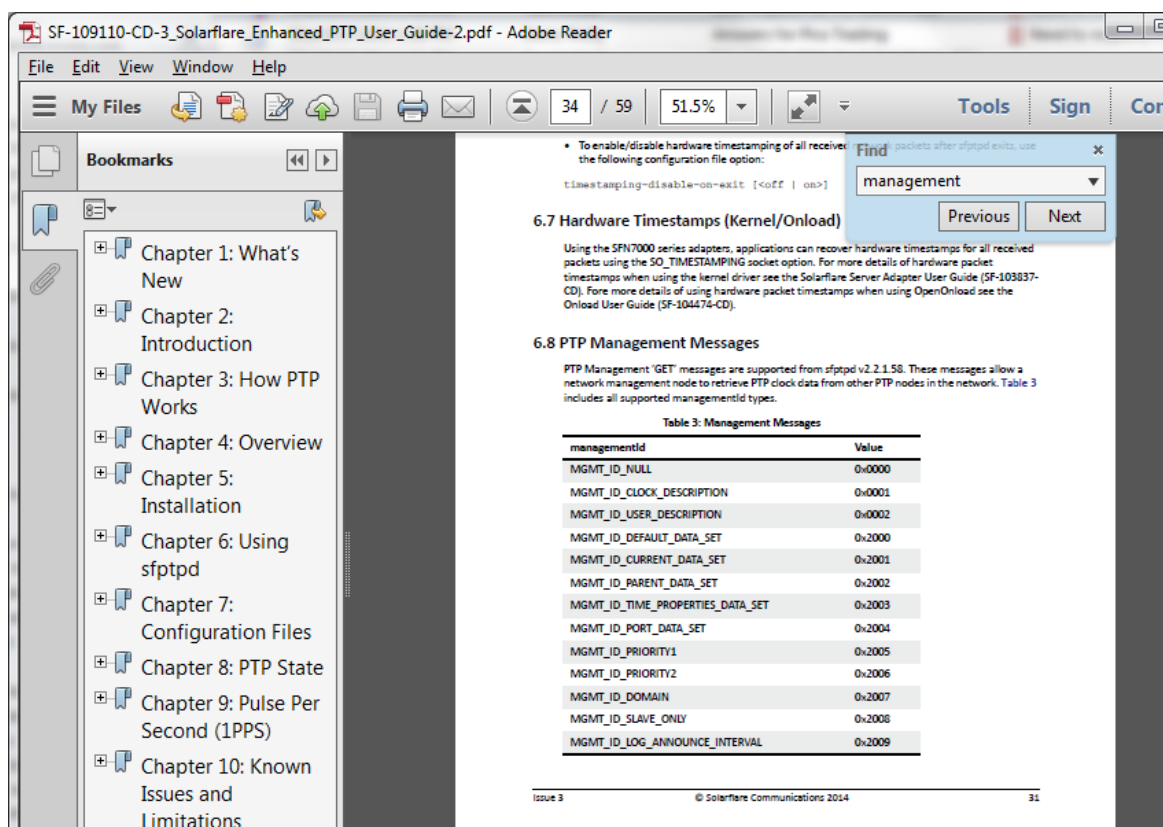
Programmatic Interface

Because the LXI standard requires that all devices have an Interchangeable Virtual Instrument (IVI) driver, it allows you to use whichever programming language or development environment you prefer. IVI-COM and IVI-C are well-established industry standard drivers that instrument makers supply with their products.

Email from Denis Reilly (9 Jan 2013)

I found the LXI specification, and I believe LXI management messages are the same thing as IEEE 1588 management messages. At least, the Spec makes reference to IEEE 1588 management messages several times, with no apparent reference to any management protocol of its own. 1588 is an integral part of LXI so it makes sense to me. I am attaching the spec here, and also putting it on Sharepoint in the General PTP directory.

List of PTP Management commands (from a Solarflare manual)



In the case of an error in the execution of a management message, a management error status TLV is to be returned as defined in 15.5.4.

“Custom” Management messages

- IEEE specs provide a designated area in Management messages for “custom” Management messages
- Wireshark/PCAP doesn't recognize the custom info, so it marks the custom Management packets as “Malformed Packet”

Note: PTP Clients that support Management packets but not the custom message received will send an Error message to the PTP Multicast address when they receive a custom message that wasn't intended for it to understand. Refer to the example response further below regarding TimeKeeper software customer Management message.

A) FSMLabs Timekeeper custom Management Message for reporting its status

- Info field- “Management (unknown management ID 53249 (GET [malformed packet])”
- Example Timekeeper custom Management message from a PTP Client running Timekeeper below:

| | | | | | |
|----------------|-------------|-------|--|-------|-------|
| 10.105.110.117 | 224.0.1.129 | PTPV2 | 112 Management (Unknown management Id 53249) GET[Malformed Packet] | False | 53249 |
| 10.105.110.117 | 224.0.1.129 | PTPV2 | 112 Management (Unknown management Id 53249) GET[Malformed Packet] | False | 46209 |

| | | | | | |
|-----|--|--|--|--|--|
| !!! | | | | | |
|-----|--|--|--|--|--|

```

# Frame 59580: 112 bytes on wire (896 bits), 112 bytes captured (896 bits) on interface 0
# Ethernet II, Src: 00:1c:73:1f:55:4e (00:1c:73:1f:55:4e), Dst: IPv4mcast_01:81 (01:00:5e:00:01:81)
# Internet Protocol Version 4, Src: 10.105.110.117 (10.105.110.117), Dst: 224.0.1.129 (224.0.1.129)
# User Datagram Protocol, Src Port: 320 (320), Dst Port: 320 (320)
# Precision Time Protocol (IEEE1588)
  0000 .... = transportSpecific: 0x00
    ...0 .... = V1 Compatibility: False
    .... 1101 = messageId: Management Message (0x0d)
    .... 0010 = versionPTP: 2
    messageLength: 70
    subdomainNumber: 0
  # flags: 0x0000
    0... .... = PTP_SECURITY: False
    .0... .... = PTP profile Specific 2: False
    ..0... .... = PTP profile Specific 1: False
    ...0... .... = PTP_UNICAST: False
    .... .0... .... = PTP_TWO_STEP: False
    .....0 .... = PTP_ALTERNATE_MASTER: False
    ..... .0... .... = FREQUENCY_TRACEABLE: False
    ..... ..0 .... = TIME_TRACEABLE: False
    ..... ...0... = PTP_TIMESCALE: False
    ..... ....0... = PTP_UTC_REASONABLE: False
    ..... .....0... = PTP_LI_59: False
    ..... ....0... = PTP_LI_61: False
  # correction: 0.000000 nanoseconds
    correction: Ns: 0 nanoseconds
    correctionSubNs: 0.000000 nanoseconds
    ClockIdentity: 0x000f53ffffe0d1a2c
    SourcePortID: 0
    sequenceId: 46209
    control: Unknown (127)
    logMessagePeriod: 0
    targetPortIdentity: 0xffffffffffffff
    targetPortId: 65535
    startingBoundaryHops: 10
    boundaryHops: 10
    .... 0000 = action: GET (0)
    tlvType: Management (1)
    lengthField: 22
    managementId: Unknown (53249)
# [Malformed Packet: PTP]
# [Expert Info (Error/Malformed): Malformed Packet (Exception occurred)]
# [Malformed Packet (Exception occurred)]
# [Severity level: Error]
# [Group: Malformed]

```

- Example Error message from a PTP Client not running Timekeeper that received a TimeKeeper custom Management message being sent out to the multicast address.
- **Per Michel (22 Sept 2014)** The malformed Management GET packets (sent by 10.105.110.117 and 10.105.110.119) have no impact because the master is able to parse and reject them (because these packets are not so malformed).

Info field: “Management Error Message (No_Such_ID)”

```

# Frame 59580: 112 bytes on wire (896 bits), 112 bytes captured (896 bits) on interface 0
# Ethernet II, Src: 00:1c:73:1f:55:4e (00:1c:73:1f:55:4e), Dst: IPv4mcast_01:81 (01:00:5e:00:01:81)
# Internet Protocol Version 4, Src: 10.105.110.117 (10.105.110.117), Dst: 224.0.1.129 (224.0.1.129)
# User Datagram Protocol, Src Port: 320 (320), Dst Port: 320 (320)
# Precision Time Protocol (IEEE1588)
  0000 .... = transportSpecific: 0x00
    ...0 .... = V1 Compatibility: False
    .... 1101 = messageId: Management Message (0x0d)
    .... 0010 = versionPTP: 2
    messageLength: 70
    subdomainNumber: 0
  # flags: 0x0000
    0... .... = PTP_SECURITY: False
    .0... .... = PTP profile Specific 2: False
    ..0... .... = PTP profile Specific 1: False
    ...0... .... = PTP_UNICAST: False
    .... .0... .... = PTP_TWO_STEP: False
    .....0 .... = PTP_ALTERNATE_MASTER: False
    ..... .0... .... = FREQUENCY_TRACEABLE: False
    ..... ..0 .... = TIME_TRACEABLE: False
    ..... ...0... = PTP_TIMESCALE: False
    ..... ....0... = PTP_UTC_REASONABLE: False
    ..... .....0... = PTP_LI_59: False
    ..... ....0... = PTP_LI_61: False
  # correction: 0.000000 nanoseconds
    correction: Ns: 0 nanoseconds
    correctionSubNs: 0.000000 nanoseconds
    ClockIdentity: 0x000f53ffffe0d1a2c
    SourcePortID: 0
    sequenceId: 46209
    control: Unknown (127)
    logMessagePeriod: 0
    targetPortIdentity: 0xffffffffffffff
    targetPortId: 65535
    startingBoundaryHops: 10
    boundaryHops: 10
    .... 0000 = action: GET (0)
    tlvType: Management (1)
    lengthField: 22
    managementId: Unknown (53249)
# [Malformed Packet: PTP]
# [Expert Info (Error/Malformed): Malformed Packet (Exception occurred)]
# [Malformed Packet (Exception occurred)]
# [Severity level: Error]
# [Group: Malformed]

```

Requested desire for us to support PTP Management Messages with SecureSync PTP Option Cards

➤ Refer to Salesforce case 117322

Email Keith sent (31 Aug 17) For your reference, the Spectracom SecureSync's two PTP modules (Models 1204-12 and 1204-32) do not support management messages. So, there is no way to enable this VERY seldom requested (I recall only one other previous request from several years ago, for this functionality to be available), and often not supported in PTP slaves, function in the SecureSyncs.

I am not aware of any plans at this time for this functionality to be added to the 1204-32 Gb PTP card (as the 1204-12 PTP card is discontinued, I highly suspect it will never be added to this particular earlier Card). However, I will forward your desire to have this function over to our SecureSync Product Manager for his review/consideration for a possible addition sometime in the future.

In some cases (such as with very limited requests, such as this one is) we have implemented newer capabilities when the customer was willing to help fund the development via an NRE fee. If this is something that you (and our SecureSync Product Manager) is interested in possibly doing, please let Sadie know. She can then work directly with him directly to see if this would be possible (based on availability of Engineering resources, for instance) and if so, what the associated NRE fees would be for this development.

Timekeeper monitoring capability

- Refer to the VelaSync/Timekeeper assistance document
- Timekeeper installed in all version 5.2.0 and higher but disabled by default.
- License file needs to be purchased/installed to enable timekeeper monitoring for PTP and NTP.

PTP client lists *(timekeeper's TimeMap function versus PTP Option Cards)

A) Timekeeper software enabled (purchased license file required)

If Timekeeper is enabled, it can report all of the PTP Clients it sees on Ethernet ports eth0-eth3 (if PTP Option Cards (such 1204-12 and/or 1204-32 are also installed in the SecureSync, Timekeeper can't report any PTP clients that may be isolated to the PTPO Option Cards.

- 1) List of PTP clients being serviced by the VelaSync/Timekeeper

| Current Client Snapshot Details | | | | |
|---------------------------------|--------|------------------|---------------|--------------------------|
| Client ↕ | Source | Estimated offset | One way delay | Age of update in seconds |
| 10.10.128.14 | 0 | 0.010330358 | 0.000350958 | 7 |

Q. For the PTP protocol in both VelaSync and SecureSync, is there a mechanism to see how many client/machine are connected to the grandmaster.

A. Yes, you do but they are very different from one another. On the SS it gives a summary count of the unicast slaves and you can get more detail by clicking on the (i) button next to it. On the VelaSync we have what is called a "Time Map", which gives a graphic representation of the network. We will have to wait for the engineer to get back for more detail on the VelaSync.

B) PTP Option Cards (1204-32 and 1204-12)

1. Model 1204-32 Gb PTP Option Card

Reports the number of PTP slaves the 1204-12 card can see and can also open a PTP Client table that displays the IP address(es) of up to 4000 unicast slaves

Excerpt below is from the 1204-32 card section of this document

The screenshot shows the GB PTP 0 configuration window. The 'Main tab' is selected. The 'Ethernet Status' is 'CONNECTED (100 MBPS)' with a green dot. The 'Port State' is 'MASTER' with a green dot. The 'Number of Unicast Slaves' is 0. The 'Profile (Default or Telecom)' is set to 'Default'. The 'Domain Number' is 0. The 'IP Address' is 10.10.15.5. The 'MAC Address' is 00:0C:EC:FF:00:76.

Annotations:

- Number of unicast slaves found on network:** Points to the 'Number of Unicast Slaves' field.
- Ethernet status (green=connected, orange=not connected):** Points to the 'Ethernet Status' field.
- Port state (see notes below):** Points to the 'Port State' field.
- View table of up to 4000 unicast slaves found on the network:** Points to the 'Slave Statistics' window.
- Port state (green=connected, orange= not connected):** Points to the 'Port State' field.

Port State

- **Port State**— Reports the current state of the PTP State Machine:
 - **Disabled**—PTP Ethernet port is Disabled. See PTP Setup/Network page, PTP Network Settings options.
 - **Initializing**—Ethernet link is unplugged/PTP Module is in power-up state. A Master Clock doesn't leave this state while it can't get the current time and synchronization references from the SecureSync to synchronize with it.
 - **Listening**—PTP module is looking for a Master Clock.
 - **Master**—PTP Master has become the active Master Clock on the network.
 - **Passive**—PTP Module has become a Passive Master Clock. (There is another Master Clock on the network with better quality or higher priority). This Master will wait until the Best Master Clock Algorithm determines it should become the best Master Clock, and then it will transition to the Master Clock state.
 - **Uncalibrated**—PTP Slave has selected a Master Clock on the network attempts to synchronize with it using sync packets.

Slave Statistics

Search:

| ip Address | Sync Remaining | Announce Remaining | DelayReq Remaining |
|-----------------|----------------|--------------------|--------------------|
| 010.002.100.205 | 284 / 300 s | 284 / 300 s | 284 / 300 s |

Buttons: First Previous 1 Next Last

Annotation: **If these fields have values, the Master is seeing unicast slave(s) on the network** points to the table.

2. Model 1204-12 PT Option Card

The 1204-12 card (as of at least Nov, 2015) does not report any info on the number of PTP clients it can see or which PTP clients it is providing timestamps to.

**IGMP (v1, v2 and v3)

Source-specific multicast (SSM) is a method of delivering [multicast](#) packets in which the only packets that are delivered to a receiver are those originating from a specific source address requested by the receiver. By so limiting the source, SSM reduces demands on the network and improves security.

Per Denis Reilly (2 May 14) The SSM feature in v3 means that only source specific multicast messages, which the switch has been told to pass through, will be delivered. All the other multicast packets will be dropped, and that is on purpose, because the intent of SSM seems to be to get rid of unneeded multicast traffic. In other words, the switch assumes that if you didn't program it to specifically allow for that specific traffic, then you must not want it.

When we've seen this happen in the past, the symptom is that delay requests aren't making it back to the master. Packet traces show everything looks good, but the master can't link up with the slave. And if they switched to v2 and that resolved the problem, then it's absolutely a v3 configuration issue on their end.

To make things even more complicated, this SSM (source-specific multicast) has nothing to do with the Sync-E SSM (synchronization status message)

***IGMPv3

IGMPv3 multicast configuration

- Refer to http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/ipmulti/command/imc-cr-book/imc_i1.html

The following example shows how to configure the interface (loopback 0) to join the PTP multicast group.

```
Device(config)# interface loopback 0
Device(config-if)# ip igmp join-group 224.0.1.129
```

**IGMPv3 Snooping:

- Refer to: http://en.wikipedia.org/wiki/IGMP_snooping

The feature allows a [network switch](#) to listen in on the IGMP conversation between [hosts](#) and [routers](#). By listening to these conversations the switch maintains a map of which links need which [IP multicast](#) streams. Multicasts may be filtered from the links which do not need them and thus controls which ports receive specific multicast traffic

Hi Keith,

It's not that we don't support IGMPv3. It's a matter of configuring the switch to not ignore and drop the multicast packets which will happen if IGMPv3 isn't configured to route them.

IGMPv2 improves over IGMPv1 by adding the ability for a host to signal desire to leave a multicast group. IGMPv3 improves over IGMPv2 mainly by supporting [source-specific multicast](#) (SSM)

Q. Email from Keith to Denis/Jeremy (2 May 2014) I found the following at this link:
http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/ipmulti/command/imc-cr-book/imc_i1.html

The following example shows how to configure the interface (loopback 0) to join the PTP multicast group.

```
Device(config)# interface loopback 0
Device(config-if)# ip igmp join-group 224.0.1.129
```

Is this all that needs to be done to support IGMPv3 on both PTP boards?

Reply from Jeremy-The SSM feature in v3 means that only source specific multicast messages, which the switch has been told to pass through, will be delivered. All the other multicast packets will be dropped, and that is on purpose, because the intent of SSM seems to be to get rid of unneeded multicast traffic. In other words, the switch assumes that if you didn't program it to specifically allow for that specific traffic, then you must not want it.

When we've seen this happen in the past, the symptom is that delay requests aren't making it back to the master. Packet traces show everything looks good, but the master can't link up with the slave. And if they switched to v2 and that resolved the problem, then it's absolutely a v3 configuration issue on their end.

Desire for SecureSync to store/archive PTP time stamps.

Q. (from Masataka w/TOYO) Can SecureSync store PTP timestamps that it send

A. **Reply from Dick Fox after working w/engineering (25 Nov 14)** Here is the answer I get back from our development team
We can't currently provide these timestamps.

- On the Master side, timestamps for the Sync and Delay Request messages are generated in real time, and are only stored briefly deep in the Ethernet controller in order to be sent in the corresponding Follow Up or Delay Response messages. (And in the case of one-step mode, the timestamp is not stored at all, but is inserted into the Sync packet in real time.) They are not accessible at the User Interface level.
- On the Slave side, the timestamps transmitted by the Master are combined with the timestamps generated by the Slave to provide input to our control loop that provides the timing reference to the system. But we do not make the individual timestamps available outside of our embedded firmware.

Spectracom is not aware of any Grand Master Providers that offers this functionality. We currently have no plans to add this to Spectracom PTP Grand Master products.

IP addresses assigned to PTP cards / Duplicate addresses (relating to the standard Ethernet ports Eth0- Eth4)

The IP address assigned to each installed PTP card (1204-12 or 1204-32) is completely isolated from the standard Ethernet ports (Eth0 through Eth3). So, the IP address assigned to a PTP card can be on the same subnet, or can be a duplicate of, any of the others as long as the PTP card isn't connected to the same network as the standard Ethernet port (this is a limitation of the network they are connected to- not a limitation of the SecureSync itself).

Unicast mode/Minicast mode and Multicast mode

- Both Unicast and Minicast modes were added to SecureSync in Archive version 4.8.8 (Dec 2012, ECN 3099)
- Only Multicast mode was available in SecureSync versions 4.8.7 and prior.

Email from Michel Reyverand (8/31/12) about Unicast, Minicast and Multicast

The minicast is a special case of the unicast mode.

- In **unicast** mode, Slaves shall request unicast contracts for the Announce, Sync and Delay_Resp packets.
- In **minicast** mode, Slaves only request unicast contracts for the Delay_Resp packets (and so Delay_Req packets). Announce and Sync packets are still sent in multicast mode by the Master.

On Master Side:

- Multicast: multicast is allowed (since power-up) for sync, announce and delay_resp packets.
- Minicast mode: multicast is allowed (since power-up) for sync and announce packets (not for delay_resp packets).
- Unicast mode: multicast is prohibited (since power-up).

On Slave side:

- Unicast mode: Slave requests unicast contracts for Announce, Sync and Delay_Resp packets.
- Minicast mode: Slave requests unicast contracts for Delay_Resp packets only.
- Multicast: Slave doesn't request unicast contracts. Will sync to a Master in multicast mode (may be in Minicast mode, I'm not sure)

When a Slave is in unicast mode (or Minicast mode), the Master will run in unicast/Minicast mode even if it is set in Multicast mode, because when the Slave unicast requests are granted by the Master, the Master switches into unicast mode with this Slave.

I've said that mix of transmission modes is out of spec. because the transmission mode is a network setting that has not to be changed once the network switches are set in one given transmission mode. Masters and Slaves should be set with the same transmission mode to ensure good conditions to sync each other.

PTP Unicast Contracts/contract negotiations (TLV signalling Messages)

- For more info on Unicast Contracts, **refer to online SecureSync** user guide at:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/PTP_Grandm.htm
- In **Unicast** mode, there are three contracts negotiated between Master in Slave
 - In **Unicast** mode, Slaves shall request unicast contracts for the Announce, Sync and Delay_Resp packets.
 - In **minicast** mode, Slaves only request unicast contracts for the Delay_Resp packets (and so Delay_Req packets). Announce and Sync packets are still sent in multicast mode by the Master.

Per: <https://blog.meinbergglobal.com/2019/12/06/tlvs-in-ptp-messages/>

TLV = Type, Length, Value

General Structure of a TLV In PTP:

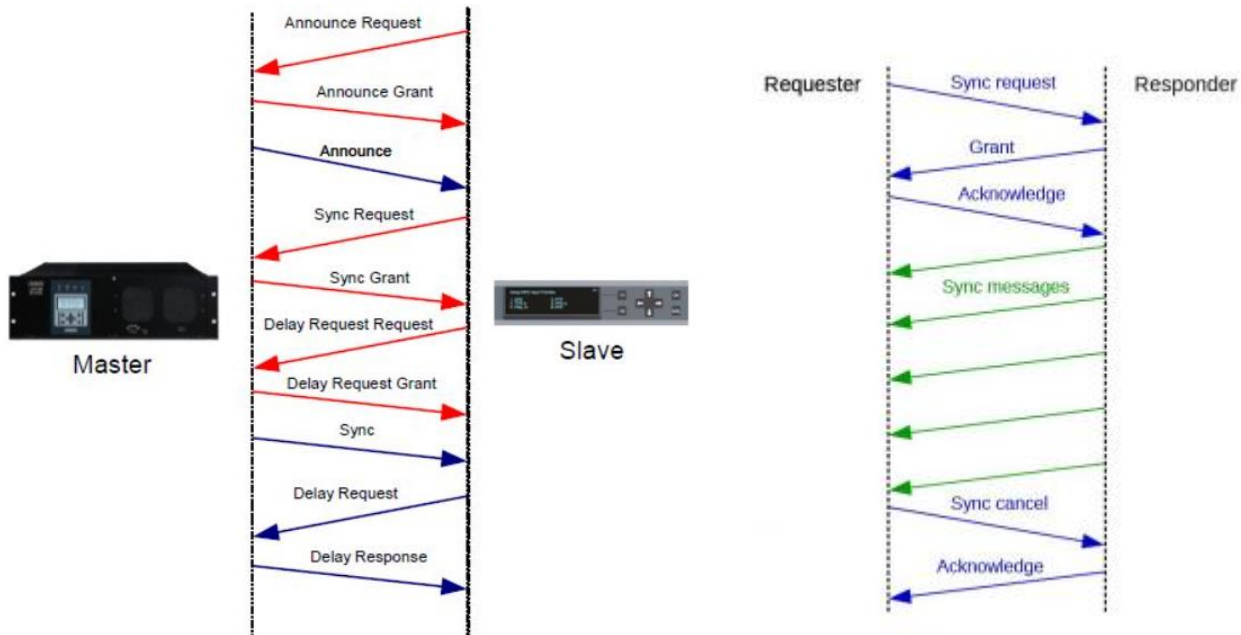
| | |
|--------|---|
| TYPE | A unique number to identify which kind of TLV this is |
| LENGTH | How many Octets long the VALUE field of the TLV is |
| VALUE | Any fields for information included in the TLV |

Per: <https://blog.meinbergglobal.com/2016/11/29/art-negotiation-ptp-way/>

The slave port asks for Announce messages from all of the master ports on its list, i.e. the ones it has configured unicast addresses for. Note that I said master ports, not grandmasters. They might be ports on a [Boundary Clock](#). Whichever master port has the best clock properties, gets further requests for Sync and either Delay Request/Delay Responses or Peer Delay messages. Each message type is negotiated separately. Often there is just one address on the list, and that makes the decision easy for the slave. So far unicast negotiation is generally only used with the delay request/response mechanism, so we will focus on that case in this tutorial.

When a port asks for unicast messages it specified three attributes:

1. The message type (Announce, Sync, Delay Request/Response)
2. The message rate, for example 16 messages per second.
3. The duration of the grant, for example 300 seconds.

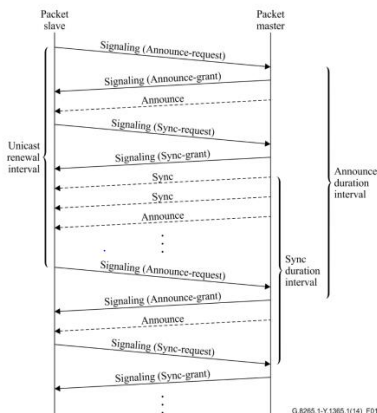


Once, granted the messages stop coming when any of three things happen:

1. The grant duration times out (this is the usual case)
2. The Requestor sends a cancel message, "I don't need this anymore".
3. The Responder sends a cancel message, "I've had it, I can't do this anymore!"

The figure shows the Sync message grant being terminated by the Requester. This is kind of complicated, why do we need this? Well, we're glad you asked. If a Responder is sending unicast message to a lot of Requesters, it might want to manage its capacity by terminating grants early or by saying no in response to a grant request. That's right, a port can just say no to a request. IEEE 1588 also allows a Responder to grant part of a request, however to make things simpler the [telecom profiles](#) which use unicast require that a Responder either grant the whole request or say no. So that is how most implementations work. A negotiation can look like this:

Requester: "can you give me 64 Sync messages/second for 300 seconds?"
 Responder: "No"
 Requester: "OK, how about 16 Syncs/second for 300 seconds?"
 Responder: "No"
 Requester: "Oh come on, at least give me 4 Syncs/second for 300 seconds?"
 Responder: "Yes"



Once, unicast has been granted, the messages stop coming when any of three things happen:

1. The grant duration times out (this is the usual case)
2. The Requestor sends a cancel message, "I don't need this anymore".
3. The Responder sends a cancel message, "I've had it, I can't do this anymore!"

A) Example of Unicast transmission granted by PTP Master

1. Request Unicast Transmission (PTP Slave sends to PTP Master)

| | | | | | | | |
|----------------------------------|-------------|-------|---------------|---------------|----|-------|--------------------|
| Feb 3, 2021 13:55:39.987323000.. | 1183.200604 | 16889 | 67.200.170.2 | 10.47.132.142 | 54 | PTPv2 | Signalling Message |
| Feb 3, 2021 13:55:39.987326000.. | 1183.200607 | 16890 | 67.200.170.2 | 10.47.132.142 | 54 | PTPv2 | Signalling Message |
| Feb 3, 2021 13:55:39.988683000.. | 1183.201964 | 16891 | 10.47.132.142 | 67.200.170.2 | 56 | PTPv2 | Signalling Message |
| Feb 3, 2021 13:55:39.989541000.. | 1183.202822 | 16892 | 10.47.132.142 | 67.200.170.2 | 56 | PTPv2 | Signalling Message |
| Feb 3, 2021 13:55:40.003131000.. | 1183.216412 | 16893 | 10.47.132.142 | 67.200.170.2 | 44 | PTPv2 | Sync Message |

```

> Frame 16889: 96 bytes on wire (768 bits), 96 bytes captured (768 bits) on interface \Device\NPF_{5C2841E0-108C-4156-8019-9FB13A1281BC}, id 0
> Ethernet II, Src: Alcatel_33:6f:45 (a0:f3:e4:33:6f:45), Dst: Spectrac_0a:08:79 (00:0c:ec:0a:08:79)
> Internet Protocol Version 4, Src: 67.200.170.2, Dst: 10.47.132.142
> User Datagram Protocol, Src Port: 320, Dst Port: 320
> Precision Time Protocol (IEEE1588)
  > 0000 .... = transportSpecific: 0x0
  .... 1100 = messageId: Signalling Message (0xc)
  0000 .... = Reserved: 0
  .... 0010 = versionPTP: 2
  messageLength: 54
  subdomainNumber: 4
  Reserved: 0
  > flags: 0x0400
  > correction: 0.000000 nanoseconds
  Reserved: 0
  > ClockIdentity: 0x94434dffffea25fc0
  SourcePortID: 1
  sequenceId: 76
  control: Other Message (5)
  logMessagePeriod: 127
  targetPortIdentity: 0xffffffffffffff
  targetPortId: 65535
  > tlvType: Request unicast transmission (4)
    lengthField: 6
    0000 .... = messageType: Sync Message (0x0)
    > logInterMessagePeriod: -6
    durationField: 300 seconds

```

The configurable range for the logInterMessagePeriod is given in Annex A for all the relevant messages. The durationField value in each REQUEST_UNICAST_TRANSMISSION TLV has a default initialization value of 300 seconds and a configurable range of 60 to 1000 second

2. Grant unicast transmission (PTP Master sends back to PTP Slave)

| | | | | | | | |
|----------------------------------|-------------|-------|---------------|--------------|----|-------|--------------------|
| Feb 3, 2021 13:55:39.989541000.. | 1183.202822 | 16892 | 10.47.132.142 | 67.200.170.2 | 56 | PTPv2 | Signalling Message |
| Feb 3, 2021 13:55:40.003131000.. | 1183.216412 | 16893 | 10.47.132.142 | 67.200.170.2 | 44 | PTPv2 | Sync Message |

```

> Frame 16892: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface \Device\NPF_{5C2841E0-108C-4156-8019-9FB13A1281BC}, id 0
> Ethernet II, Src: Spectrac_0a:08:79 (00:0c:ec:0a:08:79), Dst: Alcatel_33:6f:45 (a0:f3:e4:33:6f:45)
> Internet Protocol Version 4, Src: 10.47.132.142, Dst: 67.200.170.2
> User Datagram Protocol, Src Port: 320, Dst Port: 320
> Precision Time Protocol (IEEE1588)
  > 0000 .... = transportSpecific: 0x0
  .... 1100 = messageId: Signalling Message (0xc)
  0000 .... = Reserved: 0
  .... 0010 = versionPTP: 2
  messageLength: 56
  subdomainNumber: 4
  Reserved: 0
  > flags: 0x043c
  > correction: 0.000000 nanoseconds
  Reserved: 0
  > ClockIdentity: 0x000cecfffe0a0879
  SourcePortID: 1
  sequenceId: 76
  control: Other Message (5)
  logMessagePeriod: 127
  targetPortIdentity: 0x94434dffffea25fc0
  targetPortId: 1
  > tlvType: Grant unicast transmission (5)
    lengthField: 8
    1001 .... = messageType: Delay_Resp Message (0x9)
    > logInterMessagePeriod: -6
    durationField: 300 seconds
    .....0 = renewalInvited: False

```

In implementing the GRANT_UNICAST_TRANSMISSION TLV mechanism, the granted values shall be the same as requested in the received REQUEST_UNICAST_TRANSMISSION TLV as long as the requests are in the configurable range.

Unicast cancellation (can be cancelled by either the Master or the Slave)

Specific type PTP messages (Sync, Announce, etc) can be cancelled by either the Master or Slave.

B) Example of Unicast transmission cancelled by **Slave**

1. Cancel unicast transmission (PTP Slave sends to PTP Master)

```
Feb 3, 2021 13:55:27.762832000... 1170.976113 16879 67.200.170.2 10.47.132.142 50 PTPv2 Signalling Message
Feb 3, 2021 13:55:27.763214000... 1170.976495 16880 67.200.170.2 10.47.132.142 50 PTPv2 Signalling Message
Feb 3, 2021 13:55:27.764037000... 1170.977318 16881 10.47.132.142 67.200.170.2 50 PTPv2 Signalling Message
Feb 3, 2021 13:55:27.764756000... 1170.978037 16882 10.47.132.142 67.200.170.2 50 PTPv2 Signalling Message

> Frame 16879: 92 bytes on wire (736 bits), 92 bytes captured (736 bits) on interface \Device\NPF_{5C2841E0-10BC-4156-8019-9F813A12818C}, id 0
> Ethernet II, Src: Alcatel_33:6f:45 (a0:f3:e4:33:6f:45), Dst: Spectrac_0a:08:79 (00:0c:ec:0a:08:79)
> Internet Protocol Version 4, Src: 67.200.170.2, Dst: 10.47.132.142
> User Datagram Protocol, Src Port: 320, Dst Port: 320
> Precision Time Protocol (IEEE1588)
  > 0000 .... = transportSpecific: 0x0
  .... 1100 = messageId: Signalling Message (0xc)
  0000 .... = Reserved: 0
  .... 0010 = versionPTP: 2
  messageLength: 50
  subdomainNumber: 4
  Reserved: 0
  > flags: 0x0400
  > correction: 0.000000 nanoseconds
  Reserved: 0
  > ClockIdentity: 0x94434dffffea25fc0
  SourcePortID: 1
  sequenceId: 75
  control: Other Message (5)
  logMessagePeriod: 127
  targetPortIdentity: 0xffffffffffffff
  targetPortId: 65535
  > tlvType: Cancel unicast transmission (6)
    lengthField: 2
    0000 .... = messageType: Sync Message (0x0)
```

2. Acknowledge cancel unicast transmission (PTP Master sends back to PTP Slave)

```
Feb 3, 2021 13:55:27.764756000... 1170.978037 16882 10.47.132.142 67.200.170.2 50 PTPv2 Signalling Message
Feb 3, 2021 13:55:28.784291000... 1171.997572 16883 10.47.132.142 67.200.170.2 64 PTPv2 Announce Message
Feb 3, 2021 13:55:30.784287000... 1173.997568 16884 10.47.132.142 67.200.170.2 64 PTPv2 Announce Message

> Frame 16882: 92 bytes on wire (736 bits), 92 bytes captured (736 bits) on interface \Device\NPF_{5C2841E0-10BC-4156-8019-9F813A12818C}, id 0
> Ethernet II, Src: Spectrac_0a:08:79 (00:0c:ec:0a:08:79), Dst: Alcatel_33:6f:45 (a0:f3:e4:33:6f:45)
> Internet Protocol Version 4, Src: 10.47.132.142, Dst: 67.200.170.2
> User Datagram Protocol, Src Port: 320, Dst Port: 320
> Precision Time Protocol (IEEE1588)
  > 0000 .... = transportSpecific: 0x0
  .... 1100 = messageId: Signalling Message (0xc)
  0000 .... = Reserved: 0
  .... 0010 = versionPTP: 2
  messageLength: 50
  subdomainNumber: 4
  Reserved: 0
  > flags: 0x043c
  > correction: 0.000000 nanoseconds
  Reserved: 0
  > ClockIdentity: 0x000cecfefea08079
  SourcePortID: 1
  sequenceId: 75
  control: Other Message (5)
  logMessagePeriod: 127
  targetPortIdentity: 0x94434dffffea25fc0
  targetPortId: 1
  > tlvType: Acknowledge cancel unicast transmission (7)
    lengthField: 2
    1001 .... = messageType: Delay_Resp Message (0x9)
```

PTP Hybrid mode versus PTP minicast mode.

For much more information on Hybrid and minicast modes: Refer to the “PTP Precision Timing Protocol (IEEE1588) (for all products)” section in the “TsyncCustAssist” document

Note: The 1204-12 can be an all unicast, all multicast or all hybrid Master. But it doesn't support a mixture of Unicast, Multicast and/or hybrid (like the 1204-32 card supports)

Email from Denis Reilly (2 Feb 2015) You're correct that Minicast and Hybrid are not the same functionality. **But the main difference involves the Unicast Negotiation.** Recall that in a full Unicast environment, the Slave must make a Signaling request to the Master and effectively “ask” for Sync, Announce, and Delay Request messages. Our Unicast master will not send information to a Slave unless it “asks” for it using these signaling messages. In our Minicast implementation in OC12, we use Multicast for Sync/Follow-up and Announce. But our Minicast Master will not respond to Delay Requests unless it first receives a Signaling Message “asking” for it. Without that signaling message, Delay Requests will go unanswered.

While there is no formally defined Hybrid mode, most implementations do not require the signaling message first. Our Gb PTP card (OC32), for instance, doesn't require the signaling message. If a signaling message is sent from a slave, the OC32 will accept it – there's nothing wrong with sending the signaling message. But if a Slave sends a Delay Request without a signaling message first, the OC32 will still generate a Delay Response, while the OC12 will ignore it. It's possible that some of their Unicast slaves send the signaling message, and some don't, leading to their confusion.

PTP “Hybrid” mode

- Supported in 1204-32 card
- Not supported in 1204-12 card

A) Mix of Multicast and Unicast packets

- Allows a mix of multicast and UDP unicast transmission methods for PTP messages between PTP master and slave clocks.
- Most Hybrid implementations don't require a signaling message to “ask” for **Sync, Announce, and Delay Requests**.
- **Sync, Follow-Up and Announce messages:** any mix of multicast or unicast messages.

Unicast Contract Negotiation (especially with Enterprise Profile) Per Denis Reilly (28 May 2019) is optional for the PTP Slaves in Hybrid mode (unlike true Unicast mode, which uses contract negotiation. Refer to Salesforce Case Number 196361

B) SyncE and PTP

- The combined operation of Synchronous Ethernet (Sync-E) and Precision Time Protocol (PTP) is also known as hybrid mode.
- Provides frequency and phase synchronization.

PTP “Minicast” mode

Summary: Multicast mode for Sync/Follow-up messages and unicast negotiation for Delay Requests.

- Minicast is similar to, but not exactly the same as Hybrid mode
- Minicast is a unique modification of Unicast mode.
- In Minicast mode, Slaves only unicast contract for **Delay Responses**.
- Minicast mode consists of:
 - **Always sent via Multicast:** Sync, Follow-Up and Announce messages

- **Always sent via Unicast (OC 12 requires a Signaling message asking for these messages before they are sent):** Delay Request and Delay Response messages.

Note: Without this signaling message being received, Delay Requests will go unanswered.

OK for the 1204-12 Option Card:

- All clients using unicast mode
- All clients using multicast mode
- All clients using minicast mode

(July 2014 KW) Important note about Hybrid mode (Refer to Salesforce case 14883): The Model 1204-12 card can be a unicast master, multicast master or a hybrid master. But it's not intended to service any combination of unicast, multicast, or Hybrid slaves together. This will cause issues with this option card. All slaves should be running in multicast mode, Unicast mode or hybrid mode for the card to operate normally! Otherwise, if there is a mixture of both, there may be times that PTP packets aren't outputted.

- If a mixture of any of Unicast and Multicast Slaves is required, a 1204-32 Gb PTP card should instead be used for its Hybrid mode support.

Viable alternate approach to using minicast mode (requires two 1204-12 Option Cards be installed in the SecureSync)

- Configure one 1204-12 PTP Option Card as **Multicast** master- on **one** domain.
- Configure the other 1204-12 PTP Option Card as a **Unicast** master - on **another** domain.
- Configure each Slave's domain, depending on whether it's a multicast or unicast slave.

Q. **Email from Keith to Michel** I thought of another potential solution that should help the customer and with the least amount of impact on Spectracom, as well. If we gave them one additional Actarus card (available in our Sales demo pool) could they configure one as a unicast master and the other as a multicast master, each one on its own domain, without one having any effects on the other?? Then the majority of slaves could sync to the one card and the one slave could sync to the other?

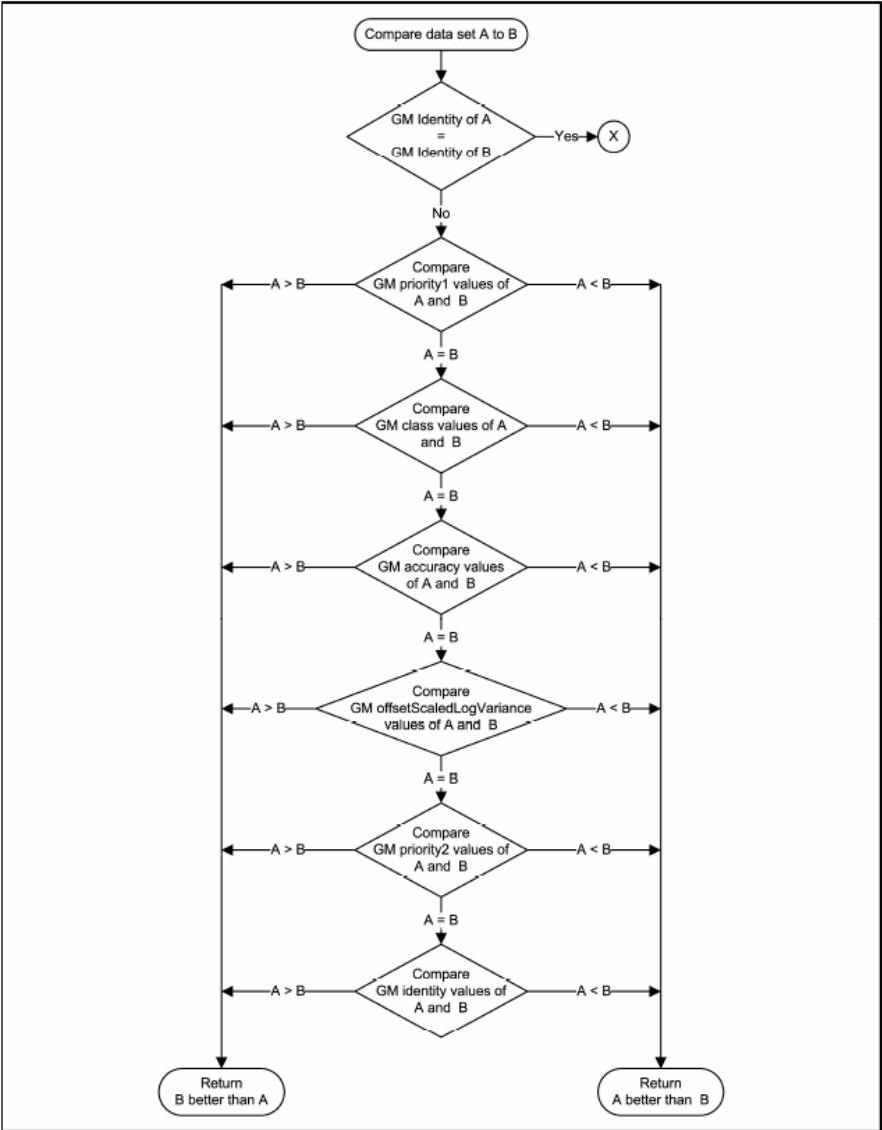
A. **(Reply from Michel, 6 Feb 15)** Yes, if you have 2 different PTP domains, with one PTP Master in unicast mode on a domain (and PTP Slaves set, in this domain, in unicast mode, and referring to the unicast PTP Master) and another PTP Master in multicast mode on the other domain (and PTP Slaves set, in this domain, in multicast mode), it will work.

The only drawback is that all the PTP Slaves will not be synchronized by the same Master. A minor drawback knowing that the two Masters will be synchronized by the same synchronization source (GNSS, I guess).

NOTA: The Minicast Mode you refer to in your e-mail object is something else than the hybrid mode, mixing unicast and multicast PTP clocks on the same PTP network, that we are talking about for your customer.

Best Master Clock (Active Master) Selection process (Passive Master when not selected)

Here is a flowchart of the master selection process.



Best Master Clock algorithm consists of the following three factors (in descending order of precedence)

1) Quality level (ClockClass attribute of the Announce message)

Table 5—clockClass specifications

| clockClass (decimal) | Specification |
|----------------------|--|
| 0 | Reserved to enable compatibility with future versions. |
| 1–5 | Reserved. |
| 6 | Shall designate a clock that is synchronized to a primary reference time source. The timescale distributed shall be PTP. A clockClass 6 clock shall not be a slave to another clock in the domain. |
| 7 | Shall designate a clock that has previously been designated as clockClass 6 but that has lost the ability to synchronize to a primary reference time source and is in holdover mode and within holdover specifications. The timescale distributed shall be PTP. A clockClass 7 clock shall not be a slave to another clock in the domain. |
| 8 | Reserved. |
| 9–10 | Reserved to enable compatibility with future versions. |
| 11–12 | Reserved. |
| 13 | Shall designate a clock that is synchronized to an application-specific source of time. The timescale distributed shall be ARB. A clockClass 13 clock shall not be a slave to another clock in the domain. |
| 14 | Shall designate a clock that has previously been designated as clockClass 13 but that has lost the ability to synchronize to an application-specific source of time and is in holdover mode and within holdover specifications. The timescale distributed shall be ARB. A clockClass 14 clock shall not be a slave to another clock in the domain. |
| 15–51 | Reserved. |
| 52 | Degradation alternative A for a clock of clockClass 7 that is not within holdover specification. A clock of clockClass 52 shall not be a slave to another clock in the domain. |
| 53–57 | Reserved. |
| 58 | Degradation alternative A for a clock of clockClass 14 that is not within holdover specification. A clock of clockClass 58 shall not be a slave to another clock in the domain. |
| 59–67 | Reserved. |
| 68–123 | For use by alternate PTP profiles. |
| 123–127 | Reserved. |
| 128–132 | Reserved. |
| 133–170 | For use by alternate PTP profiles. |
| 171–186 | Reserved. |
| 187 | Degradation alternative B for a clock of clockClass 7 that is not within holdover specification. A clock of clockClass 187 may be a slave to another clock in the domain. |
| 188–192 | Reserved. |
| 193 | Degradation alternative B for a clock of clockClass 14 that is not within holdover specification. A clock of clockClass 193 may be a slave to another clock in the domain. |
| 194–233 | Reserved. |
| 233–247 | For use by alternate PTP profiles. |
| 248 | Default. This clockClass shall be used if none of the other clockClass definitions apply. |
| 249–250 | Reserved. |
| 251 | Reserved for version 1 compatibility; see Clause 18. |
| 252–254 | Reserved. |
| 255 | Shall be the clockClass of a slave-only clock; see 9.2.3. |

PTP Clock Classes

ARB Clock Classes

Telecom Profile (ITU-T G.8265.1) Clock Classes 80-110

2) PTSF (Packet Timing Signal Fail)

(PTSF-lossSync, PTSF-lossAnnounce, PTSF-unusable);

This clause defines the notion of packet timing signal fail (PTSF), which corresponds to a signal indicating a failure of the PTP packet timing signal received by the slave.

Three types of PTSF may be raised in a slave implementation:

[PTSF-lossSync], lack of reception of PTP timing messages from a master (loss of the packet timing signal): if the slave does not receive any more the timing messages sent by a master (i.e., *Sync* and eventually *Follow_up* and *Delay_Resp* messages), then a

PTSF-lossSync associated to this master must occur. A timeout period (e.g., "syncReceiptTimeout" and "delayRespReceiptTimeout") for these timing messages must be implemented in the slave before triggering the PTSF-lossSync (the range and default value of this timeout parameter are for further study).

[PTSF-lossAnnounce], lack of reception of PTP *Announce* messages from a master (loss of the channel carrying the traceability information): if the slave does not receive any more the *Announce* messages sent by a master, then a PTSF-lossAnnounce associated to this master must occur. A timeout period for these *Announce* messages must be implemented in the slave before triggering the PTSF-loss Announce (the range and default value of this timeout parameter are as per [IEEE 1588]). This timeout corresponds to the "announceReceiptTimeout" attribute specified in [IEEE 1588], clause 7.7.3.1.

3) Priority values 1 and 2 (user-configurable from 1 to 128, with 1 being the highest priority)

Timescales for PTP Option Cards and timekeeper software (UTC/Arbitrary timescales)

Email from Denis Reilly (28 Sept 16) The default timescale for PTP is TAI. UTC is available because the Announce message broadcasts the TAI to UTC offset.

The ARB timescale would permit the master to broadcast whatever timebase it wants, and then I think the offset field in the Announce message is ignored / set to 0.

I don't think either the 12 or 32 cards support ARB timescale. I recall experimenting with this on the 12 card years ago, but I think we removed the option from the UI. I may not be remembering properly, but it is easy enough to check on a unit with the two cards.

Now that Timekeeper is on the SecureSync, I need to mention that Timekeeper doesn't comply with the standard here. They put UTC in their timestamps, and set the Offset field to 0. After doing the math, you still recover UTC properly, and since pretty much all of their customers care about UTC exclusively, nobody really cares. I might be the only person who's noticed. Certainly none of their customers have complained, or they would have changed it.

--

I believe that as a Master, both the 1204-12 and 1204-32 will use the KTS system time calls to get TAI. So if there is a discrepancy between NTP and PTP here, then perhaps whatever reference is setting the KTS time is setting it incorrectly?

General PTP troubleshooting for all PTP Option Cards

***** Get Packet Captures, if at all possible!*****

Note: also refer to the timing board assistance document for general issues associated with PTP.

I was informed that you observed an issue associated with the PTP functionality of your Spectracom SecureSync. I have some initial/general questions for you to better assist you with what you observed:

- 1) What exactly did you see happen?
- 2) Was this an issue observed on just one PTP client or all of the PTP clients on the network?
- 3) What version of software is installed in the SecureSync (as indicated in the **Tools -> Versions** or **Tools -> Upgrade/Backup** page of the browser)? Note that with a skylight SecureSync, the version should be version 4.7L.
- 4) When was this issue first noticed?
- 5) Is this time issue still occurring or has it since cleared? If it since cleared, when did it clear?
- 6) If it has cleared, did it clear on its own or did you have to do something to cause it to clear?
- 7) About how long has the SecureSync been installed on the network?
- 8) Which Model PTP card is installed in the back of the SecureSync? Is it the Model 1204-12 10/100 PTP card or the Model 1204-32 Gb PTP card (as indicated by a silkscreened number in the corner of the PTP Option Card itself). Note the 1204-32 is a newer PTP Option Card, just made available in the last couple of months.
- 9) Do you happen to have a packet capture showing network traffic at the time of the anomaly? If the issue is still occurring, please send us a packet capture taken on the same subnet as the PTP Option Card

Please send us a copy of the unit's logs for our review. Below is information on how to capture the logs as a single bundle file to send to us.

**Interface issues between Spectracom and non-Spectracom PTP devices

1) Symmetricom SCi300 PTP Slaves (refer to Salesforce case 4810)

Delay responses all zeroes

Masataka with TOYO (~2/20/12) SecureSync as PTP Master, using Symmetricom SCi300 as their slaves. The Delay response message sent from the SecureSync PTP Master was indicating it was compatible with PTPv1. This was preventing the SecureSync from being able to fill in the "receivetimestamp (nanosecond)" field with just "0". Told him he would need to disable the delay request message flag that was indicating the PTP slave supports PTPv1.

Email from Denis (2/21/12)

In case they ask for more details, the flag in question is the "Hardware Compatability" bit in the "transportSpecific" field, as documented in Annex D.4 / Table 123 in the IEEE 1588 specification. We are expecting all bits in the transportSpecific field to be 0.

2) PTP Traffic not getting through a switch/router

Email sent to Bluefirecapital on 11/23/11:

I may be able to help explain why you may not be seeing any PTP traffic on the output side of the switch. There are a couple of reasons that this could happen.

To begin and just to confirm, the Ethernet cable to the switch is connected directly to the PTP Option Card on the SecureSync (and not to the base Ethernet port (Eth 0) of the Gigabit Option Card- if installed). Also, when using a switch

between the Master and Slave, the PTP Option Card needs to be configured with the applicable network settings in order to be on the same subnet as the switch.

If you haven't already, I recommend you first try to capture the network traffic directly from the PTP Master's side of the switch. This will confirm the PTP Master is outputting PTP traffic, as expected. If there is no traffic from the Option Card, there may be a problem with either the PTP Option Card or with its connection to the SecureSync.

The PTP outputs are multicast messages. The specs recommend multicast traffic remain on the immediate subnet only, to prevent potentially flooding the entire network with PTP packets. For this reason, the factory default TTL (Time To Live) value is set to "1". Depending on the internal operation of the switch, this will often prevent the switch from passing any PTP traffic. You may need to increase the TTL value of the PTP Master to a higher number than 1 (up to a max of 255), to allow the switch to pass the multicast traffic to other subnets.

Another potential reason for not having PTP traffic on the output side of the switch is if there is a firewall installed on the switch. The PTP traffic need ports 319 and 320 to be continuously left open, in order for the traffic to pass.

We also recommend verifying that the SecureSync has been indeed re-configured, since it was initially received, to be a PTP Master. By factory default, the PTP Option cards are configured to be a PTP Slave, unless they are reconfigured by a user to be a PTP Master.

To verify that the Option Card is re-configured to be a PTP Master, open the SecureSync's web browser and navigate to the Setup/Inputs page and select the PTP Option Card. In the Clock Setup tab, please make sure the Mode field is set to "Master Only" (not "Slave only" or "Master/Slave").

He clarified that there will be packets broadcasted, even without PTP Slaves being present, as long the PTP Option Card is an ACTIVE PTP Master and not just a passive PTP Master (this makes a difference). If the Option Card is a passive Master, no packets will be observed.

The other webpage that will confirm the port is in the Master mode and is an ACTIVE master (not just a passive Master) is in the Status/Inputs page, Network tab. Verify the Port State indicates "Master", This indicates the Option Card is an Active Master and not just a passive master. In this same table, the "Port Enable" and "Link Connected" fields should indicate "Enabled".

Below are the possible indications for the "Port State" field with 1204-12 card"

- 1) **Initializing:** Cable is unplugged / in power-up state.
- 2) **Listening:** PTP is looking for a Master.
- 3) **Master:** PTP Master has become the active master on the network.
- 4) **Passive:** PTP Master has become a passive master. (There is another Master on the network with higher priority.) This Master will wait until such time as the Best Master Clock Algorithm determines it should be the Best Master, then it will transition to the Master state.
- 5) **Uncalibrated:** PTP Slave has detected a Master on the network.
- 6) **Slave:** PTP Slave is actively synchronizing to a Master on the network.

"Port Enable" indicates the port is enabled for PTP.

"Link Connected" indicates whether or not the Ethernet Link is connected.

No Delay Responses being sent from the PTP Master

- 1) **Are there multicast Announce and Sync messages being sent from the PTP card**
- 2) **Make sure there are Delay Requests (sent from the PTP Clients) reaching the PTP Master**
 - Request a packet capture on the same side of the switch as the PTP Master
 - If there are no Delay Requests present, the clients aren't sending the request, or they are being blocked in between) (possibly an issue with IGMP or the TTL value configured in the PTP Client)

- Specific to the 1204-32 Gb PTP: Try a different SFP module in both the 32 card and the switch (preferably a Model in our previously qualified list/table of SFP modules). If there is an issue with the “Receive” side of the SFP, the Delay Requests won’t be received and then the 32 card won’t send the delay Responses that the Slaves(s) need.
-

PTP Delay Requests present but no other PTP packets present/PTP Master sending Delay Request packets

- 1) **Every PTP device (Master and Slave) sends Delay Requests, even if there aren’t any Sync packets present.**

Email from Denis Reilly I was puzzled by why our Master would be sending Peer Delay Requests. Don't Delay Requests come from the Slaves?

The answer is that Peer Delay Requests are different. Each port is supposed to exchange Peer Delay Requests to all other ports it is connected to, and the requests can go both ways. So, it actually is expected a P2P Master could send Peer Delay Requests.

Issues with PTP Delay Response/Peer Delay response messages

To better assist you with this condition, I have some questions and a request for you:

To begin, in order for the SecureSync to be able to send delay responses, a properly formatted delay request needs to be received.

If you can send us a wireshark packet capture from a device on the same subnet as the SecureSync, we will be happy to evaluate the capture to ensure a valid delay request is being sent to the SecureSync. If the PTP slave is on a different subnet, please also send a capture of the PTP Slave’s traffic from its network, as well. This can help show delay requests that may not be getting to the Master.

Questions for you:

1. Are the PTP slaves using One step or Two step mode?
2. Is the PTP Master configured as Multicast or Unicast mode?
3. What are you using for the PTP Client? Are you using Timekeeper software from Spectracom, PTPd freeware or some other program?
4. If you are running PTPd freeware program, what is the version of the software?
5. Are there any firewalls in between the device? If there are, make sure ports 319 and 320 are both open.
6. If there are any switches in between, make sure IGMP is not set to V3, which will block the packets from getting through.
7. Are the PTP clients configured to send the delay request messages on port 319?

Issues with Delay Response messages not present, even though Delay Request messages are present

- 1) Make sure that the PTP Delay Request messages are getting all the way to the PTP Master.
- 2) Verify Ethernet port speed settings- What is the Ethernet port speed of all devices on the network (are any switches hard-set, or are they set to auto-negotiate)? Please note that the PTP Option Card is a 10/100 Base-T device only. It is not compatible with faster 1 Gbit/s or 10Mbit/s devices, so devices should not be hard set to these values.
- 3) Make sure the PTP Slave is configured to send the PTP Delay Request on the correct PTP port (port 319). Example of this being an issue is below:

“The problem was the port number used by the delay request. It was using the general udp port rather than the event udp port (319)”

2) Verify the PTP Slave is configured/sending PTP Delay Requests

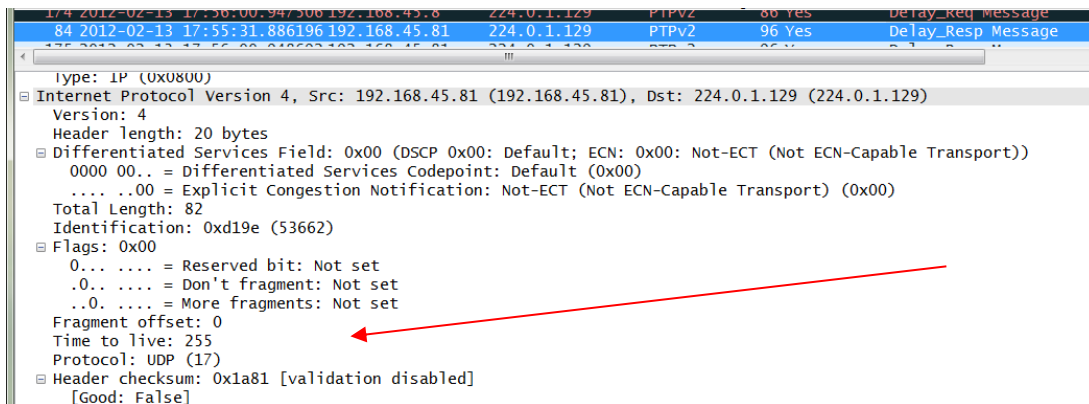
(grab a packet capture from a system on the same subnet as the slave and verify the packets are present in the capture). If a firewall is located between the two, make sure the PTP ports are left open (ports 319 and 320).

3) Check packet captures to see if SecureSync is sending out Peer Delay requests, instead of delay responses.

Email from Denis Reilly- In the packet traces, I could see that the Slave was sending out Delay Requests, and the Master was sending Peer Delay Requests. Delay Request/Responses are for E2E, and Peer Delay Request/responses are for P2P, and they don't mix well. Solution was to change the Slave to E2E instead of P2P.

4) If PTP Slave is sending Delay Request messages, verify they are being sent through any or all network switches.

5) Verify TTL level is configured large enough in the PTP master to allow the packets to get through ALL switches and routers in between Master and Clients.



Issues with IGMPv3 (Internet Group Management Protocol) on network switches (IGMP v2 is OK, IGMP V3 is not-

Per Jeremy Onyan- It's not that we don't support IGMPv3. It's a matter of configuring the switch to not ignore and drop the multicast packets which will happen if IGMPv3 isn't configured to route them.

IGMPv2 improves over IGMPv1 by adding the ability for a host to signal desire to leave a multicast group. IGMPv3 improves over IGMPv2 mainly by supporting source-specific multicast (SSM)

Source-specific multicast (SSM) is a method of delivering multicast packets in which the only packets that are delivered to a receiver are those originating from a specific source address requested by the receiver. By so limiting the source, SSM reduces demands on the network and improves security.

So, in other words, IGMPv3 is filtering out the packets because it's not been configured to allow the PTP multicast packets to go through. They can use IGMPv3, and we have customers that do, they just need to configure it to allow multicast (on port 224 I think...).

Note: Refer to Mantis case 1776 for more info

- 1) IGMP is a network switch configuration that may be present (it's not in the Spectracom devices).
- 2) IGMP v3 is blocking Delay Request messages.
- 3) Change IGMP in the network switches to IGMP V2.

(**Note:** reported by Stewart Smith with Virtu Financial)

Apparently, they were having trouble with the PTP slaves having high jitter and offset values. Delay response messages apparently stopped getting passed through a network switch, after a short period of time

Well - I'm finding out that it responds with Delay Response packets for about 5 minutes. Then they all go unanswered again.

Update status email from Stewart (9/29/12) about this issue

I brainstormed the issue with our network engineer Rex. He changed our switch configuration from IGMPv3 to IGMPv2 and it immediately started working. In other words, with no other changes the clients immediately started seeing Delay_Response messages from the Spectracom SecureSync PTP option card.

I believe the timeout I referred to in my previous message was probably imposed by the switch. I think some additional work could be put into the implementation of IGMP on the PTP option cards — but there is an obvious work-around which we are using now. Just use IGMP v2.

From Mantis case 1776 (note added by Denis Reilly): We have a customer who has reported successfully using SecureSync PTP with a router that was configured with IGMPv3. When asked how they did it, they replied that they forced Multicast Joining for 224.0.1.129 on the port of the switch connected to the SecureSync.

Perhaps this is an IGMP configuration issue after all?

5) PTP_TWO_STEP flag and “transport-specific” field settings in the Delay Request

Email from Denis (2/22/13) -Please advise Todd that he needs to set the **PTP_TWO_STEP flag** to 0 and the “transport-specific” field to 0x00 in his delay requests. This is why he is seeing problems with the return timestamps in the Delay Responses.

Our hardware timestampers are very particular and will not timestamp delay request packets with these issues. But our PTP stack will send the Delay Response anyway, sometimes with a stale timestamp.

- 7) (Model 1204-12 10/100 card only) make sure the PTP slave is NOT configured to use Telecom or Power Profile.

PTP Slaves that are configured to use other than the default profile (Such as Telecom or Power profiles) send multiple TLVs. This is an issue as the 1204-12 card only supports one TLV.

Email from Denis Reilly, 13 Mar 2014) I think Exfo is the client that tries to connect with Multiple TLV's in one message. That's explicitly called out as a possibility in the Telecom profile, but not in the main spec. The Actarus 1204-12 card does not support this, and the Korusys 1204-32 card does. As far as I know, there are no plans to put that function into Actarus, because Actarus is not sold as being Telecom-profile compatible. I've copied Laurent and Michel in to confirm.

A) Timestamp is missing in the Delay Response message

Email from John Fleck

I have a Secure Sync device with GPS and a PTP option module card.

When the delay mechanism is set to E2E, it seems the timestamp in the delay response message is invalid.

The field is called the receive timestamp. The seconds of the field seem stuck, at an early time, and the nanoseconds are always zero. See his example below (bold value towards the bottom indicates the issue).

Transmission of delay response

Frame 9 (96 bytes on wire, 96 bytes captured)

Ethernet II, Src: Spectracom_08:04:86 (00:0c:ec:08:04:86), Dst: IPv4mcast_00:01:81 (01:00:5e:00:01:81)

Internet Protocol, Src: 192.168.1.221 (192.168.1.221), Dst: 224.0.1.129 (224.0.1.129)

User Datagram Protocol, Src Port: ptp-general (320), Dst Port: ptp-general (320)

Precision Time Protocol (IEEE1588)

0000 = transportSpecific: 0x00

.... 1001 = messageId: Delay_Resp Message (0x09)

.... 0010 = versionPTP: 2

messageLength: 54

subdomainNumber: 0

flags: 0x0000

0... = PTP_SECURITY: False

.0.. = PTP profile Specific 2: False

..0. = PTP profile Specific 1: False

.... 0.. = PTP_UNICAST: False

.... 0.. = PTP_TWO_STEP: False

.... 0.. = PTP_ALTERNATE_MASTER: False

.... 0.. = FREQUENCY_TRACEABLE: False

.... 0.. = TIME_TRACEABLE: False

.... 0... = PTP_TIMESCALE: False

.... 0.. = PTP_UTC_REASONABLE: False

.... 0.. = PTP_LI_59: False

.... 0.. = PTP_LI_61: False

correction: 0.000000 nanoseconds

ClockIdentity: 0x000cecffe080486

SourcePortID: 1

sequenceId: 8

control: Delay_Resp Message (3)

logMessagePeriod: 4

receiveTimestamp (seconds): 1357564928

receiveTimestamp (nanoseconds): 0

requestingSourcePortIdentity: 0x000da8ffe23d768

requestingSourcePortId: 1

To troubleshoot this condition:

Have the customer send a packet capture of the Delay Request and delay Response messages. Make sure that all values in the PTP Delay Request (sent from the PTP client) have all of the correct values. All other values NEED to be False (0). If the Delay Request is not completely per the specs, the Delay Response is still sent to the Client, but the timestamp data is not included in the reply.

The IEEE Standard 1588-2008 defines each of the fields for the Delay Request packet (as shown below):

- The API calls associated with PTP Input and output (Master and Slave modes) are the “PTR” calls. PTR calls control and process decoded PTP network packets (either as an input reference or a time output).
With specific example above, reply from Denis Reilly: Our timestamper is likely not timestamping the packets because the PTP_TIMESCALE flag in the Delay Request is enabled.

After mentioning this to Denis, he replied to me: Keith, this makes sense. Packets sent to the general UDP port are not timestamped, packets sent to the event port are. I need to remember this in the future.

- 1) **Make sure that the PTP Delay Request messages are getting all the way to the PTP Master. If a firewall is located between the two, make sure the PTP ports are open.**
- 2) **Make sure the PTP Slave is configured to send the PTP Delay Request on the correct PTP port. Example of this being an issue is below (Reply from the customer, regarding the root cause of the issue above)**

The problem was the port number used by the delay request. It was using the general UDP port rather than the event UDP port

13.3.2.6 flagField (Octet[2])

The value of the bits of the flagField array shall be as defined in Table 20. For message types where the bit is not defined in Table 20, the values shall be FALSE.

Table 20—Values of flagField

| Octet | Bit | Message types | Name | Description |
|-------|-----|---------------------------------------|------------------------|--|
| 0 | 0 | Announce, Sync, Follow_Up, Delay_Resp | alternateMasterFlag | FALSE if the port of the originator is in the MASTER state. Conditions to set the flag to TRUE are specified in 17.3 and 17.4. |
| 0 | 1 | Sync, Pdelay_Resp | twoStepFlag | For a one-step clock, the value of twoStepFlag shall be FALSE. For a two-step clock, the value of twoStepFlag shall be TRUE. |
| 0 | 2 | ALL | unicastFlag | TRUE, if the transport layer protocol address to which this message was sent is a unicast address. FALSE, if the transport layer protocol address to which this message was sent is a multicast address. |
| 0 | 5 | ALL | PTP profile Specific 1 | As defined by an alternate PTP profile; otherwise FALSE. |
| 0 | 6 | ALL | PTP profile Specific 2 | As defined by an alternate PTP profile; otherwise FALSE. |
| 0 | 7 | ALL | reserved | See NOTE. |
| 1 | 0 | Announce | leap61 | The value of timePropertiesDS.leap61. |
| 1 | 1 | Announce | leap59 | The value of timePropertiesDS.leap59. |
| 1 | 2 | Announce | currentUtcOffsetValid | The value of timePropertiesDS.currentUtcOffsetValid. |
| 1 | 3 | Announce | ptpTimescale | The value of timePropertiesDS.ptpTimescale. |
| 1 | 4 | Announce | timeTraceable | The value of timePropertiesDS.timeTraceable. |
| 1 | 5 | Announce | frequencyTraceable | The value of timePropertiesDS.frequencyTraceable. |

NOTE—This bit is reserved for the experimental security mechanism of Annex K.

Bits 2, 5, 6, and 7 (highlighted) are specific to the Delay Request to add time to the Delay Response.

All unused flags are reserved.

13.3.2.7 correctionField (Integer64)

The correctionField is the value of the correction measured in nanoseconds and multiplied by 2^{16} . For example, 2.5 ns is represented as 0000000000028000₁₆.

A value of one in all bits, except the most significant, of the field shall indicate that the correction is too big to be represented.

The value of the correctionField depends on the message type as described in Table 21.

In the example issue above, the issue was due to the “PTP_TimeScale” field indicating “true” (should be false) as shown as bolded in the delay request message below).

Transmission of delay request

Frame 7 (86 bytes on wire, 86 bytes captured)

Ethernet II, Src: Teletron_23:d7:68 (00:0d:a8:23:d7:68), Dst: IPv4mcast_00:01:81 (01:00:5e:00:01:81)

Internet Protocol, Src: 192.168.1.5 (192.168.1.5), Dst: 224.0.1.129 (224.0.1.129)

User Datagram Protocol, Src Port: ptp-general (320), Dst Port: ptp-general (320)

Precision Time Protocol (IEEE1588)

```

0000 .... = transportSpecific: 0x00
.... 0001 = messageId: Delay_Req Message (0x01)
.... 0010 = versionPTP: 2
messageLength: 44
subdomainNumber: 0
flags: 0x0008
  0... .. = PTP_SECURITY: False
  .0.. .. = PTP profile Specific 2: False
  ..0. .. = PTP profile Specific 1: False
  ....0.. .. = PTP_UNICAST: False
  ....0.. .. = PTP_TWO_STEP: False
  ....0 .. = PTP_ALTERNATE_MASTER: False
  ....0 .. = FREQUENCY_TRACEABLE: False
  ....0 .. = TIME_TRACEABLE: False
  ....1... = PTP_TIMESCALE: True
  ....0.. = PTP_UTC_REASONABLE: False
  ....0.. = PTP_LI_59: False
  ....0.. = PTP_LI_61: False
correction: 0.000000 nanoseconds
ClockIdentity: 0x000da8fffe23d768
SourcePortID: 1
sequenceId: 8
control: Delay_Req Message (1)
logMessagePeriod: 0
originTimestamp (seconds): 1357564981
originTimestamp (nanoseconds): 322428487

```

C) Issue with PTPd freeware client software

(8 Nov 2012 KW per discussion with Denis Reilly), Denis said there is an issue with PTPd, where they are doing something incorrect (though technically, our PTP Masters should be able to tolerate) which prevents delay responses from being able to be processed. This results in Delay responses not being able to be processed by the PTP clients.

- 1) **Make sure PTP Client is operating in Multicast mode, if the PTP Master is in in Multicast mode (and vice-versa).**

Results: a wireshark packet capture showed delays requests were present but it showed the PTP client was in Unicast mode, while the SecureSync PTP card only supports Master mode. The destination address of 10.8.8.101 indicated it was being sent via Unicast mode. A multicast packet is always sent to the address of 224.0.1.129. So, Denis could tell that it was sending it in Unicast mode, causing the PTP Master to completely ignore the delay requests.

Example wireshark screenshot of the delay request packet because of this configuration issue (Notice the flags are false).

```

3906 653.817637 10.8.8.101      224.0.1.129      PTPv2  Announce Message
3907 654.221258 10.105.110.118  10.8.8.101      PTPv2  Delay_Req Message
3908 654.818206 AristaNe_14:d5:84 0x06c8 Multicast

```

```

subdomainNumber: 0
flags: 0x0400
  0... .. = PTP_SECURITY: False
  .0... .. = PTP profile Specific 2: False
  ..0... .. = PTP profile Specific 1: False
  ....1... = PTP_UNICAST: True
  ....0... = PTP_TWO_STEP: False
  ....0... = PTP_ALTERNATE_MASTER: False
  ....0... = FREQUENCY_TRACEABLE: False
  ....0... = TIME_TRACEABLE: False
  ....0... = PTP_TIMESCALE: False
  ....0... = PTP_UTC_REASONABLE: False
  ....0... = PTP_LI_59: False
  ....0... = PTP_LI_61: False

```

```

correction: 0.000000 nanoseconds
correction: Ns: 0 nanoseconds

```

```

0020 0a 08 08 65 01 3f 01 3f 00 34 8b 91 01 02 00 2c ...e.?.?.4....
0030 00 00 04 00 00 00 00 00 00 00 00 00 00 00 00 ...S...6.....
0040 00 0f 53 ff fe 0c 36 fc 00 00 02 7e 01 00 00 00 P.....OG
0050 50 9a db ac 05 89 4f 47

```

```

** Text item (text), 8 bytes
Packets: 3944 Displayed: 3944 Marked: 0 Lo

```

D) PTP module (Port State field) is stuck in “initializing”

Q. When I look at the output status the port is “initializing”...

Does the reported version information for the 1204-12 card look correct? If it looks valid, the Option Card is likely “awake”.

Email from Denis Reilly about a card stuck in “Initializing”

Everything looks like it upgraded properly. It's on 4.8.6, and the PTP firmware is on B105. In particular, the fact that the Version information is present means that the card is awake!

He should look at the “Network” PTP Status page and confirm that the “Link Connected” field says “Enabled”. “Disabled” means that the PTP card does not detect a physical network connection.

I assume he has tried rebooting the unit. He may also try unplugging and re-plugging the Ethernet from the back of the unit, and cold restarting the card.

I can see two possible scenarios:

- 1) The cable is not plugged in all the way!
- 2) A longshot, but somehow, the KTS is confused about the state of the PTP module. So, the module may be operating properly, but the KTS component does not realize it. We actually built-in a feature where when the Ethernet cable is plugged in, the KTS detects this and will re-query the state of the PTP card. Of course, there needs to be a certain amount of communication present for this to work at all, but since he has version information, it's worth a shot.

PTP Option Card reverted from PTP Master to Slave Mode (or vice-versa)

Examples

- 1) PTP Option Card reverted to PTP slave mode from PTP Master mode after update was performed
- 2) After a power cycle, PTP Card switches from PTP Master to PTP slave.

The following statement was from a customer. Just before performing a software update from 4.7.0 to 4.8.7, as directed by the update instructions, the PTP card was reconfigured from PTP Master to PTP Slave mode. At the end of the update, the PTP card was automatically back in PTP Master mode.

The PTP card returned to a "Master Only" mode after the upgrade - was that supposed to happen? I thought I'd have to change it back from slave mode myself.

Keith's explanation (10/11/12): Not technically, but I can now easily see how this could occur (nothing was adversely affected by this happening). In all earlier versions of the PTP Option Card firmware, whenever a configuration change was made by a user to the PTP card, the settings had to then be manually "Saved to ROM" as a second step, if you wished for the settings to persist through power cycles of the SecureSync. If changes were made without the "Saved to ROM" step being performed, the changes that were just made did not persist through any reboots. The changed values that weren't saved to ROM reverted back to the values that were configured just before the more recent changes were made by the user.

Specific to this instance, if you didn't perform a "Save Settings to ROM" before the update process was started, it was in Slave Mode initially, as you had configured it, but this setting reverted back to the Master Mode during the internal reboots that occur during the update process, because the change wasn't Saved to ROM first.

"Save Settings to ROM" only applied to the PTP Option Card setting. The Version 4.8.7 software update now alleviates the need to save the PTP configuration changes to ROM. This now happens automatically, when changes are made to the PTP card.

****Excessive PTP/1PPS jitter from a SecureSync-PTP Master (as exhibited on the PTP Slave)**

One way to test PTP accuracy is to compare a 1PPS output from the PTP Master and one from the PTP Slave to see how closely they are aligned to each other. Due to certain conditions, there may be fairly high jitter/wander between them.

This is because the 1PPS output from the PTP slave is not tied directly to the PTP input time stamps. The better the oscillator in the PTP Master and PTP Slave, the lower the 1PPS jitter will likely be (and vice versa) A TCXO oscillator in a PTP Slave can potentially see like 50-70ns of jitter, as a factor of the oscillator- not a factor of the time stamps. And TCXO oscillator can be greatly affected by even small, ambient temperature changes.

1. 1PPS input on the SecureSync?
2. Is an external 1PPS input reference applied to the SecureSync?
3. If a PTP Slave that is synced to a SecureSync PTP Master is exhibiting higher than expected jitter (besides factors such as Delay mechanism) if the SecureSync is ever using NTP/External PPS input as the selected references, NTP Expert Mode must be used to apply the external PPS input to the SecureSync. Otherwise, the SecureSync's output (such as PTP outputs) will have more jitter than expected. The external PPS can only be utilized by manually editing the ntp.conf file in Expert Mode. Refer to the Example Use Cases in the SecureSync NTP Peering document for proper configuration of the NTP Servers page of the browser.
4. How good is the oscillator on the PTP Slave?

Q. What type of oscillator is installed in the PTP Slave?

A. The better the oscillator type, the less 1PPS jitter that will be present.

Regarding the amount of jitter your customer is observing/reporting this is likely an expected amount of jitter, as a factor of the internal operation of the PTP Slave. If the PTP Slave has a low-end oscillator installed, such as a TCXO oscillator, this is an expected amount of jitter. The PTP input is likely VERY good, but the 1PPS output is not directly tied to the accuracy of the PTP packets. We have observed this with our own testing, when using a PTP Slave with a TCXO oscillator (we have seen similar

measurements as he is observing). The 1PPS jitter of a PTP slave could be minimized by using a PTP slave with a more stable, high-end oscillator installed such as an ovenized OCXO or Rubidium oscillator.

Especially with TCXO oscillators, which aren't ovenized, the stability of the oscillator can be significantly affected by just the ambient temperature. Even slight changes to the temperature changes how these oscillators operate.

Regarding the specific question:

The idea is if the SecureSync can tell us what the PTP output jitter is (let say 30ns), than, when we measure the slave device and see 91ns, we can say the slave generate 61ns jitter. (Does it work this way?)

The engineer mentioned this is a likely a good estimation, as the PTP Slave is the device that handles the majority of the math needed for the ontime point in the PTP Slave to be established (not the PTP Master). The PTP Master is primarily just providing an ontime point for the PTP Slave to reference. Then it's up to the PTP Slave to perform the math/calculations necessary to align its ontime point. This means that like 70% of this process is up to the Slave, as was mentioned.

**** Get Packet Captures, if at all possible!****

Monitoring PTP performance/operation

- Refer to "Monitoring PTP performance/operation" in custserviceassistance doc: <..\CustomerServiceAssistance.pdf>

****Excessive PTP/1PPS jitter from a SecureSync-PTP Master (as exhibited on the PTP Slave)**

- Refer to Salesforce case 8930 as an example

One way to test PTP accuracy is to compare a 1PPS output from the PTP Master and one from the PTP Slave to see how closely they are aligned to each other. Due to certain conditions, there may be fairly high jitter/wander between them.

This is because the 1PPS output from the PTP slave is not tied directly to the PTP input time stamps. The better the oscillator in the PTP Master and PTP Slave, the lower the 1PPS jitter will likely be (and vice versa) A TCXO oscillator in a PTP Slave can potentially see like 50-70ns of jitter, as a factor of the oscillator- not a factor of the time stamps. And TCXO oscillator can be greatly affected by even small, ambient temperature changes.

- 1PPS input on the TSync?
- Is an external 1PPS input reference applied to the TSync?
- If a PTP Slave that is synced to a PTP Master is exhibiting higher than expected jitter (besides factors such as Delay mechanism) if the SecureSync is ever using NTP/External PPS input as the selected references, NTP Expert Mode must be used to apply the external PPS input to the SecureSync. Otherwise, the SecureSync's output (such as PTP outputs) will have more jitter than expected. The external PPS can only be utilized by manually editing the ntp.conf file in Expert Mode. Refer to the Example Use Cases in the SecureSync NTP Peering document for proper configuration of the NTP Servers page of the browser.
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Especially with TCXO oscillators, which aren't ovenized, the stability of the oscillator can be significantly affected by just the ambient temperature. Even slight changes to the temperature changes how these oscillators operate.

Regarding the specific question:

The idea is if the SecureSync can tell us what the PTP output jitter is (let say 30ns), than, when we measure the slave device and see 91ns, we can say the slave generate 61ns jitter. (Does it work this way?)

The engineer mentioned this is a likely a good estimation, as the PTP Slave is the device that handles the majority of the math needed for the ontime point in the PTP Slave to be established (not the PTP Master). The PTP Master is primarily just providing an ontime point for the PTP Slave to reference. Then it's up to the PTP Slave to perform the math/calculations necessary to align its ontime point. This means that like 70% of this process is up to the Slave, as was mentioned.

***** Get Packet Captures, if at all possible!*****

****VRRP (Virtual Router Redundancy Protocol) packets included in captures**

Email from Michel (22 Sept 14) VRRP packets have no impact because they are to a specific multicast address to which the master doesn't join;

****Symantec Endpoint Protection (SEP)**

Q. On the PTP case (multicasting problem):

A I have WireShark proof (from one system, a server, without Symantec Endpoint Protection, a. k. a. SEP) that there is PTP traffic being broadcast, every two seconds, from 00:0c:ec:08:09:22 (the MAC address of the SecureSync's PTP option card).

Unfortunately, the PTP client (a PC) has SEP and not even WireShark on that system can see the PTP traffic, so I assume this is why the PTP card in it cannot synchronize with the PTP master.

I have tried several things with changing SEP settings and adding "allow" rules to the Windows Firewall (which is controlled by SEP, when SEP is installed), but have had no luck. Do you have any suggestions? Ports to allow, Windows Firewall adjustment, SEP adjustments, etc.? (SEP is NASA-mandatory on PCs.)

A. **Reply from Denis Reilly (7 Aug 2014)** How to troubleshoot blocked network traffic with the Symantec Endpoint Protection firewall <http://www.symantec.com/business/support/index?page=content&id=TECH203497>

****Cisco slaves not syncing**

Sync packet rate

Email from Denis (18 Jul 2014) What is the **Sync** rate on the PTP Master? Cisco gear may not sync properly if the Sync rate is less than **4 per sec.**

One Cisco switch is syncing to two different 1204-32 cards. Another Cisco switch not syncing to same two 1204-32 cards using same ethernet cable/SFP

➤ Refer to Salesforce Case 270265

****PTP Master not sending Delay Response Messages to Slaves**

1. Check **transportspecific** field in **Delay Request** message to ensure its set to 0x00.
2. Verify the PTP card is actually receiving the Delay Request (it may be being blocked)
3. With a packet capture, see if the delay requests have UDP checksum errors.
4. See if the switch(es) that the card is connected to is using IGMP. If it is, verify the PTP Master has joined the multicast group properly.

Note: If using IGMPv3, special configuration is necessary

Per Jeremy Onyan- it's not that we don't work with IGMPv3, it's that v3 has multi cast packet filtering that needs to be configured to allow the packets. So they can use it if they know how to set that up.

Note: Ping is unicast, so a successful ping doesn't verify IGMP group join.

Checksum errors: No Delay Responses being sent from the Master (observed on 1204-32 but can apply to either 1204-12 or 1204-32)

Q ...You will notice there are no delay response packets coming from the SecureSync. The flags seem to be correct for the one-step mode, but that isn't affecting the behavior of the SecureSync.

My email to Denis Reilly (8 Sept 15) 1204-32 card is interfacing with PTPd. Card is sending PTP Announce (clock class 6) and Sync (one-step) and appears it should be receiving delay requests just fine. But as Eric's customer is seeing, there are no delay responses from this PTP master,

The delay request appears to be valid, as far as I can see (other than the packet length is shorter than I thought it should be (44 instead of 72). It's a multicast packet on port 319 with a transportspecific field of 0x00 (as it should be) Orintimestamp seconds and nanoseconds are not 0s.

A. Reply from Denis Reilly (8 Sept) 44 is the proper length for Delay Requests, 54 for Delay Responses. The Delay Request packets do not have the proper UDP checksum – all checksums in those packets are reporting 0xf7df when in reality they are all different. Could the switches be dropping the packets with invalid checksums? I doubt it. Have we seen something like this before?

A Reply from Dave L to Eric Girard (8 Sept 15) Denis had a look at the pcap and did find a problem. The Delay Request packets do not have the proper UDP checksum – all checksums in those packets are reporting 0xf7df when in reality they are all different. Could the switches be dropping the packets with invalid checksums? Can you find out what type, make and model of the switches they are using? The switch may be the source of the problem.

****PTP Master sending more than one delay response per received delay request/ "UP" packets present on ports 319/320**

- There should be only one delay response per delay request
- Pico trading has two timekeeper slaves that may be affecting delay responses. Blocking the two slaves from the network to see if it stops sending two responses per request. Refer to Salesforce cases 15800/15817

Email from Michel (22 Sept 14) The issue is that sometimes extra Delay_Resp packets are sent by the master through the UDP port 319. The 2 points are that for one Delay_req packet received by the master, a right Delay_resp packet is sent through the UDP port 320, but sometimes 2 extra Delay_resp packets or more are sent through the UDP port 319 (whereas a Delay_resp shall be sent through the UDP port 320).

I don't know yet why, but I guess that it is related to the order in which Delay_req and Delay_resp packets are sent and received. I mean that sometimes 2 Delay_req packets are received by the master before it sends the Delay_resp packet of the first received Delay_req packet; it's just a hypothesis at this time;

The "UDP" packets could be another manifestation of the same issue.

Suggestion: to know finally whether the wrong Delay_resp packets sent by the master are du, or not, to the wrong Delay Req packets sent by the two slaves sending these wrong packets (10.105.110.117 and 10.105.110.119), we could suggest to the customer to remove them from the network and then, to capture new wireshark traces during few minutes.

PTP Leap Second operation (for both the 1204-12 and 1204-32 cards)

Summary of the email further below: The PTP slaves receive a flag 12 hours prior to let them know they need to apply the leap second at the end of the current day.

Details:

- 1) The PTP Announce message from the SecureSync changes the “LI 61” flag from False to True at 12 hours prior
- 2) (12:00 UTC) to report to the PTP slaves they need to assert the leap second at the end of the current day.
- 3) The slaves should repeat second “59” on their own.
- 4) After the leap second has been asserted (59, 59”, the Announce message:
 - A. Increments the TAI to UTC offset by one (35 to 36 for the 2015 leap second)
 - B. Changes the LI 62 flag from True back to False to indicate no leap second is pending.

To begin (and most importantly) there are no software updates required for the SecureSync Grandmaster for it to properly handle the upcoming leap second. This may or may not be the case with your PTP Slaves (I recommend you also contact their manufacturer as well, if you haven't already).

As I just confirmed, the SecureSync master will change a flag in its Announce message at approximately 12:00 UTC time (not local) on the day of the leap second being asserted (6/30). At that time, the flag of “LI bit 61” will change from False to True (LI bit 59 remains False since a second is being added instead of subtracted). This flag change reports to the PTP slaves that a leap second is occurring at the last second of the current day.

The Announce message flag change lets the PTP slaves that are receiving the Announce message know that they need to add a second at the end of that day in order to apply the leap second.

No Delay Responses being sent from the Master (observed on 1204-32 but can apply to either 1204-12 or 1204-32)

Q ...You will notice there are no delay response packets coming from the SecureSync. The flags seem to be correct for the one-step mode, but that isn't affecting the behavior of the SecureSync.

My email to Denis Reilly (8 Sept 15) 1204-32 card is interfacing with PTPd. Card is sending PTP Announce (clock class 6) and Sync (one-step) and appears it should be receiving delay requests just fine. But as Eric's customer is seeing, there are no delay responses from this PTP master,

The delay request appears to be valid, as far as I can see (other than the packet length is shorter than I thought it should be (44 instead of 72). it's a multicast packet on port 319 with a transportspecific field of 0x00 (as it should be) Origintimestamp seconds and nanoseconds are not 0s.

Reply from Denis Reilly (8 Sept) 44 is the proper length for Delay Requests, 54 for Delay Responses. The Delay Request packets do not have the proper UDP checksum – all checksums in those packets are reporting 0xf7df when in reality they are all different. Could the switches be dropping the packets with invalid checksums? I doubt it. Have we seen something like this before?

A Reply from Dave L to Eric Girard (8 Sept 15) Denis had a look at the pcap and did find a problem. The Delay Request packets do not have the proper UDP checksum – all checksums in those packets are reporting 0xf7df when in reality they are all different. Could the switches be dropping the packets with invalid checksums? Can you find out what type, make and model of the switches they are using? The switch may be the source of the problem.

| Io. | Time | PTP_LI_61 | Protocol | Peer Clock Stratum | VLAN | Info |
|-------|-------------------|-----------|----------|--------------------|------|------------------|
| 8305 | 20:23:14.69695900 | False | PTPv2 | | | Announce Message |
| 8460 | 20:23:22.69686000 | False | PTPv2 | | | Announce Message |
| 8671 | 20:23:30.69654600 | False | PTPv2 | | | Announce Message |
| 8995 | 20:23:38.69641600 | False | PTPv2 | | | Announce Message |
| 9259 | 20:23:46.69617800 | False | PTPv2 | | | Announce Message |
| 9478 | 20:23:54.69604300 | False | PTPv2 | | | Announce Message |
| 9653 | 20:24:02.69621700 | False | PTPv2 | | | Announce Message |
| 9816 | 20:24:10.69564900 | False | PTPv2 | | | Announce Message |
| 10031 | 20:24:18.69548500 | False | PTPv2 | | | Announce Message |
| 10462 | 20:24:26.69529200 | False | PTPv2 | | | Announce Message |
| 10678 | 20:24:34.69505900 | False | PTPv2 | | | Sync Message |
| 10679 | 20:24:34.69506100 | False | PTPv2 | | | Announce Message |
| 10838 | 20:24:42.69492200 | True | PTPv2 | | | Announce Message |

[Time delta from previous displayed frame: 0.000002000 seconds]
[Time since reference or first frame: 362.045089000 seconds]
Frame Number: 10679
Frame Length: 106 bytes (848 bits)
Capture Length: 106 bytes (848 bits)
[Frame is marked: False]
[Frame is ignored: False]
[Protocols in frame: eth:ethertype:ip:udp:ptp]
[Coloring Rule Name: UDP]
[Coloring Rule String: udp]

- Ethernet II, Src: Spectrac_0a:09:0f (00:0c:ec:0a:09:0f), Dst: IPv4mcast_01:81 (01:00:5e:00:01:81)
- Internet Protocol Version 4, Src: 10.2.100.170 (10.2.100.170), Dst: 224.0.1.129 (224.0.1.129)
- User Datagram Protocol, Src Port: 320 (320), Dst Port: 320 (320)
- Precision Time Protocol (IEEE1588)
 - 0000 = transportSpecific: 0x00
 - 1011 = messageId: Announce Message (0x0b)
 - 0010 = versionPTP: 2
 - messageLength: 64
 - subdomainNumber: 0
 - flags: 0x003c
 - 0... .. = PTP_SECURITY: False
 - .0.. .. = PTP profile Specific 2: False
 - ..0. = PTP profile Specific 1: False
 -0.. = PTP_UNICAST: False
 -0. = PTP_TWO_STEP: False
 -0 = PTP_ALTERNATE_MASTER: False
 -1. = FREQUENCY_TRACEABLE: True
 -1 = TIME_TRACEABLE: True
 -1... = PTP_TIMESCALE: True
 -1.. = PTP_UTC_REASONABLE: True
 -0. = PTP_LI_59: False
 -0 = PTP_LI_61: False

Then, at the time of the leap second being asserted, the Announce message will change its “*OriginCurrentUTCOffset*” (TAI to UTC offset) from the current value of 35 to the new value of 36. Also, at the same time, LI bit 61 will change from True back to False to indicate a leap second is no longer pending (as shown in the two screenshots below):

Just before the leap second is asserted

```

.... ..0. = PTP_LI_59: False
.... ....1 = PTP_LI_61: True
+ correction: 0.000000 nanoseconds
ClockIdentity: 0x000e0ecffff0a090f
SourcePortID: 1
sequenceId: 142
control: Other Message (5)
logMessagePeriod: 3
originTimestamp (seconds): 0
originTimestamp (nanoseconds): 0
originCurrentUTCOffset: 35

```

Just after the leap second is asserted

```
.....0. = PTP_LI_59: False
.....0 = PTP_LI_61: False
+ correction: 0.000000 nanoseconds
ClockIdentity: 0x000eecdffff0a090f
SourcePortID: 1
sequenceId: 143
control: Other Message (5)
logMessagePeriod: 3
originTimestamp (seconds): 0
originTimestamp (nanoseconds): 0
originCurrentUTCOffset: 36
```

*****(1204-12) Actarus PTP Option Card (Master/Slave) Discontinued**

Note: This card is also NetClock “**Option 12: PTP I/O**”



Discontinued (27 May 2016)

- For an alternate **PTP Master**: refer to [***\(1204-32\) Korusys PTP Gb Option Card \(PTP Master only\)](#)
- For an alternate **PTP Slave**: refer to [\(1204-3B\) GB PTP Slave Option Card](#)

Links/shortcuts

- **Option Card data sheet:** [I:\Marketing\ Product Data Sheets \(archive\)\Time & Frequency References](#)
- **Schematic:** [I:\Engineering\Archive\New Released\PCB Documentation](#) (Refer to the “**Schematics**” folder in “1204-10C0-F000” board files folder)- Note- not in Arena.
- For much more information on PTP: Refer to the:
- PTP Precision Timing Protocol (IEEE1588) (for all products)” section in the “TimingBoardCustAssist” document: [I:\Customer Service\1- Cust Assist documents](#) and
- The general PTP folder: [I:\Customer Service\PTP](#) (items such as Tech notes, Standards, etc)

Note: Info about 1204-12 card is not in the online SecureSync guide. For more info on 1204-12 card, refer to an earlier rev of the SecureSync user manual (1200-5000-0050) such as Rev R [I:\Engineering\Archive\New Released\Manuals\1200-xxxx-xxxx](#)

Accuracy specs from data sheet:

- 30ns or better (3 sigma) via network cross-over cable (higher when connected to a network).
- Sync rate above 512 sync messages/second.

1204-12 firmware Version info

For PTP software assembly versions, refer to: (1204-SHxx, SP1xx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

For additional software update info, refer to Release Notes: [PSB, PSP software updates\948x and SecureSync\948x and SecureSync Software updates](#)

Firmware

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “**Items**” for “**Item number**” and search for “**1200-SU01***”

The screenshot shows a search bar with the following components: a label 'Search:', a dropdown menu set to 'Items', the word 'for', another dropdown menu set to 'All Items', the word 'where', a third dropdown menu set to 'Item Number', the word 'is', a text input field containing '1200-SU01*', and a 'Go' button on the right.

| Added in Archive Version | | PTP module Version | FPGA version reported as | ECN/EC O cut-in | ECN released | highlights of changes incorporated (Refer to SecureSync Release Notes for more info) |
|--------------------------|--|--------------------|--------------------------|-----------------|--------------|--|
| 4.5.0 | | 1.0.0 | A_11 | 2498 | Nov 2010? | Initial release of PTP option Card |
| | | 1.0.4 | | | | |
| | | 1.0.5 | | | | |
| 4.6.0? | | 1.1.0 | A_19 | 2637/2740 | Apr 2011 | Support of Transparent clock compensation and various bug fixes. Better PTP performance. |
| | | 1.1.1 | | | | Fixed a PTP port configuration issue when version 1.1.0 software was not previously installed. |
| | | 1.2.0 | A_20 | 2681 | Jun 2012 | |
| (4.7L) | | B027 | | | | Skylight uses B027 (Skylight can't be updated beyond this version unless receiver changed out with Res-SMT-GG) |
| 4.8A (4.8.6 for all?) | | B030 | | 2880 | Mar 2012 | <ul style="list-style-type: none"> Prevents PTP packets from being used if SecureSync is not yet in sync. |
| 4.8.6 | | B105 | 1.04 | 2955 | Jun 2012 | <ul style="list-style-type: none"> Added "Forced Holdover" mode Fixed condition which could cause a one second time error if SecureSync is first synced via NTP. |
| 4.8.7 | | B120 | 1.04 | 3018 | Oct 2012 | <ul style="list-style-type: none"> Loss of PTP FollowUp packets is now detected. <ul style="list-style-type: none"> If this occurs, the PTP Slaves remain in an 'Uncalibrated' state (as is also the case with the loss of Sync status or Delay Response packets). Removed the need to "Save Settings to ROM" after configuration changes are made. The PTP module is automatically restarted, when required by configuration changes being made by a user. |
| 4.8.8 | | B127 | 1.05 | 3099 | Dec 2012 | <ul style="list-style-type: none"> Added Unicast/Minicast modes Fixed an issue where only 4 installed PTP Option Cards were supported <ul style="list-style-type: none"> Slots 5 and 6 weren't able to support PTP Option Cards being installed, when PTP Option Cards were also installed in Slots 1 through 4. Removed Sync-E from the browser. Fixed an issue where only 4 installed PTP Option Cards were supported. |
| 5.2.1 | | S141 | 1.05 | 409 | 11 May 2015 | ?? |
| N/A | | T141 | . | Not cut-in | N/A | This was a special patch released to address an issue (in S141) with settings being lost upon reboot—settings weren't being saved to EEPROM. |
| Not yet cut-in | | S153 | | Not yet cut-in | | Fix to allow 1204-12 to be able to sync to a 1204-32 card. |
| Not yet cut-in | | T156 | | Not yet cut-in | | Please note that is recommended to disconnect the PTP network cable while doing the upgrade. |

| | | | | | | |
|-------|--|--|--|----------|--|--|
| 5.4.0 | | S141 (S141 is still the latest rev as of at least version 5.4.0) | 1.05 (1.05 is still the latest rev as of at least version 5.4.0) | N/A | | From the v5.4.0 release notes: “command management improvements have been made.” Note: There were no changes in the 1204-12 card's FPGA in the 5.4.0 update. The v5.4.0 release notes (the statement above) is referring to changes made inside of the main SecureSync software for talking to the 1204-12 card- it's not referring to any changes in the 1204-12 board") |
| 5.4.5 | | T156 | | ECO 980 | ~12 Sept 2016 | Applied an earlier patch for general improvements in released/shipping version. |
| 5.5.0 | | T159 | | ECO-1080 | ~Dec 2016 (not yet released as a 30 Nov 16) | Update T159 to correct Minicast for 1204-12 10/100 PTP Option Card Note this update was initially sent to BAE as a patch for Raytheon AMDR SecureSyncs. |
| 5.8.0 | | N/A | | ECO-1685 | May 2018 | Changed just the Main software only (not the 1204-12 card firmware) to add support for all six option bays to have 1204-12 cards installed (six 1204-12 cards) |

1204-12 Hardware changes

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.5.0 | | Added support for this Option card (first release) | |
| | | | | |

JIRA SSS-377: Known issues with limit on the number of 1204-12 PTP cards which can be installed in the same SecureSync having a ublox receiver (affects at least versions 5.5.1, 5.6.0, 5.7.0, 5.7.1. fixed in 5.8.0)

- Versions 5.7.3 and below (not sure how far back in software version this issue goes) cannot have six 1204-12 cards installed in the same unit. Can only have up to four installed
- Version 5.8.0 update (and above) restores support for having up to six 1204-12 cards installed. Per v5.8.0 Release Notes: **“Corrected support of 6 1204-12 PTP 10/100 cards with u-blox M8T receiver”**

Per JIRA SSS-377:

NOTE: Production reported issues with 4 HaveQuick output cards and IRIG 05 and another card not allowing the last Havequick card in slot 6 to generate a data output.

Release 5.5.1 can support 5 1204-12 PTP 10/100 Cards, 1204-01 Card and a u-blox M8T receiver. However if we updated to Release 5.6.0 or 5.7.1 an error occurs in initialization of the PTR Reference as seen in the IN_GetStatus 0 command. The PTR Fails to initialize. Only PTR_GetNumInst can be called only... ALL other PTR Commands fail because they are NOT registered.

IF the GPS component or a PTR component is removed from the system the SecureSync can support 5 or 4 1204-12 option cards.

This indicates a KTS Resource is being consumed and the SMX-RTOS kernel needs the number of resources increased and the SMX-RTOS kernel libraries to be rebuilt.

Whatever SMX-RTOS resources increase in usage between 5.5.1 and 5.6.0 is the cause.

1204-12 PTP configuration/Support

Refer to the SecureSync user Manual (Section 8: Model 1204-02 Option Card section) for an extensive discussion on how to set up the PTP Option Cards:

- SecureSync PTP Option Cards are factory configured as **PTP Slaves** (can be re-configured in the field as PTP Masters).
- SecureSync must be “**in sync**” with a TFOM better than “15” for PTP Slaves (TSyncs or other SecureSyncs) to sync to it. SecureSync PTP Master can be synced to any available input reference or can also be synced to “self” (The PTP module knows if the SecureSync/TSync-PCIe is synced to “Self”. If it is, TFOM 15 is acceptable).
- Unlike the TSync PTP module, all versions of the SecureSync PTP Option Cards have supported the transparent clock delay compensations (used when configured as a PTP Slave).
- **TAI offset** needs to be defined:
As for your questions on the TAI offset, you are correct. Because the SecureSync cannot obtain this value from an external input (none are currently being applied), the value needs to be manually defined. The TAI offset is automatically calculated when the “GPS to UTC offset” has either been set by an input reference (such as GPS) or has been manually entered by a user. This value is entered in the Setup / Time Management page of the browser. If the “GPS to UTC Offset” doesn’t indicate a value of “15”, enter this value and hit Submit. This will automatically set the TAI offset value to the current value of “34”.

Classic interface browser

Below is a screenshot of the **Setup / Time Management** page showing the TAI offset being properly configured:

| SYSTEM TIME SETUP | |
|--|--|
| Time Scale | UTC |
| Year | 2012 |
| <input type="button" value="Submit"/> <input type="button" value="Reset"/> | |
| Set Timescale Offsets | |
| GPS to UTC Offset | 15 <input type="button" value="Submit"/> |
| TAI to UTC Offset | 34 TAI = GPS + 19 |

- As of (10/24/11) we only support **PTP multicast mode**, but we plan on supporting unicast mode in the SecureSync by end of the 2012.
- The **SecureSync’s Input Reference Status table** shows the sync status of all possible input references that SecureSync can sync with. “PTP 0” will indicate “Not Valid” for one of two reasons.
 - A) When the PTP Module is configured as a PTP Master, this entry will always indicate “Not Valid”.
 - B) When the PTP module is configured as a PTP Slave, it will indicate “Not Valid” until the SecureSync has been synced to a PTP Master, which is connected to the Ethernet port of the PTP module (whether connected directly with a network cross-over cable or through network hubs and switches. Once connect to a PTP master, the PTP Module should achieve sync within about a minute of connecting the Ethernet cables.
 - C) With PTP 0 being enabled in the Input Reference Priority Table (Setup/ Reference Priority page of the web browser) and with it being the highest valid priority reference, SecureSync will declare its in sync using PTP as its selected reference.

Configuration of 1204-12 PTP card

**API calls (CLI commands) associated with the Model 1204-12 Card

- Unlike most Option Cards, 1204-12 configs are not stored in the “**ktsif.conf**” file, or any other conf file in the System. This one card stores its own settings internally. When a config change is made for this card, a “PTR” call tells the card to change and store internally the new value.

Notes:

- 1) The following info and commands apply only to the 1204-12 cards (not the 1204-32 card).
- 2) The entire list of commands consists of GETs only. As of at least versions 5.4.5 and below, there are no SETs available to perform PTP configuration changes via the CLI.

```
Offset Scaled Log Variance : 65535 (0xffff)
spadmin@Spectracom /usr/bin $ PTR_Get
PTR_GetBootImg          PTR_GetFtpItf          PTR_GetNumInst          PTR_GetRefId          PTR_GetUnctSlaveProp
PTR_GetClockProperties  PTR_GetGMProp          PTR_GetParentProp       PTR_GetState          PTR_GetUnitSettings
PTR_GetClockQuality    PTR_GetMacAddr        PTR_GetPortSettings    PTR_GetSyncEItf      PTR_GetUserDescription
PTR_GetDebugOutput     PTR_GetMode           PTR_GetPortState       PTR_GetTimeProp      PTR_GetVLAN
PTR_GetEthernetITF     PTR_GetModuleInfo     PTR_GetPtpItf          PTR_GetUnctMasterAdd  PTR_GetValidity
PTR_GetEthernetStatus  PTR_GetModuleStatus   PTR_GetPtpStatistics   PTR_GetUnctMasterProp
spadmin@Spectracom /usr/bin $ PTR_Get
```

- 3) Optionally press the tab key to complete the commands

To see or use these commands, from the home/spectracom directory, type: **cd /usr/bin**

- Type **PTR_Get** <tab> to view all the available Gets associated with the PTP cards (spadmin account can only perform the get commands)

Some specific examples

Get MAC address

```
spadmin@Spectracom /usr/bin $ PTR_GetMacAddr 0 0
PTR (0) MAC Address: 00:0c:ec:08:00:14
spadmin@Spectracom /usr/bin $
```

Get Clock Quality

```
PTR_GetClockProperties PTR_GetClockQuality
spadmin@Spectracom /usr/bin $ PTR_GetClockQuality 0 0
PTR (0) Clock Quality information:
Clock Class      : 255
Clock Accuracy   : 0xfe
Offset Scaled Log Variance : 65535 (0xffff)
```

Timescale of 1204-12 PTP cards

- Always uses **TAI** timescale (can't be changed to a different timescale)
- Refer also to general PTP info section of this doc: [Timescales for PTP Option Cards and timekeeper software \(UTC/Arbitrary timescales\)](#)

Changing the network settings of a 1204-12 PTP option Card

Refer to [Changing the network settings of an PTP Option Card or TSync-PCIe-PTP board](#)

- **Setting the TAI offset for PTP:** The TAI offset is automatically calculated when the “GPS to UTC offset” has either been set by an input reference (such as GPS) or has been manually entered by a user. This value is entered in the Setup / Time Management page of the browser. If the “GPS to UTC” Offset doesn’t indicate a value of “15”, enter this value and hit Submit. This will automatically set the TAI offset value to the current value of “34”.
- **Save Settings to ROM (applicable to archive versions 4.8.6 and below):** After making any configurations specifically to the PTP Option Card configuration pages that you wish to persist through reboots/power cycles, the settings should be “Saved to ROM”. This can be performed in the “Module Setup” tab for the PTP Option Card.
- **TTL (Time To Live) Default is “1”.** This value is decremented on the input of each switch and router. If the TTL value is “0” after it’s decremented, this will likely prevent the switch from forwarding the PTP packets.

The TTL value is configured in the “**Network**” tab of the PTP card (via either Setup/Inputs or Setup outputs page of the browser)

Email to a customer (on 11/23/11)

The PTP outputs are multicast messages. The specs recommend multicast traffic remain on the immediate subnet only, to prevent potentially flooding the entire network with PTP packets. For this reason, the factory default TTL (Time To Live) value is set to “1”. Depending on the internal operation of the switch, this will often prevent the switch from passing any PTP traffic. You may need to increase the TTL value of the PTP Master to a higher number than 1 (up to a max of 255), to allow the switch to pass the multicast traffic to other subnets.

Known potential issue with Firmware version S141 (starting in update version 5.2.1) causing any changes to the network settings to require a reboot of the SecureSync to take effect

- Refer to Mantis case 3089.
- Reported by Kris Fear and Esther Sheih with Raytheon.

Known potential issue with Firmware version S141 (starting in update version 5.2.1) with the Network Status page showing different settings than what were actually configured.

- Refer to Mantis case 3089.
- The network settings (IP address, gateway address, etc) can be set to particular values, but the Status page shows them set to other values.
- The values reported in the Status page may periodically change on their own
- I also saw here a problem disabling DHCP in this firmware release.
- Raytheon AMDR found the settings took effect after rebooting the SecureSync.
- This was temporarily addressed with patch update T141.

Model 1204-12 configured as a PTP Slave

Q. Is it possible to configure more than one unicast master clock in the network with BMCA mechanism

A. (Per Denis Reilly, 24 Mar 2014) The Model 1204-12 PTP card can only sync to one Unicast master at a time.

PTP validity

“PTP 0” will indicate “Not Valid” for one of two reasons:

- 1) When the PTP Module is configured as a PTP Master, this entry will always indicate “Not Valid”. (In this particular configuration, PTP is a SecureSync output, so it doesn't apply to the Input reference table).
- 2) When the PTP module is configured as a PTP Slave, it will indicate “Not Valid” until the SecureSync has been synced to a PTP Master, which is connected to the Ethernet port of the PTP module (whether connected directly with a network cross-over cable or through network hubs and switches. Once connect to a PTP master, the PTP Module should achieve sync within about a minute of connecting the Ethernet cables.

With PTP 0 being enabled in the Input Reference Priority Table (Setup/ Reference Priority page of the web browser) and with it being the highest valid priority reference, SecureSync will declare its in sync using PTP as its selected reference.

Known potential issue when syncing 1204-12 to a PTP Master via a direct connection (cross-over cable)

- Applicable in at least version 5.1.4 software
- Refer to Mantis case 2807
- Reported by Denis Reilly

During release testing for V5.1.4: A 1204-12 PTP card was configured as a Master and synced to GPS A 1204-12 PTP card in a different unit was configured as a Slave. The two cards were properly synced over a direct Ethernet cable from one to the other.

I disconnected the Slave from the Master, observed the Slave unit go out of Sync, then reconnected the Slave. I observed that the Slave would now cycle between "Initializing" and "Cable Unplugged". I looked at the back of the units, and noted that the Ethernet Link lights for both cards were cycling on and off as well. I had access to the debug serial port from both cards and observed that both cards were resetting themselves every few seconds. I unplugged and re-plugged the connection several times. Each time the connection was made again, the cards would continually reset.

I rebooted the Slave machine while the connection was inactive, then plugged the cable back in. At this point, both cards behaved normally, the link lights stayed on, and eventually the Slave went in sync to the Master.

The processor in these 1204-12 cards gets reset by KTS every time a connection is made. It is possible that the cards got themselves into a state where they entered a reset loop: when one reset, it caused the link to go down, which causes the other card to reset, which causes the link to go down again. If so, it will only be seen over a crossover connection. I have no clue why resetting one unit breaks the loop, or why we don't see this more often.

I do not think this should hold up any release, but am logging it in case we ever look at the KTS for 1204-12 again (and

Q. Is there a downside to using one method vs. the other (P2P versus E2E)? From your documentation it seemed like P2P was preferred?

Known issue when trying to sync a 1204-12 card to a 1204-32 PTP Master

Symptom reported: 'Port State' status of SecureSync (Slave) indicate "Uncalibrated:Attempting to SYNC"

- Applicable in at least software versions 5.3.0 and 5.3.1 (and likely prior)
- Refer to Salesforce case 20213 / Mantis case 3221
- Reported by Masataka
- Per Michel, 1204-12 card needs to be updated to vS153 (or later) to fix (post v5.3.1)

Email from Michel
I've found the cause of the problem.

There was a PTP protocol issue in the B127 release of a 1204-12 option board which prevent from syncing with a 1204-32 option board. The issue has been fixed in a subsequent release. Of course it is fixed in the last S153 release.
Email from Laurent

To complete Michel's answer, we are working on a new firmware version for the OC12 called S153 that will fix this customer issue and some others. We should complete the validation of this new firmware at the beginning of January next year. Can you ask if the customer is ready to wait a bit until we have this new firmware?

Model 1204-12 configured as a PTP Master

- **(Per Denis Reilly)** Although the 10/100 card supports one-step, we don't recommend it. (two-step works better for that.)
- Software Version 4.8.8 added support for Unicast/Minicast modes.

Limitations (number of slaves it can handle)

- 512 Delay Requests per second

Email from Jeremy Onyan (13 Mar 15) regarding a Sync without a follow-up packet also being sent: I guess what I'm trying to figure out is whether this is a deficiency of the OC12, or if they are trying to use it outside of what we spec it capable of.

Our specs on the OC12 are 512 delay requests per second. I understand that the actual capacity is a bit higher, but if Pico is exceeding these specs then I don't think we are obligated to send them an OC32. Yes, it will fix their problem, but if the OC12 is performing within spec then I don't think it warrants us upgrading them for free. But if they are using it as directed, and within spec, and there is still an issue, then I think the onus is on us to provide them with a fix.

Reply from Denis Reilly (13 Mar 15) regarding a Sync without a follow-up packet also being sent: "I would say it's a deficiency in the card. I think it can occur with fewer than 512 clients connected. But I would defer to Laurent and Michel on that."

Passive Master/Active Master mode

- Per Denis Reilly (6 Oct 2014): he is not aware of any issues with passive/active master switching. The 1204-12 card should be able to switch just fine between being the active master or a passive master.

Model 1204-12 configured as a "Master/Slave" mode (not recommended)

- Refer to Salesforce Case Number 190629

Email from Denis Reilly to Morgan (10 June 2019) As you know, the 1204-12 card is discontinued. I don't really know how much support Apps Eng can provide on this, since the card is not in general use. If we do need further support, we will ultimately have to go to Laurent's team in Les Ulis.

But, in the meantime, can you clarify with them why they have the cards set to master/slave?

According to the manual, master/slave mode has a very specific use case: it's designed to be used as a backup unit. The SecureSync with a 12 card and master/slave mode enabled should have no other references (not even GPS) going to it. While there are other PTP masters on the network, the 12 card with Master/Slave mode enabled will operate as a Slave and provide the timing source to the SecureSync.

If all PTP Masters leave the network, this SecureSync will go into Holdover (since there are no other references). However, when this happened the Master/Slave card will “promote” itself to be a Master, and will provide PTP time to the network based on its oscillator while in holdover.

Is this the behavior the customer wants? If both units have GPS, they may have better luck simply operating them both in Master mode. This setup also more closely aligns with their diagram below, which shows direct timeflow from the SecureSync masters down to their end-unit PTP Slaves.

Transmission modes: Multicast / Unicast / Minicast / Hybrid modes

- For much more information on Hybrid and minicast modes: Refer to the “PTP Precision Timing Protocol (IEEE1588) (for all products)” section in the “TsyncCustAssist” document.

Note: The 1204-12 can be an all unicast, all multicast or an all Hybrid Master. But it doesn't support a mixture of Unicast, Multicast and/or hybrid (like the 1204-32 card supports)

- Software update version 4.8.8 added support for Unicast/Minicast modes.
- 1204-12 supports Multicast, Unicast modes and Minicast modes, but should never be used in conjunction with each other:

OK for 1204-12 Option Card:

- All clients using unicast mode
- All clients using multicast mode
- All clients using minicast mode

Since the 1204-12 doesn't support mixing unicast and multicast clients, if there needs to be a mix of both multicast and unicast slaves, one solution is to replace with the 1204-32 card (which supports Hybrid mode). Or, add another 1204-12 card, with one operating in unicast mode and the other operating in multicast mode (two separate networks of clients).

A) Unicast mode

Max number of unicast contracts supported with 1204-12 card

- 1204-12 card supports up to **128** unicast/minicast clients (1204-32 card supports up to **4000** unicast/hybrid clients)
- The Model 1204-12 card can grant up to 128 unicast contracts (so it can handle up to a total of **128** PTP clients) whereas the 1204-32 Gb PTP card can handle up to **4000** unicast contracts.
- And unlike the 1204-32 Option Card, the Model 1204-12 doesn't support mixing unicast and multicast clients on the same domain. When using the 1204-12 PTP card with unicast clients, all clients need to be configured to use unicast mode.

B) PTP “Hybrid” mode (also refer to “minicast” mode below)

- 1204-12 PTP card **does not** support true Hybrid mode (and there are no intentions to add it).
- If a mixture of Unicast and Multicast Slaves is required (Hybrid mode), the 1204-32 Gb PTP Option Card should be used instead, for its Hybrid mode support.

(July 2014 KW) Important note about Hybrid mode (Refer to Salesforce case 14883): The Model 1204-12 card can be a unicast master, multicast master or a hybrid master. But it's not intended to service any combination

of unicast, multicast, or Hybrid slaves together. This will cause issues with this option card. All slaves should be running in multicast mode, Unicast mode or hybrid mode for the 1204-12 card to operate normally! Otherwise, if there is a mixture of both, there may be times that PTP packets aren't outputted.

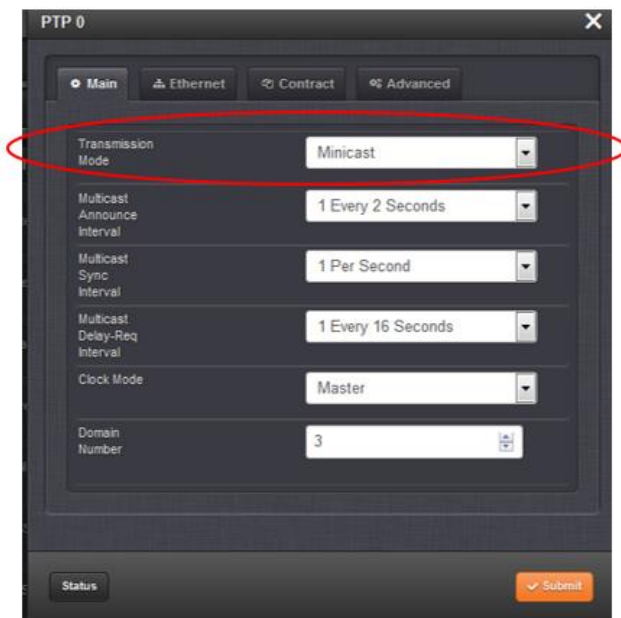
If a mixture of any of Unicast and Multicast Slaves is required, a 1204-32 Gb PTP card should instead be used for its Hybrid mode support.

Q. Got it. So if I switch ALL clients to hybrid, things should work?

A Email from Denis Reilly (22 July 14) Yes, the 1204-12 card will work correctly with all clients in Multicast, or all clients in Unicast, or all clients in Minicast/Hybrid.

Note that hybrid clients connecting to the 1204-12 card must first use Unicast Negotiation to register for Delay Responses before the 1204-12 card will respond to Delay Requests.

C) PTP “Minicast” mode

The image shows a software window titled "PTP 0" with a close button in the top right corner. Below the title bar are four tabs: "Main", "Ethernet", "Contract", and "Advanced". The "Main" tab is selected. The window contains several configuration fields, each with a label and a dropdown menu or text input. The "Transmission Mode" field is highlighted with a red oval and shows "Minicast" selected. Other fields include "Multicast Announce Interval" (1 Every 2 Seconds), "Multicast Sync Interval" (1 Per Second), "Multicast Delay-Req Interval" (1 Every 16 Seconds), "Clock Mode" (Master), and "Domain Number" (3). At the bottom left is a "Status" button, and at the bottom right is a "Submit" button with a checkmark icon.

- Minicast is similar, but not exactly the same as Hybrid
- Minicast is a unique modification of Unicast mode.
 - PTP Slaves only **unicast contract for Delay Responses**.
 - **Announce, Sync and Follow-up packets** are still sent by Master in **multicast** mode

Minicast mode consists of:

- **Always Multicast:** Sync, Follow-Up and Announce messages
- **Always Unicast:** Delay Request and Delay Response messages.

Alternate approach to using Minicast mode (acts more like hybrid mode, which is only available in the Model 1204-32 Option Card).

- Refer to [Viable alternate approach to using minicast mode \(requires two 1204-12 Option Cards\)](#) located in the *general information on PTP section (just prior to the 1204-12 card info)*.

Issues with Minicast mode (in at least software versions 5.4.5 and below)

- Refer to SR 6153 in SAP.
- Software Change to alleviate need for contract negotiation was incorporated in 1204-12 card update version **T159**. This update was initially sent to BAE as a patch. Its intended to be included in the SecureSync v5.5.0 update (expected to be available ~Dec 2016, refer to ECO 1080)
- The 1204-12 card requires contract negotiations via signaling messages with TLVs (specifically, the “**REQUEST_UNICAST_TRANSMISSION TLV**”) exchanged with the PTP Master in order to send unicast packets to the master. But if the PTP Master doesn’t support contract negotiations (doesn’t send it any TLVs), the 1204-12 card doesn’t send the master any of its unicast packets (just the multicast packets are sent).

IGMP

- Refer also to IGMP in Custserviceassist doc. <I:\Customer Service\1- Cust Assist documents\CustomerServiceAssistance.pdf>
- Per Michel, the 1204-12 PTP card supports **IGMPv1 only**.
- Though IGMPv2 is supposed to be backwards compatible on all network devices, Michel recommends explicitly enabling IGMPv1 on the network to be safe.
- Per Denis Reilly (13 Jan 15) he is not aware of any issues with IGMP.
- Contact Laurent and Michel in France regarding any issues relating to IGMP.

Email from Michel The Spectracom Model 1204-12 PTP Option Card only runs the IGMPv1. According to the standard a router running the IGMPv2 should also process the IGMPv1 but may be, in practical, it is necessary to explicitly enable the IGMPv1 layer in the router's configuration. So, I think that it is necessary to check whether the IGMPv1 is enabled or not in the customer's routers.

IGMP Joins

- Reportedly from a customer (23 Aug 16), the 1204-12 card sends joins when it's a **multicast** master. But it doesn't send them if it's a **Minicast** master.

Report of issue with IGMP – 5 minutes after it registers with the group.

- "We have been experiencing various issues with some of the cards in our Spectracom. Refer to Salesforce case 16832 for Jeremy Connell with "Thesys".
- SecureSync was running v4.7.0 software at the time.

Most recently, we discovered one of the cards was not communicating properly to the PTP multicast group. We have enabled a workaround to get the card publishing on the group, but we wanted to get some feedback on what we found. In brief, when the spectracom card is reset it registers with the switch on the ptp multicast group and everything works.

After 5 minutes the membership times out, and the switch no longer see's the card registered with the group. When we force the switch the spectracom is plugged into to be the designated router for the multicast group, the clients are able to connect regardless of whether the spectracom is registered to the group. Being the DR for the group, all hosts must use this switch to register. Seeing that the spectracom is not a member but clients are able to connect, it appears the spectracom is flooding data to the group, but not properly registering with IGMP. Further, when the group is up, the switch reports the group as using igmpv3 (which we are not configuring)."

Follow-on email to the one above Yes, IGMPv2 is configured on the network, and the device does join the PTP group and is visible on the switch right after the card is reset. **After a few minutes the switch no longer sees the card as a member of the group (via IGMP snooping) and the clients are no longer able to receive data from the card. To me, it seems the card is not sending or responding to IGMP group membership reports, as a result the switch is timing out the interface because it believes it's no longer a member of the group.**

Fragmentation errors

- The following is from SAP Case 6667 (the database before we started using Salesforce)

Q We are having fragmentation issues on our PTP links. It's a Spectracom SecureSync SW V5.4.1, Model 1200-413. The router MTU is set at 1500, previously at 9212, which is directly connected the Spectracom and we are still getting input fragmentation errors from the Spectracom. I checked the manual, but couldn't find MTU settings related to the PTP port.

A Reply from Denis R (27 Oct `17)

<https://ask.wireshark.org/questions/41152/how-to-check-if-fragmentation-is-happening>

Look in the "Internet Protocol Version 4" section of the packet, in the Flags.

Based on the above link, I think if there are fragments, you will see the "More Fragments" bit set.
I don't see that set anywhere – in fact, I see the "Don't Fragment" bit set on Delay Request and Delay Response (but NOT on Sync or announce....).

Packet Delay Variation (PDV)

- Apparently, part of the Telecom profile

Q. From Semic to Sylvain regarding 1204-12 Option Card

A Response from Sylvain) 27 Aug 2014)

We don't specify maximum acceptable PDV in our current documentation. However, Telecom standards specify a maximum acceptable PDV in a network (for frequency transfer applications)

Ø Such specification is described in ITU-G.8261.1: « In any 200 s window, at least 1%, with a minimum of 2 packets, should be observed in a cluster comprised between floor delay and floor delay + 150 us »*

This can be used as a starting point; measuring the PDV requires dedicated measurement equipment.

Using the 1204-12 as a PTP Master with Exfo PTP Slaves

- Not recommended to use 1204-12 with these PTP Slaves, as they apparently require Telecom Profile.
 - Telecom profile is supported with 1204-32 Gb PTP Option Card.
-

No Delay Responses being sent from 1204-12 card

A) PTP slave is trying to use Telecom profile (sending multiple TLVs)

Email from Denis Reilly (13 Mar 2014) I think Exfo is the client that tries to connect with Multiple TLV's in one message. That's explicitly called out as a possibility in the Telecom profile, but not in the main spec.

The Actarus 1204-12 card does not support this, and the Korusys 1204-32 card does.

As far as I know, there are no plans to put that function into Actarus, because Actarus is not sold as being Telecom-profile compatible. I've copied Laurent and Michel in to confirm.

Auto-negotiate port speed

- **Note:** Connecting the 1204-12 card to a port that is hard-set at 1GB or higher may result in Sync messages periodically being sent out without follow-up messages being sent

Per Michel Reyverand (17 Nov 2104) regarding Stephen Lin with Calix We see that some sync packets are not followed by FollowUp packets. I've already seen such behavior when the Ethernet link is not set at 100Mbps/s.

I don't know whether the Ethernet link is well configured or not in this case (Port settings: auto negotiation, speed, full/half duplex) but it is a point to check.

Q. Is it possible to disable PTP auto-negotiation, and how can you do it if possible?

A. Reply from Keith after talking to Denis Reilly (28 Feb 2014) To answer your question, there is currently no way to disable auto-negotiation in the PTP Option Cards.

The Model 1204-12 Option Card will be either 10 base T, or 100 base-T, depending on how it negotiates. At this time, we do not plan on ever adding the ability to hard-set the port speed on this Option Card.

SecureSync loss of Sync (not in sync or Holdover)

I believe the following started in Version 4.8.6/4.8A (refer to ECN 2880, March 2013)

- **1204-12 card:** When SecureSync is not in Sync or Holdover Mode (Sync is False), and the 1204-12 card is configured as a Master, it will stop sending out all packets except the Announce messages (It stops sending out Sync and Delay Response packets).
Note: Denis Reilly thinks this might be a software bug. He doesn't think this is the way it should work. He believes the 1204-12 should work like the 1204-32 card, which keeps outputting Sync packets, but with a reduced clock class value in its announce message (7 instead of the normal 6 when it's in sync)
- **1204-32 Gb PTP (for comparison):** Per Denis Reilly, if the SecureSync loses sync, the 1204-32 card will continue outputting Sync messages, but the clock class degrades from 6 to 7 so that the best master clock algorithm can switch to a master that is in sync.

Announce messages from 1204-12

(Starting in version 4.8.6) Announce messages continue to be sent from 1204-12 even if the SecureSync is not in sync.

sfptpd client (solarflare sfptpd daemon) is logging: **warning: failed to receive Announce within 12.000 seconds.**

- Refer to Salesforce case 17523
- **Resolution (reply from customer)** “On the PTP interface configuration, I changed the protocol to **IPv4** from **802.3/Ethernet**. That did it.”

For General info on ClockClass and ClockAccuracy (Clock Quality) fields. Refer to “**Announce Messages**” in: [..\CustomerServiceAssistance.pdf](#)

Sync and Follow-up packets from the 1204-12 card

Sequence ID field

- The Sequence ID starts at 1 after each restart of the PTP module, and then continues to increment from there.

Note: The PTP module is restarted after each boot-up. It also restarts if loss of link occurs. So if the network cable is unplugged or the switch its connected to is rebooted/restarted, this will cause a loss of link, resulting in the PTP module restarting – setting its sequence ID back to 1 again.

Sync messages upon SecureSync going out of sync

When SecureSync is not in Sync or Holdover Mode (Sync is False), and the 1204-12 card is configured as a Master, it will stop sending out all packets except the Announce messages.

Note: Denis Reilly thinks this might be a software bug. He doesn't think this is the way it should work. He believes the 1204-12 should work like the 1204-32 which keeps outputting sync, but with a reduced clock class.

Sync message interval: User-configurable via the "log sync interval" field. For example, once a second, once every 2 seconds, etc.

"Follow-up" messages (should be one for every sync message) The 1204-12 PTP card always uses two step mode. So, all Sync messages SHOULD be followed by a Follow up packet with the same SequenceID number.

Issue: Not all Sync messages have an associated Follow-up messages being sent

- Refer to salesforce cases such as 17381 (for Pico trading).

Note: Connecting the 1204-12 Card to a port that is hard-set at 1GB or higher may result in Sync messages periodically being sent out without follow-up messages being sent

Per Michel Reyverand (17 Nov 2104) We see that some sync packets are not followed by FollowUp packets. I've already seen such behavior when the Ethernet link is not set at 100Mbps/s. I don't know whether the Ethernet link is well configured or not in this case (Port settings: auto negotiation, speed, full/half duplex) but it is a point to check.

Email I sent to Stephen Lin (18 Nov 2014)

Thanks again for sending us the packet capture for the Spectracom PTP master, as it was helpful (packet captures for troubleshooting issues related to PTP are almost always necessary).

The capture did show periodic issues with the exchange of PTP packets with the PTP Master. Specifically, we noticed that there were times when the Sync messages were being sent without correlating two-step Follow-up messages being sent thereafter. We have observed this happen if the Model 1204-12 10/100 PTP Option Card is interfaced with a port that is hard-set at 1GB or higher.

We recommend verifying that the particular switch port that this Option Card is connected to is set to auto-negotiate instead of being hard-set to a particular speed/duplex. If it's currently hard-set, it could cause the periodic issues you are observing.

Email from Jeremy Onyan (13 Mar 15) regarding a Sync without a follow-up packet also being sent: I guess what I'm trying to figure out is whether this is a deficiency of the OC12, or if they are trying to use it outside of what we spec it capable of.

Our specs on the OC12 are 512 delay requests per second. I understand that the actual capacity is a bit higher, but if Pico is exceeding these specs then I don't think we are obligated to send them an OC32. Yes, it will fix their problem, but if the OC12 is performing within spec then I don't think it warrants us upgrading them for free. But if they are using it as directed, and within spec, and there is still an issue, then I think the onus is on us to provide them with a fix.

Reply from Denis Reilly (13 Mar 15) regarding a Sync message without a follow-up packet also being sent:

Laurent says "sometimes our PTP master doesn't see requests from some slaves and therefore doesn't answer" This isn't quite the issue here, though. It's a follow-up packet that is missing. The Master is supposed to output Sync and Follow-Up together. When experiencing a high volume of delay requests, it looks like it is possible that the follow-up goes missing. This is a real issue with this card.

I agree with Michel's assessment that PTP slaves in general should be more tolerant of missed packets, since we are using UDP. But that doesn't solve the customer's problem.

I agree with the idea of replacing with an OC32. The OC32 cannot be a Slave, and there are other features that the OC12 supports that the OC32 does not. But this customer is using it strictly as a Layer 3 End-to-End Master, so the OC32 would work for them. And the card will not have any issues with mixed multicast/unicast or capacity issues. like the OC12 has. I've added Jeremy O since he probably sold it to Pico, and they may be willing to buy the card at this point (i.e. we may not have to give it to them).

"I would say it's a deficiency in the card. I think it can occur with fewer than 512 clients connected. But I would defer to Laurent and Michel on that."

If I understand correctly, it's not so much a capacity issue where we can say "don't exceed x slaves".

It's more like "Bad things may happen when too many slaves send Delay Requests within x milliseconds of the Master sending a Sync". The more Slaves you have connected, the higher chance you have of violating that. But there's no way of knowing for sure when (or even if) bad things will happen.

I'm having a hard time figuring out how exactly to explain this to a customer succinctly.

Announce/Delay Responses not working at faster intervals on 12 card

- Refer to the "Troubleshooting" -> "More Specific Troubleshooting" section further below

Delay mechanism for 1204-12 (end-to-end or Peer-to-Peer)

Delay Mechanisms (P2P and E2E)

Note:

- E2E (End to End) mode uses the standard Delay Requests / Delay Responses
- P2P (Peer to Peer) mode changes the standard Delay Requests / Delay Responses to Peer Delay Requests / Peer Delay Responses (they are not inter-changeable)

Note: Volant indicated P2P mode is working fine with v5.7.0 installed.

A) End to End (E2E) mode: (delay requests/delay responses)

- Measures the path delay as a total value between Master and Slave.

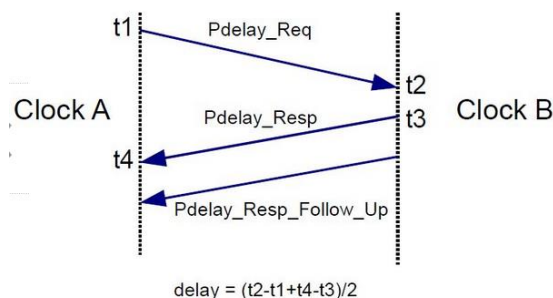
E2E (End-To-End) delay mechanism (used to calculate path delay) (KW 11/29/11) was added to SecureSync in v4.7.0 software. BUT, this selection was inadvertently not added to the drop-down list to be able to select this as a configuration. SHOULD be added in v4.8.0 but not confirmed.

B) Peer to Peer (P2P) mode (AKA “Point to Point”): (peer delay requests/peer delay responses)

Note- P2P is not supported in the 1204-32 card (only supports E2E mode)

- Measures the path delays as individual delays between each host (measures network segments individually) and then combines the values for a total. Provides additional accuracies. P2P can be better, because in theory you are measuring the delay of each path separately, which will minimize problems if packets take different paths. But this requires that all your network elements in the path know how to exchange peer delay messages.

From: <https://blog.meinbergglobal.com/2013/09/19/end-end-versus-peer-peer/>



P2P (Peer to To-Peer) delay mechanism (used to calculate path delay) wasn't available for 1204-12 card until version 4.8.0. Need to update to at least v4.8.0 for this capability.

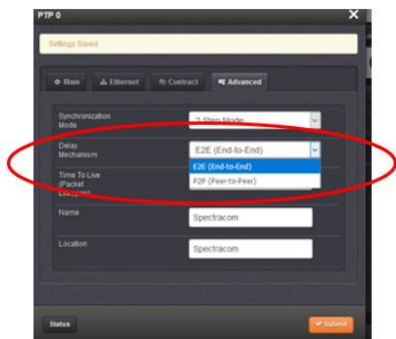
Q. Is there a downside to using one method vs. the other (P2P versus E2E)? From your documentation, it seemed like P2P was preferred?

A. **Reply from Denis Reilly:** P2P can be better, because in theory you are measuring the delay of each path separately, which will minimize problems if packets take different paths. But this requires that all your network elements in the path know how to exchange peer delay messages. I don't think your equipment can do that.

Given your network topology, I don't think it will matter for you, but it's my experience that E2E is a bit more common, and would probably interoperate with more of the Slaves that are available right now

Delay mechanism configuration for 1204-12

- configured in the **Advanced** tab, “**Delay mechanism**” field



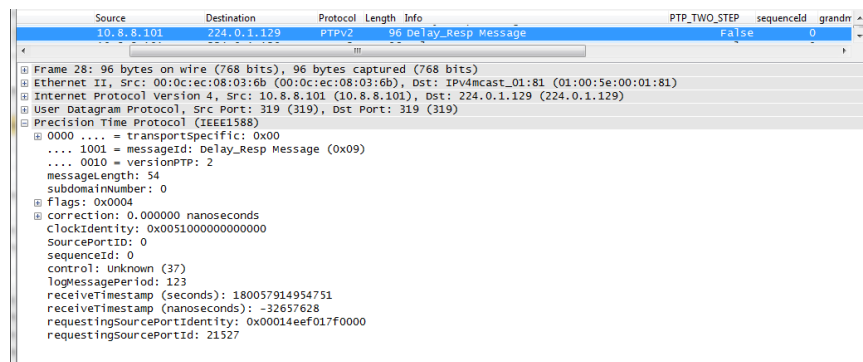
Associated Journal log entry

- End to End mode (E2E): Delay Mechanism : 0x01
- Peer to Peer (P2P): Delay Mechanism : 0x02

Delay Response messages

A) SequenceID (sequence ID) reported as 0 (observed in fielded unit)

- Noticed in Pico Trading packet captures that the 1204-12 card was periodically setting the Sequence ID value to 0 in Delay response and reporting other bogus info in these same packets. Example below.
- Refer to Salesforce Case 15800 and 15817.



B) More than one Delay Response sent for one Delay Request (on port 319 instead of 320) (as shown by the sequenceID number being the same for more than one packet)

- Pico Trading showed this happening in their packet capture.

Email from Michel (22 Sept 14) The issue is that sometimes extra Delay_Resp packets are sent by the master through the UDP port 319. The 2 points are that for one Delay_req packet received by the master, a right Delay_resp packet is sent through the UDP port 320, but sometimes 2 extra Delay_resp packets or more are sent through the UDP port 319 (whereas a Delay_resp shall be sent through the UDP port 320).

I don't know yet why, but I guess that it is related to the order in which Delay_req and Delay_resp packets are sent and received. I mean that sometimes 2 Delay_req packets are received by the master before it sends the Delay_resp packet of the first received Delay_req packet; It's just an hypothesis at this time;

The “UDP” packets could be another manifestation of the same issue.

Suggestion: to know finally whether the wrong Delay_resp packets sent by the master are due, or not, to the wrong Delay req packets sent by the two slaves sending these wrong packets (10.105.110.117 and 10.105.110.119), we could suggest to the customer to remove them from the network and then, to capture new wireshark traces during few minutes.

SNMP management for the 1204-12 card

- As of May 2013, the only Option Card with SNMP functionality is the Model 1204-12 PTP Option Card.
- One of the six MIB files we send define OID for SNMP “gets” for the PTP Card (there are no available sets or traps for this Option Cards)

Q Are there any OIDs we can poll for the info about cards inserted in these devices?

A. There are currently no SNMP OIDs associated with any of the Option Cards (there is no SNMP functionality associated with any the Option Cards nor is any planned at this time).

Update to this answer (7 May 13): As mentioned in the bullets above, the Model 1204-12 PTP Option Card does have a dedicated MIB file for SNMP gets. As of at least Nov 2014, this is the only Option Card that has PTP functionality.

Troubleshooting 1204-12 PTP Option cards

III. Basic troubleshooting

- A) What is status of the two LEDs near the Ethernet connector?
- B) Get a packet capture!!!!!!
- C) Get browser screenshots of the PTP Card's Setup and especially Status screens
- D) Things to watch out for in PTP packet capture of 1204-12 cards

Domain: Are all the packets in the same domain (all 0 or all 1 for instance)? Or, is there more than one domain in use?

Software upgrade issues

B) Updating S/S to v5.6.0 (or above) with at least three 1204-12 10/100 PTP cards installed causes upgrade failure

- Refer to SF case **116914** for Open Access
- Engineering was able to duplicate issue here.
- Somehow related to the main bus the PTP cards are plugged into- not due to the PTP cards themselves.
- Downgrading back to 5.5.1 or below temporarily fixes

Report from John (28 Aug 17) I've been trying to set up the PTP option cards, things like setting an IP address, mask, gateway.

An example IP setup: IP: 10.201.1.1 Netmask 255.255.255.0 gateway 10.201.1.1

The GUI gave me an error: Master Ip Error: Please supply a valid IP address.

So I thought I would clear-out the config and start fresh.

Check out the command output (from SSH session) below... "Failed to factory reset PTP Module" ?!

```
spadmin@pptp201 ~ $ clearstats
```

```
spadmin@pptp201 ~ $ clearlogs
```

```
spadmin@pptp201 ~ $ clean
```

```
PTP 0: Failed to factory reset PTP Module. Error=12 <br>PTP 1: Failed to factory reset PTP Module. Error=12 <br>PTP 2: Failed to factory reset PTP Module. Error=12 <br>PTP 3: Failed to factory reset PTP Module. Error=12 <br>PTP 4: Failed to factory reset PTP Module. Error=12 <br>PTP 0: Failed to factory reset PTP Module. Error=12 <br>PTP 1: Failed to factory reset PTP Module. Error=12 <br>PTP 2: Failed to factory reset PTP Module. Error=12 <br>PTP 3: Failed to factory reset PTP Module. Error=12 <br>PTP 4: Failed to factory reset PTP Module. Error=12
```

```
<br>spadmin@pptp201 ~ $
```

```
spadmin@pptp201 ~ $ clean
```

```
Exit: Fail to open logfifo
```

```
Exit: Fail to open logfifo
```

```
Exit: Fail to open logfifo
```

I can't use this system unless I can set the IP addresses and parameters on the PTP cards. None of the cards are taking a config as I'm getting errors setting the IP addresses.

Web browser indications:

Newer browser: Interfaces -> PTP 0, “Advanced” tab

| Ethernet Status | |
|---------------------------|--------------|
| Current IP Address | 10.2.100.97 |
| Current Network Mask | 255.255.0.0 |
| Current Gateway | 10.2.1.1 |
| Port Status | |
| Port Number | 1 |
| Port Activity | Enabled |
| Port State | Master |
| Link Status | Connected |
| Slave Sync Mode | 2 Step Mode |
| Module Info. | |
| PTP Version | 2 |
| Software Version | 156 |
| Hardware Version | T |
| Software Compilation Date | Feb 16, 2016 |
| Software Compilation Time | 10:30:45 |

Classic interface: Status -> Inputs (or Outputs) -> PTP, Network tab

| Port Status | |
|---------------|-----------|
| Port Number | 1 |
| Port State | Master |
| Port Activity | Enabled |
| Link Status | Connected |

- 5) Does “**Port State**” of the PTP Option Card indicate “Master” or Slave”?
- 6) Does “**Port Activity**” indicate “Enabled”?
- 7) Does “**Link Status**” of the PTP Option Card indicate “Connected”?

- A)** Get wireshark packet captures whenever possible (refer to: [**WireShark/TCP dump packet capture](#))
1. PTP MULTICAST destination address is **224.0.1.129** (any other address indicates UNICAST mode)
 2. Are there Sync, Follow-up, announce, Delay Request and Delay Response packets in the capture?
- B)** Max recommended network cable run 100 meters (from one device to another). Longer runs may result in packet losses.
- C)** Is the PTP Slave and all switches in between configured for 10/100 base-T. Make sure none are set to 1000 Base-T when using the 1204-12 Option Card or the TSynC-PCIe-PTP board.
- D)** Is the PTP Slave in sync?

For a TSync-PTP board as a PTP Slave: is the green LED on the edge of the board lit?

- E) Is PTP Master in sync (to itself or an external reference)? **Is the SecureSync synced to GPS (is the front panel Sync LED solid green)?**
- F) (With the exception of NTP sync or SecureSync synced to itself) Does PTP Master have a TFOM better than TFOM 15? If TFOM is 15 when synced to a reference, PTP packets are not outputted. **What is the SecureSync's TFOM value (As reported in the Status -> Time and Frequency page of the web browser)?**

Note (KW 12/17/12): According to Denis Reilly, the code is written in a way that if SecureSync is synced to Self or to NTP, the PTP Option Card knows the TFOM will be TFOM 15. So if TFOM of 15 is due to these conditions, this won't prevent the PTP card from outputting packets. But if it's synced to another reference and TFOM is 15, the PTP Option Card won't output any packets.

- G) Network topography (switches in between the Master and Slave)?
- H) Note that when using PTP Multicast, some switches need special configuration to allow the PTP multicast traffic to get through. make sure the switch is configured to pass PTP multicast traffic.
- I) Refer to the following specific indications/conditions below for more info.
- J) Are the PTP Master, Slaves (and any Cisco switches) all configured to be on the same PTP domain.

One simple thing that came to me while reviewing your configuration: please make sure that your GrandMaster, Slave, and Cisco switch are all set to the same PTP domain. The Cisco switch is set to Clock Domain 0. I believe our equipment defaults to Domain 0 as well, but you may want to check to make sure this hasn't changed – a PTP device will ignore traffic on domains other than the one it is set to.

Some questions for you and your customer, to get a better idea on exactly what is occurring:

- 1) Is the SecureSync synced to GPS (is the front panel Sync LED solid green)?
- 2) What is the SecureSync's TFOM value (As reported in the **Status -> Time and Frequency** page of the web browser)?
- 3) Have they tried temporarily connecting the TSync directly to the SecureSync using a network cross-over cable to see if the TSync-PCIe board can sync to the SecureSync? If they haven't, I recommend they do so first. This will verify the equipment is operational.
- 4) Have they configured the network settings for both the SecureSync and TSync-PCIe will applicable values for the network they are connected to? Note that with at least one switch in between, the TSync board has to be configured with an appropriate address for the network.
- 5) Are they basing their interpretation on packets not getting through on just the fact that the TSync-PCIe board is not syncing? Or have they verified with a packet capture performed from a PC on that particular subnet that lacks any PTP packets (note that they can't capture packets from a subnet on the other side of the switch)? If they haven't performed a packet capture yet (using wireshark for instance), I recommend they do so. If they can send us the capture, we'll be happy to also review it for them.
- 6) I'm confirming with engineering, but I do not believe the switch being 1000 base T would prevent packets from getting through at all. It may affect the optimal timing of the TSync, but I don't believe this would block any packets from getting through.
- 7) What is the TTL (Time To Live) value configured in the SecureSync (**Setup -> Outputs -> PTP** page of the browser, Network tab)? Can you have them send us a screenshot for each of the tabs on this page of the browser. If it's still set to 1, I recommend they try increasing it to a number slightly higher than the number of switches in between (if there are only two switches in between, try changing it to a value of "3" instead of "1").
- 8) As the TSync board does not yet support PTP Unicast mode, can you verify the SecureSync is configured for PTP **"Multicast"** mode and not set to Unicast mode (**Network** tab)?

FYI- in their packet captures, the PTP packets from the SecureSync should have a destination address of

“224.0.1.129”. Any other Destination address value indicates the SecureSync is configured for Unicast mode and should be reconfigured for Multicast mode in order for the TSync-PCIe packets to be able to receive PTP packets (otherwise there will be no packets on the network).

More specific PTP troubleshooting

I. IP address being set, but then reporting its 0.0.0.0

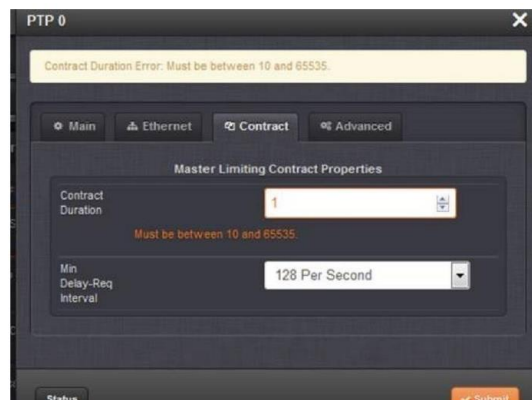
II. 1204-12 in either PTP Master or Slave Mode

A) “Contract Duration Error: Must be between 10 and 65535”

- Indicates the “**Contract Duration**” field in the “**Contract**” tab is set to a value outside its valid range.
- If the Transmission mode field in the “**Main**” tab is set to Multicast The fields in the “**Contract**” tab won’t be visible to correct this field value (temporarily set the Transmission mode in the Main tab to either unicast or minicast mode to make the Contract tab fields visible to change the value- don’t need to press Submit after changing from Multicast mode. But need to Submit after correcting the Contract Duration field.

Email Keith sent to a customer reporting this error and that the Contract Tab fields were not visible (2 Sept 16)
Note that when the PTP card is in Multicast Mode (configured at the top of the Main tab) the card doesn’t use Contracts. So, the fields in the Contract tab become hidden. Contracts are only used while the card is in either unicast or minicast mode,

It looks like one of the Contract settings was inadvertently set to an invalid value, before changing the transmission mode to multicast mode. So now that field isn’t visible. To easily fix this condition, temporarily change the transmission mode at the top of the **Main** tab to either unicast or minicast mode (no need to press Submit). Then select the Contract table and increase the Contract Duration field to a value of at least 10 and then press Submit (I suspect you will see the following after selecting the Contract tab. The error should clear after changing the field and pressing Submit).



Then, if your PTP client desires to use Multicast mode for all PTP packets, change the Transmission mode at the top of the Main tab back to Multicast mode and press Submit. With Multicast mode selected, the Contract fields will no longer be visible again.

III. 1204-12 in PTP Master Mode

A) No PTP packets at all in packet capture (from Master or Slaves)

1. If all multicast, could be an issue with a switch set to IGMPv3.
2. Per Denis Reilly, if using full multicast mode on master/slaves, the slaves will go silent if the PTP Master stops transmitting

3. If using Unicast mode on Master/Slaves, the clients should still be sending PTP packets even if the Master stops transmitting.
4. Look in packet capture for ARP requests with no responses (indicating either a switch blocking the traffic or a bad card)

Announce/Delay Responses not working at faster intervals

- refer to SF case 162118
- Solution is to replace 12 card with a 32 card

Q (report from customer) We tested with the following settings:

SecureSync as a Master in unicast mode.

We tested with different Sync interval and Min. Delay Request intervals.

When we increase the sync. message rate the PTP connection breaks very often and then it is re-negotiated.

16 and 32 sync msgs/sec, works fine. However, when we increase the Sync. and Delay request rate to 64 or 128 msgs/sec. The PTP connection is broken and then re-negotiated.

We also observed that the change in settings of PTP option module are not always saved when using the WebUI. Is this a bug in the SecureSync firmware or an update is required?

A Response from Denis R (8 May 18) Yes, I think this is a problem with the -12 card. I remember there being some issues at high rates, although I thought that it would do fine with high rates to only 1 slave. The -32 can definitely handle packets at this rate. If they are open to replacing it, that may be the way to go.

Email from Morgan to this customer (9 Apr 18) It appears there may be an issue with the 1204-12 cards, where the high rate works to one slave. but if you have more than one. you would have problems. The 1204-12 card has been discontinued for some time now, so the recommendation would be upgrade to the 1204-32 card which is master only. At this time getting a new case may be the only option.

B) Mix of Slaves sending both multicast and unicast Delay Requests (Minicast/Hybrid mode)

One or more slaves in multicast mode while others are in unicast mode (refer to known issues below regarding this PTP board's inability to sync this combination of clients).

Note: How to tell the difference between unicast and multicast slaves

- **Multicast** slaves send delay requests to the multicast address of **224.0.1.129**
- **Unicast** slaves send delay requests to the **IP address of the PTP Master**

Email from Michel The main problem is that there is a mix of multicast and unicast PTP Slaves on the same PTP network. Unicast PTP Slaves: 10.9.11.125, 10.9.11.126, 10.9.11.62, 10.9.11.61, 10.7.8.84, 10.7.8.85, 10.7.8.188, 10.8.8.84). Our Actarus PTP stack is not able to process both multicast and unicast PTP Slaves on the same network. Besides the PTP standard doesn't specify such architecture because in multicast mode the best master clock is elected by the masters, whereas, in unicast mode, the best master clock is elected by each slave (in our case, in mono unicast master mode, the best master clock is the master declared in the slave configuration).

So you can recommend to set all the PTP slaves in multicast mode (and the PTP master itself), or in unicast mode (but in this case the master clock, set in unicast mode, shall be declared in each slave configuration).

Announce messages

- Standard **length** of Announce message is **64 bytes**

- **Clock Class** of PTP Master should be “6” (indicating it’s in sync)
- **Priority** field set to “0” (refer to known issues below)
 - Note: If Priority field is set to “0”, refer to known issues below.

sfptpd client (solarflare sfptpd daemon) is logging: warning: failed to receive Announce within 12.000 seconds.

- Refer to Salesforce case 17523
- Resolution (reply from customer): “On the PTP interface configuration I changed the protocol to **IPv4** from **802.3/Ethernet**. That did it.”

Sync messages

- Standard **length** of Sync message is **86 bytes**
- **Two_Step** field can be “True” or False.

Follow-up messages

- Standard **length** of Follow-up message is **86 bytes**
- Should be one present for every Sync message if **Two Step** field i(in Sync message) is **true**.
- **preciseOriginTimestamps** (2 fields) should be reported in this message when if messages are present
- Missing follow-up packets (every Sync message doesn’t have a corresponding Follow-up with the same SequenceID number as the Sync message)

Email from Michel (16 Jan 15) I can’t explain why a Follow-Up message is missing from the only whreshark capture, but the PTP Slaves shall be tolerant to the loss of PTP packets. PTP packets are transported by an untrusted transport layer (UDP). If only one synchronization packet (sync, follow-up, delay_req, delay_resp) is missing there is no consequence on the synchronization status and the synchronization is maintained by the next PTP packets.

Delay Request messages

- Standard **length** of Delay Requests is **86 bytes**
- All Delay Requests should on **Source/Destination** port **319**.

Example

| Destination | Length | Source Port | Info |
|-------------|--------|-------------|-------------------|
| 10.8.8.101 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |
| 10.8.8.101 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |
| 10.8.8.101 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |

Delay Response messages

- Standard **length** of Delay Response packet is **96 bytes**
- All Delay Requests should on **Source/Destination** port **320**
- Missing Delay Responses (refer to known issues below)
- One Delay Request has more than one Delay Response with its same SequenceID number.
- Delay responses sent out on wrong UP Source/Destination port (sent on 319 instead of 320)
- Caused by having mix of unicast and multicast Delay Requests (not supported with 1204-12)

Example of Delay Response on wrong Source/Destination port (319 instead of 320)

| Info | Source | Destination | Length | Source Port | Destination Port |
|--------------------|------------|-------------|--------|-------------|------------------|
| Delay_Resp Message | 10.8.8.101 | 224.0.1.129 | 96 | 320 | 320 |
| Delay_Resp Message | 10.8.8.101 | 224.0.1.129 | 96 | 319 | 319 |
| Delay_Resp Message | 10.8.8.101 | 224.0.1.129 | 96 | 320 | 320 |
| Delay_Resp Message | 10.8.8.101 | 224.0.1.129 | 96 | 319 | 319 |
| Delay_Resp Message | 10.8.8.101 | 224.0.1.129 | 96 | 320 | 320 |

Known issues and conditions with 1204-12 cards (not in any particular sequential order)

A) Specific to Version S141 (version 5.2.1), configs are lost upon reboot

- Refer to Mantis cases 3055 and 3057
- Multicast Sync, Announce and Delay Request configurations aren't persisting when setup menu is re-opened, but no error messages are displayed when submitted.
- Refer to Salesforce case 18043 (GE Aviation) and Mantis case 3055.
- Esther with Raytheon AMDR noticed the delay request interval was different after rebooting.

B) No Delay Responses being sent from the Master (observed on 1204-32 but can apply to either 1204-12 or 1204-32)

Q ...You will notice there are no delay response packets coming from the SecureSync. The flags seem to be correct for the one-step mode, but that isn't affecting the behavior of the SecureSync.

My email to Denis Reilly (8 Sept 15) 1204-32 card is interfacing with PTPd. Card is sending PTP Announce (clock class 6) and Sync (one-step) and appears it should be receiving delay requests just fine. But as Eric's customer is seeing, there are no delay responses from this PTP master.

The delay request appears to be valid, as far as I can see (other than the packet length is shorter than I thought it should be (44 instead of 72). It's a multicast packet on port 319 with a transportspecific field of 0x00 (as it should be) Origintimestamp seconds and nanoseconds are not 0s.

A Reply from Denis Reilly (8 Sept) 44 is the proper length for Delay Requests, 54 for Delay Responses. The Delay Request packets do not have the proper UDP checksum – all checksums in those packets are reporting 0xf7df when in reality they are all different. Could the switches be dropping the packets with invalid checksums? I doubt it. Have we seen something like this before?

A Reply from Dave L to Eric Girard (8 Sept 15) Denis had a look at the pcap and did find a problem. The Delay Request packets do not have the proper UDP checksum – all checksums in those packets are reporting 0xf7df when in reality they are all different. Could the switches be dropping the packets with invalid checksums?

Can you find out what type, make and model of the switches they are using? The switch may be the source of the problem.

C) PTP Master is in sync but PTP packets are being lost between the PTP Master and Slave (as verified with Wireshark captures performed on same subnet as the Master and the Slave.

Summary:

- A network switch in between may be blocking packets
- A network switch in between may be a misconfigured PTP Boundary clock (not a transparent clock as expected)
- The PTP Master may be in Unicast mode, while the PTP client is in Multicast mode

Diagnostics:

1. Have they configured the network settings for both the SecureSync and TSync-PCIe will applicable values for the network they are connected to? Note that with at least one switch in between, the TSync board has to be configured with an appropriate address for the network.
2. What is the TTL (Time to Live) value configured in the PTP Master?

For SecureSync PTP Master: Setup -> Outputs -> PTP page of the SecureSync browser, **Network** tab)? It may need to be increased to get through switches.

3. Is the PTP Master configured for Multicast mode when using Some more sophisticated switches have special configurations to allow multicast traffic to pass.

For a SecureSync-PTP as the Master: As the TSync board does not yet support PTP Unicast mode, can you verify the SecureSync is configured for PTP **"Multicast"** mode and not set to Unicast mode (**Network** tab)?

4. What are the Models of all switches/devices in between? If it's actually a PTP boundary switch that isn't configured correctly, it will inherently block the original PTP packets and may not generate/output its PTP packets, resulting in no output packets being sent from that network device.

D) PTP Master is synced but PTP Slave is not (PTP packets are getting exchanged)

- A) If the PTP Slave from another vendor isn't syncing to our PTP Master, verify their PTP Slave supports PTPv2 (not PTPv1). We don't support PTPv1 Slaves.

- B) Verify Sync status of the PTP Master:

What is the Master synced to?

What is its TFOM value?

E) Delay responses always has 0 for nanoseconds

Issue: Delay response message always has 0 for nanoseconds, and the seconds indicates that the delay request was received BEFORE the master sent out the follow-up message that caused the slave to send the delay request.

Summary: This can be an issue with earlier versions of the PTPd software.

Example report Masataka with TOYO (~2/20/12) SecureSync as PTP Master, using Symmetricom SCi300 as their slaves. The Delay response message sent from the SecureSync PTP Master was indicating it was compatible with PTPv1. This was preventing the SecureSync from being able to fill in the "receivetimestamp (nanosecond)" field with just "0". Told him he would need to disable the delay request message flag that was indicating the PTP slave supports PTPv1.

Email from Denis Reilly: If the transportSpecific field in a Delay Request is set to a value other than 0, the timestamp that is transmitted in the corresponding Delay Response packet may be incorrect. It is recommended that customers who are using their own clients make sure the value of this field is set to 0 in their Delay Response packets. Customers who are using ptpd from Sourceforge should upgrade to the latest version, where the transportSpecific is set to the proper value. See <http://sourceforge.net/p/ptpd/bugs/25/> for more information about this issue in Sourceforge.

Email from Denis (2/21/12)

In case they ask for more details, the flag in question is the “Hardware Compatability” bit in the “transportSpecific” field, as documented in Annex D.4 / Table 123 in the IEEE 1588 specification. We are expecting all bits in the transportSpecific field to be 0.

F) As a PTP master, it's only sending out Announce message (no sync or delay responses)

- A) When SecureSync is not in Sync or Holdover Mode (Sync is False), and the 1204-12 card is configured as a Master, it will stop sending out all packets except the Announce messages.
- B) If there are other PTP masters on the network, this card may not be the best master so it's currently a passive master.

G) TSynC-PCIe Issue with P2P delay mechanism when in One step Mode only- two step mode is OK)
According to Denis (as of least 11/29/11) Les Ulis found a bug with P2P (Peer to Peer mode), when PTP is in the one step mode (not an issue if in “E2E” - End to End mode).

Update (4 March 2013, email from Michel Reyverand)

Yes, I confirm that TSynC-PTP supports both P2P and E2E delay mechanisms.

No, the issue in P2P/One step mode is not fixed and will not be. The purpose of the P2P delay mechanism is to reach a higher accuracy than the E2E delay mechanism, using specific IEEE1588 compatible switches/routers.

The present implementation of the One Step mode in the Zürich PTP Stack is based on a software timestamping of the PTP events. The timestamps, so produced, are not accurate at all. So the One Step mode, as presently implemented, invalidates the interest in using the P2P delay mechanism. It doesn't make sense using both P2P delay mechanism and One Step mode with our PTP Stack.

H) PTP module stuck in “initializing” (6/25/12) Bradley Wilson from GE Energy reported “just updated a SecureSync to firmware version 4.8.6 and the PTP module no longer multicast out synch messages. When I look at the output status the port is “initializing”.

Denis Reilly emailed me with: I know one way the card can stay in “initializing” state, and it's bad: if somehow the update hosed the card. Or if the rest software got upgraded, but for some reason the card didn't – I don't think the new PTP card software plays well with the old software in the rest of the system.

Potential fix (from Denis): I haven't tried it yet, but assuming we have new NWP software and old PTP software:

- A forced update to 4.8.P would revert the NWP software without attempting to touch the PTP card
- Then, a forced update to 4.8.6 ***should*** update everything.

I) Issues where delay requests are being sent, but delay responses not being returned.

- **(8 Nov 2012 KW per discussion with Denis Reilly),** Denis said there is an issue with PTPd, where they are doing something incorrect (though technically, our PTP Masters should be able to tolerate) which prevents delay responses from being able to be processed. This results in Delay responses not being able to be processed by the PTP clients.

J) 1204-12 configured as a Slave may not sync with a network cross-over cable to PTP Master

- Refer to Mantis case 2807 (also discussed about two pages back in this document)

K) Loss/change of Clock Identity/MAC address (Note the MAC address is also the “Clock Identity” field in the PTP card)

➤ Refer to Salesforce cases such as:

- Unknown case number: Clock ID (“Clock identity”): Reported in Delay Response as 000cecfffe080000(unknown)/01,

Email from Denis: And see how the Clock ID of the second card ends in 080000? That’s bad. That means that the card lost its Serial Number.

It should come back regardless, to be reprogrammed. What S/N cards do they have? Keith, haven’t we seen OC12 cards in the field lose their S/Ns before?

- 14216: MAC address was set to all 0’s (00:00:00:00:00:00) out of the box.
- 122976: Clock Identity field in Journal log entries changed from being a valid value in one entry to all ff’s (00:ff:ff:ff:ff:ff) in the next entry of the log

Example excerpt from Journal log showing invalid value: Clock Identity : 00:ff:ff:ff:ff:ff

Email from Denis to Laurent (5 Dec KW) I believe the MAC address on the 1204-12 is stored in its internal storage. So if the MAC address goes away, it can only be restored in the factory. And the firmware is stored in the same flash, so likely the whole thing will have to be reprogrammed.

Laurent may have more details.

L) Loss of Ping (Versions 4.8.5 and below)

- PTP Option Card responds to pings from Windows PCs, but not from Linux machines.
- Fixed in version 4.8.6 update

M) DHCP assigned IP address

NOTE: (starting in Archive v4.8.7) If DHCP is enabled and PTP was not successful in obtaining an IP address, DHCP will need to be restarted to retry. To restart DHCP:

1. Navigate to the **Setup-> Outputs -> PTP Setup** page and select the **Network** tab.
2. From the **PTP Network Settings** section, locate the **Port Activity** option.
3. Selected **Disabled**, then **Submit**.
4. Re-Enable the **Port Activity** option by selecting **Enabled**, then **Submit**. The restart may take up to a few minutes to complete.

N) Version 4.8A (Mar 2012, ECN 2880)

- (Refer to Mantis case 1642 for Open Access)
- This release contains only a PTP card firmware upgrade.
- PTP Firmware Version B030 resolves an issue where PTP Masters can report the wrong time on power-up or reboot.

After the fix, the PTP Master will stay in the "INITIALIZING" Port State until it first receives valid time. Then it will transition to "LISTENING", then to "MASTER" if it is the Best Master, and "PASSIVE" if it is not. In order for time to be considered valid the unit must be in sync to another reference AND the TFOM value of the system must be less than 15.

- Users can check the "Tools > Versions" page to see if their PTP card successfully updated. Under "System Version" Slots with PTP cards should read: OC12 V0001 FPGA 10 V0102 FW VB030
- Fix to all PTP Option Cards: likely incorporated in Archive v4.8.6, but not confirmed

O) Issue with Priority field being set to 0

- Priority value of 0 is a valid value (it's the highest priority).
- In at least versions 5.1C and below, if Priority is set to 0, it appears that it can't operate as a PTP Master. It needs to be set to a range of 1 to 128.
- Refer to Mantis case 2841 <http://cvsmantis.int.rolia.com/mantis/view.php?id=2841>

P) Issue with being able to change the Priority value from 0 to 1 using the new browser

- Refer to Mantis case 2842 <http://cvsmantis.int.rolia.com/mantis/view.php?id=2842>
- In at least versions 5.1C and below, can change field from 0 to 1 with the classic interface browser but not in the newer browser, Need to switch to Classic view to change.

Q) Issue with ability to sync a mixture of one or more slaves in multicast mode and one or more in unicast mode

- Refer to Salesforce case 14883
- Mixing unicast and multicast clients can result in periodic losses of PTP packets or other symptoms.
- **(July 2014 KW) Important note about Hybrid mode (Refer to Salesforce case 14883):** The Model 1204-12 card can be a unicast master or a multicast master. But it's not intended to service both unicast and multicast slaves together. This will cause issues with this card. All slaves should be running in multicast mode or all should be running in Unicast mode! Otherwise, if there is a mixture of both, there may be times that PTP packets aren't outputted.
- If a mixture of both modes is required, a 1204-32 Gb PTP card should instead be used.

R) Output Timing issues not necessarily due to the 1204-12 Option Card itself.

Example issues to look for:

Note: Also refer to the TSync CustAssistance document for other interface type issues.

- Res-SMT-GG receiver installed with early firmware 1.06. This can result in timing issues on the PTP outputs. The software in the SecureSync should be updated so that the receiver's firmware can be updated also.
- SecureSync switching between references that aren't aligned with each other.
- PTP clients using PTPd (open source PTP software)
 - Refer also to the TSync Cust assistance document

A) Issues with Delay Requests affecting Delay Response messages sent from the PTP Master- poor sync issues – due to **transportSpecific field set to **0x08** (instead of **0x00**).**

- Refer to the following link for more info:

http://sourceforge.net/tracker/index.php?func=detail&aid=3471843&group_id=139814&atid=744632

- Refer to Salesforce cases such as 11043 for specific examples of this happening.
- Note this issue applies only to the 1204-12 card (not the 1204-32, as the 1204-32 card is more tolerant on this value being in correct)

| | | | | | |
|----|----------|-------------------|-------------|-------|---|
| 13 | 1.000778 | 10.8.8.101 | 224.0.1.129 | PTPV2 | Sync Message |
| 14 | 1.001255 | 10.8.8.101 | 224.0.1.129 | PTPV2 | Follow_Up Message |
| 15 | 1.001967 | 10.8.8.101 | 224.0.1.129 | PTPV2 | Announce Message |
| 16 | 1.011677 | 10.105.116.105 | 224.0.1.129 | PTPV2 | Delay_Req Message |
| 17 | 1.047828 | 10.105.116.104 | 224.0.1.129 | PTPV2 | Delay_Req Message |
| 18 | 1.155867 | 10.105.116.105 | 224.0.1.129 | PTPV2 | Delay_Req Message |
| 19 | 1.297827 | 10.105.116.104 | 224.0.1.129 | PTPV2 | Delay_Req Message |
| 20 | 1.417372 | 10.105.116.40 | 224.0.1.129 | PTPV2 | Delay_Req Message |
| 21 | 1.534342 | 10.105.110.119 | 224.0.1.129 | PTPV2 | Delay_Req Message |
| 22 | 1.535567 | 10.8.8.101 | 224.0.1.129 | PTPV2 | Delay_Resp Message |
| 23 | 1.624829 | AristaNe_15:83:7c | PVST+ | STP | RST. Root = 32768/1757/00:1c:73:13:46:7a Cost = |
| 24 | 1.653017 | 10.105.110.117 | 224.0.1.129 | PTPV2 | Delay_Req Message |
| 25 | 1.654241 | 10.8.8.101 | 224.0.1.129 | PTPV2 | Delay_Resp Message |
| 26 | 1.949183 | 10.105.116.105 | 224.0.1.129 | PTPV2 | Delay_Req Message |
| 27 | 2.002515 | 10.8.8.101 | 224.0.1.129 | PTPV2 | Sync Message |
| 28 | 2.003007 | 10.8.8.101 | 224.0.1.129 | PTPV2 | Follow_Up Message |
| 29 | 2.282117 | 10.105.110.117 | 224.0.1.129 | PTPV2 | Delay_Req Message |
| 30 | 2.283335 | 10.8.8.101 | 224.0.1.129 | PTPV2 | Delay_Resp Message |
| 31 | 2.292386 | 10.105.116.40 | 224.0.1.129 | PTPV2 | Delay_Req Message |
| 32 | 2.395442 | 10.105.110.119 | 224.0.1.129 | PTPV2 | Delay_Req Message |
| 33 | 2.396641 | 10.8.8.101 | 224.0.1.129 | PTPV2 | Delay_Resp Message |


```

# Frame 19: 86 bytes on wire (688 bits), 86 bytes captured (688 bits)
# Ethernet II, Src: Solarfla_0d:b3:61 (00:0f:53:0d:b3:61), Dst: IPv4mcast_00:01:81 (01:00:5e:00:01:81)
# Internet Protocol, Src: 10.105.116.104 (10.105.116.104), Dst: 224.0.1.129 (224.0.1.129)
# User Datagram Protocol, Src Port: ptp-event (319), Dst Port: ptp-event (319)
# Precision Time Protocol (IEEE1588)
  # 1000 .... = transportSpecific: 0x08
    .... 0001 = messageId: Delay_Req Message (0x01)
    .... 0010 = versionPTP: 2
  
```

Transportspecific should be **0x00**. If not, our PTP Master won't send a Delay Response packet to the client.

We have seen this with PTPv2- Symptoms of this issue include the following:

- 1) PTP clients wavering off the correct time by many microseconds (one customer is seeing~ 50 microseconds of error).
- 2) Also, there will be some or all Delay Requests that don't have corresponding Delay Responses sent from the PTP Master. The client sends delay requests that the PTP Master can't respond to with a corresponding Delay Response.

FIX: Customers should upgrade to a newer version of PTPD and recompile to fix this issue

Transport specific field in delay request should always be set to **0x00**. However, this issue can change this field to **0x08**, causing us not to respond with a valid Delay Response

Specific example of this issue occurring with a 1204-12 card

Delay Request message
(transport specific "0x08")

Corresponding Delay Request message
| "receiveTimestamp (nanoseconds)" value is "0"

```
Delay_Req message, DTS4050 -> multicast
Decode:
Precision Time Protocol (IEEE1588)
...0000... = transportSpecific: 0x08
...0... = V1 Compatibility: False
...0001 = message: Delay_Req Message (0x08)
...0010 = versionPTP: 2
messageLength: 44
subdomainNumber: 0
flags: 0x0200
...0... = PTP_SECURITY: False
...0... = PTP_profileSpecific2: False
...0... = PTP_profileSpecific1: False
...0... = PTP_UNICAST: False
...1... = PTP_TWO_STEP: True
...0... = PTP_ALTERNATE_MASTER: False
...0... = FREQUENCY_TRACEABLE: False
...0... = TIME_TRACEABLE: False
...0... = PTP_TIMESCALE: False
...0... = PTP_UTC_REASONABLE: False
...0... = PTP_U_59: False
...0... = PTP_U_61: False
correction: 0.000000 nanoseconds
ClockIdentity: 0x00605dfff6900c8
SourcePortID: 1
sequenceId: 36264
control: Delay_Req Message (1)
logMessagePeriod: 127
originTimestamp (seconds): 42949672970
originTimestamp (nanoseconds): 65536
```

```
Configuration: Spectracom SecureSync with 1204-12 PTP Card
Delay_Resp message, SecureSync -> multicast
Decode:
Precision Time Protocol (IEEE1588)
0000... = transportSpecific: 0x00
...0... = V1 Compatibility: False
...1001 = message: Delay_Resp Message (0x09)
...0010 = versionPTP: 2
messageLength: 54
subdomainNumber: 0
flags: 0x0000
...0... = PTP_SECURITY: False
...0... = PTP_profileSpecific2: False
...0... = PTP_profileSpecific1: False
...0... = PTP_UNICAST: False
...0... = PTP_TWO_STEP: False
...0... = PTP_ALTERNATE_MASTER: False
...0... = FREQUENCY_TRACEABLE: False
...0... = TIME_TRACEABLE: False
...0... = PTP_TIMESCALE: False
...0... = PTP_UTC_REASONABLE: False
...0... = PTP_U_59: False
...0... = PTP_U_61: False
correction: 0.000000 nanoseconds
ClockIdentity: 0x000cecf8e08117d
SourcePortID: 1
sequenceId: 36264
control: Delay_Resp Message (3)
logMessagePeriod: 2
receiveTimestamp (seconds): 1525267200
receiveTimestamp (nanoseconds): 0
requestingSourceOrIdentity: 0x00605dfff6900c8
requestingSourcePortID: 1
```

Q. It seems like the Symmetricom units we have implement the delay request-response functionality whereas the Spectracom does not. At this point I am assuming I have not correctly set something up on the Spectracom units. We could use some guidance here.

A. **Email from Denis Reilly:** We've seen something similar in the past. The Delay Request packets have the transportSpecific field set to **0x08**. Our hardware timestamper is expecting the transportSpecific field to be set to **0x00**.

We had seen this in older versions of ptpv2d, but I thought this was fixed in the latest versions, so I am a bit confused. I see that someone has submitted this as a bug for ptpv2d, which is now closed.

http://sourceforge.net/tracker/index.php?func=detail&aid=3471843&group_id=139814&atid=744632

Clients using Solarflare cards

Solarflare 5322 PTP Slave board has high offsets and jitter

- refer to Salesforce case 4860
- Eric Aversa was having trouble with high offsets and jitter between a SecureSync-PTP master and their PTP slaves. They contacted SolarFlare and got a software update that fixed this issue.

S) Frame Check Sequence (FCS) errors in a packet capture

- Refer to http://en.wikipedia.org/wiki/Frame_check_sequence
- Some Solarflare PTP slaves send longer than usual Delay Request packets which wireshark may report as Frame Check Sequence errors.

Exfo PTP slaves

No Delay Responses being sent from 1204-12 card

PTP slave is trying to use Telecom profile (sending multiple TLVs)

Email from Denis Reilly, 13 Mar 2014) I think Exfo is the client that tries to connect with Multiple TLV's in one message. That's explicitly called out as a possibility in the Telecom profile, but not in the main spec.
The Actarus 1204-12 card does not support this, and the Korusys 1204-32 card does.
As far as I know, there are no plans to put that function into Actarus, because Actarus is not sold as being Telecom-profile compatible. I've copied Laurent and Michel in to confirm.

A) 1204-12 with Software Versions 5.1.2 and above (new web browser)

Interfaces -> PTP page

PTP: Indicates 1204-12 (10/100) Option Card
Gb PTP: Indicates 1204-32 (10/100/1000) Option Card



Status

Configuration

Port State

Slave: Indicates PTP card is configured as a Slave

Master: Indicates PTP card is configured as a Master

Cable Disconnected: no cable connected

Blinking "Slave" LED



Q. The PTP Slave Led in the WEB interface is blinking all the time, is this normal?

A. **Per Denis Reilly (24 March 2014)** The blinking lights on the mini-status line are generated by the web interface, while the text is generated by direct feedback from the card. If the lights and text are conflicting, I think the text should be considered more accurate. (But they shouldn't be conflicting – please enter a mantis case if you think there is a problem.)

1204-12 CONFIGURATION

Interfaces-> PTP 0 -> Edit

A) PTP Master

1. Main tab with Minicast Transmission Mode selected

- same as Hybrid
- Minicast is a unique modification of Unicast mode.
- In Minicast mode, Slaves only unicast contract for Delay Responses.
- Minicast mode consists of:
 - **Multicast:** Sync, Follow-Up and Announce messages
 - **Unicast:** Delay Request and Delay Response messages

2. Main tab with Unicast Transmission Mode selected (and Delay Mechanism in Advanced tab set to E2E – see note further below)

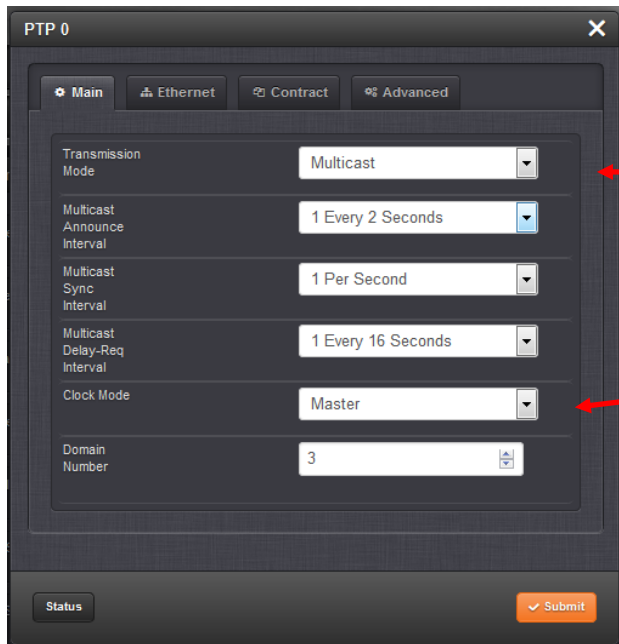
The screenshot shows the 'PTP 0' configuration window with the 'Main' tab selected. The 'Transmission Mode' is set to 'Unicast' and the 'Clock Mode' is set to 'Slave'. The 'Domain Number' is 0 and the 'Master Clock IP Address' is 0.0.0.0. A note below the IP address states: 'Master's static IP must be specified with current transmission mode (Unicast Tab)'. At the bottom, there are 'Status' and 'Submit' buttons.

Note: Transmission mode and Master Clock address fields disappear with Delay Mechanism (in Advanced tab) changed to “P2P”

The screenshot shows the 'PTP 0' configuration window with the 'Main' tab selected. A yellow banner at the top says 'Settings Saved'. The 'Clock Mode' is set to 'Slave' and the 'Domain Number' is 1. The 'Transmission Mode' and 'Master Clock IP Address' fields are no longer visible. At the bottom, there are 'Status' and 'Submit' buttons.

Main Tab (with Mode set to Master)

Main tab with “Multicast” selected (and Delay Mechanism in Advanced tab set to E2E – see note further below)



PTP 0

Main Ethernet Contract Advanced

Transmission Mode: Multicast

Multicast Announce Interval: 1 Every 2 Seconds

Multicast Sync Interval: 1 Per Second

Multicast Delay-Req Interval: 1 Every 16 Seconds

Clock Mode: Master

Domain Number: 3

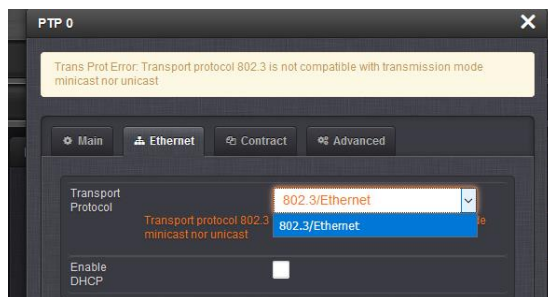
Status Submit

Choices are: **Multicast, Unicast and Minicast** (see below for info on Minicast mode)

Clock Mode: Choices are: **Slave, Master, Slave/ Master, and Disabled**

If delay mechanism is changed from E2E to P2P

Note: If **Delay Mechanism** (in **Advanced** tab) is changed to P2P (instead of “E2E”) Transmission Mode field will no longer be displayed (Transport protocol 802.3 is not compatible with transmission mode minicast or unicast)



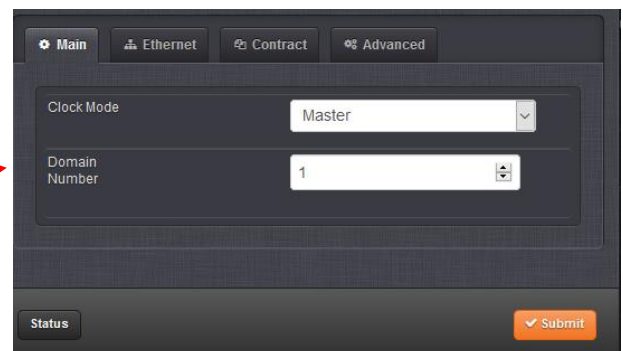
PTP 0

Trans Prot Error: Transport protocol 802.3 is not compatible with transmission mode minicast nor unicast

Main Ethernet Contract Advanced

Transport Protocol: 802.3/Ethernet

Enable DHCP: ☐



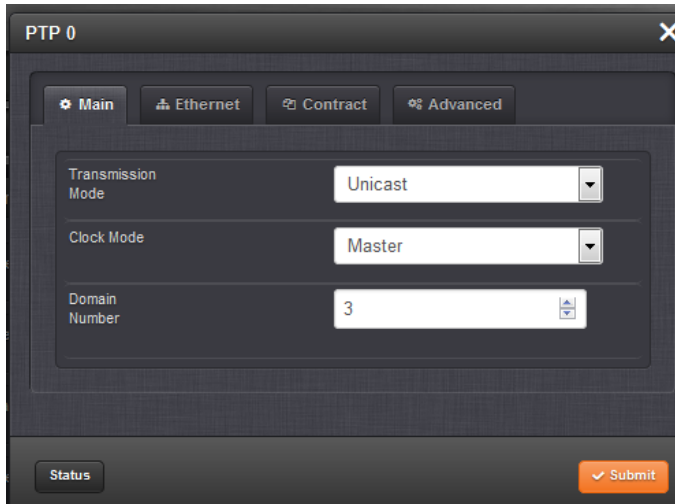
Main Ethernet Contract Advanced

Clock Mode: Master

Domain Number: 1

Status Submit

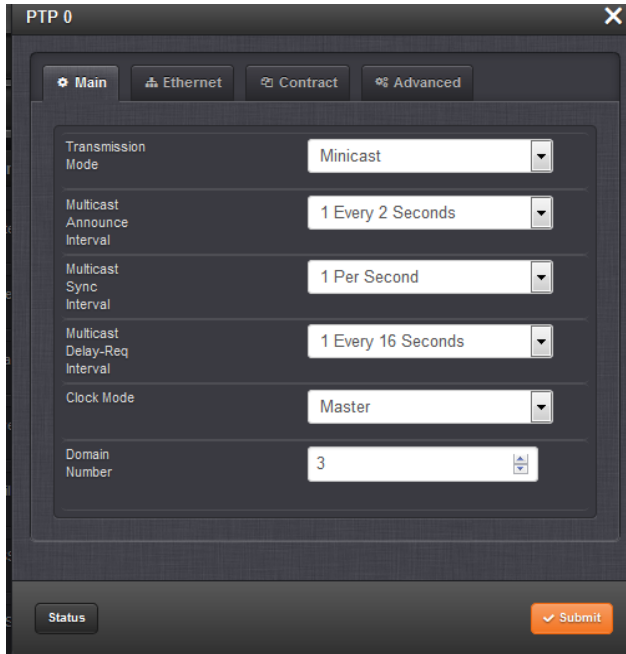
Main tab with Unicast selected



The screenshot shows the 'PTP 0' configuration window. The 'Main' tab is selected. The 'Transmission Mode' is set to 'Unicast'. The 'Clock Mode' is set to 'Master'. The 'Domain Number' is set to '3'. At the bottom, there is a 'Status' button and a 'Submit' button with a checkmark.

| Configuration Item | Value |
|--------------------|---------|
| Transmission Mode | Unicast |
| Clock Mode | Master |
| Domain Number | 3 |

Main tab with Minicast selected

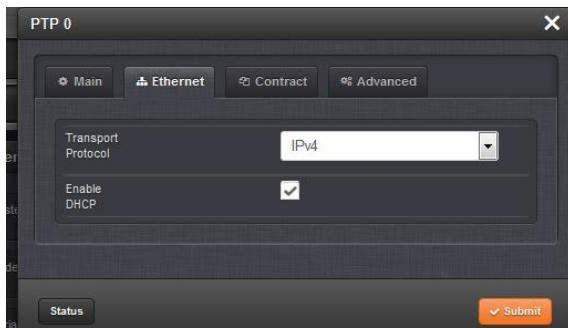


The screenshot shows the 'PTP 0' configuration window. The 'Main' tab is selected. The 'Transmission Mode' is set to 'Minicast'. The 'Multicast Announce Interval' is set to '1 Every 2 Seconds'. The 'Multicast Sync Interval' is set to '1 Per Second'. The 'Multicast Delay-Req Interval' is set to '1 Every 16 Seconds'. The 'Clock Mode' is set to 'Master'. The 'Domain Number' is set to '3'. At the bottom, there is a 'Status' button and a 'Submit' button with a checkmark.

| Configuration Item | Value |
|------------------------------|--------------------|
| Transmission Mode | Minicast |
| Multicast Announce Interval | 1 Every 2 Seconds |
| Multicast Sync Interval | 1 Per Second |
| Multicast Delay-Req Interval | 1 Every 16 Seconds |
| Clock Mode | Master |
| Domain Number | 3 |

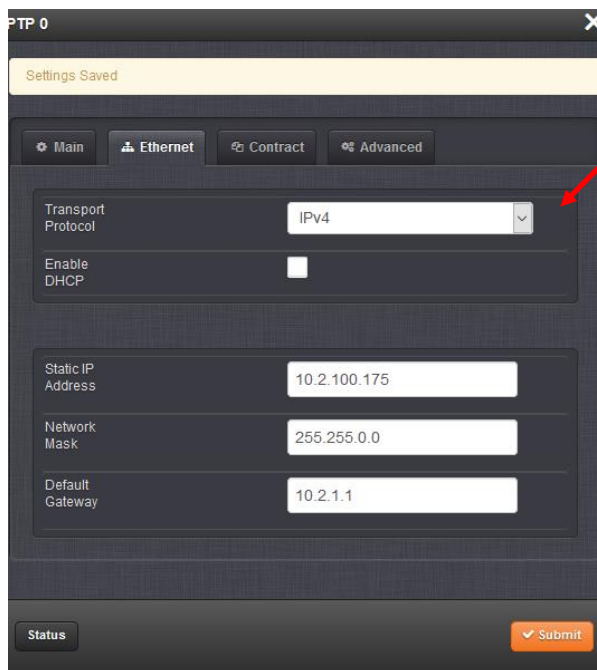
Ethernet tab

B) With DHCP enabled



The screenshot shows the 'PTP 0' window with the 'Ethernet' tab selected. The 'Transport Protocol' dropdown is set to 'IPv4'. The 'Enable DHCP' checkbox is checked. The 'Status' button is on the bottom left, and the 'Submit' button is on the bottom right.

C) With DHCP not selected



The screenshot shows the 'PTP 0' window with the 'Ethernet' tab selected. The 'Transport Protocol' dropdown is set to 'IPv4'. The 'Enable DHCP' checkbox is unchecked. Below this, the 'Static IP Address' is set to '10.2.100.175', the 'Network Mask' is '255.255.0.0', and the 'Default Gateway' is '10.2.1.1'. The 'Status' button is on the bottom left, and the 'Submit' button is on the bottom right.

“Transport protocol”: Available selections vary based on Delay Mechanism (**Advanced** tab)

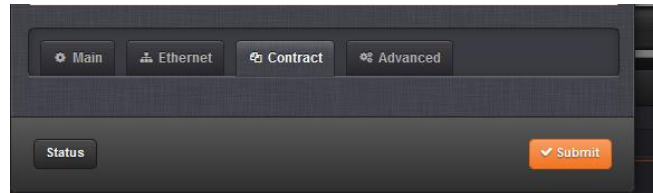
- Delay set to **E2E** (default), **IPv4** or **“802.3/Ethernet”** is available

- Delay set to **P2P**, only **“802.3/Ethernet”** is available

Contract tab

Contract tab when configured for Unicast mode (and Transmission mode in Advanced tab is not set to “Multicast”, and Delay Mechanism is set to default value “E2E”)

Note: The Contract fields are **not** displayed (as shown directly below) when:



- 1) **Transmission** Mode (in **Main** tab) is set to “**Multicast**”
- 2) and/or **Delay Mechanism** (**Advanced** tab) has been changed from **E2E** (default selection) to **P2P**

Contract Duration: Duration of the unicast contract. Units: Seconds. Must be between 10 and 65535.

Announce Interval: The Master uses this value to determine the rate at which Announce messages are sent to the Slaves - once every 4 seconds or faster

Sync Interval: A Master uses this value to determine the rate at which Sync messages are transmitted.

Min Delay_Req Interval: A Master will broadcast this value to Slaves to determine the rate at which Delay Request messages are transmitted. (When the End-to-End Delay

Note: The Model 1204-12 card can grant up to 128 unicast contracts (so it can handle up to a total of 128 PTP clients) whereas the 1204-32 Gb PTP card can handle up to 4000 unicast contracts.

Contract tab when configured for Minicast mode (and Transmission mode in Advanced tab is not set to “Multicast”, and Delay Mechanism is set to default value “E2E”)

The screenshot shows a configuration window titled "PTP 0" with a close button (X) in the top right corner. Below the title bar are four tabs: "Main", "Ethernet", "Contract" (which is selected), and "Advanced". The "Contract" tab displays "Master Limiting Contract Properties". There are two input fields: "Contract Duration" with a value of "10" and a spin button, and "Min Delay-Req Interval" with a value of "128 Per Second" and a dropdown arrow. At the bottom left is a "Status" button, and at the bottom right is an orange "Submit" button with a checkmark icon.

Field descriptions

Email from Dave L (6 Feb 17): in newer versions of SecureSync firmware the 1204-12 PTP card configuration screens are different. They will appear as you see now rather than in older documentation.

The settings in the **Contract** tab have to do with setting up Unicast Contracts with the PTP Slave devices

Here are brief descriptions of the parameters:

Contract Duration: Duration of the unicast contract. Units: Seconds. Must be between 10 and 65535.

Announce Interval: The Master uses this value to determine the rate at which Announce messages are sent to the Slaves - once every 4 seconds or faster

Sync Interval: A Master uses this value to determine the rate at which Sync messages are transmitted.

Min Delay_Req Interval: A Master will broadcast this value to Slaves to determine the rate at which Delay Request messages are transmitted. (When the End-to-End Delay Mechanism is chosen). In packets per second. [128 Per Second]

Advanced tab

Advanced tab when configured for Unicast/Multicast/Minicast Master mode

The screenshot shows the 'Advanced' tab of the 'PTP 0' configuration window. The 'Synchronization Mode' is set to '2 Step Mode'. The 'Delay Mechanism' is set to 'E2E (End-to-End)'. The 'Time To Live (Packet Lifespan)' is set to '3'. The 'Name' and 'Location' fields both contain 'Spectracom'. Below these fields is the 'Best Master Clock Algorithm Settings' section, which contains 'Priority 1' and 'Priority 2' fields, both set to '128'. At the bottom, there is a 'Status' button and a 'Submit' button.

“Delay Mechanism”: defaults to **E2E** but can be changed to **P2P**. See note further below about P2P mode changing the fields in the Main tab.

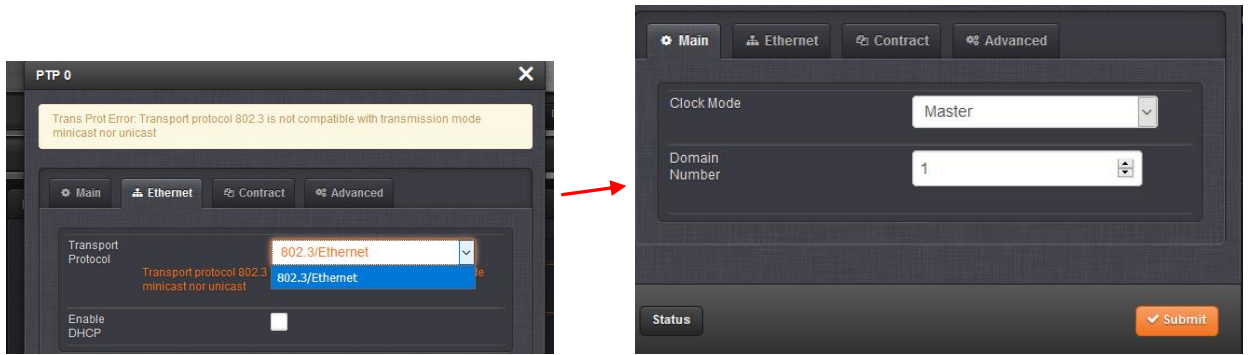
“Priority 1” and **“Priority 2”** values (PTP Master is typically “1” and PTP Slave is typically “128”)

If “Delay Mechanism” field is changed to “P2P”

The screenshot shows the 'Advanced' tab of the 'PTP 0' configuration window after the 'Delay Mechanism' has been changed to 'P2P (Peer-to-Peer)'. A yellow banner at the top indicates 'Settings Saved'. The 'Synchronization Mode' remains '2 Step Mode'. The 'Delay Mechanism' is now 'P2P (Peer-to-Peer)'. The 'Min Peer Delay-Req Interval' is set to '1 Per Second'. The 'Time To Live (Packet Lifespan)' is set to '64'. The 'Name' and 'Location' fields both contain 'Spectracom'. The 'Priority 1' and 'Priority 2' fields are no longer visible. At the bottom, there is a 'Status' button and a 'Submit' button.

Notice: **“Priority 1”** and **“Priority 2”** fields disappear when **Delay Mechanism** is changed to “P2P”

Note: If **Delay Mechanism** (in **Advanced** tab) is changed to P2P (instead of “E2E”) Transmission Mode field will no longer be displayed (Transport protocol 802.3 is not compatible with transmission mode minicast or unicast)



PTP 0

Main Ethernet Contract Advanced

Transport Protocol IPv4

Enable DHCP ☒

Status Submit

Choices are: **IPv4** or **802.3/Ethernet**

Three network config fields additionally displayed when the “**Enable DHCP**” checkbox is not selected.

Note whether or not the various Contract configuration fields are displayed in the **Contract** tab is dependent upon which drop-down field is **selected** in the “**Transmission Mode**” field (**Main tab**), as shown directly below

PTP 0

Main Ethernet Contract Advanced

Transmission Mode Unicast

A) **Contract** tab when **Multicast Transmission** mode is selected in the **Main** tab

- Contracts **do not** apply to **Multicast** mode, so the fields **are not** displayed in the Contract tab

Main Ethernet Contract Advanced

Status Submit

B) Contract tab when Unicast Transmission mode is selected in the Main tab

- Contracts **do** apply to **Unicast** mode, so the fields ARE displayed in the Contract tab

The screenshot shows a configuration window titled "Slave Proposed Contract Properties". At the top, there are four tabs: "Main", "Ethernet", "Contract" (which is selected), and "Advanced". The "Contract" tab contains the following fields:

- Contract Duration:** A text input field containing the value "300".
- Log Query Interval:** A dropdown menu showing "1 Every 2 Seconds".
- Announce Interval:** A dropdown menu showing "1 Every 2 Seconds".
- Sync Interval:** A dropdown menu showing "1 Per Second".
- Min Delay-Req Interval:** A dropdown menu showing "1 Every 16 Seconds".

At the bottom of the window, there is a "Status" button on the left and a "Submit" button on the right.

Contract tab when Multicast Transmission mode is selected in the Main tab.

The screenshot shows the same configuration window titled "Slave Proposed Contract Properties" with the "Contract" tab selected. In this mode, only three fields are visible:

- Contract Duration:** A text input field containing the value "300".
- Log Query Interval:** A dropdown menu showing "1 Every 2 Seconds".
- Min Delay-Req Interval:** A dropdown menu showing "1 Every 16 Seconds".

The "Announce Interval" and "Sync Interval" fields are not present in this view. The "Status" and "Submit" buttons remain at the bottom.

Number of PTP Masters the PTP Option card can sync to when it's a PTP Slave

- As of Feb 2013, each installed PTP Option Card in Slave mode can be configured to sync to only one PTP Unicast **Master**.
- If it's desired for the SecureSync PTP slave to be able to sync to more than one PTP Unicast Master, more than one PTP Option Card can be installed and configured as a PTP slave. Then, each Card can be configured to sync to a different PTP Master. The Reference Priority assigns a different index to each PTP Board, so this table decides which PTP Slave Option Card takes priority for the system sync (PTP 0 priority 1, PTP 1 priority 2, for example).
- Otherwise, to sync the PTP slave Option Card to more than one PTP Master, use multicast mode instead of unicast mode.

Issue with having more than four PTP Option Cards installed (and the higher PTP cards - slots 5 and 6- being reconfigured to be PTP Masters (not PTP Slaves))

With at least versions 4.8.8 and below

Mantis case 1912 discusses an issue of SecureSync having more than four PTP Option Cards installed, and Option Cards 5 and 6 configured as PTP Masters.

Note: This issue was fixed in Version 4.8.8 (Dec 2012, ECN 3099)

- Fixed an issue where only 4 installed PTP Option Cards were supported.
- Slots 5 and 6 weren't able to support PTP Option Cards being installed, when PTP Option Cards were also installed in Slots 1 through 4.

A) External PPS input being applied

Is an external 1PPS input being combined with NTP time input? If yes, keep in mind that Expert Mode has to be enabled and manually edited when using External PPS input. Otherwise, the SecureSync's outputs will have excessive jitter and won't utilize the stability of the external 1PPS.

Refer to the SecureSync NTP peering document and the 1PPS (EPP0) input reference section in ["SecureSync \(*Input References \(GPS/SAASM, PTP, IRIG, Freq in NTP, Havequick, ASCII etc\)/Reference Priority table/Time to synchronize to input reference"](#)

"PTP Protocol Setup" tab (One Step/Two Step, transmit message rates)

A) "PTP Protocol" tab in Archive Versions 4.8.7 and above (including v4.8.8)

PTP SETUP (SLOT3)

Network Clock **PTP Protocol**

| | |
|-----------------|----------|
| Delay Mechanism | E2E |
| One Step Mode | Disabled |

Multicast Settings

| | |
|---------------------------------|---|
| Log Announce Interval | 1 |
| Log Sync Interval | 0 |
| Log Min Delay_Req Interval | 3 |
| Log Min Peer Delay_Req Interval | 3 |

Submit Reset

Choices are: **E2E P2P** or **Disabled**. See note below

Choices are: **Disabled** (Two Step) or **Enabled** (One step)

See Notes further below (Below the Version 4.8.6 screenshot)

B) "PTP Protocol" tab in Archive Versions 4.8.6 and below

PTP SETUP (SLOT5)

Module Clock Network **PTP Protocol** Statistics

| | |
|-------------------------------------|----------|
| One Step Mode | Disabled |
| Announce Reception TimeOut | 3 |
| Log Announce Interval | 1 |
| Log Sync Interval | 0 |
| Log Min Delay Request Interval | 4 |
| Log Min Peer Delay Request Interval | 0 |
| Delay Mechanism | E2E |
| Re-init the PTP protocol | Disabled |
| PTP management via the PTP port | Enabled |

Choices are: **Disabled** (Two Step) or **Enabled**

See Notes below

Choices are: **E2E P2P** or **Disabled**. See note

See note below

Choices are: **Disabled** or **Enabled**. See Note

- **Note about Announce Reception Timeout:** In order for a slave to synchronize to a Master, it must see at least one announce message coming in during an interval defined as the slave's Announce Interval times the slave's Announce Reception Timeout. Example: if a slave's Announce Reception Timeout is 3, and its Log Announce Interval is 1, it must see an Announce message within $3 * (2^1) = 6$ seconds.
- **Note about Log Announce Interval:** A slave uses this value combined with the Announce Reception Timeout to determine its announce timeout. A Master uses this value to determine the rate at which it sends out Announce messages.
- **Note about Log Sync Interval:** A Master uses this value to determine the rate at which Sync messages are transmitted. (Same values for either TSync-PCIe or SecureSync).
 - N^2 or N^{-2} power = How often Sync message is transmitted to the slaves
 - 2^2 = once every 4 seconds
 - 2^{-2} = 4 times per seconds
- **Note about Log Delay Request Interval:** A Master will broadcast this value to Slaves to determine the rate at which Delay Request messages are transmitted. (When the End-to-End Delay Mechanism is chosen).
- **Note about Log Peer Delay Request Interval:** A Master will broadcast this value to Slaves to determine the rate at which Peer Delay Request messages are transmitted (when the Peer-to-Peer Delay Mechanism is chosen).
- **Note about Delay Mechanism**

- **E2E:** End-to-End Delay Mechanism
- **P2P:** Peer-to-Peer Delay Mechanism (Added in software version 4.8.0-Dec 2011).

None:

- **Note about Re-Init the PTP Protocol:** When “Enabled”, the PTP protocol will be re-started after the new settings are applied. This will not reboot the Option Card or the SecureSync.
- **Note about PTP Management via the PTP Port:** When “Enabled”, the PTP Module will respond to PTP Management Protocol messages through the PTP network port, as specified in Section 15 of IEEE 1588-2008.

Advanced Tab

The screenshot shows the 'Advanced' tab for 'PTP 0'. It contains the following fields:

- Synchronization Mode:** A dropdown menu set to '2 Step Mode'.
- Delay Mechanism:** A dropdown menu set to 'E2E (End-to-End)'.
- Time To Live (Packet Lifespan):** A numeric input field set to '3'.
- Name:** A text input field set to 'Spectracom'.
- Location:** A text input field set to 'Spectracom'.
- Best Master Clock Algorithm Settings:**
 - Priority 1:** A numeric input field set to '128'.
 - Priority 2:** A numeric input field set to '128'.

Annotations on the right side of the image:

- A box pointing to the 'Synchronization Mode' dropdown: "Choices are: **1 Step Mode** and **2 Step Mode**
Per Denis Reilly (24 Mar 2014) Although the 10-100 card supports one-step, we don't recommend it"
- A box pointing to the 'Time To Live' field: "TTL"
- A box pointing to the 'Priority 1' and 'Priority 2' fields: "PTP Master **“Priority1”** and **“Priority 2”** values (only available when PTP card is configured as a Master.)"

At the bottom, there is a 'Status' button on the left and a 'Submit' button on the right.

Advanced tab when configured as a PTP Slave

PTP 0

Main Ethernet Contract **Advanced**

Synchronization Mode: 2 Step Mode

Delay Mechanism: E2E (End-to-End)

Time To Live (Packet Lifespan): 64

Name: Spectracom

Location: Spectracom

Status Submit

Choices are: **1 Step Mode** and **2 Step Mode**
Per Denis Reilly (24 Mar 2014) Although the 10-100 card supports one-step, we don't recommend it

Choices are: **"E2E (End to End)"** or **"P2P (Peer to Peer)"**

STATUS

Interfaces-> PTP 0 -> Status

"Main" tab (Ethernet Status-link state/link status, Number of unicast slaves, PTP Domain, IP address/MAC address)

PTP 0

Main Advanced

Ethernet Status: NETWORK CABLE UNPLUGGED

Port State: INITIALIZING: UNPLUGGED/POWERING UP

Status: SLAVE ONLY

Transmission/Clock Mode: Multicast Slave

Domain Number: 0

Current IP Address: 169.254.3.23

MAC Address: 00:0C:EC:08:03:17

Notes about "Port State":

- **Initializing: unplugged/powering-up:** Cable is unplugged / in power-up state.
- **Listening:** PTP is looking for a Master.
- **Master:** PTP Master has become the active master on the network.
- **Passive:** PTP Master has become a passive master. (There is another Master on the network with higher priority.) This Master will wait until such time as the Best Master Clock Algorithm determines it should be the Best Master. Then it will transition to the Master state.
- **Slave:** PTP Slave is actively synchronizing to a Master on the network.
- **Uncalibrated:** PTP Slave has detected a Master on the network (See below)

“Advanced” tab (Time info, Clock Quality, Clock accuracy, Network Setting, Port status)

Note: refer instead to the **“Main”** tab section above for info on Ethernet/link state and Port status

The screenshot shows the 'Advanced' tab of a network configuration interface. It contains four main sections, each with a title bar and a list of configuration items:

- Time Properties:** UTC Offset (0), UTC Offset Valid (Disabled), Leap Second (None Scheduled), Time Traceable (Disabled), Frequency Traceable (Disabled), PTP Time Scale (Universal Coordinated Time (UTC)), Time Source.
- Clock Quality:** Clock Class (255), Clock Accuracy, Offset Scaled Variance (FFFF).
- Ethernet Status:** Current IP Address (169.254.3.23), Current Network Mask (255.255.255.0), Current Gateway (169.254.3.253).
- Port Status:** Port Number (1), Port Activity (Enabled), Port State (Initializing: Unplugged/Powering up), Link Status (Disconnected), Slave Sync Mode (1 Step Mode).

“Time Properties”

(UTC offset, Leap seconds, PTP timescale, Time Source)

“Clock Quality”

(Clock Class, Clock Accuracy, Offset Scaled Variance)

Note: see additional info below the screenshot

“Ethernet Status” (network settings)

Note: Refer to the **“Main”** tab (not the **“Advanced”** tab) for info on Ethernet/link state and Port status

“Port Status”

(Port state, Delay mechanism and PPS offset)

Note: Refer to the **“Main”** tab for info on Ethernet/link state and Port status

Port Status

➤ Notes about “Port State”:

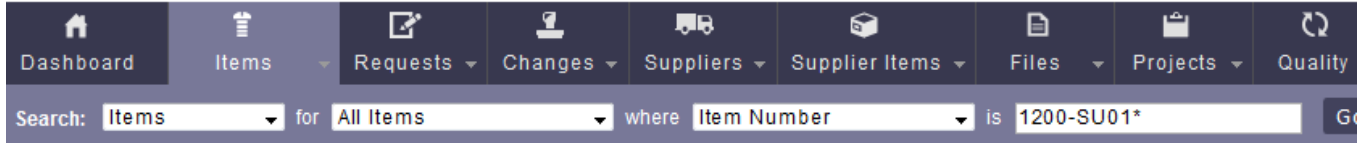
- **Initializing:** Cable is unplugged / in power-up state.
- **Listening:** PTP is looking for a Master.
- **Master:** PTP Master has become the active master on the network.
- **Passive:** PTP Master has become a passive master. (There is another Master on the network with higher priority.) This Master will wait until such time as the Best Master Clock Algorithm determines it should be the Best Master, then it will transition to the Master state.
- **Slave:** PTP Slave is actively synchronizing to a Master on the network.
- **Uncalibrated:** PTP Slave has detected a Master on the network (See below)

****Firmware version for 1204-32 card**

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware_Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



The screenshot shows the top navigation bar of the Arena software interface. It includes tabs for Dashboard, Items, Requests, Changes, Suppliers, Supplier Items, Files, Projects, and Quality. Below the navigation bar is a search bar with the following text: "Search: Items for All Items where Item Number is 1200-SU01*" and a "Go" button.

FPGA (firmware) for the 1204-32 card (ascending order): rt_oc32_hw01_fpga.bin

| ECN | ECO | Archive /System version | FPGA version reported (ascending order) | Change | approximate cut-in |
|------|------|-------------------------|---|---|--------------------|
| 3362 | | 5.1.0 | | Added support for this Option card (first release for Logix only) | Dec 2013 |
| 3368 | | 5.1.1 | | made one parameter change in this card (for Logix only) | Dec 2013 |
| 3395 | | 5.1.2 | | release for all customers | Dec 2013 |
| 3442 | | 5.1.3 | 1.19 | <ul style="list-style-type: none"> Fixed issues with this card joining the IGMP group. Fixed issue with the Sourceport ID not being set correctly. | Apr 2014 |
| | 0063 | 5.1.D | 1.21 | Fixes Active/Passive Master mode switching (Mantis case 2724). Refer to: https://app.bom.com/changes/detail-ecrs?change_id=2384151052 | Jun 2014 |
| | 0109 | 5.1.5 | 1.2.1 | Fixes Active/Passive Master mode switching (added 5.1d to main software release) | Aug 2014 |
| | 0292 | 5.2.0 | 1.2.7 | <ul style="list-style-type: none"> Added 1PPS offset capability Added two-step mode capability | Feb 2015 |
| | | 5.6.0 | 1.2.7 (this change didn't affect the firmware in the card) | <ul style="list-style-type: none"> The SNMP MIBs now provide read-only support for PTP variables from the 1204-32 Gigabit PTP Option Card | |
| | | 5.8.1 | 1.27 (these two changes didn't affect the firmware in the card) | <ul style="list-style-type: none"> 1204-32 PTP Option Card no longer displays incorrect IP addresses and other values. The communication speed was slowed down to prevent corruption (fixes potential issues with "originCurrentUTCOffset" field in Announce message temporarily reporting wrong UTC offset, due to byte swapping) | |
| | | | 1.28 (patch update) | <p>Associated with Salesforce Case 176583 (~Oct 2018) Refer to JIRA ticket SSS-545</p> <ul style="list-style-type: none"> ???1204-32 card Patch update to allow 1204-32 to sync an "OnTime" switch via PTP. There was apparently an issue with the contents of one of the PTP packets that the ontime switch cared about- while most other devices ignore because the flags have been deprecated??? | |
| | | N/A | 1.29 (patch update) | <ul style="list-style-type: none"> 1204-32 card Patch update to address a PPS alignment issue when PTP first starts-up. Refer to case 196648 (originCurrentUTCOffset" field in Announce message temporarily reporting wrong UTC offset (similar to the byte swapping issue fixed in v1.27) | |

| | | | | | |
|--|--|-------------------------|------|--|--|
| | | 5.8.5 (July 2019) | 1.30 | <ul style="list-style-type: none"> • Per the 5.8.5 release note (July 2019) • 1204-32 Gb PTP Master Card had several improvements: updated firmware, repaired functionality when in slot 4, corrected a control field value, corrected the output time until the first PPS, and fixed a bug when switching between masters <p>Email from Denis Reilly (3 Sept 2019) There was a change to the 1204-32 in 5.8.5, Dave Sohn did the work. Here is the ticket for the release, with the tickets he fixed all linked: https://spectracom.atlassian.net/browse/SSS-644</p> <p>Q Version 5.8.5 made some changes to the PTP Operation and Toyo was asking for more details on the changes. A Reply from Denis Reilly (18 Oct 2019) I see 4 1204-32 tickets related to 5.8.5:</p> <p>[1204-32] Gb PTP Master Card gives wrong time until first PPS Salesforce Case 196301 We have found that the 1204-32 card does not give the proper time after power-up until the first PPS occurs after it has been activated by KTS. Before that first PPS, the time will be off by a seemingly random amount. https://spectracom.atlassian.net/browse/SSS-641</p> <p>(1204-32) PTP card has incorrect control field value in Sync, Follow-Up Messages No SalesForce case is listed. This bug is ignored by most implementations, but not be OnTime Networks switches, which discards the packers since they are malformed. https://spectracom.atlassian.net/browse/SSS-545</p> <p>I think these last two are related:</p> <p>1204-32 card in Slot 4 is outputting incorrect UTC offset (9472) in some of the first few Announces after becoming Selected Master Keith originally make this one, so I assume he has a Salesforce case, it's not in the ticket https://spectracom.atlassian.net/browse/SSS-465</p> <p>1204-32 outputs incorrect UTC offset on BMCA change https://spectracom.atlassian.net/browse/SSS-360</p> <p>I don't have the actual details on the scope of the code changes, since they are not linked to the Jira tickets. But if I recall how Dave described them, I think issue #2 was a simple fix in a state machine, and the other fixes were resolving some race conditions.</p> | |
|--|--|-------------------------|------|--|--|

| | | | | | |
|--|--|-----------------------------|-------------|--|--|
| | | 5.9.0 (Jan 2021) | 1.31 | <ul style="list-style-type: none"> 1204-32 Gb PTP Master Card had several improvements with the updated version 1.31 firmware added in v5.9.0 update <ul style="list-style-type: none"> fixed inoperability with devices that use non-standard values for the PTP transportSpecific field resolved an issue with PTP packets being broadcast before the unit is fully synchronized changed generation of clockAccuracy parameter to reduce unnecessary transitions between Best Masters fixed configuration of TTL value on PTP multicast announce packet corrected the MAC address in Layer 2 PTP packets. | |
|--|--|-----------------------------|-------------|--|--|

Hardware / Connectors

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 5.1.0 | | Added support for this Option card (first release) | Dec 2013 |

1204-32 card installed in a NetClock (instead of SecureSync)

- Refer to Salesforce Case 14814 (<https://na8.salesforce.com/500C000000afMTR>)
- Card is detected and can be configured, but it's not listed in the **Tools -> Upgrade/Backup** page as being installed. **Note:** this appears to be if the card is installed in slots 5 or 6 only.

Serial Number/Serialization of 1204-32 cards

Per Dave West (18 May 2020) "GB PTP cards require a MAC address, which uses our S/N to create it. Therefore, yes they have serial numbers assigned and a label is on the cage for the SPF"

The customer has access to the MAC address

The MAC address is the hex number for the serial number (last 4)

For example: if last four are 000A, that would be serial number 10

Email from Keith to Josh/Dave West (19 May 2020)

There is no PTP log in SecureSyncs.

The only place the Serial Number of the 1204-32 card MAY potentially be visible (I don't readily have access to a SecureSync with a Model 1204-32 card installed, to confirm) is in the **Tools -> Upgrade/Backup** page of the browser.

This page is where versions and other Serial Numbers are reported.

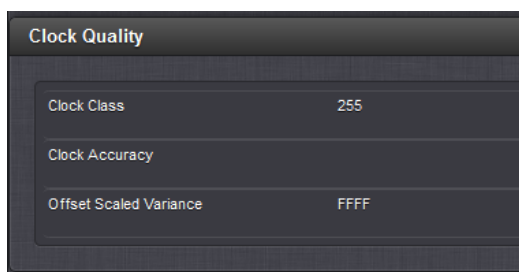
The **Manifest log** captures the Models of Option Cards installed and installed firmware, but it's not reporting a Serial Number (as shown below) and I believe this log obtains this info from the Tools-> Upgrade/Backup page.

```
Option Card Slot 3: 1204-32
|->Card ID: 0x32
|->Card Version: 0x01
|->FPGA ID: 0x01
|->FPGA Version: 0x0127
```

So, I suspect the Serial Number of the Model 1204-32 card is not visible via the system software. The customer can obtain it from the card itself.

Dave West can confirm, but it appears his Test Engineering database may capture Serial Numbers of installed Cards. If the customer tells us the Serial Number of the unit and which slot the 32 card is installed in, we can see which Serial Number was installed when it was shipped from the factory.

“Clock Quality” section of Advanced tab (“Clock Class”, “Clock Accuracy” and “Offset Scaled Variance”)



- Refer also to the info on these values in: <..\CustomerServiceAssistance.pdf>
- Note these values are also reported in the PTP Master's Announce messages.

A) Clock Class (clockClass) field

Example: clock class: 0x6

Table 5—clockClass specifications

| clockClass (decimal) | Specification |
|----------------------|---|
| 0 | Reserved to enable compatibility with future versions. |
| 1-5 | Reserved. |
| 6 | Shall designate a clock that is synchronized to a primary reference time source. The timescale distributed shall be PTP. A clockClass 6 clock shall not be a slave to another clock in the domain. |
| 7 | Shall designate a clock that has previously been designated as clockClass 6 but that has lost the ability to synchronize to a primary reference time source and is in holdover mode and within holdover specifications. The timescale distributed shall be PTP. A clockClass 7 clock shall not be a slave to another clock in the domain. |
| 8 | Reserved |

Note: Set to **ClockClass 6** when the SecureSync is in sync.

B) 1204-12 “Clock Accuracy” (reported in Announce messages) (“time is accurate to within”)

- A number describing the accuracy of the oscillator in the Grandmaster (see IEEE 1588-2008 Section 7.6.2.5).
from Salesforce Case 158356:

1. SecureSyncs

The PTP clock accuracy for **SecureSync** PTP outputs is based on the SecureSync's current Phase Error value, (as reported in both the **Home** page and **Management** -> **Disciplining** page of the SecureSyncs web browser)

For more information on the SecureSync's **TFOM** value, please visit the online SecureSync user guide at:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/TIME/TFOM.htm

Per Denis Reilly (2 Jan 20) That accuracy value is not directly in ns, but it is an enumeration that is defined in the standard. 0x20 is the best accuracy. I don't have the standard in front of me, but I think that might be 10ns, then 25 ns for 0x21, then 100 ns, etc. If you can find the table, you will know the values.

(per Keith, after discussing with Denis Reilly: we apparently round-up to the next higher value. For instance, if our Phase error is 24ns, we use Value of "20", to report the time is accurate to within **25** ns. But if the phase error goes to 26, we will then use Value "21" to report the time is within **100** ns. Refer to the following chart.

Excerpt below from IEEE-1588 Standard

The clockAccuracy indicates the expected accuracy of a clock when it is the grandmaster, or in the event it becomes the grandmaster.

The ordering of clock accuracy in the operation of the best master clock algorithm (see 9.3.2) is specified as follows. When comparing clock accuracies, clock A shall be deemed better than clock B if the value of the clockAccuracy of A is lower than that of B.

NOTE— The range from 80 to FD₁₆ is reserved for use by alternate PTP profiles. It is expected that this range will be used by PTP profiles defining applications that distribute only frequency to define accuracy specifications appropriate for frequency distribution.

Table 6—clockAccuracy enumeration

| Value (hex) | Specification |
|-------------|---------------------------------------|
| 00-1F | Reserved |
| 20 | The time is accurate to within 25 ns |
| 21 | The time is accurate to within 100 ns |
| 22 | The time is accurate to within 250 ns |
| 23 | The time is accurate to within 1 μs |
| 24 | The time is accurate to within 2.5 μs |
| 25 | The time is accurate to within 10 μs |
| 26 | The time is accurate to within 25 μs |
| 27 | The time is accurate to within 100 μs |
| 28 | The time is accurate to within 250 μs |
| 29 | The time is accurate to within 1 ms |
| 2A | The time is accurate to within 2.5 ms |
| 2B | The time is accurate to within 10 ms |
| 2C | The time is accurate to within 25 ms |
| 2D | The time is accurate to within 100 ms |
| 2E | The time is accurate to within 250 ms |
| 2F | The time is accurate to within 1 s |
| 30 | The time is accurate to within 10 s |
| 31 | The time is accurate to >10 s |
| 32-7F | Reserved |
| 80-FD | For use by alternate PTP profiles |
| FE | Unknown |
| FF | Reserved |

2. 1225 VelaSyncs

The Clock Accuracy for **Legacy VelaSync's** PTP outputs is derived from the VelaSync's "**Source Accuracy**" value, as reported in **Status** tab of the Timekeeper GUI interface. For more info on Source Accuracies, refer to the VelaSync online user guide at the following link

http://manuals.spectracom.com/VS/Content/VS/Topics/TASKS/TK_StatusMon.htm

Note that VelaSync offer an available configuration to add a minimum “floor” that prevents its Clock Accuracy value from being reported below a minimum value. As the Clock Accuracy value can directly affect the switching back and forth between active masters, over reported accuracies of very little difference between PTP masters, (such as below 10ns for instance) it may be desired to activate this “floor”, otherwise, VelaSync will report accuracies greater than this floor, resulting in the potential of often changing of which Master is the currently active master, based on minute differences in reported clock accuracies.

The field for this is the “**Limit advertised accuracy**” field. As also excerpted below, refer to the VelaSync online user guide at the following link for more information on this available/optional field:

http://manuals.spectracom.com/VS/Content/VS/Topics/TK/PTPserv_subtab.htm

Limit advertised accuracy: If set, the server will limit the accuracy advertised in PTP announce messages to be no better than the value provided (in seconds). This is helpful when trying to prevent some clients from switching between grandmasters quickly.

Additional questions also associated with Salesforce Case 158356 (answers from Denis Reilly 22 Mar 18)

Q What criteria would have to be met for the devices to send a clock accuracy of 0x20 and 0x21 then? As an example the GM is reporting 0x20 accuracy at the moment, what value of source accuracy would the GM have to have to amend the clock accuracy it send 0x21 to its clients in an announce message? I would like to know the thresholds for both the vela and sec sync and any other attributes that are used to determine the value of the clock accuracy sent in announce messages.

A In both the SecureSync and Velasync, the clock accuracy is a measure of how far the internal system time is from the reference time (usually GPS / GNSS). When they report 0x20, it means that at the time the Announce Message was sent, we estimate there was less than 25 ns error between the internal system time (used to generate PTP hardware timestamps) and the reference time.

Q How often do the VelaSync and secure syncs send announce messages by default

A Velasyncs send Multicast Announce message roughly once a second by default. SecureSyncs send Multicast Announce messages every two seconds by default, but that setting is easily changed.

Q The clock accuracy value it sends in the announce message, is this based on the source accuracy at the time of sending? Or does it look over the last X amount of time?

A It is based on the instantaneous source accuracy at the time of sending.

Q What are your recommended settings to deal with accuracy issue explained. Our client has a report that checks for the GM clock accuracy and they keep seeing it change.

A For Timekeeper Velasyncs, I would recommend changing the “limit advertised accuracy” field.

Q If I limit the accuracy advertised by the velasync to be 0x20 (time accurate to within 25ns) , will this cause any issues if the accuracy is less than this value say to within 100ns? Will it continue to output a signal with announce messages containing info of accuracy to within 25ns even if this is actually not the case?

A That setting simply limits what is advertised in the Announce Messages to prevent clients thrashing from one PTP master to another based on the BMCA (assuming Priority1 and ClockClass are the same). The quality of the time is otherwise unaffected.

25 ns is the lowest advertised accuracy that the 1588 standard supports (See Table 6 of IEEE 1588-2008), so limiting accuracy to 25 ns does nothing. Customers who use this feature usually limit advertised accuracy to 100 ns. Or 250 ns.

If a master's current clock quality is less than 25 ns, but it is broadcasting 100 ns, this setting will may prevent a PTP client from switching to it. But the master's current clock quality may not stay below 25 ns for very long. Customers who activate this setting prefer to have the client keep listening to its current master than have it switch for a short period of time.

(Keep in mind that the other master must also be broadcasting 100 ns, and is being selected based on the other BMCA parameters, so it's time is not really “bad”. Switching to a nominally better master for a short period of time can result in worse performance than not switching at all.)

C) Offset Scaled Variance” (GrandmasterClockVariance” (AKA “OffsetScaledLogVariance”-OSLV)

- **Variance:** A clock's estimate of its stability based on observation of its performance against the PTP reference.
- part of the BMCA (Best Master Clock Algorithm)
- Reported in **Announce** messages and in the **Advanced** tab of the 1204-32 browser

Also called:

- “GrandmasterClockVariance” in pcap captures
- “Offset Scaled Variance” in 1204-32 web browser and
- “OffsetScaledLogVariance (OSLV)” in PTP Specs

Reported OSLV values with our products

- Refer to CustomerServiceAssistance doc for side-by-side comparison of our various products
- Refer to Salesforce Case Number case 202779
- SecureSync’s 1204-32 card: **Per Denis R** “the OSLV value in the 1204-32 card is based on the type of oscillator that is installed in the SecureSync. An OCXO unit will have a different value than a Rb oscillator”

Report from Case 20779: We have a report from Pico Trading of a situation where two different PTP Masters are sending different information in the Announce Messages.

“We are seeing SecureSync and VelaSync present different value in "grandmasterClockVariance", so we would like to understand the significance of it and its relation in ptp accuracy.

grandmasterClockVariance=23008 in SecureSync
grandmasterClockVariance=0 in VelaSync’

There is a difference in these packets from the Velasync and the SecureSync. Is this an error or simply the way the software is designed?

What are these values based on?

Email from Denis Reilly to Dave Lorah regarding Salesforce Case 202779 (15 Jul 2019) The OSLV value in the 1204-32 card is based on the type of oscillator that is installed in the SecureSync. An OCXO unit will have a different value than a Rb.

The OSLV value is a special calculation in Clause 7.6.3 of 1588-2008 that is based on a scaled computation that is similar to Allan Deviation. It is used in the Best Master Clock algorithm because they felt that if all other things in the BMCA were equal, you would want to listen to the clock that was most stable. The math is a bit tricky but generally speaking, lower values are more stable. We can do this math on SecureSync because we are using the SecureSync’s oscillator to directly drive the timestamps.

In practice, very few people pay attention to this because in order for it to matter, the priority1, clock class, and clock accuracy values of two masters have to be the same – this is the 4th tiebreaker in the BMCA.

Email Morgan sent (31 Jan 2019) This is some feedback from one of the engineers:

OSLV is set by the Grandmaster. It's the GM's estimate of its clock quality. In our products, we normally set that to a constant value based on the type of oscillator.

It's used in the BMCA:

Priority 1
Clock Class
Clock Accuracy
OSLV
Priority 2
MAC Address

So, if the GM is broadcasting an OSLV of 0 then if it and another master have the same values for the first three things then this GM will always look like it has a better Variance and will win the BMCA. It has no other effect on the protocol at all. The true OSLV of the unit is probably not 0 but broadcasting 0 doesn't make any difference to PTP operation, other than the BMCA thing.

| Grand Master Properties | |
|---------------------------|-------------------------|
| Clock Identity | 00 0C EC FF FE 00 03 17 |
| Clock Class | Slave Only |
| Clock Accuracy | |
| Offset Scaled Variance | 65535 |
| Priority 1 | 128 |
| Priority 2 | 128 |
| Slave Properties | |
| Negotiation Enabled | Enabled |
| Contract State | NEGO_ON |
| Contract Duration | 0 |
| Contract Delay | 0 |
| Message Interval | 1 Per Second |
| Contract State | NEGO_ON |
| Contract Duration | 0 |
| Contract Delay | 0 |
| Message Interval | 1 Per Second |
| Contract State | NEGO_ON |
| Contract Duration | 0 |
| Contract Delay | 0 |
| Message Interval | 1 Per Second |
| Module Info. | |
| PTP Version | 2 |
| Software Version | 127 |
| Hardware Version | B |
| Software Compilation Date | Nov 16, 2012 |
| Software Compilation Time | 16:54:22 |

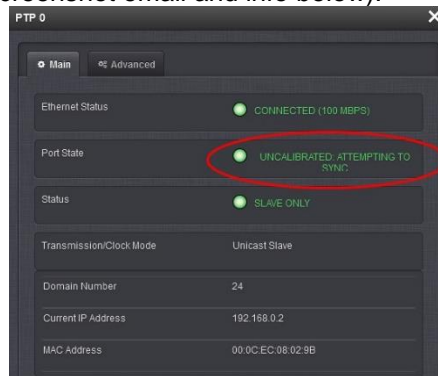
**Grand Master
info**

PTP Slave

Version info

➤ Notes about “Port Status” for 1204-12:

- **Initializing: unplugged/powering-up:** Cable is unplugged / in power-up state.
- **Listening: Looking for Master:** 1204-12 card is in Slave mode and looking for a Master.
- **Master:** PTP Master has become the active master on the network.
- **Passive:** PTP Master has become a passive master. (There is another Master on the network with higher priority.) This Master will wait until such time as the Best Master Clock Algorithm determines it should be the Best Master. Then it will transition to the Master state.
- **Slave:** PTP Slave is actively synchronizing to a Master on the network.
- **Uncalibrated: Attempting to Sync** PTP Slave has detected a PTP Master on the network (See example screenshot email and info below):



Per Denis Reilly (24 Mar 2014) “Uncalibrated: Attempting to Sync” in the PTP mini-status line means that the Slave sees a Master, but has not yet locked onto it. This (combined with the fact that they have to reboot the Master) leads me to believe that the Master is having problems with operating in Unicast.

- For info on troubleshooting “Uncalibrated...” message, refer to (in this document): [Uncalibrated: Attempting to Sync](#)

Issue: 1204-32 link state doesn't work at 10MB. Radio is getting Sync and the PTP messages are going across, but the SecureSync web UI reports the PTP Ethernet port is “Unplugged”.

- Refer to Salesforce case 118992
- Refer to JIRA ticket SSS-374. <https://spectracom.atlassian.net/browse/SSS-374?filter=-4&jql=ORDER%20BY%20key%20DESC%2C%20created%20DESC>

Report from Dave L: This is a strange report from Bombardier. They are doing some lab testing on what I believe is a Positive **Train** Control system. We have already updated the firmware to v5.7.1.

They have a 1204-32 PTP card connecting to a GE TD200 Radio. The **radio is getting sync and the PTP messages are going across but the SecureSync's web UI reports the PTP Ethernet port is “Unplugged”**. The radio is a 10mB speed port. Could this have something to do with it?

I am not sure why the port would be saying unplugged otherwise.

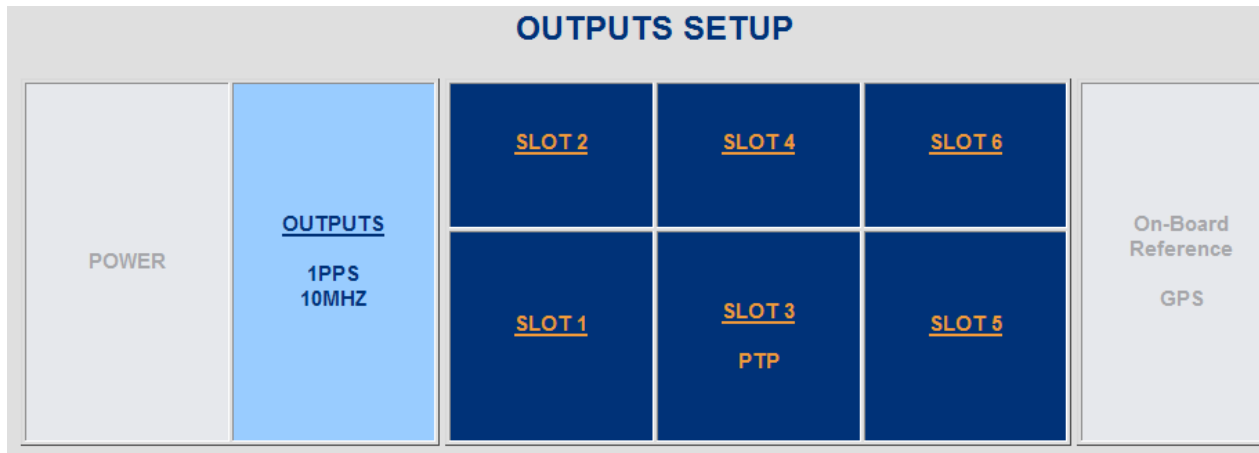
A Per Denis T (28 Sep 17) The link state comes from communication the SFP, and it's entirely possible the communication is working but the link state is not. Which SFP are they using? Are they using the Belfuse that we stock?

A Reply from Dave L to Denis (28 Sep 17) I confirmed they are using our Belfuse SFP. I think they may have to live with the “Unplugged” message. Do you agree?

A. Reply from Denis: I added this to JIRA as SSS-374.

Software Versions 5.0.2 and below

Setup-> Inputs -> PTP OR **Setup-> Outputs -> PTP** (both go to the same pages)



Software version notes:

- ❖ Version 4.8.8 adds support for Unicast/Minicast modes.
- ❖ Version 4.8.7 removed the follow three tabs from the browser (to simplify PTP configuration) There are only three tabs present in version 4.8.7
 - PTP Setup Module Tab
 - PTP Setup Statistics Tab
 - PTP Setup VLAN Tab
- ❖ Version 4.8.8 PTP now has (4) tabs: “Network”, “Clock” “PTP Protocol” and the new tab “Unicast”
- ❖ Version 4.8.7 PTP now has just three configuration tabs: “Network”, “Clock” and “PTP Protocol;”

“Network Setup” tab (Network settings, PTP port, multicast TTL)

A) “Network” tab in Archive software versions 4.8.7 and above (including v4.8.8):

The screenshot shows the 'PTP SETUP (SLOT3)' interface with the 'Network' tab selected. The 'Ethernet Settings' section includes fields for DHCP (Disabled), Static IP Address (010.005.015.011), Network Mask (255.255.000.000), Default Gateway (010.005.001.001), Transport Protocol (IPv4), Transmission Mode (Multicast), and Time To Live (TTL) (5). The 'PTP Network Settings' section includes Port Activity (Enabled) and Domain Number (0). Callouts provide additional information: DHCP choices are Disabled or Enabled; Static IP Address, netmask, and gateway address are assigned; Transport Protocol choices are IPv4 or 802.3/Ethernet; Transmission Mode choices are Multicast, Minicast, or Unicast (starting in v4.8.8); TTL sets the TTL field of TCP "Multicast" packets; Port Activity choices are Disabled or Enabled; and Domain Number is a custom value allowing multiple PTP domains on the same physical network.

Notes:

Archive version 4.8.8 changes

- 1) Archive version 4.8.8 changed Transmission mode from "Multicast" indication to a drop-down field that allows selection of 'Multicast', 'Minicast' or 'Unicast'.

Archive version 4.8.7 changes

- 2) Archive version 4.8.7 removed the SyncE (Synchronous Ethernet) capability.
- 3) Archive version 4.8.7 removed FTP interface (originally intended for firmware updates, but not being used).
- 4) Archive version 4.8.7 removed Port Number.

Note about "Transport protocol" field:

Email from Michel: There are two ways to transmit the PTP protocol:

- **IPv4:** PTP over IPv4 protocol (also referred as the layer 3 PTP protocol). In this case, the Ethernet Type of the PTP frames is 0x0800.
- **802.3/Ethernet:** PTP over 802.3/Ethernet protocol (also referred as the layer 2 PTP protocol). In this case, the Ethernet Type of the PTP frames is 0x88F7.

B) "Network" tab in Archive Versions 4.8.6 and below:

The screenshot shows the 'PTP SETUP (SLOT5)' configuration page. It has tabs for 'Module', 'Clock', 'Network' (selected), 'PTP Protocol', and 'Statistics'. The page is divided into three sections: 'Ethernet Settings', 'PTP Network Settings', and 'Synchronous Ethernet'. Each section contains configuration fields with arrows pointing to explanatory notes.

| Ethernet Settings | |
|--------------------|-----------------|
| DHCP Enable | Disabled |
| Static IP Address | 010.010.013.011 |
| Network Mask | 255.255.000.000 |
| Default Gateway | 010.010.001.001 |
| Transport Protocol | IPv4 |
| Time To Live (TTL) | 1 |
| FTP Interface | Disabled |

| PTP Network Settings | |
|----------------------|---|
| Port Number | 1 |
| Domain Number | 0 |

| Synchronous Ethernet | |
|---------------------------|----------|
| Synchronous Ethernet Mode | Disabled |
| Transmit the SyncE Clock | Disabled |

Annotations:

- Choices are either: **Disabled** or **Enabled** (points to DHCP Enable)
- Selects the transport protocol used for PTP Packets. See note further below (points to Transport Protocol)
- Sets the TTL field of TCP packets. See Note below. (points to Time To Live (TTL))
- See note below about FTP Interface (points to FTP Interface)
- See note below about Port number. Leave at default of "1" (points to Port Number)
- See note below. Factory Default is "0". (points to Domain Number)
- Enables PTP over Synchronous Ethernet (points to Synchronous Ethernet Mode)
- If enabled (and the card is configured as Master mode), this port will provide the Synchronous Ethernet clock to the network. (points to Transmit the SyncE Clock)

- **Important Note:** Unlike other configurations changes that are made to the PTP module (which take effect immediately) changes to the network settings require at a minimum that the PTP module be reset (or that the SecureSync to be rebooted/power cycled).

The first step that should always be performed after one or more configuration changes have been made to the PTP Option Card (if it's desired for the configuration changes to persist through a power cycle of the SecureSync) is to "Save Settings to ROM". To perform this step, navigate to the "Module Setup" tab and change the "Save Settings to ROM" field to "Enabled". Then hit Submit. This step saves all of the current PTP card configurations to memory, so that they are restored after each reboot of the SecureSync.

The second step needed to be performed after changing specifically the network configuration in order for the Option Card to start using the new network settings is either the SecureSync needs to be rebooted or the PTP Module just needs a "Cold Reset" be performed. Resetting only the PTP Module allows the new network settings to take effect without having to reboot the entire unit. The PTP Module can be cold reset in the same page of the browser as the "Save Settings to ROM" ("Module Setup" tab).

To perform a cold rest of the PTP module, simply change the "Reset the Module" field to Enabled and change the "Reset Type" field to "Cold Reset". This will cause the receiver alone to reset. Moments later when it's operational again, it will be using the new network settings you had assigned it.

➤ **Notes about "Transport Protocol":**

Email from Michel: There are two ways to transmit the PTP protocol:

- **IPv4:** PTP over IPv4 protocol (also referred as the layer 3 PTP protocol). In this case, the Ethernet Type of the PTP frames is 0x0800.
- **802.3/Ethernet:** PTP over 802.3/Ethernet protocol (also referred as the layer 2 PTP protocol). In this case, the Ethernet Type of the PTP frames is 0x88F7.

Q. We are seeing ethertype IP (0x800) on the PTP mcast and are curious why isn't this ethertype PTP (0x88F7)? Is this expected? IE: does the device send 0x800 versus 0x88F7? Is that something that can be altered?

The Annex F that Paul mentions refers only to the PTP over 802.3/Ethernet protocol.

In the PTP web pages (PTP SETUP), the way to transmit the PTP protocol can be configured in the field "Transport Protocol" of the "Network" tab.

Email from Denis: The Spec states that the Ethertype when using Layer 3 / IPV4 is 0x0800, and when using 802.3/Ethernet the Ethertype is 0x88F7

Email Keith sent to customer: For your information, The Spectracom SecureSync's PTP Option Card supports support both "IPv4" and "802.3/Ethernet" Transport Protocols. This is a configurable selection via the SecureSync's web browser.

To choose either IPv4 or 802.3/Ethernet protocol, navigate to the **Setup -> Inputs (or Outputs) -> PTP Option Card** of the browser. Then, select the **Network** tab. As shown in the screenshot below, the Transport Protocol field allows either mode to be selected, as desired:

The screenshot shows the 'Network' tab of the PTP Setup web interface. It contains two sections: 'Ethernet Settings' and 'PTP Network Settings'. In the 'Ethernet Settings' section, the 'Transport Protocol' dropdown menu is set to 'IPv4'. A red arrow points to this dropdown menu. The 'PTP Network Settings' section shows 'Port Activity' as 'Enabled' and 'Domain Number' as '0'. At the bottom, there are 'Submit' and 'Reset' buttons.

| Ethernet Settings | |
|--------------------|-------------|
| DHCP | Disabled |
| Static IP Address | 10.5.15.90 |
| Network Mask | 255.255.0.0 |
| Default Gateway | 10.5.1.1 |
| Transport Protocol | IPv4 |
| Transmission Mode | IPv4 |
| Time To Live (TTL) | 1 |

| PTP Network Settings | |
|----------------------|---------|
| Port Activity | Enabled |
| Domain Number | 0 |

Submit Reset

- **Note about TTL (Time to Live):** This value decrements by one each time the packet goes **into** (not out of) a switch/router (not hubs). Once it decrements to 0 on the output of a switch/router, it can no longer go through any active network devices. This value is used to keep the PTP packets on an immediate network. Per PTP specs, for PTP multicast mode (factory default), this value should be set to “1” (it decrements to “0” at the input of the switch/router, so it can’t go out the router). For PTP Unicast mode, this value can be set to a higher value, if desired, to go through one or more switches/routers on the network.

➤ Notes about FTP Interface

(email from Denis) The "FTP interface" is actually the upgrade mechanism for our TSync PTP product. The interface still exists on SecureSync, but is not used. It's a simple FTP server that interacts only with the embedded firmware on the TSync card. (It does not give access to the SecureSync Linux filesystem). We suggest that SecureSync customers leave it disabled. (It only supports a single connection at a time, so some FTP clients that initiate multiple connections can't even connect to it successfully.)

Note: FTP interface was removed from the web browser in version 4.8.6 update, as its not required for updates.

- **Note about Port Number:** This is not the UDP port number for PTP (ports 319 and 320). This field is a variable in the PTP specs. It should normally be left as the default value of 1. Do not change this to 319 or 320.
- **Note about Domain Number:** Allows the ability to set up VLAN on the PTP network (PTP Masters and Slaves on “0” and other Masters and Slaves on “1” for “isolation”).
- **Note about SyncE:** SyncE mode, when enabled either outputs a 125 MHz carrier on the PTP network when the PTP module a PTP Master or can receive this frequency when it's a PTP slave.

“Clock” tab (Master/Slave mode selection, Name/location fields, Priority fields)

“Clock” tab in Archive software versions before and after version 4.8.7 (versions 4.8.7/4.8.8 did not change this tab)

PTP SETUP (SLOT3)

Network **Clock** PTP Protocol

| | |
|-----------------|-------------------------|
| Clock Identity | 00:0C:EC:FF:FE:08:01:F4 |
| Device Name | Master |
| Device Location | Spectracom |
| Clock Mode | Master Only |
| Priority 1 | 1 |
| Priority 2 | 1 |

Submit Reset

MAC address (Display only, not configurable)

Custom fields

Choices are:
Slave only (factory default setting)
Master only
Master/ Slave

Priority values of 0 thru 128 (with 0 being the highest priority) Set both to 128 for Slave Mode.

Note: These boxes are grayed-out when the “Clock Mode” field is set to “Slave Only” mode.

Notes about value of “Master/Slave”:

As of at least 2012, this mode is available. But due to current implementation/limitations of the PTP module/SecureSync interface, Denis Reilly does not recommend using the Master/Slave Mode (supposed to allow the SecureSync to be switch automatically between being a Master or a Slave. We recommend using only “Slave Only” or “Master Only” Mode selections.

Email from Denis Reilly to Morgan (10 June 2019) As you know, the 1204-12 card is discontinued. I don't really know how much support Apps Eng can provide on this, since the card is not in general use. If we do need further support, we will ultimately have to go to Laurent's team in Les Ulis.

But, in the meantime, can you clarify with them why they have the cards set to master/slave?

According to the manual, master/slave mode has a very specific use case: it's designed to be used as a backup unit. The SecureSync with a 12 card and master/slave mode enabled should have no other references (not even GPS) going to it. While there are other PTP masters on the network, the 12 card with Master/Slave mode enabled will operate as a Slave and provide the timing source to the SecureSync.

If all PTP Masters leave the network, this SecureSync will go into Holdover (since there are no other references). However, when this happened the Master/Slave card will "promote" itself to be a Master, and will provide PTP time to the network based on its oscillator while in holdover.

Is this the behavior the customer wants? If both units have GPS, they may have better luck simply operating them both in Master mode. This setup also more closely aligns with their diagram below, which shows direct timeflow from the SecureSync masters down to their end-unit PTP Slaves.

Number of PTP Slaves on the network that the PTP Master can synchronize

- From the data sheet, the PTP Master can provide more than 512 Sync events per second.

***Precision Time Protocol (PTP):** >512 syncs/sec dependent on number of slaves (1024 slaves/master dependent on number of syncs/sec)*

Note: This was calculated for the data sheet back when the 10/100 PTP card supported only multicast mode. I submitted a new Mantis case to have this retested in Unicast mode (27 Feb 2013).

Q. The customer wants to know if we have more information and clarification on this?

- A. **Reply from Denis Reilly (24 Apr 13)** For applications where Slaves need to be synchronized at a high rate, our PTP hardware can broadcast Sync packets at a rate in excess of 512 packets per second. But most customers do not need to send Sync packets at this rate.

The actual number of slaves that can connect to a given Master is harder to calculate and depends on both the Sync and Delay Request rates chosen by the customer. (Lower rates will let the Master service more Slaves.)

To give you an idea of what rates are "reasonable", our default rates are 1 sync per second and 1 Delay Request every 16 seconds, and we have no problem synchronizing our equipment at that rate. This will theoretically support thousands of Slaves.

Our Sync Rate benchmark is mainly used as a benchmark to compare performance against other Masters.

(27 Feb 2013) I sent the following email to a customer based on conversation with Denis Reilly

The number of PTP clients that each Option Card that is configured as a PTP Master can sync is really dependent upon the Sync request interval of the PTP clients. As each PTP Master can support over 500 Sync events every second, it can sync a minimum of 500 clients, assuming all of the PTP clients are configured to sync every second. If the PTP clients are configured to sync less than every second, each PTP Option Card can sync an even higher number of PTP clients on the network.

Note: I asked Denis if this drops for Two Step mode. Because the packet the same time stamp is sent the second time, it really doesn't slow down how fast the Sync events can be generated. He said the results would be similar for either one step or two step mode.

Configuration and Status Screenshots

“Unicast” tab (IP address, contract length, Announce / Sync / Delay Request intervals) New tab starting in v4.8.8 (Dec 2012)

A) Configured as Unicast Master (defined by the “Clock Mode” field in the “Clock” tab)

The screenshot shows the 'PTP SETUP (SLOT3)' interface with the 'Unicast' tab selected. The 'Unicast Master Only' section contains the following settings:

| Field | Value |
|-----------------------------------|-------|
| Lowest Contract Duration | 11 |
| Lowest Log Announce Interval | 1 |
| Lowest Log Sync Interval | 0 |
| Lowest Log Min Delay_Req Interval | 1 |

Buttons: Submit, Reset

B) Configured as Unicast Slave (defined by the “Clock Mode” field in the “Clock” tab)

The screenshot shows the 'PTP SETUP (SLOT3)' interface with the 'Unicast' tab selected. The 'Unicast Slave Only' section contains the following settings:

| Field | Value |
|--------------------------------|------------|
| Master Clock Static IP Address | 10.5.15.53 |
| Log Query Interval | 1 |
| Contract Duration | 30 |
| Log Announce Interval | 1 |
| Log Sync Interval | 0 |
| Log Min Delay_Req Interval | 4 |

Buttons: Submit, Reset

“Module Setup” tab (Saves settings, reset just the PTP module) (N/A for versions 4.8.7 and higher)

i. **Archive software versions 4.8.7 and above**

- **Note:** The “Module Setup” tab was removed in version 4.8.7.
- To **reset** the PTP module with this tab no longer being present, either change the network settings for the PTP card or cycle the card between Master/Slave modes. Either of these config changes will reset just the PTP card in the background.

ii. **Archive software versions 4.8.6 and below:**

PTP SETUP (SLOT3)

Module Setup | Clock Setup | Network Setup | Protocol Setup

Save Settings to ROM: Disabled

Reset the Module: Disabled

Reset Type: Cold Reset

Submit Reset

Disabled or Enabled (Enable to save settings). See Note below.

Disabled or Enabled (Enable to perform a reset)

Choices are:

Cold Reset: (Simulates a power-up restart)

Warm Reset: (Shorter than Cold Reset)

Factory Reset: (Overwrite all settings to factory defaults)

Factory Setup

➤ **Notes about “Save Settings to ROM”**

- 1) “Save Settings to ROM” was removed in Archive version 4.8.7, settings for the PTP module are an additional step.
- 2) **(Applicable only to versions 4.8.6 and below)** Use this selection when it's desired for the PTP module configurations to persist through reboots/power cycles. Otherwise, the configuration changes that have been made since this last function was used will be lost if the PTP module is reset or if the SecureSync is rebooted/power cycled.

“Statistics” tab (Management serial link of Parent/Clock properties) (N/A for versions 4.8.7 and higher)

Archive software versions **4.8. 7 and above**

- **Note:** The “Statistics” tab was removed in Archive Versions 4.8. 7

“Statistics” tab in Archive software versions **4.8. 6 and below**

PTP SETUP (SLOT5)

Module | Clock | Network | PTP Protocol | **Statistics**

Output on the Management serial link of Parent Properties: Disabled

Output on the Management serial link of Clock Properties: Disabled

Submit Reset

Output Parent Properties: When “Enabled”, the PTP Module will periodically send information on the state of its parent. (When “Disabled”, Parent information on the **PTP Status / Statistics** page may be out of date.)

Output Clock Properties: When “Enabled”, the PTP Module will periodically send information on the state of its internal clock. (When “Disabled”, Clock information on the **PTP Status / Statistics** page may be out of date.)

Status -> Inputs -> PTP OR Status -> Outputs/PTP (both go to same pages)

Version 4.8.8 and higher

Clock Tab (Clock Quality and time information)

PTP STATUS(SLOT3)

Clock | Network | PTP Protocol | Unicast | Module

Clock Quality

| | |
|----------------------------|----------------|
| Clock Class | 255 |
| Clock Accuracy | Unknown |
| Offset Scaled Log Variance | 65535 (0xFFFF) |

Time Properties

| | |
|-----------------------|----------|
| UTC Offset | 35 |
| UTC Offset Valid | Enabled |
| Forward Leap Second | Disabled |
| Backwards Leap Second | Disabled |
| Time Traceable | Enabled |
| Frequency Traceable | Enabled |
| PTP Time Scale | TAI |
| Time Source | GPS |

See Notes below

Defined in IEEE 1888-2008, section 1.6.3 (**Unknown** when time is hand set)

The Master's current offset between UTC time and TAI time

whether or not the Master's UTC Offset is valid.

24 hour notice of Leap second pending.

See Note below.

Indicates the timescale that the Master is using to broadcast its time.

The Time Source that the Master is using.
GPS, Hand Set, Internal Oscillator

➤ **Note about "ClockClass":**

A number describing the configuration of the PTP module (See values below):

PTP Masters

- **6** = In sync to valid reference
- **7** = In Holdover
- **52** = Not in Sync and Not in Holdover (out of sync)

PTP Slaves

- **187** = Currently configured as a Master/Slave clock.
- **248** = Currently configured as a Master or Master/Slave (this is not the clock class broadcast by the Master).
- **255** = Currently configured as a Slave-Only (see IEEE 1588-2008 Table 5 of Section 7.6.2.4 for more information).

➤ **Note about Clock Accuracy:** A number describing the accuracy of the oscillator in the Master relative to its UTC reference. (See IEEE 1588-2008 Section 7.6.2.5). Slaves will always report "**Unknown**" here.

➤ **Note about "Time Traceable":** Indicates whether the Master's time is traceable to a primary reference.

➤ **Note about "Frequency Traceable":** Indicates whether the Master's Frequency is traceable to a primary reference.

➤ **ITU-T G.8625.1 Provisionable Clockclass and SSM Quality values:**

- ITU-T G.8625.1 is part of the **Telecom** Profile

- Not available with the Model 1204-12 Option Card (is available with the 1204-32 Gb PTP card)

Network Tab (Network and PTP port settings)

PTP STATUS(SLOT3)

Clock
Network
PTP Protocol
Unicast
Module

Ethernet Status

| | |
|----------------------|-------------------|
| MAC Address | 00:0C:EC:08:01:F4 |
| Current IP Address | 010.005.015.067 |
| Current Network Mask | 255.255.000.000 |
| Current Gateway | 010.005.001.001 |

Port Status

| | |
|---------------|-----------|
| Port Number | 1 |
| Port State | Slave |
| Port Activity | Enabled |
| Link Status | Connected |

Defined in the IEEE 1588-2008 Specification.

Master, Passive or Slave

See Notes below

➤ Notes about “Port State” for 1204-12 card:

- **Initializing:** Cable is unplugged / in power-up state.
- **Listening:** PTP is looking for a Master.
- **Master:** PTP Master has become the active master on the network.
- **Passive:** PTP Master has become a passive master. (There is another Master on the network with higher priority.) This Master will wait until such time as the Best Master Clock Algorithm determines it should be the Best Master, then it will transition to the Master state.
- **Uncalibrated:** PTP Slave has detected a Master on the network, but hasn’t synced to the Master
 Note: for more info, refer to (in this document): [Uncalibrated: Attempting to Sync](#)
- **Slave:** PTP Slave is actively synchronizing to a Master on the network.

➤ **Note about “Port Activity”:** Indicates whether or not the network interface is enabled for PTP.

➤ **Note about “Link Connected”:** Indicates whether or not the Ethernet link is connected.

PTP Protocol Tab (Priority settings, clock class, PTP version)

PTP STATUS(SLOT3)

Clock
Network
PTP Protocol
Unicast
Module

| | |
|-------------|---|
| PTP Version | 2 |
|-------------|---|

Parent Properties

| | |
|----------------------------|-------------------------|
| Clock Identity | 00:0C:EC:FF:FE:08:03:D4 |
| Port Number | 1 |
| Log Announce Interval | 1 |
| Log Sync Interval | 0 |
| Log Min Delay_Req Interval | 4 |
| One Step Mode | Enabled |

Grand Master Properties

| | |
|----------------------------|-------------------------|
| Clock Identity | 00:0C:EC:FF:FE:08:03:D4 |
| Clock Class | 6 |
| Clock Accuracy | Within 25ns |
| Offset Scaled Log Variance | 22752 (0x58E0) |
| Priority 1 | 128 |
| Priority 2 | 128 |

Always PTP version "2"

←

MAC address

←

current Announce Interval (for Masters)

←

current Sync Interval (for Masters)

←

current Delay Request interval (for Slaves)

←

One Step (**Enabled**) or Two step (**Disabled**)

←

See Notes below

←

See Notes below

←

- **Note about "Clock Class":** A number describing the state of the clock (see Table 5 of Section 7.6.2.4 of IEEE 1588-2008).

| PTP Time Scale | Arbitrary Time Scale | Clock Class Definition |
|----------------|----------------------|--|
| 6 | 13 | Time and 1pps references are synchronized with the host references and PTP clock shall not be a slave to another clock in the domain. |
| 7 | 14 | Time and 1pps references are in holdover state, within specifications and PTP clock shall not be a slave to another clock in the domain. |
| 52 | 58 | Time and 1pps references are in holdover state, not within specifications, and PTP clock shall not be a slave to another clock in the domain. Then, applied to Master Clocks who have just powered on and have not yet achieved a suitable TFOM value. |
| 187 | 193 | Time and 1pps references are in holdover state, not within specifications, and PTP clock may be a slave to another clock in the domain. |
| 255 | 255 | Class assigned to "Slave-Only" clocks. |
| 248 | 248 | "Unknown" class. |

PTP Masters

- **6** = In sync to valid reference or to itself
- **7** = In Holdover
- **52** = Not in Sync and Not in Holdover (out of sync)

PTP Slaves

- **187** = currently configured as a Master/Slave clock.
- **248** = currently configured as a Master or Master/Slave (this is not the clock class broadcast by the Master).
- **255** = currently configured as a Slave-Only (see IEEE 1588-2008 Table 5 of Section 7.6.2.4 for more information).

- **Note about “Clock Accuracy”:** A number describing the accuracy of the oscillator in the Grandmaster (see IEEE 1588-2008 Section 7.6.2.5).

“Statistics” tab (Note: This tab was removed in version 4.8.8 and higher)

Unicast Tab (Unicast information)

- A) Configured as Unicast Master (defined by the “Clock Mode” field in the “Clock” tab)

| PTP STATUS(SLOT3) | | | | |
|----------------------------------|---------|--------------|---------|--------|
| Clock | Network | PTP Protocol | Unicast | Module |
| Master Properties | | | | |
| Unicast Negotiation | Enabled | | | |
| Number of Slave Clocks Connected | 0 | | | |

- B) Configured as Unicast Slave (defined by the “Clock Mode” field in the “Clock” tab)

| Clock | Network | PTP Protocol | Unicast | Module |
|----------------------------|---------|--------------|---------|--------|
| Slave Properties | | | | |
| Unicast Negotiation | Enabled | | | |
| Announce Messages | | | | |
| Contract State | GRANTED | | | |
| Contract Duration | 30 | | | |
| Contract Delay | 20 | | | |
| Log Message Interval | 1 | | | |
| Sync Messages | | | | |
| Contract State | GRANTED | | | |
| Contract Duration | 30 | | | |
| Contract Delay | 20 | | | |
| Log Message Interval | 0 | | | |
| Delay_Resp Messages | | | | |
| Contract State | GRANTED | | | |
| Contract Duration | 30 | | | |
| Contract Delay | 20 | | | |
| Log Message Interval | 4 | | | |

Module Tab (Version info, cause of last reset)

| | | | | |
|---------------------------|----------------------|--------------|---------|--------|
| Clock | Network | PTP Protocol | Unicast | Module |
| Software Version | 127 | | | |
| Hardware Version | B | | | |
| Software Compilation Date | Nov 16 2012 16:54:22 | | | |
| Software Compilation Time | 16:54:22 | | | |
| Reset cause | Loss Lock | | | |

- **Note about “Reset cause”:** Reports why the PTP module was last reset (SecureSync was rebooted/power cycled (**External**) or type of PTP module reset that was last performed **Cold**, **Warm** or **Factory reset**).

Earlier Archive versions (4.8.6 and below)

“Module information” tab (Version info, cause of last reset)

| PTP STATUS(SLOT5) | |
|---------------------------|--------------|
| Module Information | Clock |
| Network | PTP Protocol |
| Statistics | Factory |
| Software Version | 2 |
| Hardware Version | B |
| Software Compilation Date | Apr 8 2011 |
| Software Compilation Time | 14:03:02 |
| Reset cause | External |
| See Note below | |

Note about “Reset cause”: Reports why the PTP module was last reset (SecureSync was rebooted/power cycled (**External**) or type of PTP module reset that was last performed **Cold**, **Warm** or **Factory reset**).

“Clock” tab (Clock Quality and time information)

PTP STATUS(SLOT3)

Module Information **Clock** Network PTP Protocol Statistics

Clock Quality

| | |
|----------------------------|----------------|
| Clock Class | 52 |
| Clock Accuracy | Unknown |
| Offset Scaled Log Variance | 23264 (0x5ae0) |

Time Properties

| | |
|-----------------------|---------------------|
| UTC Offset | 0 |
| UTC Offset Valid | 0 |
| Forward Leap Second | 0 |
| Backwards Leap Second | 0 |
| Time Traceable | 0 |
| Frequency Traceable | 0 |
| PTP Time Scale | UTC |
| Time Source | Internal Oscillator |

See Notes below

Defined in IEEE 1888-2008, section 1.6.3

The Master's current offset between UTC time and TAI time

UTC Offset and Whether or not the Master's UTC Offset is valid.

24 hour notice of Leap second pending.

Is Time and Freq traceable.

Indicates the timescale that the Master is using to broadcast its time.

The Time Source that the Master is using.

- **Note about “Clock Class”:** A number describing the state of the clock (see Table 5 of Section 7.6.2.4 of IEEE 1588-2008). (See values below):

PTP Masters

- **6** = In sync to valid reference
- **7** = In Holdover
- **52** = Not in Sync and Not in Holdover (out of sync)

PTP Slaves

- **187** = Currently configured as a Master/Slave clock.
- **248** = Currently configured as a Master or Master/Slave (this is not the clock class broadcast by the Master).
- **255** = Currently configured as a Slave-Only (see IEEE 1588-2008 Table 5 of Section 7.6.2.4 for more information).

- **Note about Clock Accuracy:** A number describing the accuracy of the oscillator in the Master relative to its UTC reference. (See IEEE 1588-2008 Section 7.6.2.5). Slaves will always report “**Unknown**” here.
- **Note about “Time Traceable”:** Indicates whether the Master's time is traceable to a primary reference.
- **Note about “Frequency Traceable”:** Indicates whether the Master's Frequency is traceable to a primary reference.

“Network” tab (Network and PTP port settings)

PTP STATUS(SLOT3)

Module InformationClock**Network**PTP ProtocolStatistics

Ethernet Status

| | |
|--------------------|-------------------|
| Current IP Address | 10.10.13.10 |
| MAC Address | 00:0c:ec:ff:00:00 |

Port Status

| | |
|----------------|---------|
| Port Number | 1 |
| Port State | Master |
| Port Enable | Enabled |
| Link Connected | Enabled |

Defined in the IEEE 1588-2008 Specification.

See Notes below

➤ **Notes about “Port State” for 1204-12:**

- **Initializing:** Cable is unplugged / in power-up state.
- **Listening:** PTP is looking for a Master.
- **Master:** PTP Master has become the active master on the network.
- **Passive:** PTP Master has become a passive master. (There is another Master on the network with higher priority.) This Master will wait until such time as the Best Master Clock Algorithm determines it should be the Best Master, then it will transition to the Master state.
- **Uncalibrated:** PTP Slave has detected a Master on the network.
- **Slave:** PTP Slave is actively synchronizing to a Master on the network.

➤ **Note about “Port Enable”:** Indicates whether or not the network interface is enabled for PTP.

➤ **Note about “Link Connected”:** Indicates whether or not the Ethernet link is connected.

“PTP Protocol” tab (Priority settings, clock class, PTP version)

PTP STATUS(SLOT5)

Module Information
Clock
Network
PTP Protocol
Statistics
Factory

| | |
|-------------|---|
| PTP Version | 2 |
|-------------|---|

← Always PTP version “2”

Parent Properties

| | |
|--------------------------------|----------------------|
| Clock Identity | 00:0C:EC:FF:FE:FF:04 |
| Port Number | 1 |
| Log Announce Interval | 1 |
| Log Sync Interval | 0 |
| Log Min Delay-Request Interval | 4 |
| One Step Mode | Disabled |

← current Announce Interval (for Masters)

← current Sync Interval (for Masters)

← current Delay Request interval (for Slaves)

← One Step (Enabled) or Two step (Disabled)

See Notes below

Grand Master Properties

| | |
|----------------------------|-------------------------|
| Clock Identity | 00:0C:EC:FF:FE:FF:00:00 |
| Clock Class | 6 |
| Clock Accuracy | Within 100ns |
| Offset Scaled Log Variance | 23008 (0x59E0) |
| Priority 1 | 1 |
| Priority 2 | 128 |

- **Note about “Clock Class”:** A number describing the state of the clock (see Table 5 of Section 7.6.2.4 of IEEE 1588-2008).
 - 6 = Currently a Master with an active reference
 - 7 = Currently a Master with no active reference, but within holdover specification
 - 52 = Currently a Master with no active reference, outside of holdover specification (also applies to Masters who have just powered on and have not yet achieved a suitable TFOM value)

- **Note about “Clock Accuracy”:** A number describing the accuracy of the oscillator in the Grandmaster (see IEEE 1588-2008 Section 7.6.2.5).

“Statistics” tab (Port number, clock identify)

| PTP STATUS(SLOT5) | |
|-------------------------|-------------------------|
| Module Information | Clock |
| Network | PTP Protocol |
| Statistics | Factory |
| Parent Properties | |
| Stats Calculated | 0 |
| Observed OSLV | 65535 (0xFFFF) |
| Observed CPRC | 2147483647 (0x7FFFFFFF) |
| Clock Properties | |
| Offset From Master (ns) | 0 |
| Mean Path Delay (ns) | 0 |
| Steps Removed | 0 |

“Parent Properties section” Displays information from the current Parent. (In order for these fields to be populated with correct information, the “Output on the Management serial link of Clock Properties” setting on the “**PTP Setup / Statistics**” page needs to be enabled) (Refer to the IEEE 1588-2008 Specification).

Clock Properties: Displays statistics calculated by the PTP module (This information is normally only useful for PTP slaves). In order for these fields to be populated with correct information, the “Output on the Management serial link of Clock Properties” setting on the “**PTP Setup / Statistics**” page needs to be enabled.

See Notes below

- **Note about “Offset From Master (ns)”**: The computation of the clock offset between the PTP Master and the PTP Slave, (defined in IEEE 1588-2008 Section 11.2)
- **Note about “Mean Path Delay (ns)”**: The computation of the mean delay along the network path between the PTP Master and the PTP Slave (defined in IEEE 1588-2008 Section 11.4)

Asymmetries in path delay can cause small fixed offsets between Master and Slaves

Q. A dealer's customer is **COMPLAINING** about 120 ns of offset between our PTP Master and their Slave.

A. **Denis Reilly (3 June 2014)** PTP assumes that all paths are symmetrical. Any asymmetry in the path between Master and Slave at all will manifest itself in a fixed offset.

We see this most often when using our 10/100 Master on faster networks: the transition from 100 Mb to 1 Gb introduces asymmetry because it goes faster in one direction than another. That will result in a few us of offset. This is obviously smaller, and can probably be attributed either to asymmetries in the switch between them or (if this is a Gb card) asymmetries in the SFP. Using a crossover cable is probably the best next step, as you suggest.

Mean Path Delay

- Refer to Salesforce case 24557 for more on following emails/info

Email from Denis (6 Mar 17) Mean Path Delay is a calculation of the path delay between the Master and the Slave based on the timestamps as seen by the Slave. It's factored into the Slave's sync algorithm.

So it is both related to the -12 card (assuming it is the Slave), and related to the switch – any delays in the switch will show up here.

The “fixed” portion of this mean path delay is compensated for by the protocol – that's why the slave calculates it in the first place, to compensate for it. So if the Slave is reporting 1.5 us, it's already been compensated for.

Where you get into issues is if the actual path delay is varying by a large amount – then the Slave will only compensate for the fixed portion that it can calculate.

Follow-up email from Denis (13 Mar) In general we know that if you plug a PTP Master to a PTP slave through a standard network switch it is very possible that the time rendered by the slave varies by an order of magnitude of 1 or 2 μ s.

In the case of this customer, we need to understand who is the master, who is the slave and who is providing the MPD he mentioned. Otherwise, if the customer is wondering why the MPD can vary by up to 8 ns then it is by design in our PTP option board as the clock resolution is exactly 8 ns.

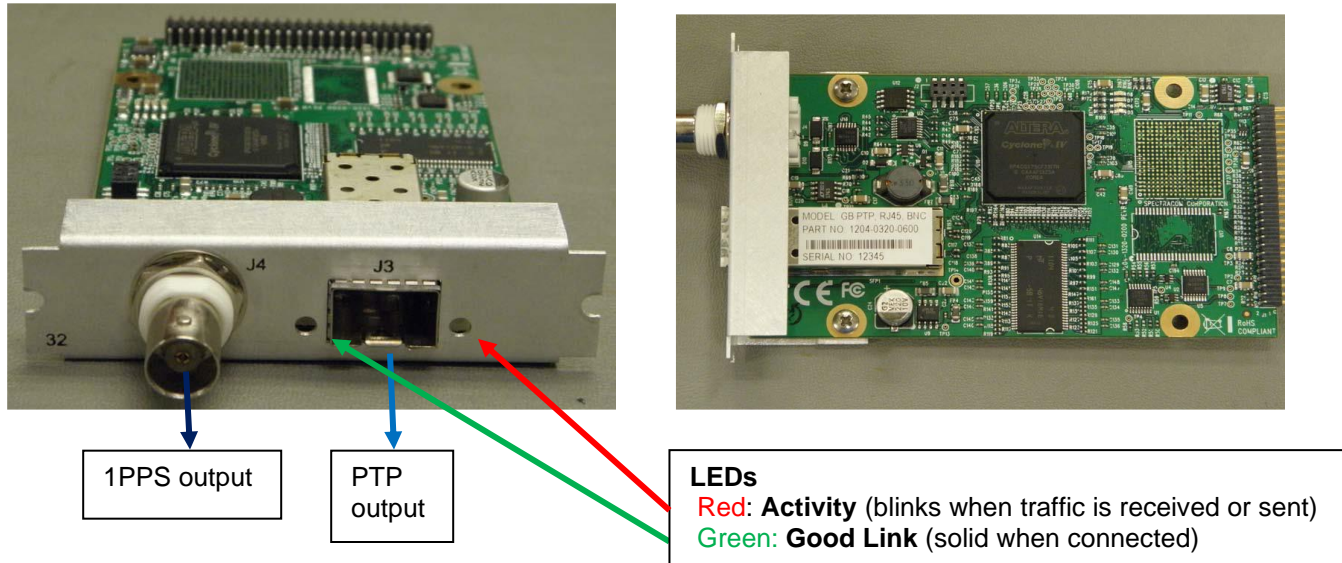
So it seems you have to better understand the background of this customer case.

Another follow-up email from Denis (15 Mar 17) MPD is calculated on the Slave based on calculations made from the timestamps. But when the switch is in boundary mode, it's basically acting like a Stratum 2 NTP clock: it's syncing to the Master but then it acts as a Master to all the slaves connected to it. So this MPD calculation is being made with timestamps from the boundary clock, not the 1204-12.

Disabling boundary mode will take the Arista clock out of the business of generating timestamps. Now the PTP packets will go through the switch from the Master to all the Slaves. This may cause packet delays through the switch, but it could be better than Arista's boundary clock.

- **Note about “Steps Removed”:** Measures how many PTP Master/Slave communications paths separate this clock from the time reference:
 - 0** = Direct connection to a reference (PTP Master)
 - 1** = PTP Slave directly connected to a PTP Master (or connected through a switch or transparent clock)
 - 2** = PTP Slave connected to a PTP Master through 2 paths (1 boundary clock).
 - 3** = PTP Slave connected to a PTP Master through 3 paths (2 boundary clocks).

***(1204-32) Korusys PTP Gb Option Card (PTP Master only)



Link/shortcuts:

Online SecureSync user guides

A) 1200 series SecureSyncs:

https://orolia.com/manuals/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/PTP_Grandm.htm

B) 2400 series SecureSyncs:

https://orolia.com/manuals/2400/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/PTP_Grandm.htm

- Option Card data sheet (and SecureSync PTP data sheet): [I:\Marketing\ Product Data Sheets \(archive\)\Time & Frequency References](I:\Marketing\ Product Data Sheets (archive)\Time & Frequency References)
- Schematic: P/N 400421 (refer to 1204-0320-F000) in Arena: https://app.bom.com/items/detail-bom-flat?item_id=1202835905&version_id=10221220528&orb_msg_single_search_p=1&redirect_seqno=7654235820
- PCB: (refer to 1204-0320-F000) in Arena: https://app.bom.com/items/detail-spec?item_id=1202835905&version_id=10221220528&orb_msg_single_search_p=1&redirect_seqno=7654277633
- For much more information on PTP: Refer to the:
 - PTP Precision Timing Protocol (IEEE1588) (for all products)” section in the “TimingBoardCustAssist” document: <I:\Customer Service\1- Cust Assist documents> and
 - The general PTP folder: <I:\Customer Service\PTP> (items such as Tech notes, Standards, etc)

Korusys technical contacts:

paul.rushton@korusys.com
vern.middleton@korusys.com

Important Note: PTP Master only. This card cannot operate as a PTP Slave!!!

Available: December 2013 (Released on ECN 3333)

Accuracy specs from data sheet:

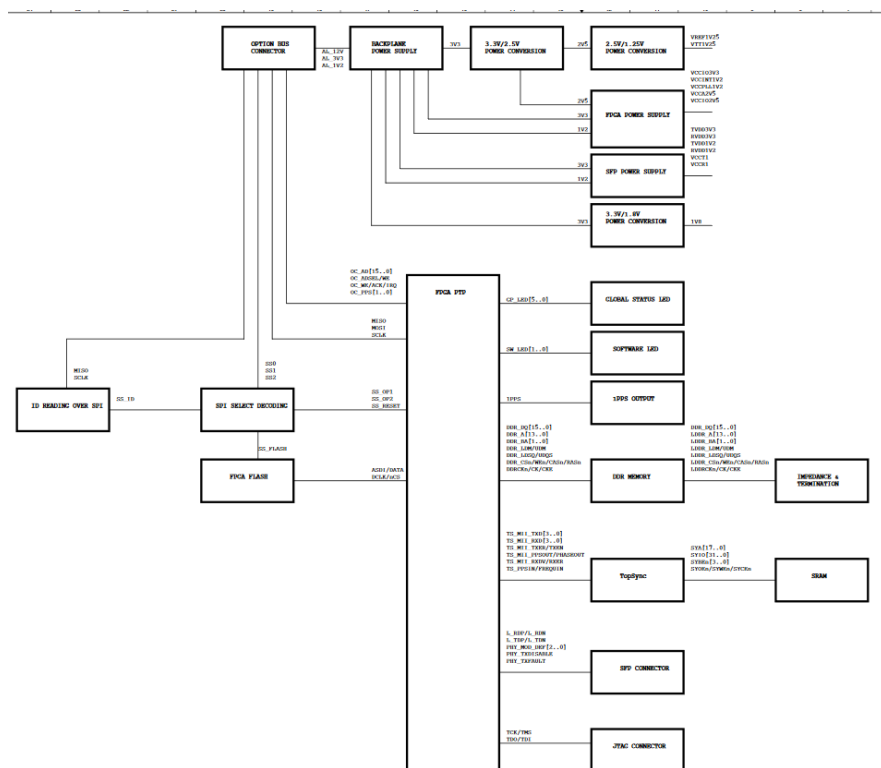
- Accuracy: 30 ns accuracy (3σ) Master to Slave, via crossover cable
- Can sync up to 4000 PTP slaves at full telecom rates (128 requests/second)
- Gigabit interface
- Supports **Telecom** profile (choices are either **Telecom** or **Default** profile)-
 - **Note:** 1204-32 doesn't support the **Power** profile
- This board "unofficially" released to "Logix" with Archive versions 5.1.0 and 5.1.1 (Dec 2013)
- "Official" general release for all customers is Archive version 5.1.2 (Dec 2013)
- Implemented in new web browser design only- not supported in the original "classic interface" web browser design.

Email from Keith (24 Apr 18) Specific to your question about the Model 1204-32 GP PTP Option Card, please be aware that this module requires software versions 5.1.2 or higher be installed in the SecureSync. This Option Card is not supported in versions prior to version 5.1.2. So. your customer must update their software to at least version 5.1.2 or higher to be able to use this card,

Software versions prior to version 5.1.3 only have the "classic interface" (white background) web browser available. The Model 1204-32 card is not supported in this much earlier, legacy web browser. It is only supported in the newer (black/charcoal) web browser which was added to the SecureSync via software update version 5.1.2. there are no intentions of adding support for this Option Card to the classic interface browser, so the software in the SecureSync must be updated to at least the minimum software version which adds the newer black/charcoal web browser to SecureSync, version 5.1.2.

Block diagram of the 1204-32 board

- From the first page of the schematic (our P/N 400421)
- (internal use only - do not send this out to customers/dealers)



Dedicated Processor/microprocessor for the 1204-32 (doesn't use the ETX module)

- (besides timekeeper PTP) PTP using the 1204-12 and 1204-32 cards do not use the ETX module (“outer processor”)
- The 1204-32 has a dedicated “software processor” (inside its onboard FPGA) which handles all the processing for its PTP functionality.

Q Can you confirm that PTP is also a higher priority thread & not affected by high CPU? You mentioned already that "NTP performance is NOT affected in any way by high CPU usage". I wanted to check that the same applies to PTP as well?

A email from Keith (10 Jan 18) PTP from an installed PTP Option Card (such as the Model 1204-32 GB PTP card) does not use the same “outer” processor as NTP uses. It has its own processor

The processor in SecureSync which can be monitored for CPU usage is called the “outer processor”. This processor is used for functions such as the web browser/CLI, SNMP the base operating system and NTP. There is another separate processor for the Timing System (referred to as “KTS”) which maintains factors such as sync and passes info to the browser/cli when requested.

PTP card also has its own onboard processor as well. Note these two other processors for the timing system and PT card can't be externally monitored for their usage.

So even though a unit's reported CPU usage may even be greater than 80% (due to factors as network traffic loading, high levels of NTP requests, walking the MIBs, multiple users in the browser at the same time, etc) this has no bearing on the operation of its PTP functionality. The PTP card essentially just receives time/date/PPS from the timing system for the card to sync with the system, and then it separately handles all of the PTP functionality - which is all dedicated to just this card.

~~If Timekeeper software is enabled in SecureSync (via purchased license file)~~

- ~~➤ Timekeeper software started being installed in SecureSync with the version 5.2.0 software update (Jan 2015)~~
- ~~➤ Timekeeper is providing two functions:~~
 - ~~• PTPv1 support for a particular customer~~
 - ~~• Enhanced PTP monitoring capabilities~~

Note: No longer available!!

1204-32 Outputs (1PPS and Ethernet)

A) 1PPS: BNC connector J4

- Same as the 1PPS output on base SecureSync. 1PPS provided on card just for convenience.

Extra connector to provide System PPS output: This is the same PPS output as the other PPS outputs on chassis or other option cards. Can be used by PTP slaves that can accept PPS input to help calibrate for network delays.

B) Ethernet/PTP: SFP in connector J3

Minimum TFOM requirements before packets are sent

Email from Denis R, 6 Dec 17: "Also remember that once the unit first goes into sync after a cold reboot, no messages will be transmitted until the disciplining locks (TFOM < 15)

Network Speeds: per the SecureSync user manual "100 Mb/s, or 1Gb/s, depending on SFP module used (the SFP determines the port speed)

10 base T or 10/100 SFP (highly discouraged to use, as 10 base T really degrades PTP timing optimization/capabilities).

Half-duplex (also highly discouraged to use, as half duplex really decreases timing accuracy).

Auto-negotiation: This is strictly a factor of the selected/installed SFP module (NOT THE Option Card). The Option Card has no control over the port speed. It does not perform any auto-negotiation and has no ability to hard-set a particular speed.

Q We have a question about 1204-32(PTP 1G module).1.Does 1204-32 PTP module support link speed of only 1Gbps? Or does this also support 100/10Mbps? If it also supports 100/10Mbps, can we use auto-negotiation? 3. If it also supports 100/10Mbps, can we setup link speed manually? In this case, please let us know how to set manually.

A Reply from Keith (17 Dec 15) I'll begin with the "summary" of your questions, which is that it is only the SFP module installed in the Model 1204-32 Option Card that determines the link speed for this Option Card. The Model 1204-32 Option Card itself has no bearing/decision on the link speed. The Option Card itself has no settings or functionality associated with selecting the link speed. Whether link speed is hard-set or whether auto-negotiation is used is strictly a factor of the installed SFP module.

For example, if a 1Gb SFP module is installed in the 1204-32 card, the SFP module hard-sets the link speed at 1GB. If a 10/100 SFP module happens to be installed in the card, whether the SFP module auto-negotiates with the switch its connected with is a factor of just the SFP module installed. The Option Card itself doesn't have any effects on the link speed selection.

Please be aware that due to the likely significant degradation of PTP timing accuracies, we **do not** recommend that the Model 1204-32 Gb PTP Option Card be used with either a dedicated 10 base T SFP module (even if one that is compatible with this card could be found), or with a 10/100 base T SFP module (which could potentially be set to 10 base T, half duplex if the switch port is not configured to auto negotiate to 100 base T. half duplex being selected will even further degrade the PTP timing capabilities.

From the SecureSync user manual (1204-32 specifications) this Option Card supports: "**100 Mb/s, or 1Gb/s, depending on SFP module used**".

****SFP modules (interchangeable Ethernet/Fiber jack (RJ-45 connector))**



- **SFP=** (Small Form-Factor Pluggable)
- There are “**SFP**” modules and there are “**SFP+**” modules (“SFP+” modules support data rates up to 16GB/s).
 - 1204-32 card is compatible with SFP modules only (1 GB and below only; the 32 card is not compatible with “SFP+” modules - so the card is not compatible with speeds faster than 1GB, such as 20 GB or 40 GB or examples).
 - There may be “SFP +” modules that are downward compatible to “SFP”, but Denis Reilly isn’t familiar with this).
- SFPs are hot-swappable.
- No SFP module is automatically included with the purchase of the 1204-32 (must be purchased separately or obtained locally:
- **We do not automatically include any SFP with the 1204-32 cards** (whether installed in the SecureSync at time of its purchase or if the PTP card is purchased separately anytime thereafter) unless it’s also purchased with the Option Card.
- We offer them for purchase for convenience or for troubleshooting possible SFP compatibility issues. But most customers usually have several locally available, so they normally don’t need to purchase any from us.
- SFPs are simply “media converters”. They are not network processors. Network functions are performed in the 1204-32 card

Port speed/duplex settings with SFPs

Storage of 1204-32 network configuration data (such as IP address, subnet mask, etc)

- Network settings are stored in the CF card- not in either the PTP card or its SFP module
- Upon each boot-up, settings are reloaded from the CF card into the 1204-32 card via the SPI bus.

The SFP module is re-initialized when inserted into a different Option Card

Email from Keith after talking with Denis R (30 Jan 17) I confirmed with one of our engineers today that the SFP module is re-initialized with the network settings that are programmed in the PTP Option Card, each time the SFP is installed in the board, and each time the SecureSync is powered-up (the SFP module is hot-swappable). So even if it happens to have any persistent onboard memory to remember network settings, these settings will be overwritten when installed in a different board, so that the module will then have the same settings that the PTP board has been programmed to have, via the unit’s browser.

Q. He wanted to know if the copper SFP could be swapped out for fiber SFP, as they prefer fiber over copper.

A. reply from Denis Reilly (10 Dec 2012) It should work with 1G fiber SFP’s, but we don’t have a big compatibility list yet. What type does he have?

Q. I noticed your quote does not include SFP, while it’s required for the card connection. Do you usually quote it as well, if we requested, or recommend any 3rd party brand SFPs? If so, do you think we could use Cisco’s and/or Arista’s?

A. reply from Jeremy Onyan (17 Dec 15) Yes, that is correct – you can use a 3rd party SFP. The module was designed specifically to operate that way. The brand we sell is actually made by Finisar, but I know there are many other customers who are using their Cisco and Arista SFP's. So if you plan on using one of those, then you shouldn't have issues at all.

Reports of FPGA version being reported as “FPGA V0000” and/or Network settings being reset to all 0's after submitting, closing the window and then re-opening the window

- Refer to Salesforce Cases such as 25630
- Per Denis R- PTP card is likely installed in Slot 6. Try installing it in a different slot besides slot 6.
- If the card's not in slot 6, check the version info for the card (**Tools-> Upgrade/Backup** page)
 - Verify the reported version is a valid number (such as example below):

| | | |
|-----------|----------------|---------------------------------|
| HW Slot 4 | 1204-32 Gb PTP | SW V0001 / FPGA V0127 / FW V027 |
|-----------|----------------|---------------------------------|

- If an invalid version is reported (such as FPGA V0000 as shown below), there may be an issue with the card's SPI bus, a problem with the slot on the main PCB, or the card is dead. Try moving card to a different slot to test for bad card or bad slot.

| | | |
|-----------|--------------------------------|----------------------------------|
| HW Slot 1 | 1204-04 ASCII Timecode, RS-485 | SW V0002 / FPGA V0122 |
| HW Slot 2 | 1204-24 STANAG In, Isolated | SW V0001 / FPGA V0000 |
| HW Slot 3 | 1204-0F Relay Output | SW V0004 / FPGA V0000 |
| HW Slot 4 | 1204-24 STANAG In, Isolated | SW V0001 / FPGA V0000 |
| HW Slot 5 | 1204-17 Sq Wv Out, BNC | SW V0001 / FPGA V0103 |
| HW Slot 6 | 1204-32 Gb PTP | SW V0001 / FPGA V0131 / FW V0031 |

SFP module versus GBIC (Gigabit Interface Converter) / SGMII mode (Serial Gigabit Media Independent Interface)

- **GBIC & SFP** are different in their sizes, hence it is more of a question as to which gigabit solution your device supports. (the difference between SFP and GBIC is in the size).
- **SGMII**: The media-independent interface (MII) was originally defined as a standard interface to connect a Fast Ethernet (i.e., 100 Mbit/s) media access control (MAC) block to a PHY chip. Being media independent means that different types of PHY devices for connecting to different media (i.e. Twisted pair copper, fiber optic, etc.) can be used without redesigning or replacing the MAC hardware. The MII bus (standardized by IEEE 802.3u) connects different types of PHYs to MACs. Thus, any MAC may be used with any PHY, independent of the network signal transmission media. The MII bus transfers data using 4-bit words (nibble) in each direction (4 transmit data bits, 4 receive data bits). The data is clocked at 25 MHz to achieve 100 Mbit/s speed.

(my understanding from Denis) Some network devices require they be programed as to whether an SFP or a GBIC is installed. The 1204-32 used SGMII and can detect which is installed. No programming is required for this selection???

Q. We are trying to determine which SFP module to buy for our Spectracom PTP module. We currently are using the Bel Fuse 1GBT-05, but we are unsure if Spectracom had programed this to be in GBIC mode or if it is operating in the native SGMII mode?

A. reply from Denis Reilly (16 Nov 16)

Short answer: Based on some of my E-mails with Korusys from 2013/2014, I think they are using SGMII.

Long answer: the module will support both modes but comes up as SGMII by default. You can write to registers to get GBIC mode activated. But Belfuse also offers another module with another P/N, which is identical except it uses

SBIC by default. You would think that if Korusys intended to use the part in GBIC mode, it would have specified the other part.

Does that make sense? But, I don't think it really matters from the customer's perspective: all they care about is that when they plug in an SFP, it will work, And the Belfuse one will work. So, I don't really know why they care.

SFP's available for purchase from Spectracom

- **MFG Datasheets:** Refer to: [I:\Customer Service\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Option Cards\PTP \(1204-12 and 1204-32\)](I:\Customer Service\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Option Cards\PTP (1204-12 and 1204-32))

A) Copper

- Refer to Salesforce: <https://na8.salesforce.com/01tC00000043spU?srPos=0&srKp=01t>
- **Our Model Number:** SFP-COPPER
- **Our P/N:** **MP40R-0001-0001** (in Arena at: https://app.bom.com/items/detail-spec?item_id=1202844955&version_id=10686858278)
- **MFG:** Bel Fuse Inc
- **MFG PN:** SFP-1GBT-05 (<https://www.mouser.com/datasheet/2/643/ds-BPS-sfp-1gbt-05-series-1314832.pdf>)
- **MTBF:**

B) Single Mode Fiber Optic

- Refer to Salesforce: <https://na8.salesforce.com/01tC00000043sq8?srPos=0&srKp=01t>
- **Our Model Number:** SFP-FIBER-SM
- **Our P/N:** **MP40R-0002-0001** (SFP-1-GBT-05)
- **MFG:** Avago
- **Mfg P/N:** AFB-5710/AFBR-5715L
- **MTBF:**

C) Multi-Mode Fiber- Spectracom P/N: SFP-FIBER-SM

- Refer to Salesforce: <https://na8.salesforce.com/01tC00000043wZD?srPos=1&srKp=01t>
- **Our Model Number:** SFP-FIBER-MM
- **Our P/N:** **MP40R-0003-0001**
- **MFG:** Avago
- **MFG PN:** AFB-5710LZ or AFBR-5715LZ.
- **MTBF:**

email from Keith to Denis Reilly: I asked him what SFP module he was using. He responded with just, “**Arista optics, SFP 1G base T**”.

Reply from Denis Reilly (5 Mar 2018) We do have that one, it works fine as long as it's on a 1G network. It doesn't auto-negotiate down to 100M very well. But he's already noted that he's on a 1G network.

Qualified SFP Modules: From Matt Loomis email 3-15-2016:

| Manufacturer | Part Number | Interface | Standard | SyncE |
|--------------|---------------|------------------------|------------|-------|
| Arista | SFP-1G-T | RJ-45 | 1000BaseT | No |
| Avago | AFBR-5710LZ | LC-Duplex, Multi-mode | 1000BaseSX | Yes |
| Avago | AFBR-57M5APZ | LC-Duplex, Multi-mode | 1000BaseSX | Yes |
| Bel Fuse | SFP-1GBT-05 | RJ-45 | 1000BaseT | No |
| Cisco | MGBSX1 | LC-Duplex, Multi-mode | 1000BaseSX | Yes |
| Cisco | GLC-T | RJ-45 | 1000BaseT | No |
| Finisair | FTLF1318P3BTL | LC-Duplex, Single-mode | 1000BaseLX | Yes |
| Finisair | FTRJ8519P1BNL | LC-Duplex, Multi-mode | 1000BaseSX | Yes |
| Finisair | FTLF8519P3BNL | LC-Duplex, Multi-mode | 1000BaseSX | Yes |
| Omitron | 7206-0 | LC-Duplex, Multi-mode | 1000BaseSX | Yes |
| Optorate | S.1312.10.D | LC-Duplex, Single-mode | 1000BaseLX | Yes |
| Proline | SFP-TX-CDW | RJ-45 | 1000BaseT | No |

SFPs that are reported as having portstate (port state) issues with 1204-32

- Cisco SFP-10G-SR
- Cisco GLC-T

API calls associated with 1204-32 GB PTP Card

- Refer to Tim Tetreault's "cheat sheet" at: [..\..\EQUIPMENT\SPECTRACOM EQUIPMENT\Timing boards\TSync family\Tsync driver calls cheat sheet](#)
- These API calls are primarily for internal use, but the associated "get" calls are available via the CLI interface ("sets" are not available to either spadmin or user accounts)
- These are examples - additional calls may have since been added

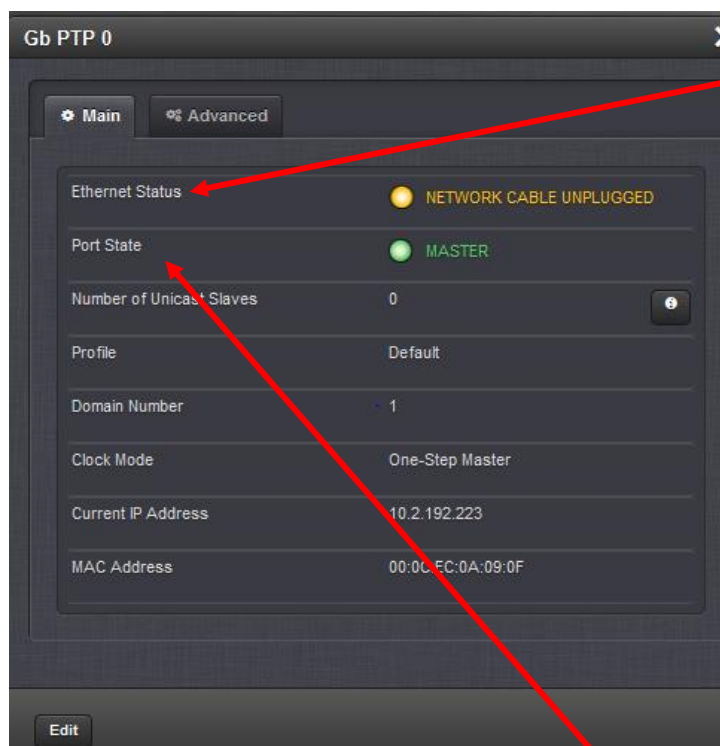
| PTP Commands |
|------------------------|
| PTR_GetClockQuality |
| PTR_GetEthernetITF |
| PTR_GetGMProp |
| PTR_GetMacAddr |
| PTR_GetMode |
| PTR_GetModuleInfo |
| PTR_GetModuleStatus |
| PTR_GetNumInst |
| PTR_GetParentProp |
| PTR_GetPortSettings |
| PTR_GetPortState |
| PTR_GetRefId |
| PTR_GetTimeProp |
| PTR_GetUnitSettings |
| PTR_GetUserDescription |
| PTR_GetValidity |
| PTR_ReinitModule |
| PTR_ResetModule |
| PTR_SaveSettingsToROM |
| PTR_SetEthernetITF |
| PTR_SetMode |
| PTR_SetPortSettings |
| PTR_SetUnitSettings |
| PTR_SetUserDescription |

STATUS windows of 1204-32 card

Interfaces-> "GB PTP 0" page of browser



"Main" tab (Ethernet Status-link state/link status, Number of unicast slaves, PTP Domain Number, IP address/MAC address)



NOTES ABOUT FIELDS in MAIN tab

Ethernet Status: (see info to right)

Port State: (see info to right)

Number of unicast slaves (see info below)

Profile: Either **Default** or **Telecom**

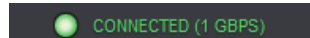
Clock Mode: Either **One-step** or **Two-step Master**

IP address/Mac Address

"Ethernet Status" (AKA "Link State") Reports either "CONNECTED" or "NETWORK CABLE UNPLUGGED"

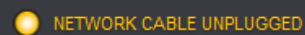
Note: The status window doesn't have to be closed to see the displayed state change. But it may take a few seconds before the reported state automatically changes in the window once the cable status has physically changed.

A) CONNECTED (1GBS) (in green)



Indicates: SFP mode is fully inserted- network cable is connected to both the SFP module and a switch/PC.

B) "NETWORK CABLE UNPLUGGED" (in either yellow/orange or in red)

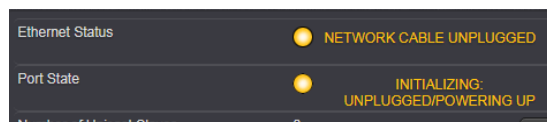


Indicates:

- 1) Network cable is either unplugged from the SFP module and/or the switch/PC (on the opposite end of cable) OR
- 2) SFP module is either not fully inserted, or is not installed in the Option Card.
- 3) Is the SFP MFG/Model on the 1204-32 "Approved SFP List"?

Notes about "Port State":

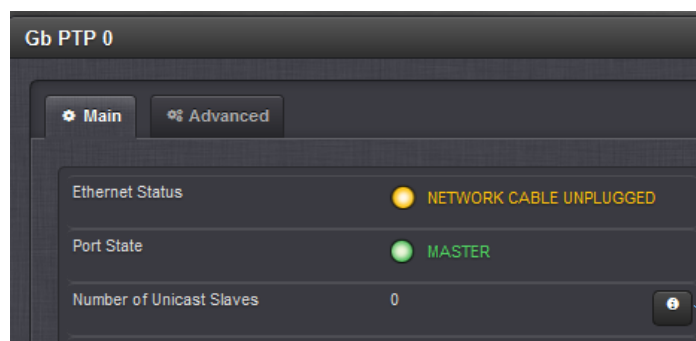
- Either "Initializing" or "Initializing: Unplugged/Powering up" Cable is unplugged / in power-up state.



- **Listening:** PTP is looking for a Master.
- **Master:** PTP Master has become the active master on the network.
- **Passive:** PTP Master has become a passive master. (There is another Master on the network with higher priority.) This Master will wait until such time as the Best Master Clock Algorithm determines it should be the Best Master. Then it will transition to the Master state.
- **Slave:** PTP Slave is actively synchronizing to a Master on the network.
- **Uncalibrated:** PTP Slave has detected a Master on the network (See info further below)

Number of Unicast Slaves (Slave statistics)

Number of unicast Slaves button



View table of up to 4000 unicast slaves found on the network

If these table rows have values, the Master is seeing unicast slave(s) on the network (which are actively using contract negotiation)

The screenshot shows the 'Slave Statistics' table with a search bar and a table with 4 columns: 'Ip Address', 'Sync Remaining', 'Announce Remaining', and 'DelayReq Remaining'. There is one row with the value '010.002.100.205' in the 'Ip Address' column and '284 / 300 s' in the other three columns. Navigation buttons 'First', 'Previous', '1', 'Next', and 'Last' are at the bottom.

| Ip Address | Sync Remaining | Announce Remaining | DelayReq Remaining |
|-----------------|----------------|--------------------|--------------------|
| 010.002.100.205 | 284 / 300 s | 284 / 300 s | 284 / 300 s |

This table lists each **active unicast contract negotiation** (for Syncs, Announces and Delay Requests).

Scenarios/situations regarding “Number of Unicast Slaves” / “Slave Statistics”

- 1) As a new contract should replace an earlier contract which has not yet expired, there should only be one entry in the table for each client.
- 2) **Hybrid mode: unicast packets being exchanged, but “Number of Unicast Slaves” field is remaining “0”**

➤ Refer to Salesforce Case 196361.

Details: Per conversation with Denis Reilly (28 May 2019) **Unicast Contract Negotiation (especially with Enterprise Profile)** is optional for the PTP Slaves in Hybrid mode (unlike true Unicast mode, which uses contract negotiation)

The “Unicast Slaves” count (and associated list) only increments for PTP Slaves actively using Contract Negotiation (required in true unicast mode, but optional to PTP slaves when in Hybrid mode)

- 3) The master SecureSync doesn't update the number of tracked slaves. The ptp slave is running in multicast hybrid. Our Microsemi devices on the other hand shows tracked slaves under slave multicast hybrid mode. (However, the Microsemis sometimes appear slightly more tolerant to slaves which maybe slightly misbehaving). Packets from the slave to master are going back via Unicast though – but I as I cannot capture on the PTP port, I'm not sure what's happening to these

Keith's response: Your observation is correct. As Multicast is one-way only transmissions, the SecureSync only reports the number of PTP Slaves operating in **Unicast** mode (two-way communications). It doesn't report info on Multicast Slaves. Unless you are using Unicast mode, the reported number of Unicast Slaves will remain at “0”.

Not sure how the Microsemi device is able to count/display the number of PTP multicast slaves (they may be processing unicast delays and tracking the Delay requests it receives from the Slaves, perhaps)? Am passing this observation over to our Product Manager to see if there may be a way for this to be captured and considered for a future software update.

- 4) There is a GUI bug where clicking on the 'Show PTP slaves' option brings up another window which cannot be cleared down in anyway; only clicking on another menu (home) or logging out seems to clear it. This appears on both Chrome and IE (Now, once again, this could be a local issue with our corporate versions, so it would be good if this can be replicated. I can provide screenshots if able)

Keith's response: Thanks for mentioning this. I see what you mean and am passing this observation along to the SecureSync Product Manager. I suspect this will be a fairly easy condition for Engineering to rectify

Update to this condition: I believe this was addressed in v5.8.0?

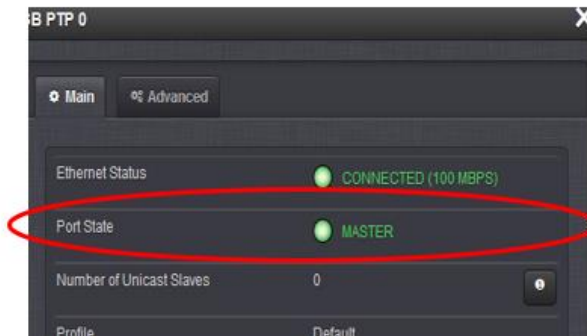
Port state (Status menu) for 1204-32 card

SFPs that are reported as having portstate (port state) issues with 1204-32

- Cisco SFP-10G-SR
- Cisco GLC-T

Note: Port state LED on the edge of the Option Card

- **Green** = connected
- **Orange** = not connected



Port State: Reports the current state of the PTP State Machine:

- **Disabled:** PTP Ethernet port is Disabled.
- **Initializing: unplugged/powering-up:** Ethernet link is unplugged/PTP Module is in power-up state (SecureSync may not have achieved sync yet)

Note: 1204-32 card remains in “**initializing**” until SecureSync has initially gone into sync to an external input, or to itself via the user/user reference (and the TFOM is less than 15, when synced to an external reference. This requirement doesn’t apply to the user/user reference).

- Per the SecureSync user guide: “*A Master Clock doesn’t leave this state while it can’t get the current time and synchronization references from SecureSync to synchronize with it.*”
- For an example email Keith sent on syncing the SecureSync to itself/battery backed time function, refer to Salesforce Case **258834**

- **Listening:** PTP module is looking for a Master Clock.
- **Master:** PTP Master has become the active Master Clock on the network.
- **Passive Master:** PTP Module has become a Passive Master Clock. (There is another Master Clock on the network with better quality or higher priority). This Master will wait until the Best Master Clock Algorithm determines it should become the best Master Clock, and then it will transition to the Master Clock state.

Note: If card is remaining as “Master” (not switching to “Passive Master”) even though there is another active master on the network, verify if the “**Transport Protocol**” field in the Advanced tab is set to “IPv4”. I found here if this field is set to “**802.3/Ethernet**”, it remained in Master mode. I changed it to **IPv4** and it switched to “**Passive Master**”.

- **Uncalibrated:** PTP Slave has selected a Master Clock on the network, attempts synchronize with it using sync packets (see below for example)

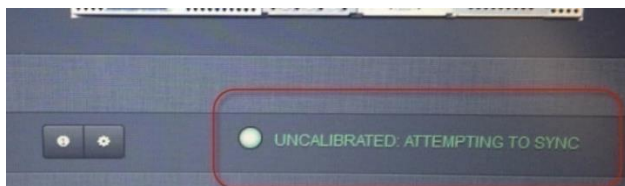
“Uncalibrated: Attempting to Sync” reported

Per Denis Reilly (24 Mar 2014) “Uncalibrated: Attempting to Sync” in the PTP mini-status line means that the Slave sees a PTP Master, but has not yet locked onto it.

(From the version 4.8.7 release notes)

Loss of PTP Follow-Up packets is now detected.

- If this occurs, the PTP Slaves remain in an '**Uncalibrated**' state (as is also the case with the loss of Sync status or Delay Response packets).



“Advanced” tab (Time info, Clock Quality, Clock accuracy, Network Setting, Port status)

Note: refer instead to the **“Main”** tab section above for info on Ethernet/link state and Port status

The screenshot shows the 'Gb PTP 0' configuration window with the 'Advanced' tab selected. The window is divided into several sections: 'Time Properties', 'Clock Quality', 'Ethernet Status', 'Port Status', and 'Module Information'. Each section contains a table of configuration parameters.

| Time Properties | |
|---------------------|---------------------------------|
| UTC Offset | 37 |
| UTC Offset Valid | Enabled |
| Leap Second | 0 |
| Time Traceable | Enabled |
| Frequency Traceable | Enabled |
| PTP Timescale | International Atomic Time (TAI) |
| Time Source | None |

| Clock Quality | |
|------------------------|--------------|
| Clock Accuracy | Within 25 ns |
| Offset Scaled Variance | 0x58E0 |
| Clock Class | 6 |

| Ethernet Status | |
|----------------------|--------------|
| Current IP Address | 10.2.192.223 |
| Current Network Mask | 255.255.0.0 |
| Current Gateway | 10.2.1.1 |

| Port Status | |
|-----------------|------------------|
| Port State | Master |
| Delay Mechanism | E2E (End-to-End) |
| PPS Offset | 0 |

| Module Information | |
|--------------------|----|
| Software Version | 27 |
| Hardware Version | 11 |

An 'Edit' button is located at the bottom left of the window.

“Time Properties”

(UTC offset, Leap seconds, PTP timescale, Time Source)

Time Source field: (see additional info below screenshot)

“Clock Quality”

(Clock Accuracy, Offset Variance, Clock Class)

See additional info below the screenshot

“Ethernet Status” (network settings)

Note: Refer to the **“Main”** tab (not the **“Advanced”** tab) for info on Ethernet/link state and Port status

“Port Status”

(Port state, Delay mechanism and PPS offset)

Note: Refer to the **“Main”** tab for info on Ethernet/link state and Port status

Port State: (see list in **“Main”** tab info further above)

“Module info” (software version/hardware version)

Ethernet Status (Link state)

Note: may need to put additional pressure on SFP to ensure its fully seated into its cage.

Known issue with link state

Per Denis Reilly (4 Mar 2014) We have a known bug where sometimes the 1G card comes up and indicates that the link state is active even if there is no SFP connected. When it is in this state, although it will send PTP messages properly once the SFP is inserted, it may not properly follow the BMCA and transition to Passive mode if it is no longer the Best Master. We are looking into it. In the meantime, I advise rebooting the unit while the SFP modules are inserted

A) SecureSync logs indicate link failures of the 1204-32 card are continuing to occur

Note: This is a known software issue that can occur with certain Cisco switches (such as the [Nexus 9k switch](#))

- Refer to Salesforce case 15840 (from back in 2014) and much more recent case 221596 (Jan 2020)

Per Denis Reilly (15 Dec 14) We just heard from Cisco this morning that they've found the root cause on their end. They logged it here: <https://tools.cisco.com/bugsearch/bug/CSCur48215/>. They say they've fixed it internally, and it will be pushed out to customers in 4 to 6 weeks. I presume they need to test it before they release it in their next general update.

Screenshot below is from case 221596 (Jan 2020)

The screenshot shows the Cisco Bug Search Tool interface for bug CSCur48215. The title is "9564TX link flaps continuously when connected to spectracom GM". The description includes a list of symptoms from 2014 Oct 10, showing repeated link failures and changes in operational speed, duplex mode, and flow control states. The conditions state that when connecting a 10G SFP to a spectracom GM, repeated link flaps occur. The workaround is "none". The details section shows the bug was last modified on Sep 11, 2019, and is classified as "Fixed". It lists affected products including Cisco Nexus 9000 Series Switches and various 9000 series switch models. There are buttons for "Customer Visits", "Save Bug", and "Open Support Case". At the bottom, there is a link to "Community Discussion on CSCur48215 - Cisco Community".

Below is the original report/research we originally performed to diagnose the reported condition (before Cisco discovered the issue)

- Find out what brand/Model SFP the customer is using and let Denis know.
- Packets may or may not still be getting through.
- The Model 1204-32 Option Card itself doesn't have any control over the link state. It only reports the link state provided by its installed SFP. The link state is maintained by the two SFPs themselves.

Email from Joe Laibach with Schonfeld (3 Oct 2014) We are seeing the multicast PTP messages fine on the servers. We are physically seeing the interfaces going down. It happens every 5 to 10 minutes and then bounces up and down multiple times.

```
2014 Oct 3 13:07:22 grv-9508-sw2 %ETHPORT-5-IF_DOWN_LINK_FAILURE: Interface Ethernet1/1 is down (Link failure)
2014 Oct 3 13:07:23 grv-9508-sw2 %ETHPORT-5-SPEED: Interface Ethernet1/1, operational speed changed to 1 Gbps
2014 Oct 3 13:07:23 grv-9508-sw2 %ETHPORT-5-IF_DUPLEX: Interface Ethernet1/1, operational duplex mode changed to Full
2014 Oct 3 13:07:23 grv-9508-sw2 %ETHPORT-5-IF_RX_FLOW_CONTROL: Interface Ethernet1/1, operational Receive Flow Control state changed to off
2014 Oct 3 13:07:23 grv-9508-sw2 %ETHPORT-5-IF_TX_FLOW_CONTROL: Interface Ethernet1/1, operational Transmit Flow Control state changed to off
2014 Oct 3 13:07:23 grv-9508-sw2 %ETHPORT-5-IF_UP: Interface Ethernet1/1 is up in mode access
2014 Oct 3 13:08:28 grv-9508-sw2 %ETHPORT-5-IF_DOWN_LINK_FAILURE: Interface Ethernet1/1 is down (Link failure)
2014 Oct 3 13:08:29 grv-9508-sw2 %ETHPORT-5-SPEED: Interface Ethernet1/1, operational speed changed to 1 Gbps
2014 Oct 3 13:08:29 grv-9508-sw2 %ETHPORT-5-IF_DUPLEX: Interface Ethernet1/1, operational duplex mode changed to Full
```

2014 Oct 3 13:08:29 grv-9508-sw2 %ETHPORT-5-IF_RX_FLOW_CONTROL: Interface Ethernet1/1, operational Receive Flow Control state changed to off
2014 Oct 3 13:08:29 grv-9508-sw2 %ETHPORT-5-IF_TX_FLOW_CONTROL: Interface Ethernet1/1, operational Transmit Flow Control state changed to off
2014 Oct 3 13:08:29 grv-9508-sw2 %ETHPORT-5-IF_UP: Interface Ethernet1/1 is up in mode access
2014 Oct 3 13:19:58 grv-9508-sw2 %ETHPORT-5-IF_DOWN_LINK_FAILURE: Interface Ethernet1/1 is down (Link failure)
2014 Oct 3 13:19:59 grv-9508-sw2 %ETHPORT-5-SPEED: Interface Ethernet1/1, operational speed changed to 1 Gbps
2014 Oct 3 13:19:59 grv-9508-sw2 %ETHPORT-5-IF_DUPLEX: Interface Ethernet1/1, operational duplex mode changed to Full
2014 Oct 3 13:19:59 grv-9508-sw2 %ETHPORT-5-IF_RX_FLOW_CONTROL: Interface Ethernet1/1, operational Receive Flow Control state changed to off
2014 Oct 3 13:19:59 grv-9508-sw2 %ETHPORT-5-IF_TX_FLOW_CONTROL: Interface Ethernet1/1, operational Transmit Flow Control state changed to off
2014 Oct 3 13:19:59 grv-9508-sw2 %ETHPORT-5-IF_UP: Interface Ethernet1/1 is up in mode access

Email from Keith to Joe: To begin, the Spectracom Model 1204-32 Option Card itself doesn't have any control over the link state. It only reports the link state provided by its installed SFP. The link state is maintained by the two SFPs themselves.

There may be some sort of compatibility issue between the Avago SFP in the PTP Master and the Cisco Model SFP you are using on the opposite end. If you have an extra Cisco SFP available, we recommend swapping out the Avago SFP in the PTP Option Card with a Cisco SFP. It's more likely that two similar Model SFPs will be able to maintain link state better than two SFPs from different manufacturers.

If you have an extra Cisco SFP available, please let me know if swapping out the Avago with the Cisco prevents the dropped link states you are observing.

CLOCK QUALITY (Consists of ClockClass and ClockAccuracy)

- The Clock Quality is transmitted in the PTP **Announce** message

Table 25—Announce message fields

| Bits | | | | | | | | Octets | Offset |
|-------------------------|---|---|---|---|---|---|---|--------|--------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| header (see 13.3) | | | | | | | | 34 | 0 |
| originTimestamp | | | | | | | | 10 | 34 |
| currentUtcOffset | | | | | | | | 2 | 44 |
| reserved | | | | | | | | 1 | 46 |
| grandmasterPriority1 | | | | | | | | 1 | 47 |
| grandmasterClockQuality | | | | | | | | 4 | 48 |
| grandmasterPriority2 | | | | | | | | 1 | 52 |
| grandmasterIdentity | | | | | | | | 8 | 53 |
| stepsRemoved | | | | | | | | 2 | 61 |
| timeSource | | | | | | | | 1 | 63 |

- Web browser report of Clock Quality (ClockClass and ClockAccuracy)



- API Call to report both **ClockClass** and **ClockAccuracy**: `GPR_GetClockQual 0 0<enter>`

```
-bash: GPR_GeClockQual: command not found
spadmin@Spectracom /usr/bin $ GPR_GetClockQual 0 0

GPR 0 Clock Quality:
    Clock Class: 6
    Accuracy: 0x20
    OSLV: 0x58E0
spadmin@Spectracom /usr/bin $
```

A) ClockClass / gptpStatusClockClass"

- **ClockClass**: A number describing the state of the time and 1pps references of the PTP Clock.
- ClockClass is provided in Announce messages.
 - Also provided in 1204-32 MIB file as "**gptpStatusClockClass**"

| Table 5—clockClass specifications | |
|-----------------------------------|---|
| clockClass (decimal) | Specification |
| 0 | Reserved to enable compatibility with future versions. |
| 1-5 | Reserved. |
| 6 | Shall designate a clock that is synchronized to a primary reference time source. The timescale distributed shall be PTP. A clockClass 6 clock shall not be a slave to another clock in the domain. |
| 7 | Shall designate a clock that has previously been designated as clockClass 6 but that has lost the ability to synchronize to a primary reference time source and is in holdover mode and within holdover specification. The timescale distributed shall be PTP. A clockClass 7 clock shall not be a slave to another clock in the domain. |
| 8 | Reserved. |
| 9-10 | Reserved to enable compatibility with future versions. |
| 11-12 | Reserved. |
| 13 | Shall designate a clock that is synchronized to an application-specific source of time. The timescale distributed shall be ARB. A clockClass 13 clock shall not be a slave to another clock in the domain. |
| 14 | Shall designate a clock that has previously been designated as clockClass 13 but that has lost the ability to synchronize to an application-specific source of time and is in holdover mode and within holdover specification. The timescale distributed shall be ARB. A clockClass 14 clock shall not be a slave to another clock in the domain. |
| 15-51 | Reserved. |
| 52 | Degradation alternative A for a clock of clockClass 7 that is not within holdover specification. A clock of clockClass 52 shall not be a slave to another clock in the domain. |
| 53-57 | Reserved. |
| 58 | Degradation alternative A for a clock of clockClass 14 that is not within holdover specification. A clock of clockClass 58 shall not be a slave to another clock in the domain. |
| 59-67 | Reserved. |
| 68-123 | For use by alternate PTP profiles. |
| 124-127 | Reserved. |
| 128-132 | Reserved. |
| 133-136 | For use by alternate PTP profiles. |
| 137-186 | Reserved. |
| 187 | Degradation alternative B for a clock of clockClass 7 that is not within holdover specification. A clock of clockClass 187 may be a slave to another clock in the domain. |
| 188-192 | Reserved. |
| 193 | Degradation alternative B for a clock of clockClass 14 that is not within holdover specification. A clock of clockClass 193 may be a slave to another clock in the domain. |
| 194-215 | Reserved. |
| 216-232 | For use by alternate PTP profiles. |
| 233-247 | Reserved. |
| 248 | Default. This clockClass shall be used if none of the other clockClass definitions apply. |
| 249-250 | Reserved. |
| 251 | Reserved for version 1 compatibility; see Clause 18. |
| 252-254 | Reserved. |
| 255 | Shall be the clockClass of a slave-only clock; see 8.7.2. |

If the inherent characteristics of a clock change such that the clockClass or clockAccuracy designations no longer apply, the clock shall either:

- Upgrade or degrade its clockClass and clockAccuracy in such a way as to correctly specify the current clock characteristics
- Be placed in the FAULTY state

The ClockClass value that is reported (in the Announce Message) is based on whether the Default or Telecom Profile is selected.

Note: As of at least versions 5.9.4 and below, the 1204-32 MIB file for 1200 SecureSyncs (and at least versions 1.3.1 and below for 2400s) is not setup to support a user changing the default profile to the Telecom Profile. The “**gtpStatusClockClass**” object only works with the default PTP clock classes (Clock classes 6 and 7).

Refer to Salesforce Case 274655 / JIRA SSS-1240 for more info (this info is also noted again in the MIB section of the 1204-32 card)

Note: For more info on the normal operation of the “**gtpStatusClockAccuracy**” Object reporting the clock class (Clock Quality), search this doc for “*The Clock Class that is reported (in the Announce Message) is based on whether the Default or Telecom Profile is selected.*”

- Search the Journal log for ‘**Profile**’ to see if the telecom profile is selected (“profile 0” appears to be the default profile. So “**Profile 0 to Profile 0**” should indicate still in default profile.

Email from Dave Lorah to the customer who reported this observation I was able to setup and run a test for the Clock Class response of gtpStatusClockClass.

After reboot and prior to sync = 52
 In Sync = 6
 In Holdover = 7
 Holdover Expired = 52

Then I noticed in the Journal Log you sent, you have selected the ITU-T G8265.1 Clock Class Set. When I switched to this setting I

was able to duplicate the "82" response.

According to this table from the Standard, "82" corresponds with a SSM QL of 0000 and is a valid response.

Table 1 - Mapping of quality levels to SSM quality levels

| SSM quality level | Quality level |
|-------------------|---------------|
| 0000 | 0000 |
| 0001 | 0001 |
| 0010 | 0010 |
| 0011 | 0011 |
| 0100 | 0100 |
| 0101 | 0101 |
| 0110 | 0110 |
| 0111 | 0111 |
| 1000 | 1000 |
| 1001 | 1001 |
| 1010 | 1010 |
| 1011 | 1011 |
| 1100 | 1100 |
| 1101 | 1101 |
| 1110 | 1110 |
| 1111 | 1111 |

I have attached the entire standard for your review.

Did you intend to use the ITU-T G8265.1 Telecom Profile? If you do not specifically need this profile then change your Clock Class Set in the PTP Advanced tab to PTP Clock Classes to return a "52" response.

This may be a MIB problem and I am reporting this to our engineering group as a potential bug. I will let you know the results.

- When the **Default** profile is selected, user can select one of the following choices (each is described further below).
 - ❖ **PTP Clock classes** (Clock Classes **6 and 7**)
 - ❖ **ARB Clock classes** (Arbitrary Clock Classes) (Clock Classes **13 and 14**)
 - ❖ **ITU-T G.8265.1 (Telecom Profile)** (Clock Classes **80 through 110**)
- When **Telecom** profile is selected, the card always uses the **ITU-T G.8265.1 clock classes**.

A) Expected ClockClass values with the default clock classes selected

After reboot and prior to sync (SecureSync not yet in sync) = 52
In Sync = 6
In Holdover = 7
Holdover Expired (SecureSync no longer in sync) = 52

B) ITU-T G.8625.1 Provisional ClockClass values and SSM Quality values (ie: ITU-T G.8265.1/Y.1365.1, table 1) for Telecom Profile

- Part of Telecom Profile - Consists of **Clock Classes 80 through 110**
- **G.8265.1/Y.1365.1 Specs**- Refer to: <http://www.itu.int/rec/T-REC-G.8265.1-201010-I/en> (download the PDF)

Also refer to https://www.juniper.net/documentation/en_US/junos/topics/reference/configuration-statement/quality-level-edit-chassis-synchronization-source-acx-series.html#:~:text=Both%20option-1%20and%20option-2%20SSM%20quality%20levels%20%28QL%29,is%20QL_STU%20whether%20or%20not%20QL%20is%20enabled.

Note from Dave Lorah (18 March 2022) I found more info about the Clock Class. For the ITU-T G8265.1 Clock Classes this is equivalent to the Quality Level of the clock. His Screen Shot shows Clock Class = 80. My PTP in the lab shows Clock Class = 82.

80 = QL= PRS Clock traceable to a primary reference source
82 = QL=STU Clock traceable to an unknown quality

Table 1 provides the mapping values of SSM quality levels to the PTP clockClass attribute. The clockClass attribute is to transmit the SSM QL from the packet master to the packet slave.

Table 1 - Mapping of quality levels to PTP clockClass values

| SSM QL | ITU-T G.781 | | | PTP clockClass |
|--------|--------------------|--------------------|------------|----------------|
| | Option I | Option II | Option III | |
| 0001 | | QL-PRS | | 80 |
| 0000 | | QL-STU | QL-UNK | 82 |
| 0010 | QL-PRC | | | 84 |
| 0111 | | QL-ST2 | | 86 |
| 0011 | | | | 88 |
| 0100 | QL-SSU-A | QL-TNC | | 90 |
| 0101 | | | | 92 |
| 0110 | | | | 94 |
| 1000 | QL-SSU-B | | | 96 |
| 1001 | | | | 98 |
| 1101 | | QL-ST3E | | 100 |
| 1010 | | QL-ST3/ QL-EEC2 | | 102 |
| 1011 | QL-SEC/ QL-EEC1 | | QL-SEC | 104 |
| 1100 | | QL-SMC | | 106 |
| 1110 | | QL-PROV | | 108 |
| 1111 | QL-DNU | QL-DUS | | 110 |

| No. | Time | Protocol | msg info | sequenceId | Source | grandmasterClockClass |
|-----|-------------|----------|---------------------|------------|----------------|-----------------------|
| 26 | 7.000001835 | PTPv2 | 64 Announce Message | 33580 | 10.129.159.181 | 23000 |
| 24 | 6.000001884 | PTPv2 | 64 Announce Message | 33579 | 10.129.159.181 | 23000 |
| 18 | 5.000001958 | PTPv2 | 64 Announce Message | 33578 | 10.129.159.181 | 23000 |
| 16 | 4.000002058 | PTPv2 | 64 Announce Message | 33577 | 10.129.159.181 | 23000 |
| 12 | 3.000001841 | PTPv2 | 64 Announce Message | 33576 | 10.129.159.181 | 23000 |
| 8 | 2.000001958 | PTPv2 | 64 Announce Message | 33575 | 10.129.159.181 | 23000 |
| 6 | 1.000001853 | PTPv2 | 64 Announce Message | 33574 | 10.129.159.181 | 23000 |
| 2 | 0.000001848 | PTPv2 | 64 Announce Message | 33573 | 10.129.159.181 | 23000 |

```

2 Frame 26: 110 bytes on wire (880 bits), 110 bytes captured (880 bits)
> Ethernet II, Src: Spectrac_Ba1eIdb (00:8c:nc:Ba1eIdb), Dst: IP4cast_0101 (01:00:5e:00:01:01)
> 802.3Q Virtual LAN, Pk1: 9, Pk2: 0, Len: 117
> Internet Protocol Version 4, Src: 10.129.159.181, Dst: 224.0.1.129
> User Datagram Protocol, Src Port: 329, Dst Port: 329
  Precision Time Protocol (IEEE1588)
    .... 1811 = messageType: Announce Message (0xb)
    .... 0010 = versionPTP: 2
    messageLength: 64
    subsecondNumber: 0
    flags: 0x0000
    correction: 0.000000 nanoseconds
    ClockIdentity: 0x0000cfff0a1db
    SourcePortID: 1
    sequenceId: 33580
    control: Other Message (5)
    logMessagePeriod: 0
    originTimestamp (seconds): 0
    originTimestamp (nanoseconds): 0
    originCurrentOffset: 37
    priority: 0
    grandmasterClockClass: 6
    grandmasterClockAccuracy: The time is accurate to within 25 ns (0x20)
    grandmasterClockSource: 23000
    priority: 0
    grandmasterClockIdentity: 0x0000cfff0a1db
    localStepsRemoved: 0
    TimeSource: GPS (0x20)

```

"gptpStatusClockClass" in the 1204-32 PTP MIB file

➤ Refer to Cases such as 282685

(Excerpt below from the GB PTP MIB file)

- gptpStatusClockClass*
SYNTAX

OBJECT-TYPE
INTEGER { sync(6),
holdoverInSpec(7),
holdoverOutSpec1(52),
holdoverOutSpec2(187),
nosync(248),
unknown(255) }

MAX-ACCESS

read-only

STATUS

current

DESCRIPTION

"This indicates the PTP clock class according to the PTP V2 standard depending on the timescale of the reference clock generated by the Host board.

6: Time and 1pps references are synchronized with the host references.

7: Time and 1pps references are in holdover state, within specifications.

52: Time and 1pps references are in holdover state, not within specifications.

187: Time and 1pps references are in holdover state, not within specifications.
255: Slave Only class.
248: Unknown class."

The Time and 1PPS references are what the SecureSync itself syncs to/with. The value of "52" indicates the SecureSync's selected reference (such as its GNSS receiver for instance) is turning not valid/have no other references to select. These are all factors of the SecureSync itself and not a factor of the PTP card. The Clock class is just passing along the Sync status of the SecureSync (with the Clock Class normally clock Class "6" with the SecureSync fully in sync. When these events occur, the SecureSync should be going into Holdover mode.

B) ClockAccuracy / gptpStatusClockAccuracy"

- Provided in the PTP Announce messages sent from the PTP Masters
- Reported in the PTP Status page of the 1204-32 card, in the web browser
- Also reported via the 1204-32 MIB file as "**gptpStatusClockAccuracy**"
- Determined by current Phase Error (update versions 5.9.0 and above) or TFOM value (update versions 5.8.9 and below)

Per the PTP specifications

"**ClockAccuracy**": A number describing the accuracy of the oscillator in the Grandmaster (see IEEE 1588-2008 Section 7.6.2.5).

Table 6 —clockAccuracy enumeration

| Value [hex] | Specification |
|----------------|--|
| 00-1F | Reserved |
| 20 | The time is accurate to within 25 ns |
| 21 | The time is accurate to within 100 ns |
| 22 | The time is accurate to within 250 ns |
| 23 | The time is accurate to within 1 μ s |
| 24 | The time is accurate to within 2.5 μ s |
| 25 | The time is accurate to within 10 μ s |
| 26 | The time is accurate to within 25 μ s |
| 27 | The time is accurate to within 100 μ s |
| 28 | The time is accurate to within 250 μ s |
| 29 | The time is accurate to within 1 ms |
| 2A | The time is accurate to within 2.5 ms |
| 2B | The time is accurate to within 10 ms |
| 2C | The time is accurate to within 25 ms |
| 2D | The time is accurate to within 100 ms |
| 2E | The time is accurate to within 250 ms |
| 2F | The time is accurate to within 1 s |
| 30 | The time is accurate to within 10 s |
| 31 | The time is accurate to >10 s |
| 32-7F | Reserved |
| 80-FD | For use by alternate PTP profiles |
| FE | Unknown |
| FF | Reserved |

from Salesforce Case 158356:

1) SecureSyncs

The PTP Clock Accuracy (provided in the PTP Announce message) for **SecureSync's** PTP output is determined by the SecureSync's current Phase Error (update versions 5.9.0 and above) or TFOM (Time Figure of Merit) value, as reported:

1. **Web Browser:** in page and the [Interfaces](#) -> [GB PTP 0](#) page of the SecureSync's web browser (**Advanced** tab, under "Clock Quality")

2. **API Call to report both Clock Class and Clock Accuracy:** `GPR_GetClockQual 0 0<enter>`

```
-bash: GPR_GeClockQual: command not found
spadmin@Spectracom /usr/bin $ GPR_GetClockQual 0 0

GPR 0 Clock Quality:
      Clock Class: 6
      Accuracy: 0x20
      OSIV: 0x58E0
spadmin@Spectracom /usr/bin $
```

For more information on the SecureSync's **TFOM** value, please visit the online SecureSync user guide at: http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/TIME/TFOM.htm

Issues associated with ClockAccuracy value toggling less than/greater than 25ns

- Improved in v5.9.0 update (1204-32 firmware version 1.31)
 - Per 5.9.0 update Release Notes: "[changed generation of clockAccuracy parameter to reduce unnecessary transitions between Best Masters](#)"

1. Toggling of ClockAccuracy value (between "<25ns" and "<100ns") during normal operation adversely affects PTP Slaves

A) Legacy 1225 VelaSyncs (for comparison)

The Clock Accuracy for **VelaSync's** PTP outputs is derived from the VelaSync's "**Source Accuracy**" value, as reported in **Status** tab of the Timekeeper GUI interface. For more info on Source Accuracies, refer to the VelaSync online user guide at the following link http://manuals.spectracom.com/VS/Content/VS/Topics/TASKS/TK_StatusMon.htm

Note that VelaSync offer an available configuration to add a minimum "floor" that prevents its Clock Accuracy value from being reported below a minimum value. As the Clock Accuracy value can directly affect the switching back and forth between active masters, over reported accuracies of very little difference between PTP masters, (such as below 10ns for instance) it may be desired to activate this "floor", otherwise, VelaSync will report accuracies greater than this floor, resulting in the potential of often changing of which Master is the currently active master, based on minute differences in reported clock accuracies.

The field for this is the "**Limit advertised accuracy**" field. As also excerpted below, refer to the VelaSync online user guide at the following link for more information on this available/optional field: http://manuals.spectracom.com/VS/Content/VS/Topics/TK/PTPserv_subtab.htm

Limit advertised accuracy: If set, the server will limit the accuracy advertised in PTP announce messages to be no better than the value provided (in seconds). This is helpful when trying to prevent some clients from switching between grandmasters quickly.

Additional questions also associated with Salesforce Case 158356 (answers from Denis Reilly 22 Mar 18)

Q What criteria would have to be met for the devices to send a clock accuracy of 0x20 and 0x21 then? As an example the GM is reporting 0x20 accuracy at the moment, what value of source accuracy would the GM have to have to amend the clock accuracy it send 0x21 to its clients in an announce message? I would like to know the thresholds for both the vela and sec sync and any other attributes that are used to determine the value of the clock accuracy sent in announce messages.

A In both the SecureSync and Velasync, the clock accuracy is a measure of how far the internal system time is from the reference time (usually GPS / GNSS). When they report 0x20, it means that at the time the Announce Message was sent, we estimate there was less than 25 ns error between the internal system time (used to generate PTP hardware timestamps) and the reference time.

Q How often do the vela and secure syncs send announce messages by default

A Velasyns send Multicast Announce message roughly once a second by default. SecureSyns send Multicast Announce messages every two seconds by default, but that setting is easily changed.

Q The clock accuracy value it sends in the announce message, is this based on the source accuracy at the time of sending? Or does it look over the last X amount of time?

A It is based on the instantaneous source accuracy at the time of sending.

Q What are your recommended settings to deal with accuracy issue explained. Our client has a report that checks for the GM clock accuracy and they keep seeing it change.

A For Timekeeper Velasyns, I would recommend changing the "limit advertised accuracy" field.

Q If I limit the accuracy advertised by the velasync to be 0x20 (time accurate to within 25ns), will this cause any issues if the accuracy is less than this value say to within 100ns? Will it continue to output a signal with announce messages containing info of accuracy to within 25ns even if this is actually not the case?

A That setting simply limits what is advertised in the Announce Messages to prevent clients thrashing from one PTP master to another based on the BMCA (assuming Priority1 and ClockClass are the same). The quality of the time is otherwise unaffected.

25 ns is the lowest advertised accuracy that the 1588 standard supports (See Table 6 of IEEE 1588-2008), so limiting accuracy to 25 ns does nothing. Customers who use this feature usually limit advertised accuracy to 100 ns. Or 250 ns.

If a master's current clock quality is less than 25 ns, but it is broadcasting 100 ns, this setting will may prevent a PTP client from switching to it. But the master's current clock quality may not stay below 25 ns for very long. Customers who activate this setting prefer to have the client keep listening to its current master than have it switch for a short period of time.

(Keep in mind that the other master must also be broadcasting 100 ns and is being selected based on the other BMCA parameters, so its time is not really "bad". Switching to a nominally better master for a short period of time can result in worse performance than not switching at all.)

➤ **Fixed in update 5.9.0** (Jan 2021)

- Per 5.9.0 Release Notes: [changed generation of clockAccuracy parameter to reduce unnecessary transitions between Best Masters](#)"

➤ Refer to Salesforce Cases 232278 and 230985 (both in May 2020 time-frame)

➤ Refer to JIRA ticket SSS-925 (created by Keith, 14 May 2020)

Customer Report from Case 232278

We have two Spectracom SecureSyns with GB-PTP option cards fitted. We have noticed that the Grandmaster keeps flipping between the two clocks, it appears this is because the "clock accuracy" value is varying between < 25ns and < 100 ns, if the current master goes to <100ns when the backup is at <25ns the grandmaster will change for a short period before changing back.

Can you tell us why the clock accuracy value is changing and if it is possible to avoid this happening?"

Status update per Denis Reilly (28 July 2020) Regarding the ClockAccuracy toggling: we decided that the best way to solve the flopping would be to institute the floor on what is broadcast. We changed the 1204-32 behavior so that the lowest clockAccuracy it will broadcast is < 100 ns. (Jira: SSS-925). If I am reading JIRA correctly, [this fix] will be in 5.9.0.

Two associated Changes/Fixes in 5.9.0 update

- Starting in 5.9.0, Announce packets no longer report accuracies better than 100ns (wont report "better than 25ns", for instance)
- It changes the clockAccuracy that the 32-card inserts into the PTP packets to be based on phase error directly, rather than TFOM.

Q. Keith sent to Denis Reilly and Ryan Johnson: What exactly changed, relating to 5.9.0 release Note "[changed generation of clockAccuracy parameter to reduce unnecessary transitions between Best Masters](#)"

A. reply from Denis Reilly (20 Jan 2021) As I recall, there were two changes:

Pre-5.9.0 we calculated the clockAccuracy that went into the PTP packets using TFOM instead of the actual accuracy, Since TFOM doesn't have the same granularity as the clockAccuracy parameter, that led us to sometimes advertise clockAccuracy that was worse than what we really were. We changed this so that the parameters in clockAccuracy accurately reflected the phase error.

But the "unnecessary change" bit involves putting a floor on our broadcast clockAccuracy. What was happening was that the GNSS performance of the SecureSync was occasionally so good that the reported accuracy would go down below 25 ns, but only stay there briefly. This would sometimes trigger a change in best master, only to have that change revert later.

To fix this, we put a floor on the broadcast accuracy so that we would never broadcast an accuracy less than 100 ns. Under the theory that if two masters were both within 100 ns of UTC, that's probably close enough that we want to stay with one, even if the other temporarily goes under 25 ns. The thrashing back and forth may have a worse effect on the PTP clients than the small amount of inaccuracy.

A (reply from Ryan Johnson 20 Jan 2021) I think technically that change is outside of the 32-card itself (semantics I suppose) but regardless you're correct -- it changes the clockAccuracy that the 32-card inserts into the PTP packets to be based on phase error directly rather than TFOM. Here are the two main tickets with details:

<https://spectracom.atlassian.net/browse/SSS-768>

<https://spectracom.atlassian.net/browse/SSS-925>

This addressed several SF cases including 232278 & 230985

2. (5.8.9 and below) Software issue converting TFOM value to ClockAccuracy value

- Fixed in 5.9.0 (refer to emails above from Denis Reilly and Ryan Johnson)

5.9.0 fixed the **ClockAccuracy** value which is sent in Announce messages and the **ClockAccuracy** value reported in the Gb PTP page of the browser. But it apparently did not fix the **ClockAccuracy** value provided by the GB PTP MIB (more on this further below)

- Refer to **JIRA SSS-768**

- Email below associated with Case **218654**

Email from Dave L to Nidal, I was reading through the email Denis Reilly sent last week. It looks like there is a bug with the clockAccuracy reporting of the PTP card. There has been a JIRA entered to fix this, but I am not sure when this would happen. Please let our customer know and mark the case accordingly.

Hopefully resolving the high phase error problem will prevent this bug from affecting his PTP operation.

Email from Denis Reilly (10 Jan 2020) Regarding the clockAccuracy: I think we goofed a bit in the 32 card development. It would have made the most sense to assign the clockAccuracy value based on the phase error directly.

If we had done that, we would send these values:

| clockAccuracy | Phase Error |
|---------------|--|
| 20 | $E \leq 25 \text{ ns}$ |
| 21 | $25 \text{ ns} < E \leq 100 \text{ ns}$ |
| 22 | $100 \text{ ns} < E \leq 250 \text{ ns}$ |
| 23 | $250 \text{ ns} < E < 1 \text{ us}$ |

But instead of reading the phase error directly, we read the TFOM instead. So our table looks more like this:

| TFOM | Clock Accuracy | Phase Error |
|------|----------------|---------------------------------------|
| 1 | 0x20 | $E \leq 1 \text{ ns}$ |
| 2 | 0x20 | $1 \text{ ns} < E \leq 10 \text{ ns}$ |
| 3 | 0x21 | $10 \text{ ns} < E < 100 \text{ ns}$ |
| 4 | 0x23 | $100 \text{ ns} < E < 1 \text{ us}$ |

It looks like I did a straight port of the TFOM ranges in the lookup table to clock accuracy values, and as a result we skip over some clockAccuracy values entirely, and report a worse value than we really have. (160ns should report as 0x22, but our table reports it as 0x23). I'm sure I thought it was a good idea at the time....

In order to fix this, we would have to change the Korusys Library to take a phase error value instead of the TFOM, and then implement the real lookup table from the standard, and not the fake one I really implemented. No change is necessary in the Korusys firmware, as we provide the TFOM value into the card form KTS.

This is now in JIRA as **SSS-768**. I can't speak to when it might be fixed.

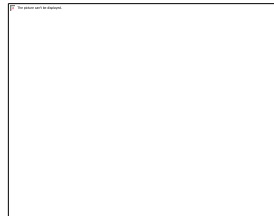
None of this analysis makes up for the fact that Rb's shouldn't have phase error values that high, so I agree with Dave Lorah's treatment of this. But even taking that into consideration, the customer is right that the 32 card is reporting a worse clock accuracy than it needs to.

Status update per Denis Reilly (28 July 2020) We are also changing how the broadcast clockAccuracy is generated, so that it is not directly dependent on TFOM, as your astute customer observed. It will now be generated directly on the calculated Phase Error, which should be closer to reality. (Jira: SSS-768)

If I am reading JIRA correctly, [this fix] will be in 5.9.0.

“gptpStatusClockAccuracy” (reported in the 1204-32 PTP MIB file)

- “gptpStatusClockAccuracy” value reports the current “ClockAccuracy (Clock Quality)” which is also provided in the Announce message and is also reported in the 1204-32 Gb PTP Status page of the browser.
- As update version 5.9.0 added a minimum floor value of not reporting better than 100ns, the lowest decimal value that can be reported now is “33” (indicating the Phase Error is currently better than 100ns).
- In versions 5.8.9 and below, the decimal value can be reported as “32” (if the Phase Error is better than 25ns)



Partial Email from Keith (5 April 2022) excerpted from Case 282683

I found out that the values returned from the GbPTP ClockAccuracy MIB aren't exactly as I thought (it turned out my understanding was a bit of a coincidence). The returns from this SNMP object are valid values, and can all be crossed to the correlating TFOM value (and the Phase Error value which needs to be exceeded, for this particular decimal value to be returned) via the chart further below.

The values you reported seeing in the responses (such as "33") aren't directly reporting the TFOM in the second digit, as I initially thought. Instead, the two returned digits are a "decimal" value that correlates to the same exact values being sent into the 1204-32 GB card, for it to populate in its Announce Messages (sent out to the PTP network). Via this chart (from the PTP specs), the current TFOM value can be ascertained from the two digit decimal value.

Here is the chart from the PTP Specs, with the column in red being for the decimal value returned from the SNMP object. As I mentioned previously, update version 5.9.0 added a "minimum floor value" of ClockAccuracy no longer reporting the Phase Error being better than 100ns (to prevent undesired toggling between PTP masters on the network). The minimum decimal ClockAccuracy value is now "33", reported as long as the ClockAccuracy/Phase Error is better than 100ns (this is the range that the SecureSync will typically remain in, when synced via GNSS, though it can exceed 100ns during normal operation).

Based on this info, there is no need to necessarily monitor the TFOM value separately from this object. But to monitor the exact current Phase Error of the SecureSync (since this table will only provide the minimum Phase Error and maximum Phase Error values that the Phase Error can be without it falling into a different row of the table), the raw Phase Error reported via SNMP can also be optionally monitored, if desired.

“GrandmasterClockVariance” / “Clock Variance” (“Offset Scaled Variance” “OSLV”)

- Called “GrandmasterClockVariance” in pcap captures and as “Offset Scaled Variance” in 1204-32 web browser

- Reported in Announce messages and in the Advanced tab of the 1204-32 browser
 - **SecureSync's 1204-32 card: Email from Denis Reilly to Dave Lorah regarding Salesforce Case 202779 (15 Jul 2019)** The OSLV value in the 1204-32 card is based on the type of oscillator that is installed in the SecureSync. An OCXO unit will have a different value than a Rb.
 - **Legacy 1225 VelaSync (Timekeeper):** Always reported as "0"

Are our current OSLVs valid: Meinberg GM are always preferred with the BMCA due to their lowest variance value (Meinberg OCXO vs SecureSync RB)

- Refer to Salesforce Case 263991
- Refer to JIRA SSS-1150 (May 2021, requesting Engineering validate current reported values)
- Eric Girard sent the following (his customer's email to him is in blue)

Email from Eric Girard (26 MAY 2021) Can someone from the Engineering team confirm me if what our customer observed below is correct or not. And if yes, what could be the workaround or fix?
I understand in their situation, Meinberg GM are always preferred with the BMCA due to their lowest variance value.

For our purposes, we use several Grandmaster-capable PTP time servers from different manufacturers. As is well known, the choice of the best master clock can be influenced by priorities in PTP. However, there is a parameter called PTP Clock Variance, which represents the stability or variability of the oscillator.

This parameter cannot be adjusted and plays an important role in the Best Master Clock algorithm. We have found that our Meinberg devices with a quartz oscillator output a better value than our SecureSync 1200 with rubidium oscillator (Clock Variance Meinberg M1000: 13563; Clock Variance SecureSync: 23008).

This leads to the fact that the clock slaves always synchronize to the Meinberg devices and never to the SecureSync (under the same conditions such as clock class, clock accuracy) without us being able to influence this. Setting a higher "Priority 1" to the SecureSync would result in Clock Slaves syncing to the SecureSync even if it had e.g. a very low accuracy or a worse clock class, since the BMCA is a strictly hierarchical selection algorithm.

According to Meinberg statements, however, the clock variance of all Grandmaster-enabled time servers should not vary and they have made interop-tests with other vendors.

For this reason we would like to ask Orolia: - Can the Clock Variance of a Rubidium-enabled SecureSync be lower than a 3rd party Time Server with an OCXO? If yes, can you please explain why? –

We are interested in acquiring a new SecureSync 2400 and have already received an offer. Can Orolia provide information on PTP Clock Variance for this product?

SETUP/CONFIGURATION of 1204-32 card

ktsif file for 1204-32 cards ("GPR_" calls)

- Example file excerpt below for 1204-32 card in slot 3 (first number in each row) Not broken down

```
3,50,1,69,0,0,1,GPR_SetControl 0 1 1 1
3,50,1,69,0,0,1,GPR_SetProfile 0 1 0
3,50,1,69,0,0,1,GPR_SetDomain 0 1 0
3,50,1,69,0,0,1,GPR_SetClockMode 0 1 1
3,50,1,69,0,0,1,GPR_SetDHCPEn 0 1 0
3,50,1,69,0,0,1,GPR_SetStaticIPv4 0 1 10.250.172.133 10.250.172.129 255.255.255.128
3,50,1,69,0,0,1,GPR_SetUnctMasterCfg 0 1 9 10000 9 10000 9 1000 64
3,50,1,69,0,0,1,GPR_SetBcastMech 0 1 1 1 1 1
3,50,1,69,0,0,1,GPR_SetEthTrans 0 1 0
3,50,1,69,0,0,1,GPR_SetClockClassCfg 0 1 0
3,50,1,69,0,0,1,GPR_SetTTL 0 1 64
3,50,1,69,0,0,1,GPR_SetPPSOffset 0 1 0
3,50,1,69,0,0,1,GPR_SetPriority 0 1 128 128
3,50,1,69,0,0,1,GPR_SetSyncEth 0 1 0 0 0 0
```

Example file excerpt below for 1204-32 card in slot 1 (first number in each row) File broken down for descriptions

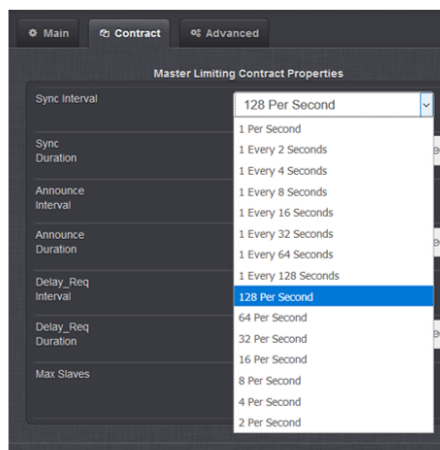
A) "Main" Tab of GUI

```
1,50,1,69,0,0,0,GPR_SetControl 0 0 1 1 (fourth digit "0" = PTP disabled. "1" = PTP Enabled)
1,50,1,69,0,0,0,GPR_SetProfile 0 0 0 (third digit "0" = default. "1"- Telecom profile)
1,50,1,69,0,0,0,GPR_SetDomain 0 0 0 (third digit is the PTP domain number)
1,50,1,69,0,0,0,GPR_SetClockMode 0 0 1 (third digit "0" is One-Step Master "1" is Two-Step Master)
1,50,1,69,0,0,0,GPR_SetDHCPEn 0 0 0 (third digit "0" is DHCP disabled and "1" is DHCP enabled.)
1,50,1,69,0,0,0,GPR_SetStaticIPv4 0 0 10.250.172.5 10.250.172.1 255.255.255.128 (IPv4 address/subnet mask)
```

B) "Contract" Tab of GUI

```
1,50,1,69,0,0,0,GPR_SetUnctMasterCfg 0 0 9 10000 9 10000 9 10000 4000 (see breakdowns below)
```

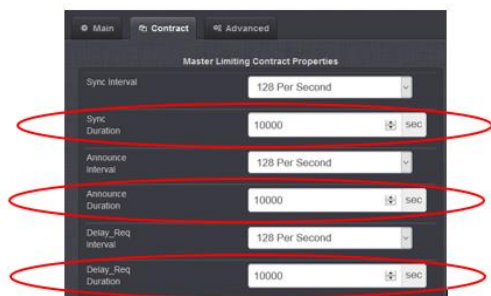
Sync, Announce and Delay Request interval drop-downs (single digit numbers in the call, starting from "0" with the first value at top)



"0" is top selection in drop-down list

"14" is last selection in drop-down list

Sync, Announce, Delay Request durations (the three five-digit numbers starting from the left of the command)

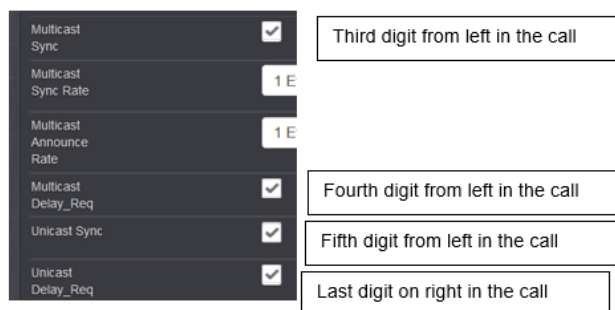


“Max Slaves” (last number in the command, such as “4000”)

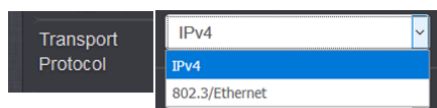


C) “Advanced” Tab of GUI

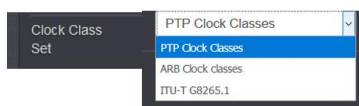
1,50,1,69,0,0,0,GPR_SetBcastMech 0 0 1 1 1 1 (left to right, the last four digits are the two “Multicast” and then the two “UNICAST” checkboxes - top to bottom, where “1” is the checkbox selected)



1,50,1,69,0,0,0,GPR_SetEthTrans 0 0 0 (“Transport Protocol” field. Third value “0” = “IPV4” and “1” = 802.3/Ethernet)



1,50,1,69,0,0,0,GPR_SetClockClassCfg 0 0 0 (“Clock Class Set” field, where “0”= “PTP Clock Classes”)



1,50,1,69,0,0,0,GPR_SetTTL 0 0 64 (Third digit is the TTL value, “64” in this example)

1,50,1,69,0,0,0,GPR_SetPPSOffset 0 0 0 (Third digit is the PPS offset, “0” in this example)

1,50,1,69,0,0,0,GPR_SetPriority 0 0 128 128 (Third value is Priority1. Fourth value is Priority2. Both are priority 128 in this example)

1,50,1,69,0,0,0,GPR_SetSyncEth 0 0 0 0 0 0 (SyncE, Enable ESMC and SSM settings)

| | |
|-----------------------|--------------------------|
| Enable SynrE | <input type="checkbox"/> |
| | |
| Enable ESMC | <input type="checkbox"/> |
| | |
| SSM Signal Control | Output Always Enabled ▾ |
| SSM Code | QL_STU_UNK ▾ |

Newer Web browser

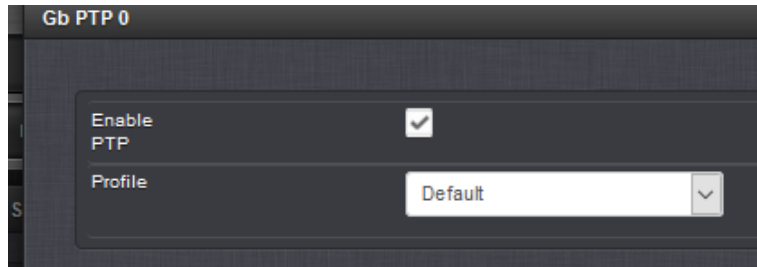
Interfaces-> “GB PTP 0” page



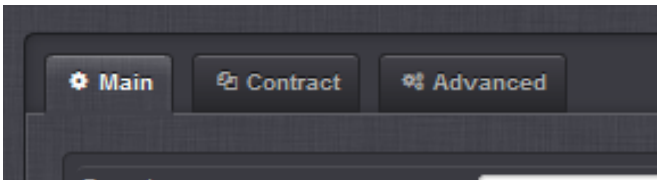
Press “Edit”

Top of all three tabs

- **Enable PTP** switch
- **Profile:** Select either Default or Telecom



Three tabs of 1204-32: **Main** (default), **Contract**, **Advanced**



A) Main tab of 1204-32 card

The screenshot shows the 'Main' tab of a configuration window for a 1204-32 card. At the top, there are three tabs: 'Main' (selected), 'Contract', and 'Advanced'. The 'Main' tab contains the following fields:

- Domain Number:** A dropdown menu with the value '1' selected.
- Clock Mode:** A dropdown menu with the value 'One-Step Master' selected.
- Enable DHCP:** A checkbox that is currently unchecked.
- Static IP Address:** A text input field containing '10.2.192.223'.
- Network Mask:** A text input field containing '255.255.0.0'.
- Default Gateway:** A text input field containing '10.2.1.1'.

At the bottom of the window, there is a 'Status' button on the left and a 'Submit' button on the right.

One-Step/Two-Step selection (additional info below screenshot)

One-step / Two-step modes

- Software versions 5.1.7 and below allows one-step mode only (did not support two step).
- Keep in mind that Follow-up messages are only sent in two-step mode. So, prior to version 5.1.5, this card does not ever send out any Follow-Up messages.
- Software version **5.2.0** added ability to **select either one-step or two-step mode**
- One Step/ Two Step mode is selected in the Edit window, **Main** tab.

The screenshot shows the 'Main' tab of a configuration window for a 1204-32 card, specifically for versions 5.2.0 and above. At the top, there are three tabs: 'Main' (selected), 'Contract', and 'Advanced'. The 'Main' tab contains the following fields:

- Enable PTP:** A checkbox that is checked.
- Profile:** A dropdown menu with the value 'Default' selected.
- Domain Number:** A dropdown menu with the value '1' selected.
- Clock Mode:** A dropdown menu with the value 'One-Step Master' selected.
- Enable DHCP:** A checkbox that is currently unchecked.
- Static IP Address:** A text input field containing '10.2.192.173'.
- Network Mask:** A text input field containing '255.255.0.0'.
- Default Gateway:** A text input field containing '10.2.1.1'.

At the bottom of the window, there is a 'Status' button on the left and a 'Submit' button on the right.

"Clock Mode" field was added in software version 5.2.0 (to add one-step mode capability)
Select either "one Step Master" or "Two-Step master"

Network settings

- Static or DHCP
- IPv4 only (does not support IPv6)

IPv6 support with PTP

- (2 Aug 17, KW) As of at least SecureSync version 5.8.2 (and timekeeper version 7.2.9), the **SecureSync** is not able to support IPv6 for PTP functionality (via the Option Cards or via the Timekeeper option). The 1204-12 and 1204-32 cards don't support IPv6, and timekeeper for SecureSync program does not currently support iIPv6 with PTP, either

Per Dave Sohn (1 Aug 17) unfortunately, there is no current IPv6 support for PTP on SecureSync.

Per Dave Sohn (2 Aug 17) I'm confused as to how this would be a defect ticket, but certainly we'll add it as a feature request. VelaSync does not support IPv6 for PTP either.

DSCP configuration for 1204-32 GB PTP card (not available in at least 5.8.6 and below, and no intentions to add it)

- Refer to Salesforce cases such as 265816 (June 2021), 220486 (Jan 2020) and 189156 (Apr 2015)

Q. "We noticed that all PTP packets are send with a DSCP value of 0. How can we configure this value in the WebUI to be different than 0 (e.g. 46 for high priority / expedited service)? We currently cannot find this option under the Interface Gb PTP 0 settings."

A. Per Dave Sohn (10 Jan 2022), associated with at least v5.8.6 and below, not available and no intentions of adding it to the 1204-32 card.

B) **Contract** tab of 1204-32 card

The screenshot shows the 'Contract' tab of the GB PTP Edit window. The title bar indicates 'Main', 'Contract', and 'Advanced' tabs. The main area is titled 'Master Limiting Contract Properties'. It contains several settings:

- Sync Interval: 128 Per Second (dropdown)
- Sync Duration: 10000 (text input) sec (spin button)
- Announce Interval: 128 Per Second (dropdown)
- Announce Duration: 10000 (text input) sec (spin button)
- Delay_Req Interval: 128 Per Second (dropdown)
- Delay_Req Duration: 10000 (text input) sec (spin button)
- Max Slaves: 4000 (text input) (spin button)

Sync/Announce
transmission intervals for
negotiation

Max unicast slaves
supported (4000 is higher
number possible)

- For more info on unicast Contracts, refer to online SecureSync user guide at:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/PTP_Grandm.htm

Unicast Contracts/contract negotiations/Signaling messages

- For more info on unicast Contracts, refer to online SecureSync user guide at:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/PTP_Grandm.htm
- In Unicast mode, there are three contracts negotiated between Master in Slave
 - In **Unicast** mode, Slaves shall request unicast contracts for the Announce, Sync and Delay_Resp packets
 - In **Minicast** mode, Slaves only request unicast contracts for the Delay_Resp packets (and so Delay_Req packets). Announce and Sync packets are still sent in multicast mode by the Master.

Signaling messages with TLVs are used to negotiate the unicast contracts. (refer to the "TLVs and Signaling messages.." section in [..\CustomerServiceAssistance.pdf](#) for more info).

Configuring PTP Contracts

1. Navigate to the **Contract** tab of the GB PTP Edit window.
2. Under the Contract tab of the GB PTP Edit window, make the following settings:
 - **Min Sync Interval:** The minimum value of Sync interval granted by the Master Clock. In packets per second.
 - **Max Sync Duration:** The maximum value of Sync interval granted by the Master Clock. In seconds.
 - **Min Announce Interval:** The minimum value of the Announce interval granted by the Master Clock. In packets-per-second.

- **Max Announce Duration:** The maximum value of the Announce interval granted by the Master Clock. In seconds.
- **Min Delay_Req Interval:** In packets per second.
- **Max Delay_Req Duration:** In seconds.
- **Max Slaves:** The maximum number of slaves to be served. The 1204-32 module can serve up to 4000 slaves

C) **Advanced** tab of 1204-32

Main Contract **Advanced**

Multicast Sync ☒

Multicast Sync Rate 1 Every 4 Seconds

Multicast Announce Rate 1 Every 4 Seconds

Multicast Delay_Req ☒

Unicast Sync ☒

Unicast Delay_Req ☒

Transport Protocol IPv4

Clock Class Set PTP Clock Classes

Time To Live (Packet Lifespan) 64

PPS Offset 0 ns

Priority 1 128

Priority 2 128

Enable SyncE ☐

Multicast Sync/Announce transmission intervals

Enable Multicast Delay Requests

Enable Unicast Syncs and Unicast Delay Requests

TTL (Time To Live) for multicast packets

1PPS offset

Priority 1 and Priority 2 (for Best Master Clock Algorithm- BMCA to select Active Master)

“Enable SyncE” Checkbox (See info below)

Ethernet Synchronization Message Channel (ESMC) / SyncE (Synchronous Ethernet)

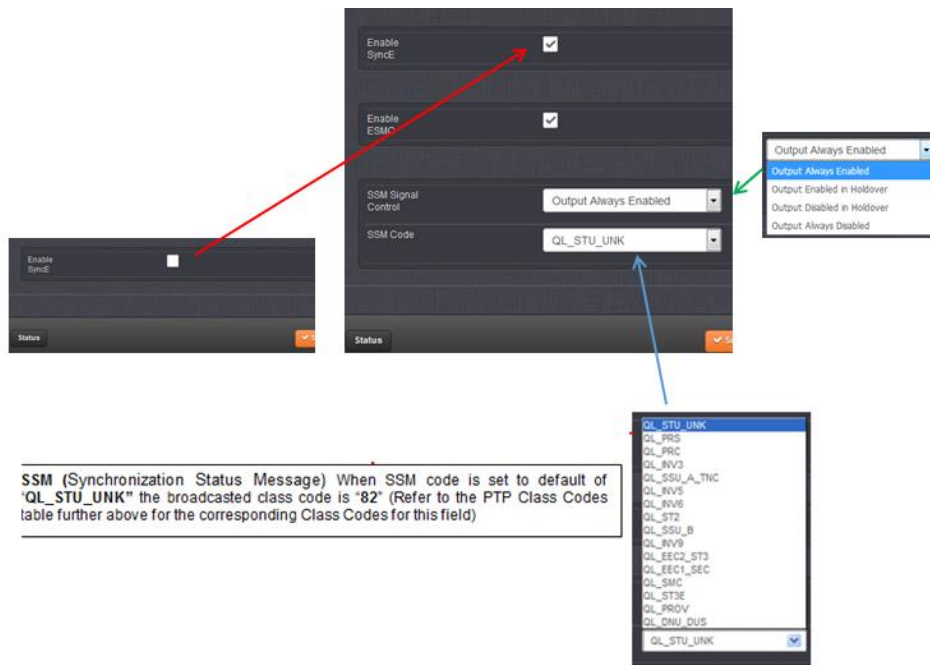
Ethernet Synchronization Message Channel (ESMC) is a logical communication channel. It transmits Synchronization Status Message (SSM) information, which is the quality level of the transmitting synchronous Ethernet equipment clock (EEC), by using ESMC protocol data units (PDUs). ESMC support is based on the ITU G.8264 specification.

“Enable SyncE”checkbox: If checked, allows access to the synchronous Ethernet settings (ESMC and SSM). There will always be an ESMC message broadcast if Enable SyncE is checked.

Note: For full functionality, SyncE requires Fiber Optic SFP modules. Standard RJ45/ 1000BASE-T modules are generally not compatible with SyncE.

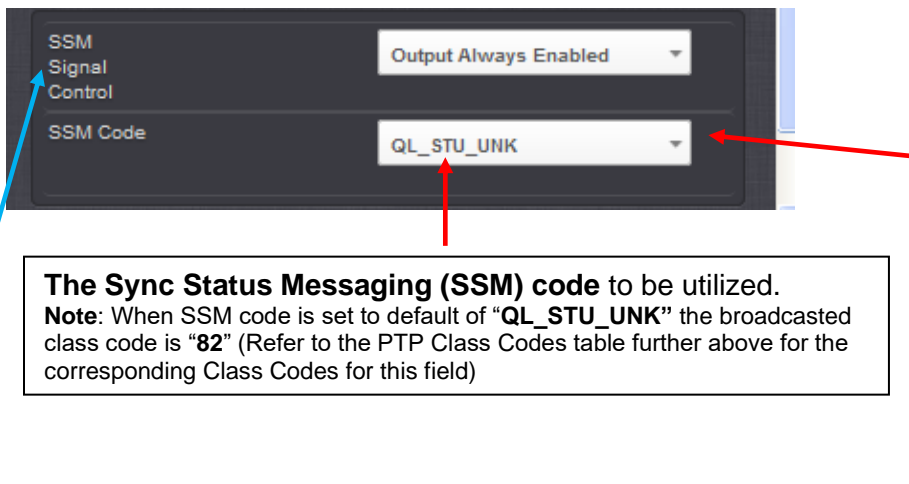
FYI: After selecting Enable SyncE, the page expands down, to show additional fields (Enable ESMC and SSM fields)

After selecting “Enable SyncE”, page expands down



SSM Code (SSM QL Codes) (Sync Status Messaging / Quality levels)

- Configured in the **Advanced tab** (shown below)
- Refer to “**Table 1**” above for mapping SSM QL codes to Clock Class values



(SSM Signal Control field- See previous figure) ESMC Signal Control:

Determines which SSM to use in the ESMC message. One of two messages will be broadcast: either the message selected in the SSM Code dropdown or the QL_DNU code. The user may set one of the following broadcasting options:

- **Output Always Enabled**—Always broadcasts the selected SSM code, even when SecureSync is not synchronized to its references.
- **Output Enabled in Holdover**—The output uses the selected SSM code unless SecureSync is not synchronized to its references (the output is present while in the Holdover mode). While SecureSync is not synchronized, **QL-DNU SSM** code will be broadcast.

- **Output Disabled in Holdover**—The output uses the selected SSM code unless the SecureSync references are considered not qualified and invalid (the output is not present while in the Holdover mode). While references are invalid, QL-DNU SSM code will be broadcast.
- **Output Always Disabled**—The output is not present, even if any SecureSync references are present and considered qualified. QL-DNU SSM code is broadcast.

Transmission modes for 1204-32 (Multicast / Unicast / Minicast / Hybrid modes)

Configured in the “Advanced” tab

The **Unicast Sync** and **Unicast Delay Request** checkboxes are always enabled. If they are unselected and Submit is pressed, they will go back to being selected (Unicast mode is always enabled).

- **IPv4:** PTP over IPv4 protocol (also referred as the layer 3 PTP protocol). In this case, the Ethernet Type of the PTP frames is 0x0800.
- **802.3/Ethernet:** PTP over 802.3/Ethernet protocol (also referred as the layer 2 PTP protocol). In this case, the Ethernet Type of the PTP frames is 0x88F7.

Additional info below the screenshot

Multicast Sync: Activating this option will cause the PTP Master to broadcast Sync and Announce messages to the Multicast address (if it's the Best Master on the network). Deactivating this option will remove the messages. When the PTP module is set in multicast mode, this will deny the requests from the Slaves Clocks to running in unicast mode.

Note: Checking this box will cause two additional fields to display that will allow you to configure the:

- Multicast Sync Rate
- Multicast Announce Rate

Multicast Delay_Req: Activating this option will cause the PTP Master to respond to multicast Delay Requests (as long as it is the Best Master on the network). Deactivating this option will prevent the Master from responding to these.

Unicast Sync: The PTP Master will always respond to attempts from Unicast slaves to communicate with it, provided the Slaves use the proper Unicast Auto-Negotiation process. [This setting is always enabled.](#)

Note: The **Unicast Sync** and **Unicast Delay Request** checkboxes are always enabled. If they are unselected and Submit is pressed, they will go back to being selected (Unicast mode is always enabled).

Unicast Delay_Req: The PTP Master will always respond to attempts from Unicast slaves to communicate with it, provided the Slaves use the proper Unicast Auto-Negotiation process. [This setting is always enabled.](#)

Note: The **Unicast Sync** and **Unicast Delay Request** checkboxes are always enabled. If they are unselected and Submit is pressed, they will go back to being selected (Unicast mode is always enabled).

Transport Protocol: Selects the transport protocol ("**ethertype**") used for PTP packets (either "**IPv4**" for layer 3, or "**802.3/Ethernet**" for Layer 2)

There are two ways to transmit the PTP protocol:

- **IPv4:** PTP over IPv4 protocol (also referred as the **layer 3 PTP protocol**). In this case, the Ethernet Type of the PTP frames is 0x0800.
- **802.3/Ethernet:** PTP over 802.3/Ethernet protocol (also referred as the **layer 2 PTP protocol**). In this case, the Ethernet Type of the PTP frames is 0x88F7

Q. We are seeing ethertype IP (0x800) on the PTP mcast and are curious why isn't this ethertype PTP (0x88F7)? Is this expected? IE: does the device send 0x800 versus 0x88F7? Is that something that can be altered?

A Email from Denis: The Annex F that Paul mentions refers only to the PTP over 802.3/Ethernet protocol. In the PTP web pages (PTP SETUP), the way to transmit the PTP protocol can be configured in the field "Transport Protocol" of the "Network" tab.

The Spec states that the Ethertype when using Layer 3 / IPV4 is 0x0800, and when using 802.3/Ethernet the Ethertype is 0x88F7.

Email Keith sent to customer: For your information, The Spectracom SecureSync's PTP Option Card supports support both "IPv4" and "802.3/Ethernet" Transport Protocols. This is a configurable selection via the SecureSync's web browser.

Wrong destination mac address for sync and announce packets (802.3/Ethernet:)

- Refer to Salesforce Case **243947** (Aug 2020) with 5.8.9 installed
- Refer to JIRA SSS-622 (<https://spectracom.atlassian.net/browse/SSS-622>)
- **Fixed in 5.9.0** (per the v5.9.0 Release Notes "[corrected the MAC address in Layer 2 PTP packets](#)")

Q report from customer we are seeing a wrong behavior from the Spectracom SecureSync PTP grandmaster we bought last year. We use Multicast and we would like to use PTP Over Ethernet (Layer2) defined in Annex F of the IEEE1588-2008 specs. The destination MAC address of the sync/announce packets going out the grandmaster is defined as IPv4mcast 01-00-5e-00-01-81. Nevertheless, the specs define 01-1b-19-00-00-00 and 01-80-c2-00-00-0e as the only valid addresses.

A. Reply from Denis Reilly (25 Aug 2020) Eric Girard just asked about this, his case is literally the next SF case after yours # (243947)

We're aware of the bug:

<https://spectracom.atlassian.net/browse/SSS-622>

It's currently slated to be fixed in 5.9.1. Ryan will be working on other fixes in that -32 card, though, and will assess whether it can be pulled in.

Q Follow-up from Eric Girard to Denis Reilly With this bug, can this customer use the PTP feature in later even if the MAC address is not correct?

Is there any restriction with our current 1204-32 software?

A (per Denis Reilly, 25 Aug 2020) It depends on how strict the client is in interpreting the standard.

The multicast message will have the wrong MAC address attached to it, but in all other respects it is a valid multicast (and PTP message), and the network will deliver it properly to the other end. But if the device on the other end is interpreting the standard strictly, it may decide to throw this message to an unexpected address out. (Perhaps it does not have a lot of processing power, and is filtering out packets it is not interested in).

So, it may work for some clients, and not for others. Regardless, though, the issue is on our end and it should get fixed.

Clock Class Set: Parameter broadcast in a PTP profile, indicating the quality of the attached reference; PTP [default], ARB, ITU (Telecom]

Can be obtained from SecureSync via:

1. **Web Browser:**
2. **API Call to report both Clock Class and Clock Accuracy:** `GPR_GetClockQual 0 0<enter>`

```
-bash: GPR_GetClockQual: command not found
spadmin@Spectracom /usr/bin $ GPR_GetClockQual 0 0

GPR 0 Clock Quality:
      Clock Class: 6
      Accuracy: 0x20
      OSLV: 0x58E0
spadmin@Spectracom /usr/bin $
```

TTL (Time To Live) (Packet Lifespan):

Sets the TTL field for PTP packets except for Peer-to-Peer packets for which TTL is forced to 1 as specified in IEEE Std 1588-2008 Annex D.3. 1PPS Offset: The 1PPS signal of this option card can be offset from the main System 1PPS.

This offset will be applied to all timestamps created by this card. It can be set in 8ns increments. Range is -500 ms to +500 ms.

Software issues associated with TTL (Time To Live) field

A) (5.8.9 and below) first few PTP packets after changing the TTL value are sent incorrectly (applicable to at least versions 5.8.8 and below)

- Fixed in 5.9.0 update (1204-32 firmware version 1.31)
 - Per 5.9.0 Release Notes: “fixed configuration of TTL value on PTP multicast announce packets”

- In 5.8.9 and below, a properly configured unit is sending a few packets at a default TTL value, before transitioning to the correct value
- Refer to Salesforce **Case 218677?** and **JIRA ticket SSS-756?**

Email from Dave S to Pritam/Denis (18 May 2020) I'm not sure a JIRA ticket has been generated for the backlog for the issue presented here of a properly configured unit sending a few packets at a default TTL value before transitioning to the correct value. We should make sure that a correct ticket is in place for this. There was already a ticket generated around the TTL submit issue, which is trivial and has a workaround already in place. It may be that the resolution of the TTL transmission issue could also have a different workaround like changing the default value within the 1204-32 option card SW from 64 to TTL, which would be a safer stating point.

B) “Software condition” with just the browser refresh when changing the TTL value incorrectly (applicable to at least versions 5.8.8 and below)

- TTL value may appear not to change in the browser, after “Submitting” a new TTL value
- Refer to Salesforce **Case 218677** and **JIRA ticket SSS-756**.
- Fixed in 5.9.0 update (1204-32 firmware version 1.31)
 - Per 5.9.0 Release Notes: [“fixed configuration of TTL value on PTP multicast announce packets](#)

1PPS offset capability

- Software **version 5.2.0** added ability to configure a 1PPS offset.

Priority 1: See IEEE 1588-2008, Section 8.10.1, 8.10.2.

Note: Priority 1 values of multiple PTP masters on the same PTP subnet **MUST** be the same values to be able to have an active master and a passive master on the same network (due to Priority 1 selection being the PTP BMC algorithm's 1st rule.

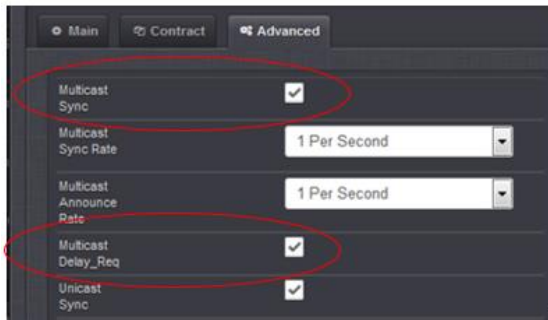
Priority 2: See IEEE 1588-2008, Section 8.10.1, 8.10.2.

A) Unicast only mode

- Unicast mode is used with **Announce**, **Sync**, **Follow-up** (if in two step mode), **Delay Request** and **Delay Response** messages
- Unicast mode is ALWAYS enabled (can't disable Unicast mode)

Configuring Unicast Mode

- 1) In the GB PTP “Edit” window, navigate to the **Advanced** tab.
- 2) De-select the Multicast Sync and Multicast Delay_Req checkboxes



- 3) Configure **Contract Negotiations** (refer to [Unicast Contracts/contract negotiations](#) further below)

The 1204-32 PTP card should now always respond to unicast negotiations.

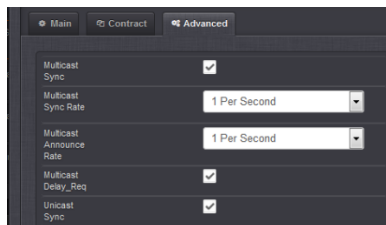
B) PTP Minicast mode (multicast sync/delay requests. Unicast Delay Responses)

- Minicast mode is similar, but not exactly the same as Hybrid mode
- Minicast is a unique modification of Unicast mode.
- In Minicast mode, Slaves only unicast contract for **Delay Responses** (all other messages use multicast)

Summary: Minicast mode consists of:

- Using Multicast mode for the Sync and Follow-up (if in two-step mode) and Announce messages that the 1204-32 card sends to all its PTP clients via the multicast address
- Using Unicast negotiation for unicast Delay Requests that it receives from the PTP clients and using unicast Delay Responses back to the particular PTP client.

Configuring Minicast Mode



To enter the Minicast mode, perform the following steps:

1. In the GB PTP Edit window, navigate to the **Advanced** tab.
2. Select the **Multicast Sync** checkbox.
3. Select the desired **Multicast Sync Rate** from the drop-down list.
4. Select the desired **Multicast Announce Rate** from the drop-down list.
5. Select the **Unicast Sync** checkbox
6. Configure **Contract Negotiations** (refer to [Unicast Contracts/contract negotiations](#) further below)

The 1204-32 PTP card should now always respond to unicast negotiations.

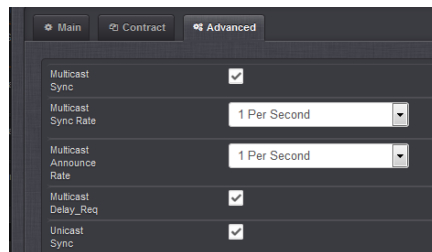
C) PTP Hybrid mode (Combination of PTP and SyncE)

- Hybrid mode can be either enabled or disabled, as desired.
- Hybrid mode is supported in 1204-32 card (note: it's not supported in 1204-12 card)
- The combined operation of Synchronous Ethernet (Sync-E) and Precision Time Protocol (PTP) is also known as hybrid mode.
- Hybrid mode provides both frequency and phase synchronization.

Hybrid mode is a mix of both Multicast and Unicast packets

- Hybrid mode allows a mix of multicast and UDP unicast transmission methods for PTP messages between PTP master and slave clocks.
- Most Hybrid implementations don't require a signaling message to "ask" for **Sync, Announce, and Delay Requests**.
- **Sync, Follow-Up and Announce messages**: any mix of multicast or unicast messages.

Configuring Hybrid Mode



The screenshot shows the 'Advanced' tab of the 'GB PTP Edit' window. It contains the following settings:

| Setting | Value |
|-------------------------|-------------------------------------|
| Multicast Sync | <input checked="" type="checkbox"/> |
| Multicast Sync Rate | 1 Per Second |
| Multicast Announce Rate | 1 Per Second |
| Multicast Delay_Req | <input checked="" type="checkbox"/> |
| Unicast Sync | <input checked="" type="checkbox"/> |

To enter the Hybrid mode, perform the following steps:

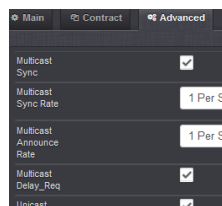
1. In the GB PTP Edit window, navigate to the **Advanced** tab.
2. Select the **Multicast Sync** checkbox.
3. Select the desired **Multicast Sync Rate** from the drop-down list.
4. Select the desired **Multicast Announce Rate** from the drop-down list.
5. Select the **Unicast Sync** checkbox
6. Configure **Contract Negotiations** (refer to [Unicast Contracts/contract negotiations](#) further below)

The 1204-32 PTP card should now always respond to unicast negotiations.

Delay Response messages with 1204-32 card

A) Slave sending Multicast Delay Requests only

- Delay responses are sent as multicast messages, when the Slave is sending Multicast Requests and the **"Multicast Delay_Req"** checkbox is selected (**Advanced** tab, as shown below):



The screenshot shows the 'Advanced' tab of the 'GB PTP Edit' window. It contains the following settings:

| Setting | Value |
|-------------------------|-------------------------------------|
| Multicast Sync | <input checked="" type="checkbox"/> |
| Multicast Sync Rate | 1 Per S |
| Multicast Announce Rate | 1 Per S |
| Multicast Delay_Req | <input checked="" type="checkbox"/> |
| Unicast | <input checked="" type="checkbox"/> |

B) Slave sending Unicast Delay Requests only

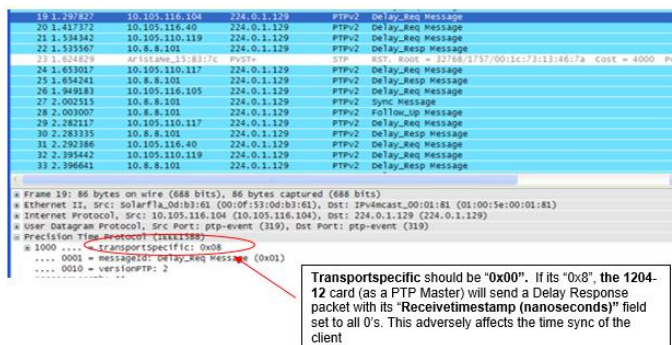
- Delay responses are sent as unicast messages, when the Slave is sending unicast Delay Requests and the “**Unicast Delay_Req**” checkbox is selected (**Advanced** tab, as shown below):

1204-32 card sends no multicast Delay Responses if:

- The PTP Slave is sending Delay Requests in unicast mode only
- The PTP Slave is sending Delay Requests in multicast mode, but the **Multicast Delay_Req** checkbox is not selected (Advanced tab)
- The PTP Slave is sending no Delay Requests as either unicast or multicast
- The PTP Slave is sending invalid Delay Request messages (request a packet capture which includes a Delay Request for analysis)

(JIRA SSS-725) Issues with Delay requests affecting Delay Response messages sent from the 1204-32 (and 1204-12) card: poor sync issues – due to transportSpecific field set to 0x08 (instead of 0x00).

- Refer to Salesforce Cases such as **209585** for PTP Slave (“Gigamon Network Packet Broker”) not able to sync to 1204-32card because the slave is sending invalid transportspecific field value of 0x08 (instead of 0c00)
- Improved in v5.9.0 update (1204-32 firmware version 1.31)
 - Per 5.9.0 update Release Notes: “fixed inoperability with devices that use non-standard values for the PTP transportSpecific field”
- Associated with versions 5.8.9 and below
- Transportspecific field in Delay Request should always be set to **0x00**. However, this issue can change this field to **0x08**, causing 1204-12 card (and 1204-32 card in at least versions 5.8.6 and below) to either:
 - not respond with a Delay Response message
 - or if its Delay response is sent, its “Receivetimestamp (nanoseconds)” field will be set to all 0’s.
- JIRA Ticket **SSS-725** created to improve 1204-32 card (post 5.8.6) to accept any value in the transportspecific field.



Note: Like the 1204-12 PTP card, even the 1204-32 GB PTP Option Card (in at least versions 5.8.6 and below), also ignores Delay Requests having transportspecific value other than 0

Per Denis Reilly (Oct 2019) associated with Salesforce Case 209585 I finally got some time to test these delay responses, and I was surprised to find out that the -32 card does ignore Delay Requests with the transportSpecific field set to values other than 0x00.

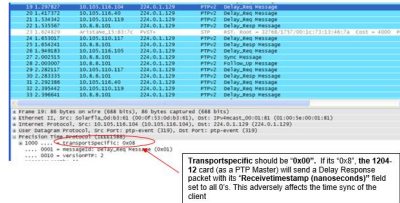
I tested this both with 1.27 and 1.30, both had the same behavior.

See the attached packet capture: the incoming Delay Request packet from 192.168.1.2 that has transportSpecific set to 0x00 is responded to while the other one is not. (In this capture, I tried 0x01, but 0x08 failed, too.)

So, I suggest that the customer try and modify his code to set transportSpecific to 0x00 and things should work again.

In the meantime, we should decide whether this is a bug or not. Strictly speaking, we are behaving correctly according to the standard. But that may not be the best response from a customer's perspective.

Draft email Keith sent (3 March 2020) As shown below, the transportspecific value needs to be 0x00. We have seen PTP slaves such as ptpd set it to an invalid value of 0x08, for instance.



If the transportspecific flag is set to 0x08 (or any other value other than 0x00) your customer will need to work with the PTP client's software manufacturer to change this to the valid value. We don't have any information on how to change this value in their software.

Note that even though the SecureSync is properly not responding to an invalid Delay Request, we are considering changing the SecureSync's software one day in the future to accept an invalid Delay Request. But this change won't likely be available for quite some time.

If this value is already 0x00, send us the pcap and we will review it further, for you

OPERATION of 1204-32 card

- Refer to the 1204-32 section of the Online SecureSync user guide:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/PTP_Grandm.htm

SecureSync Sync status

A) Minimum SecureSync “sync” requirements for the 1204-32 card to be useable

- SecureSync has to be synced to itself, or other stable input references such as GPS, IRIG etc to be useable. It can be synced via NTP input, but another requirement about the TFOM value must also be met (info further below)

Email from a customer (18 Apr 16) who had previously reported “Currently, I have a Spectracom box SecureSync that has a 1204-32 Gb PTP card and it is unable to initialize the PTP service.”

Most likely I found the cause. We are sync up using NTP and this is preventing the system from running as a PTP grandmaster. After setting the reference to local system, the PTP system initialized properly.

(5.8.9 and below) Issue with 1204-32 sending out PTP packets before SecureSync is in sync

Fixed in 5.9.0 update. Per 5.9.0 update Release Notes “[resolved an issue with PTP packets being broadcast before the unit is fully synchronized](#)”

B) Minimum TFOM requirements for messages to be sent (TFOM < 15, unless sync to self)

- TFOM value must be a value of **1 thru 14** (not 15)
 - This requirement is “waived” when the SecureSync is actively synced to itself.
 - This means the oscillator needs to be disciplining to its selected reference (this isn’t always the case for NTP input, which may or may not be disciplining, depending on whether host disciplining is enabled).
 - This additional requirement is primarily intended for NTP input (NTP has to be configured for and disciplining the oscillator, in order for this requirement to be met. Otherwise, the TFOM will remain at “15” and PTP packets won’t be sent)

Per Denis R (6 Dec 17) ...remember that once the unit first goes into sync after a cold reboot, no messages will be transmitted until the disciplining locks (TFOM < 15)

CRC/checksum errors reported on switches

- The 1204-32 does not generate a UDP checksum / CRC, and it sets that field to 0.
- Switches may discard PTP packets from the 1204-32 card if the switch isn’t configured to ignore bad CRC/checksum error values
- Refer to Salesforce cases such as 1615614.

Q (report from a customer) One the switch was upgraded and rebooted (twice), the port connected to the Spectracom eventually calibrated. However, I believe the performances aren’t great. I see a lot of error on the interfaces. See below the comparison between the faulty vs non-faulty signal.

seswx2# sh ptp corrections

PTP past corrections

| Slave Port | SUP Time | Correction(ns) | MeanPath Delay(ns) |
|------------|----------|----------------|--------------------|
|------------|----------|----------------|--------------------|

| | | | | |
|---------|--------------------------|--------|-------|---------|
| Eth1/36 | Wed Apr 25 10:34:01 2018 | 238489 | -78 | 4309959 |
| Eth1/36 | Wed Apr 25 10:29:45 2018 | 161818 | -2284 | 4309474 |
| Eth1/36 | Wed Apr 25 10:25:29 2018 | 164302 | 106 | 4309960 |
| Eth1/36 | Wed Apr 25 10:21:13 2018 | 163784 | 1488 | 4309964 |
| Eth1/36 | Wed Apr 25 10:16:57 2018 | 161978 | 771 | 4309963 |
| Eth1/36 | Wed Apr 25 10:12:41 2018 | 162396 | -1196 | 4309963 |
| Eth1/36 | Wed Apr 25 10:08:25 2018 | 162213 | -1358 | 4309962 |
| Eth1/36 | Wed Apr 25 10:04:09 2018 | 176937 | 844 | 4309960 |
| Eth1/36 | Wed Apr 25 09:59:53 2018 | 163553 | 1974 | 4309960 |
| Eth1/36 | Wed Apr 25 09:55:37 2018 | 162443 | 2052 | 4309959 |
| Eth1/36 | Wed Apr 25 09:51:21 2018 | 173372 | 2566 | 4309959 |
| Eth1/36 | Wed Apr 25 09:47:05 2018 | 162981 | 2323 | 4309953 |
| Eth1/36 | Wed Apr 25 09:42:49 2018 | 161865 | 1544 | 4309960 |

RX

0 unicast packets 180702 multicast packets 0 broadcast packets
 241474 input packets 23384024 bytes
 0 jumbo packets 0 storm suppression packets
 0 runs 0 giants 60776 CRC 0 no buffer
60776 input error 0 short frame 0 overrun 0 underrun 0 ignored

A Email from Denis Reilly (25 Apr 18) Interesting. Note that the “faulty” data is applying corrections every 5 minutes or so. I don’t think the PTP is working on that link at all.

Take a look at that “rx” description We see roughly 180k Multicast packets, and I assume most of those are PTP. Then we see 60k “input error”, along with the same amount of “CRC”.

The 1204-32 does not generate a UDP checksum / CRC, and it sets that field to 0. Broadcasting the checksum is an optional feature in UDP/IPV4, and we opted not to implement it. Perhaps the customer’s equipment not set up to ignore the checksum if it is all 0’s?

A Additional response from Pritam (25 Apr 8) Also, based on the input error and CRC – the problem could be Ethernet cable and/or Ports.

Simple exercise – swap the cable see if this fixes things, if not then changed the ethernet port (one at a time switch side and the SecureSync side).

****SecureSync loss of Sync operation (not in sync and not in Holdover)**

- 1204-32 Gb PTP (Per Denis Reilly): if the SecureSync loses sync, the 1204-32 card will continue outputting Sync messages, but the clock class degrades from 6 to 7 so that the best master clock algorithm can switch to a master that is in sync.
- 1204-12 card (for comparison): When SecureSync is not in Sync or in Holdover Mode (Sync is False), and the 1204-12 card is configured as a Master, it will stop sending out all packets except the Announce messages (It stops sending out Sync and Delay Response packets).

Minimum TFOM requirements for messages to be sent

Per Denis R (6 Dec 17) ...remember that once the unit first goes into sync after a cold reboot, no messages will be transmitted until the disciplining locks (TFOM < 15)

Active Master/Passive Master for 32 cards

Capability for Model 1204-32 to switch between being Active Master and Passive Master

Note: if Portstate is remaining as “Master” (not switching to “Passive Master”) even though there is another active master on the network, verify if the “**Transport Protocol**” field in the Advanced tab is set to “IPv4”. I found here if this field is set to “**802.3/Ethernet**”, it remained in Master mode. I changed it to **IPv4** and it switched to “**Passive Master**”.

Note: Refer also to [Known issues associated with 1204-32 card](#) (further below_ for more details

- Patch 5.1D added in Version 5.1.5 update to address this issue (Aug 2014).
- Fixed in patch update version 5.1D. Refer to https://app.bom.com/changes/detail-ecrs?change_id=2384151052.b Expected to be included in the version 5.1.5 software update in July 2014.

Potential/intermittent issues with “originCurrentUTCOffset” in Announce message temporarily reporting wrong UTC offset and with Active/Passive Master modes in the 32 card itself

3. (Versions 5.8.0 and below) issue with “originCurrentUTCOffset” in Announce message temporarily reporting wrong UTC offset, resulting in large time error in PTP Clients (such as 2.5 hours or 2.5 seconds)

Note: This potential/intermittent issue should be fixed in version 5.8.1 (and above)

Per the 5.8.1 Release Notes: “[Communication speed was slowed down to prevent corruption.](#)”

Note: Refer to “originCurrentUTCOffset: in “[Known issues associated with 1204-32 card](#) (further below) for more info on this potential condition

Timescale of 1204-32 Gb PTP cards (Always TAI output)

- 1204-32 (and 1204-12) always outputs **TAI** timescale (the PTP cards can't be changed to operate in a different timescale)
 - The PTP Option Card's Announce message provides the current TAI to UTC offset value. So, a PTP client is provided the info it needs for it to be able to convert the TAI to UTC time internal to the Slave.
- Refer also to general PTP info section of this doc: [Timescales for PTP Option Cards and timekeeper software \(UTC/Arbitrary timescales\)](#)
- Refer to the “**Known issues**” portion of this section (further below) for info on a potential issue with the origintimescale field changing the UTC offset to an erratic value: [Known issues associated with 1204-32 card](#)

SNMP management for the 1204-32 Option Card

A) Versions 5.6.0 and above

- V5.6.0 added a new MIB file for the 1204-32 card (SNMP gets only- no traps are planned)

B) Versions 5.5.1 and below

- In v5.5.1 and below, the only Option Card with SNMP functionality is still the Model 1204-12 10/100 PTP Option Card (not the 1204-32 Gb PTP card)
- We provide a Spectracom PTP MIB file, but this MIB is only compatible with the 1204-12, 10/100 PTP Option Card. It's not compatible with the 1204-32 Gb PTP card.

SecureSync loss of Sync (not in sync or Holdover)

- 1204-32 Gb PTP: Per Denis Reilly, if the SecureSync loses sync, the 1204-32 card will continue outputting Sync messages, but the clock class degrades from 6 to 7 so that the best master clock algorithm can switch to a master that is in sync.

1204-12 card: When SecureSync is not in Sync or Holdover Mode (Sync is False), and the 1204-12 card is configured as a Master, it will stop sending out all packets except the Announce messages.

Note: per Denis, he thinks this might be a software bug. He doesn't think this is the way it should work. He believes the 1204-12 should work like the 1204-32 which keeps outputting sync, but with a reduced clock class value in its announce message (7 instead of the normal 6 when it's in sync)

Web browser interface

- This card requires software versions 5.1.2 or higher to be installed and the new browser design opened.
- Can't use the "classic interface" to configure this card. All development for this card was performed in the new browser only.
- If you try to access this card from "classic interface", it will indicate the card type installed is "None".

Email from Chris Blume (5 May 2014) "When I boot up the Spectracom, slot 5 says 'Invalid'"

Auto-negotiate port speed (10/100/1000 baseT)

Q. Is it possible to disable PTP auto-negotiation, and how can you do it if possible?

A. Reply from Keith after talking to Denis Reilly (28 Feb 2014) To answer your question, there is currently no way to disable auto-negotiation in the PTP Option Cards.

The newer 1204-32 card can be 10,100 or 1000 base T depending on how it negotiates. At some point, we could add the ability to disable auto-negotiate in order to be able to hard-set to a specific value. But it's not available as of now.

Delay Mechanisms (P2P and E2E)

- 1204-32 Card only supports E2E (end to end) delay mechanism. It does not support P2P (Peer to Peer) in any version of software (past or current)
- There are no configurations/settings available for this function in the 1204-32 card.

Note:

- E2E (End to End) mode uses the standard Delay Requests / Delay Responses
- P2P (Peer to Peer) mode changes the standard Delay Requests / Delay Responses to Peer Delay Requests / Peer Delay Responses (they are not inter-changeable)

A) End to End (E2E) mode:

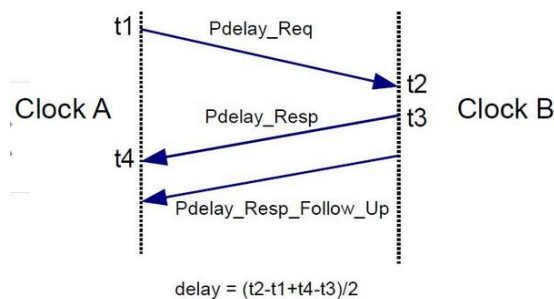
- Measures the path delay as a total value between Master and Slave.
- As of at least 5.7.1 and below, this is the only mode supported by 1204-32 (P2P not supported)

B) Peer to Peer (P2P) mode (AKA “Point to Point”)

Note: P2P is not currently supported in 1204-32)

- Measures the path delays as individual delays between each host (measures network segments individually) and then combines the values for a total. Provides additional accuracies. P2P can be better, because in theory you are measuring the delay of each path separately, which will minimize problems if packets take different paths. But this requires that all your network elements in the path know how to exchange peer delay messages.

—From: <https://blog.meinbergglobal.com/2013/09/19/end-end-versus-peer-peer/>



mean path delays

Refer to salesforce case 24557

The mean path delay is the average time taken by PTP frames to travel between master and slave. This measurement does not indicate the performance or accuracy of the switch or servers. A small mean path delay is useful for obtaining baseline results

Email from Denis Reilly (6 Mar 17) Mean Path Delay is a calculation of the path delay between the Master and the Slave, based on the timestamps as seen by the Slave. It's factored into the Slave's sync algorithm.

So, it is both related to the 1204-12 card (assuming it is the PTP Slave) and related to the switch – any delays in the switch will show up here.

The “fixed” portion of this mean path delay is compensated for by the protocol – that’s why the slave calculates it in the first place, to compensate for it.

So, if the Slave is reporting 1.5 us, it’s already been compensated for.

Where you get into issues is if the actual path delay is varying by a large amount – then the Slave will only compensate for the fixed portion that it can calculate.

Make sense?

Asymmetries in path delay can cause small fixed offsets between Master and Slaves

Q. A dealer's customer is COMPLAINING about 120 ns of offset between our PTP Master and their Slave.

A. **Denis Reilly (3 June 2014)** PTP assumes that all paths are symmetrical. Any asymmetry in the path between Master and Slave at all will manifest itself in a fixed offset.

We see this most often when using our 10/100 Master on faster networks: the transition from 100 Mb to 1 Gb introduces asymmetry because it goes faster in one direction than another. That will result in a few us of offset.

This is obviously smaller, and can probably be attributed either to asymmetries in the switch between them or (if this is a Gb card) asymmetries in the SFP. Using a crossover cable is probably the best next step, as you suggest.

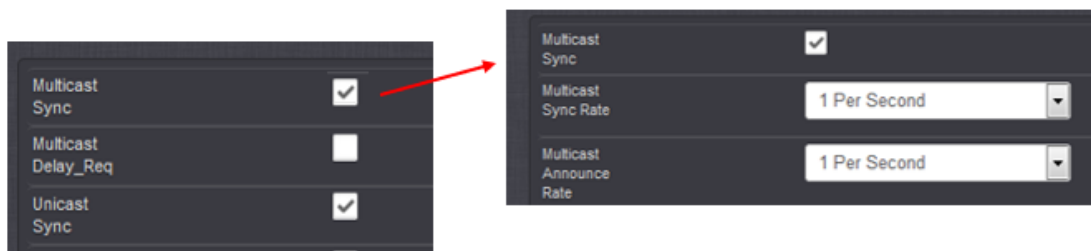
Multicast mode (Multicast Sync/Multicast Announce/Multicast Delay Responses)

- This is the factory default mode.

Configuring Multicast Mode

To enter Multicast mode, perform the following steps:

1. In the GB PTP Edit window, navigate to the **Advanced** tab.
2. Select the **Multicast Sync** checkbox.



3. Select the desired **Multicast Sync Rate** from the drop-down list.
4. Select the desired **Multicast Announce Rate** from the drop-down list.
5. Press Submit.

IGMP/IGMP Join requests when using multicast mode

- If switches are using IGMP, the 1204-32 Option Card needs to join the IGMP multicast group in order to be able to send multicast packets (such as Sync and/or Delay Requests for instance).

IGMPv3

- If using IGMPv3, special configurations is necessary
Per Jeremy Onyan- it's not that we don't work with IGMPv3, it's that v3 has multi cast packet filtering that needs to be configured to allow the packets. So, they can use it if they know how to set that up.

Issue with IGMPv3

(Per Denis Reilly, 26 Feb 2014) The 1204-32 cards support IGMPv2 (but packets indicate IGMPv1). Apparently, they don't support IGMPv3.

Per Jeremy Onyan- it's not that we don't work with IGMPv3, it's that v3 has multicast packet filtering that needs to be configured to allow the packets. So, they can use it if they know how to set that up.

1. Issue with card not joining the IGMP group

Update: This issue was fixed in the Version 5.1.3 update.

- Refer to Mantis 2766 http://cvsmantis.int.rolia.com/mantis/view_all_bug_page.php
- Refer to Salesforce cases 13583 and 13303.
- Applicable only to version 5.1.2 software

~~Option Card is apparently not sending IGMP join request. This is preventing it from sending multicast packets (such as Sync, and/or Delay Responses).~~

Potential work-around: ~~"When asked how they did it, they replied that they forced Multicast Joining for 224.0.1.129 on the port of the switch connected to the SecureSync."~~

API calls (CLI commands) associated with Model 1204-32 Option Card

1204-32 configurations are the “GPR” settings stored in the “ktsif.conf” file (/home/spectracom/config/ktsif.conf).

Notes:

- 1) The following info and commands applies only to the 1204-32 cards (not the 1204-12 card).
- 2) The following list of API calls screenshot taken with version 5.1.2 software installed.
- 3) The entire list of commands consists of GETs only. As of at least versions 5.1.7 and below, there are no SETs available to perform PTP configuration changes via the CLI.

```
GPR_GetValue
GPR_GetBcastMech
GPR_GetClockClassCfg
GPR_GetClockIdentity
GPR_GetClockMode
GPR_GetClockPorts
GPR_GetClockQual
GPR_GetClockSteps
GPR_GetControl
GPR_GetCurrentIPV4
GPR_GetDHCPEn
GPR_GetDebug
GPR_GetDelayMech
GPR_GetDomain
GPR_GetEthIrans
GPR_GetMacAddr
GPR_GetModuleInfo
GPR_GetMsgRates
GPR_GetMsgIo
GPR_GetNumInst
GPR_GetParentData
GPR_GetPortSpeed
GPR_GetPortState
GPR_GetPriority
GPR_GetProfile
GPR_GetSlaveStats
GPR_GetSlaveSummary
GPR_GetStaticIPV4
GPR_GetStatistics
GPR_GetSyncEth
GPR_GetTTL
GPR_GetTimeProp
GPR_GetUnctMasterCfg
GPR_GetUnctMasterProp
GPR_GetUnctMstr
GPR_GetUnctSlaveProp
GPR_GetUserDesc
GPR_GetUlan
GPR_GetAntenna
```

To see or use these commands, from the home/spectracom directory, type: **cd /usr/bin**

- Type **GPR_Get** <tab> to view all of the available Gets associated with the PTP cards (spadmin account can only perform the get commands)

Some specific examples

Get MAC address

```
GPR_GetClockClassCfg GPR_GetClockIdentity GPR_GetClockMode
spadmin@spectracom /usr/bin $ GPR_GetClockIdentity 0 0

GPR0 Clock Identity: 00:0C:EC:FF:FE:0E:09:0F
spadmin@spectracom /usr/bin $
```

Get Clock Quality/ clock accuracy

```
-bash: GPR_GetClockQual: command not found
spadmin@spectracom /usr/bin $ GPR_GetClockQual 0 0

GPR 0 Clock Quality:
  Clock Class: 6
  Accuracy: 0x20
  OSLV: 0x58E0
spadmin@spectracom /usr/bin $
```

Ping:

- Per Denis Reilly: "We have noticed that some SFPs have problems with responding to pings"
- Find out Manufacturer/Model of SFP being used with the card.
If you aren't able to ping the PTP card, we have observed that a few SFPs have difficulty with responding to pings. This isn't a factor of the PTP board itself. However, please note that the card not responding to ping is not an indication that the card isn't exchanging messages with the PTP slaves.

The best way to verify the operation of the PTP Master is to perform a wireshark packet captures, one on the same subnet as the PTP Master, and one on the same subnet as a couple of the PTP slaves (assuming they are on different subnets).

Slow ping responses

- Refer to Salesforce cases such as 127713
- Per Denis, a slow ping response time may indicate that PTP timing is also being adversely affected (some of the circuitry/components, but not all, used for ping response is also used with the PTP timing messages). it really depends on where the cause of the delayed ping responses actually is,

A) “PTP Clock classes” and “ARB clock classes” (Arbitrary clock classes)

Refer to 1EEE1588-2008v2 specs <https://oroliagroupemea.microsoftonline.com-1.sharepoint.emea.microsoftonline.com/Spectracom/Engineering/Projects/GeneralPTP/SitePages/Home.aspx?RootFolder=%2FSpectracom%2FEngineering%2FProjects%2FGeneralPTP%2FShared%20Documents%2FStandards&FolderCTID=0x0120001C144F4F864D1D45AC2929A4327F8AB1&View=%7bD793DF9A-1DF4-4C45-BF93-0BA34459C1FE%7d&InitialTabId=Ribbon%2EDocument&VisibilityContext=WSSTabPersistence>

Note: ARB Clock classes were added to the PTP specs to support the ability to use timescales other than TAI (such as UTC or local)

IEEE Std 1588-2008
IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems

Table 5—clockClass specifications

| clockClass (decimal) | Specification |
|----------------------|--|
| 0 | Reserved to enable compatibility with future versions. |
| 1–5 | Reserved. |
| 6 | Shall designate a clock that is synchronized to a primary reference time source. The timescale distributed shall be PTP. A clockClass 6 clock shall not be a slave to another clock in the domain. |
| 7 | Shall designate a clock that has previously been designated as clockClass 6 but that has lost the ability to synchronize to a primary reference time source and is in holdover mode and within holdover specifications. The timescale distributed shall be PTP. A clockClass 7 clock shall not be a slave to another clock in the domain. |
| 8 | Reserved. |
| 9–10 | Reserved to enable compatibility with future versions. |
| 11–12 | Reserved. |
| 13 | Shall designate a clock that is synchronized to an application-specific source of time. The timescale distributed shall be ARB. A clockClass 13 clock shall not be a slave to another clock in the domain. |
| 14 | Shall designate a clock that has previously been designated as clockClass 13 but that has lost the ability to synchronize to an application-specific source of time and is in holdover mode and within holdover specifications. The timescale distributed shall be ARB. A clockClass 14 clock shall not be a slave to another clock in the domain. |
| 15–51 | Reserved. |
| 52 | Degradation alternative A for a clock of clockClass 7 that is not within holdover specification. A clock of clockClass 52 shall not be a slave to another clock in the domain. |
| 53–57 | Reserved. |
| 58 | Degradation alternative A for a clock of clockClass 14 that is not within holdover specification. A clock of clockClass 58 shall not be a slave to another clock in the domain. |
| 59–67 | Reserved. |
| 68–122 | For use by alternate PTP profiles. |
| 123–127 | Reserved. |
| 128–132 | Reserved. |
| 133–170 | For use by alternate PTP profiles. |
| 171–186 | Reserved. |
| 187 | Degradation alternative B for a clock of clockClass 7 that is not within holdover specification. A clock of clockClass 187 may be a slave to another clock in the domain. |
| 188–192 | Reserved. |
| 193 | Degradation alternative B for a clock of clockClass 14 that is not within holdover specification. A clock of clockClass 193 may be a slave to another clock in the domain. |
| 194–215 | Reserved. |
| 216–232 | For use by alternate PTP profiles. |
| 233–247 | Reserved. |
| 248 | Default. This clockClass shall be used if none of the other clockClass definitions apply. |
| 249–250 | Reserved. |
| 251 | Reserved for version 1 compatibility; see Clause 18. |
| 252–254 | Reserved. |
| 255 | Shall be the clockClass of a slave-only clock; see 9.2.2. |

PTP Clock Classes
Clock classes 6 and 7

ARB Clock Classes
Clock classes 13 and 14

Telecom Profile (ITU-T G.8265.1)
Clock Classes 80-110

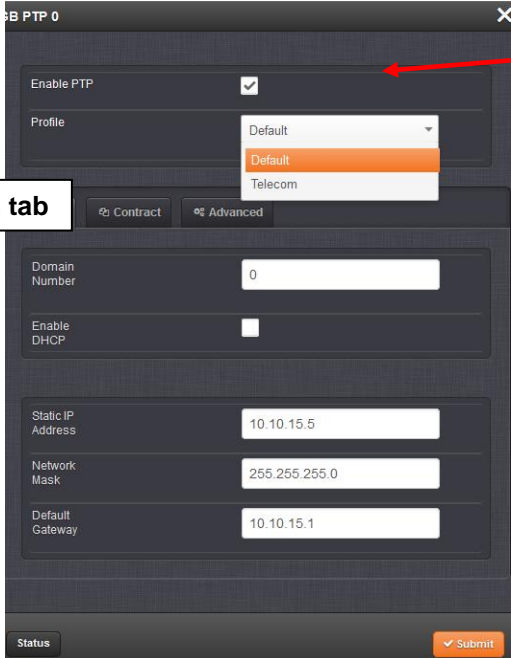
VLAN tagging

Q. Does the SecureSync PTP grandmaster have support for VLANs?

A. (As of at least Aug 2015) SecureSyncs currently do not provide VLAN tagging (with the standard network or PTP interfaces). However, they can operate on VLANs with the VLAN tagging handled outside of the SecureSync. We are considering adding direct support for VLANs with the Model 1204-32 Gb PTP Option Card in the future.

Setup pages

Main tab (network settings) Versions 5.1.7 and below



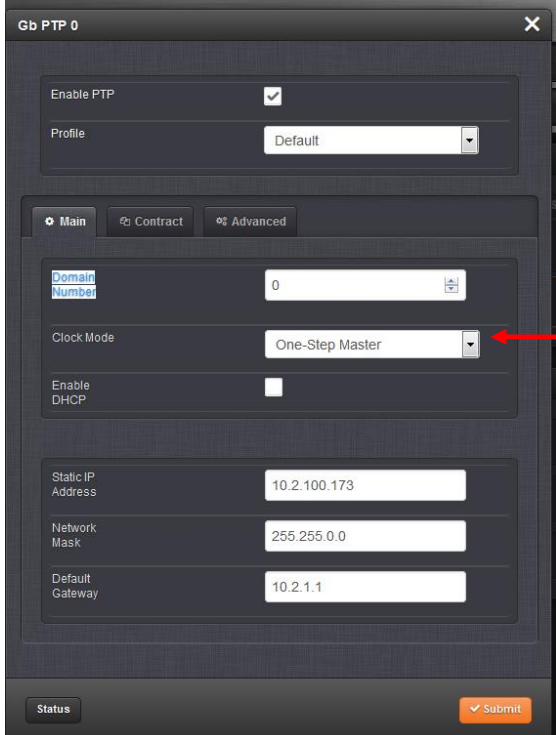
Main tab

Need to select **"Enable PTP"** to be able to see the configuration settings further below **tab**

Select either **Default** or **Telecom** profile. (See notes below about Telecom profile and this setting)

The configuration fields are displayed once **"Enable PTP"** checkbox is enabled at the top of this menu.

Versions 5.2.0 and above



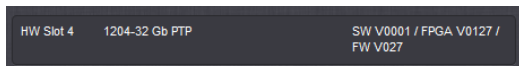
"Clock Mode" field was added in software version 5.2.0 (to add one-step mode capability)
Select either **"one Step Master"** or **"Two-Step master"**

Static routes/stating routing

- Static routes not available
- Need to use Boundary clocks to achieve complex routing.

Report of Network settings being reset to all 0's after submitting, closing the window and then re-opening the window

- Refer to Salesforce Cases such as 25630
- Per Denis R- PTP card is likely installed in **Slot 6**. Try installing it in a different slot besides slot 6.
- If the card's not in slot 6, check the version info for the card (**Tools-> Upgrade/Backup** page)
- Verify the reported version is a valid number (such as example below):



- If an invalid version is reported (such as FPGA V0000), there may be an issue with the card's SPI bus, a problem with the slot on the main PCB., or the card is dead. Try moving card to a different slot to test for bad card or bad slot.

Telecom Profile for PTP Master:

(Note about "Profile" drop-down): When this drop-down is set to "**Telecom**" it does not automatically configure any PTP fields for the Telecom profile. It just changes the error checking that occurs when the Submit button is pressed, to ensure any changes made to the settings on that page are valid for the Telecom profile. A user still needs to configure each of the settings as needed for the PTP Slaves.

Telecom configuration: Most of the Telecom configs are located in the "**Advanced**" tab.

- Refer also to the "**Advanced**" tab further below to see these configs.

Unicast: unicast mode is used in the Telecom profile

Clock Class: needs to be set to "**ITU-G.8625.1**" for telecom profile.

"Domain Number" field: Needs to be changed from "**0**" to be in the range of **4 to 23** in order to meet the telecom profile (0 is not allowed in the Telecom profile).

SSM (QL- Quality Levels) / ESMC: Need to be enabled/configured

Packet Transmission rates:

Sync messages (if used, Follow-Up messages will have the same rate)

Minimum rate: 1 packet every 16 seconds

Maximum rate: 128 packets-per-second

Delay_Request/Delay_Response messages

Minimum rate: 1 packet every 16 seconds

Maximum rate: 128 packets-per-second

Announce messages

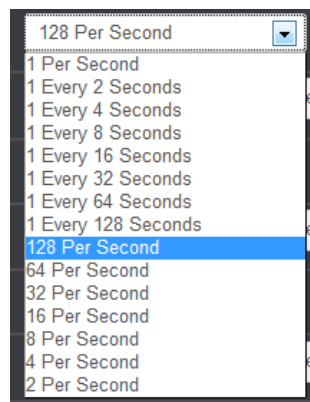
Minimum rate: 1 packet every 16 seconds

Maximum rate: 8 packets-per-second

Contract tab (“for Unicast mode” only)

Available selections for **Min Sync Interval**, **Min Announce Interval** and **Min Delay Request Interval** fields

These fields determine the max acceptable values for the PTP slaves. They have no effect on the operation of the PTP Master.



Min Sync Interval: The minimum interval allowed between Sync Messages. If PTP Client exceeds this value, it's not assigned a contract.

Max Sync Duration: The Maximum interval (in seconds) that Announce Messages will be sent for.

Min Announce Interval: The minimum interval (in seconds) allowed between Announce Messages.

Max Announce Duration: The maximum interval (in seconds) that Announce Messages will be sent for.

Min Delay_Req Interval: The minimum allowed between Delay Request Messages.

Max Delay_Req Interval: The maximum interval (in seconds) that Delay Request Messages will be sent for

Max Slaves: The maximum number of slaves that the Master is allowed to service (4000 is the largest value it can be set to).

- For more info on unicast Contracts, refer to online SecureSync user guide at: http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/PTP_Grandm.htm

Caution: it's advised to have all three durations configured as the same value. Having one with a different duration could affect the timing of the slaves (i.e. a Sync message may still be sent, but the Delay request may have expired, resulting in Sync messages with no delay responses).

Unicast Negotiation: A mechanism in PTP for Slave Clocks to negotiate unicast Sync, announce and Delay Request Message Rates from a Master Clock.

Per Denis Reilly (4 Mar 2014) The Contract page configures what Unicast Negotiation Signaling messages will be accepted by the Master. Contract requests that exceed these limits will be denied.

- **Intervals** are the amount of time between messages.
 - For message rates **faster than 1 second**, this is expressed in terms of **Messages per Second**.
 - For message rates **slower than 1 second**, this is expressed in terms of **"1 every X seconds"**.
 - Slaves that request faster rates than stated will be denied.
- **Duration** is the contract length for that type of message. The Slave will have to re-send their requests after the current contract expires/times out.
 - Slaves that request a longer duration contract than stated will be denied.

By default, we set these limits to their most permissive settings so that Unicast Negotiation requests should not be denied.

In summary, a unicast contract is negotiated for a set time-frame" that messages will be exchanged between Master and each client. At the end of the count-down, the contract expires. If the client doesn't renew the contract, the Master stops sending messages to that client. This is how the Master knows if the client is still on the network,

Email Keith sent to a customer The Unicast Negotiation is a "contract" between the PTP Master and each Unicast slave. This contract is to both set a time limit on the exchanges of Sync, Announce and Delay Request messages (duration), as well as to set limits on how often the messages can be exchanged (interval), as actually determined by the Slaves.

Max UNICAST Slaves (4000): The maximum number of UNICAST slaves that the Master is allowed to service (4000 is the largest value it can be set to).

Q From Dave L to Denis I was wondering if you might clarify if this customers statement is valid or not. It seems fairly straight forward that if you have 6 GB PTP cards and they are capable of supplying 4000 Unicast Contracts each, the total number of PTP Slaves that can be serviced is 24000.

However, my experience with PTP cards has me wondering if this is actually true. Does it really work like that?

Like, I believe we still cannot install 6 PTP cards in the system. That is a problem right away. What other problems may we be facing?

A Reply from Denis (11 Dec 17) The 32 card was designed to be able to turn around Delay Requests as quickly as possible. That 4000 Slave value was proven by Korusys in simulation

In practice, I don't think you can get that many slaves to connect at a high rate – your network will be a bottleneck before you get there.

But on an ideal network, the card can get there.

Also, the 6 cards will have 6 different IP addresses, and it's up to him to do the load-balancing on his network to get precisely 4000 to each card.

And the only reason why 6 cards is problematic is that we've had this nagging occasional issue with cards in the far slots, which is a bug. If that bug wasn't present, then we'd be closer to saying the customer is correct.

F/U Email from Dave L They are worried about capacity and might want evidence of throughput testing.

Reply from Denis No, Korusys did all that simulation and testing. They own the design, too, so any bug-fix work that we might want to do on the card has to wait either until they do it, or we gain access to their code.

Laurent is in the process of talking to them about gaining access to the code. But I don't know how far along that is. Even if we get the code it's unclear when any work would be scheduled

Issue with some settings saving but not taking effect in 32 card (until after reboot)

Note: it may at least be partially related to the 32 card being installed in Slot 6

- Refer to “**Issue** with PTP card correctly persisting/saving certain settings when the 1204-32 card is installed in Slot 6” further below in this same section (with other 1204-32 card troubleshooting) for details
- In summary, the **Contract** tab settings don't save correctly with the card installed in Slot 6 (they are different after the page is refreshed/re-opened). Noticed with version 5.2.1/5.3.0 software installed

Another example of issues due to card being installed in Slot 6 (SO 3911 in SAP, as reported by Don McConnell with Repair team)

The PTP card is giving erroneous information through the web UI. We already performed a CLEAN and then a FORCE update. The update failed because the PTP card says it is version 131. Card was installed in the field in Slot #6.

Q from Dave L to Denis Do you know if anything is in the works to fix the slot 6 issue?

A Reply from Denis (11 Dec 17) And the only reason why 6 cards is problematic is that we've had this nagging occasional issue with cards in the far slots, which is a bug.

F/U email from Denis No, Korusys did all that simulation and testing. They own the design, too, so any bug-fix work that we might want to do on the card has to wait either until they do it, or we gain access to their code. Laurent is in the process of talking to them about gaining access to the code. But I don't know how far along that is. Even if we get the code it's unclear when any work would be scheduled

Advanced tab (TTL, Clock Class, Unicast/Multicast/Hybrid selection, PTP Priority)

A) Versions 5.2.0 and above

Multicast Sync: Disabled by default. Enable if desired to send them.

Unicast Sync is always enabled (can't Disable unicast Sync messages)

Transport Protocol (Choices are either IPv4 or 802.3 Ethernet with **Default Profile** selected. (IPv4 automatically selected when **Telecom profile** is selected). No other selections available.

Clock Class (Choices are the following with **Default Profile** selected. (ITU-T G.8625.1 automatically selected when **Telecom profile** is selected). No other selections currently available.

TTL (Time To Live)

1PPS offset (added in software update versions 5.2.0)

Priority 1 and 2 (range is 0 to 128)

Enable SyncE

Enable SyncE

Notice: in versions 5.2.0 and above, the SSM Signal Control and SSM Code fields are only displayed after selecting "Enable SyncE" (as shown in the next Figure below)

Callout Box Content:

- ITU-T G8625.1
- PTP Clock Classes
- ARB Clock classes
- ITU-T G8625.1

SyncE configuration in version 5.2.0 and above, after selecting “Enable SyncE”

Enable SyncE ☒

Enable ESMC ☒

SSM Signal Control Output Always Enabled

SSM Code QL_STU_UNK

Output Always Enabled

Output Always Enabled

Output Enabled in Holdover

Output Disabled in Holdover

Output Always Disabled

QL_STU_UNK

QL_PRS

QL_PRC

QL_NV3

QL_S5U_A_TNC

QL_NV5

QL_NV6

QL_ST2

QL_S5U_B

QL_NV9

QL_EEC2_ST3

QL_EEC1_SEC

QL_SMC

QL_ST3E

QL_PROV

QL_OHU_DUS

QL_STU_UNK

SSM (Synchronization Status Message) When SSM code is set to default of "QL_STU_UNK" the broadcasted class code is "82" (Refer to the PTP Class Codes table further above for the corresponding Class Codes for this field)

B) Versions 5.2.0 and above

Multicast Sync: Disabled by default. Enable if desired to send them.

Unicast Sync: is always enabled (can't Disable unicast Sync messages)

Transport Protocol: (Choices are either IPv4 or 802.3 Ethernet with Default Profile selected. (IPv4 automatically selected when Telecom profile is selected). No other selections available.)

Clock Class: (Choices are the following with Default Profile selected. (ITU-T G.8625.1 automatically selected when Telecom profile is selected). No other selections currently available.)

TTL (Time To Live):

Priority 1 and 2: (range is 0 to 128)

Enable SyncE

SSM (Synchronization Status Message): When SSM code is set to default of "QL_STU_UNK" the broadcasted class code is "82" (Refer to the PTP Class Codes table further above for the corresponding Class Codes for this field)

SSM Code: QL_STU_UNK

SSM Signal Control: Output Always Enabled

Multicast Sync/Multicast Announce fields (When these two fields are enabled)

Multicast Sync: [checked]

Multicast Sync Rate: 1 Per Second

Multicast Announce Rate: 1 Per Second

Multicast Delay_Req: [checked]

Unicast Sync: [checked]

Unicast Delay_Req: [checked]

Note: Changes to the Sync Rate and Multicast Rate dropdown fields may require a reboot to become effective (at least version 5.8.6 and below)

- Refer to JIRA-SSS-450 and SSS-811
- Refer also to "known issues", also in the "1204-32" section of this document (further below)

SNMP with the 1204-32 card/SNMP MIB file

A) SNMP MIB file made available for the 1204-32

- New MIB file added for first time in v5.6.0
- SNMP gets only (No SMNP sets or traps capability)
- (Mar, 2017) No intentions / plans at this time to add SNMP traps or sets to the 1204-32 card
(email from Dave to Morgan Stanley, 30 Mar 17): There are no current plans to add PTP feature specific traps. What information are you looking to be notified on?)

RFC 8173 compliancy (PTPv2) (1232 MIB file not compliant with this RFC)

- Refer to <https://www.rfc-editor.org/rfc/rfc8173.html>
- Refer to Salesforce Case 294971, March 2023)

Q. We have been doing some work at one of our lab sites and we ran into an issue and while troubleshooting we were looking at the MIB reference for the SecureSync 1200, but for the MIB that we are looking at, references a PTP guide section for the information we are looking for. Is there a way that we can access that PTP specification guide/doc that you guys used to build these MIBs?

A With their MIB browser they should be able to access to OID description. Our PTP MIB for 1204-32 is not compliant with RFC8173.

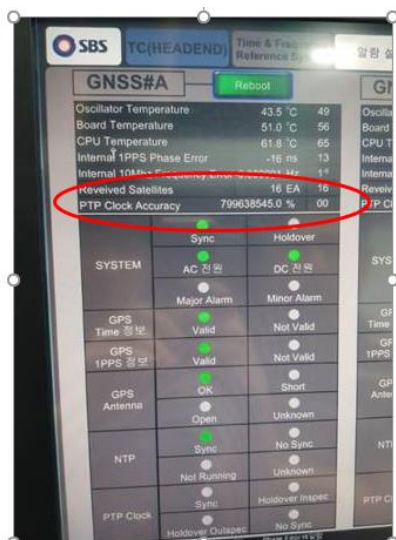
SNMP with at least two 1204-32 cards installed in same SecureSync

- refer to Salesforce case 170650

Q We use two PTP Gb option cards (1204-32) at the same time.



Outputs the same value (799638545) for both PTP accuracy and PTP Sync (799638545 as the PTP Accuracy value in the picture).



1. I suspect that the normal value (SNMP) is not output because there are two PTP cards.

Normal value

PTP Cock Accuracy : 1.3.6.1.4.1.18837.3.4.1.1.1.15

PTP Sync : 1.3.6.1.4.1.18897.3.4.1.1.1.14

If there are two PTP cards, which card value will be output?

A Email from Ron Dries (31 Aug 2018) Don had a demo SecureSync with two 1204-32 cards installed so I setup SNMP to test this out.

The SNMP MIB GET commands return the values for both cards installed.

Sent GET request to 10.2.70.224 : 161

gptpStatusClockIdentity.1 00:0C:EC:FF:FE:0A:21:6A

gptpStatusClockIdentity.2 00:0C:EC:FF:FE:0A:21:69

Clock Identity 00:0C:EC:FF:FE:0A:21:6A is **instance 0** and the other clock identity is **instance 1**.

Sending any of the individual GET commands returns the result for both PTP cards. This is at software version 5.8.1.

Known issues associated with 1204-32 card

A) 2400 SERIES (2402 and 2406) SECURESYNCS

1. IP settings being lost on reboot (versions 1.4.0 and below/fixed in version 1.4.1)

2400 SecureSync update version 1.4.1 (Apr 2022)

- **Per v1.4.1 Release Notes:** Fixed a problem with the 1204-32 PTP Grandmaster card IP settings being lost on reboot.

B) 1200 SERIES SECURESYNCS

1. (after updating to 5.8.9 or 5.9.1) No output at all or stale data outputted till after reboot

- Refer to Salesforce Cases 254069 and 265059 (both with Jane Street)
- Refer to JIRA SSS-1149 (excerpted below)

Per earlier Salesforce Case 254069 and new Case 265059, Jane Street in the UK is reporting issues sometimes occurring with the 1204-32 GB PTP Card after performing software updates (doesn't happen with every update). They reported that the unit needs to be rebooted, at least once, thereafter to correct its operation.

Per newer case 265059:

"As we begin to roll out the upgrade of 5.9.1 to our Spectracom estate we are "still" seeing instances where PTP stops functioning as expected and sending stale data to downstream consumers. The device then requires 1 or more reboots (after the initial upgrade reboot) to resolve itself.

This is the same as case number 254069.

As this is happening frequently I'm expecting this is a known issue, if so do you plan to roll a fix into the next release? Do you recommend rebooting the devices once more after an upgrade regardless?

Is it to do with the PTP cards we are using? (1204-32)

If this is not a known issue, from the 4 devices that I have upgraded so far, we have seen this on 2 of them. Please let me know what logs you would like me to pull for further diagnostics."

Per previous Case 254069:

We had a problem with it back in July where after some power maintenance, the device booted back up but didn't serve PTP. The interface showed connected, the SecureSync looked like it was showing connected/master etc., but the switch saw no traffic from the device and no ARP entry was completing.

Today, we upgraded the unit from 5.8.6 to 5.8.9. Before rebooting it, we changed the PPS output settings to 'Enable in Holdover' to protect downstream PPS consumers.

Once the clock booted back up, it looked healthy from the web interface. We were alerted by colleagues that their PTP client was reporting FAULTY. We couldn't ping the PTP interface on this SecureSync again. It reported Connected 1GBPS/Master in the UI.

After some time waiting to see if it would recover itself, it did not. I enabled 1PPS Phase Validation (Disciplining config) and rebooted the device again (having reviewed our email thread about the previous time this happened).

Once it booted, I started pinging the PTP interface and have maintained reachability. The PTP client is now happy, and everything seems to be working as normal again

2. (5.8.9 and below) Issue with 1204-32 sending out PTP packets before in sync

After SecureSync boot-up, 1204-32 card starts sending out Announce/Sync messages before SecureSync is in sync/TFOM less than 15 (applicable to at least versions 5.8.8 and below)

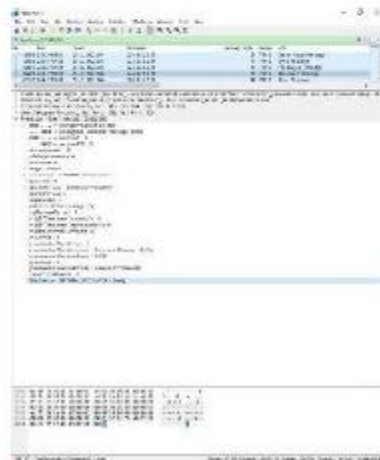
- Refer to Salesforce Case **223352** and JIRA ticket **SSS-885** (March 2020)
- Reported with **5.8.5** installed. Duplicated here with **5.8.6** installed (1204-32 card at F/W version V0130)
- Announce message reporting: **"Timesource: internal_oscillator" (0xa0)"**
- **Fixed in 5.9.0 update (F/W version 0131)**. Per 5.9.0 update Release Notes **"resolved an issue with PTP packets being broadcast before the unit is fully synchronized"**

Email from Keith to Engineering (10 March 2020) I just performed a quick 1204-32 card test of my own, and BELIEVE I am seeing the condition PICO reported (the 1204-32 doesn't appear to be operating. as I would've expected- its sending packets out before in sync).

FYI- this test is using our v5.8.6 SecureSync 10.2.192.226 (our 1204-32 card is at 10.2.192.244)

I disabled all references in the Priority table and then rebooted. With wireshark running, no packets initially sent. I then enabled only GNSS 0 and waited.

As shown below, the 32 card started sending out packets while the SecureSync was still reporting "Tracking Setup", with the Announce messages reporting SecureSyncs time was based on its **"internal_oscillator"** (and "Time is accurate to within 10 ms"). I stopped the pcap just after I noticed packets being sent out.



Is this as-expected, or is it indicating the 32 card is sending out packets too early (as I suspect)??

(Follow-up email I sent right after I sent the email above)

Reviewing the pcap file I sent (if I'm looking at it correctly) I also just noticed the first two Sync messages (ID 1 and 2) while clock class 6, were sent out as exactly the same timestamp (seconds and nanoseconds)??

| Info | grandmasterClock | sequenceId | subdomainNo | receiveTimestamp (seconds) | receiveTimestamp (nanoseconds) | originTimestamp (seconds) | originTimestamp (nanoseconds) |
|--------------|------------------|------------|-------------|----------------------------|--------------------------------|---------------------------|-------------------------------|
| Sync Message | 21726 | 1 | | 1580852689 | 748418852 | | |
| Sync Message | 21727 | 1 | | 1580852690 | 748158042 | | |
| Sync Message | 21728 | 1 | | 1580852691 | 748468243 | | |
| Sync Message | 21729 | 1 | | 1580852692 | 748518843 | | |
| Sync Message | 21730 | 1 | | 1580852693 | 748222243 | | |
| Sync Message | 21731 | 1 | | 1580852694 | 748075243 | | |
| Sync Message | 21732 | 1 | | 1580852695 | 753544243 | | |
| Sync Message | 21733 | 1 | | 1580852696 | 753252243 | | |
| Sync Message | 21734 | 1 | | 1580852697 | 754955843 | | |
| Sync Message | 21735 | 1 | | 1580852698 | 754663842 | | |
| Sync Message | 0 | 0 | | 1 | 125433744 | | |
| Sync Message | 21736 | 1 | | 1580852699 | 756138643 | | |
| Sync Message | 1 | 0 | | 1580852700 | 125433744 | | |
| Sync Message | 21737 | 1 | | 1580852699 | 756986243 | | |
| Sync Message | 2 | 0 | | 1580852700 | 125433744 | | |
| Sync Message | 21738 | 1 | | 1580852681 | 761727843 | | |
| Sync Message | 3 | 0 | | 1580852701 | 125433728 | | |
| Sync Message | 21739 | 1 | | 1580852682 | 763397843 | | |
| Sync Message | 4 | 0 | | 1580852700 | 125433728 | | |
| Sync Message | 21740 | 1 | | 1580852683 | 763686843 | | |
| Sync Message | 5 | 0 | | 1580852701 | 125433728 | | |
| Sync Message | 21741 | 1 | | 1580852684 | 763975843 | | |

3. 1204-32 card config changes may require reboot after being submitted (at least v5.8.6 and below)

- Refer to JIRA-SSS-450 and SSS-811

Ryo Suzui w/Toyo had noticed a problem with his demo SecureSync, so he wanted us to try to recreate it while he was here.

our 10.2.192.226 (SecureSync at v5.7.3) has a 32 card (v27) installed. Originally, we were switching the 32 card back and forth between .223 and .225 for testing). We changed it to domain 1 so that it could remain an active master (0 has another master on it and so it kept going passive).

We then changed the multicast Sync and Announce message intervals from once per second, to once every four seconds and submitted this change

The change appears to have been accepted by the browser But the packet capture continues after several minutes to show syncs being once per second. Here is what we are seeing (Ryo said this is also what he was observing- sometimes the change took effect right away and other times a reboot was required)

Note the screenshots I had also sent showed the browser reporting the Sync interval was changed once every fourth second, and the screenshot of the packet capture showed that after pressing submit and the packets started being sent out again, both the Sync and Announce messages kept being sent once-per-second (based on the initial configuration instead of the new configuration).

4. issue with “originCurrentUTCOffset” in Announce message temporarily reporting wrong UTC offset and with Active/Passive Master modes in the 32 card itself (only at initial PTP start-up and just for a brief time period)

- Refer to Salesforce Case Number 196648
- Similar to the “byteswap” issue discussed below ([originCurrentUTCOffset=9472](#))
- Only occurs for a brief period, right after reboot/after restarting PTP
- Slaves were observed being “mis-aligned” and then having to slew back to the 1204-32 card, once the card corrected its initial error.
- Was associated with initial PPS alignment before the first PTP messages start being sent out.
- Patch update v1.29 for the 1204-32 card (~5 June 2019) fixes it

5. Potential/intermittent issues with “originCurrentUTCOffset” in Announce message temporarily reporting wrong UTC offset and with Active/Passive Master modes in the 32 card itself

NOTE: This potential/intermittent issue **MAY** have been fixed in version 5.8.1 (and above)

- Per the 5.8.1 Release Notes: “[Communication speed was slowed down to prevent corruption.](#)”

- Refer also to the “**slots 5 and 6 only**” condition listed below
Per Denis Reilly (26 Nov 2018) this condition with the “origintimescale” field issue/fix MIGHT be related to the slots 5 and 6 only issue described further below. Since he is NOT allowed to look at the Korusys source code for the 32 card, he cannot determine if the issues with slots 5/6 only, and the issue with the byteswapping affecting the origintimescale field are related (he's not sure if the timing fix in 5.8.1 will address both conditions, or only one of the two)
- **Summary::** Erratic TAI offset values (such as **9216** or **9247**) in Announce message when switching between both: Active to Passive Master, and from Passive to Active Master. Could also be a Slot 5/6 issue as well.
- Refer to JIRA case **SSS-465**
- Refer to salesforce cases such as 162824
- in at least S/S versions 5.7.1, while the card is transitioning from Active to Passive Master, or Master to Passive Master we have seen cases of the TAI offset value temporarily switching from correct offset values (such as 36 or 37) to erratic values (such as either “**9216**” or “**9247**”)
 - Packet 28 -> **originCurrentUTCOffset=9472** (slave then slews time forward 2.5 hours)
 - Packet 31 -> **originCurrentUTCOffset=37**, no time change
- Refer to SF case 126469
- **Per Dave Sohn (3 Aug 2018):** The update in 5.8.1 may address this communication issue.

Having got multicast fixed in the lab, when enabling PTP, I'm seeing the following within announce messages (single master, multicast or hybrid mode) This is with V5.7.1 software

Packet 3 -> originCurrentUTCOffset=9472 (initial announce)
 Packet 6 -> originCurrentUTCOffset=37 (slave then slews time back 2.5 hours)
 Packet 9 -> originCurrentUTCOffset=9472
 Packet 21 -> originCurrentUTCOffset=37, no time change
 Packet 28 -> originCurrentUTCOffset=9472 (slave then slews time forward 2.5 hours)
 Packet 31 -> originCurrentUTCOffset=37, no time change

Stable after this

Disable PTP - originCurrentUTCOffset=37 (slave then slews time back 2.5 hours)

After that, everything is stable.

I do have the option of ignoring this UTC offset within ptpd, but just thought I'd sent it along. (I have no control of ptp slave settings in prod though)

Incidentally, we have another group within the bank who may've experienced similar issues however in this case the time sent via the T1 packet was dated back in 1970 (guessing unix epoch.)

They said it was reported, but no real root cause was found – GPS was in sync at the time.

Our current Microsemi devices don't display that behavior – The UTC offset is stable.

The flapping utc offset, thus time drift, is obviously not ideal behavior when PTP starts up, but is this expected from SecureSync? (This could break trading apps)

Per Keith: One customer reported it changing from “36” to “9216” and I saw it here (in Wireshark) with our 32 card going from “37” to “9247” for a few seconds while the 32 card was transitioning from one state to the other.

Email from Denis R (4 May 18) Thanks, Danny! 9472 is a magic number!
 37 is 0x0025, 9472 is 0x2500.

For some reason the card screws up the order of the bytes here.

But look closer: every time this happens, the Sequence ID of the packet goes back to 0. That tells me that the PTP stack was just reset, and the sequence numbering started over from scratch.

This is similar behavior to what we see in the Slot 5/6 bug. However, in that bug, the order swizzling persists, and applies to information that the card sends back to the Securesync, too. In this case, it's only in the packets, and it's in slot 4. So, I guess you can log it as a separate bug, but it might turn out to be related to that 5/6 bug.

Also, I don't believe that this is the root of your problem: even if the 9472 is accepted as fact by the PTP slave for a while, since that's in seconds it's really only a 157 minute difference. It still doesn't explain the significance of the June 3 date.

PTP – Using both 1204-32 cards work fine with our testing once we resolved multicast issues in our lab. (FYI, I know how PTP works, but I understand not everyone who uses PTP 'knows' the ins and outs)
However, we have noticed a few things –

- 5) When running multiple masters, using IEEE 1588-2008 defaults, the PTP port status on both devices always stays on Master. Even though our ptpd slave sees the broadcasts and selects the best master, we never see the SecureSync status transition from Master to Passive. Not sure if known issue with the reported previous PTP firmware UTC offset bug.

Keith's response: There was a known software issue in much earlier software versions, prior to version 5.1.5 (fixed in update version 5.1.5, Aug 2014) with the Model 1204-32 card transitioning to Passive Master mode.

I am not aware of any issues with the 1204-32 switching between Active and Passive Master modes in all more recent software versions. However, I am checking with one of our software engineers to confirm there should be no problems in these newer versions.

6. issues with 1204-32 card when installed in Slots 5 or 6 only

Note: This potential/intermittent issue MAY have been fixed in version 5.8.1 (and above)

- Per the 5.8.1 Release Notes: “Communication speed was slowed down to prevent corruption.”
- Refer to the “**origintimescale**” condition described above
Per Denis Reilly (26 Nov 2018) this condition with slots 5/8 only MIGHT be related to the “origintimescale” field issue/fix described above. But since he is NOT allowed to look at the Korusys source code for the 32 card, he cannot determine if the issues with slots 5/6 only, and the issue with the byteswap affecting the origintimescale field are related (he's not sure if the timing fix in 5.8.1 will address both conditions, or only one of the two)

7. “Control Fields” are swapped (part of the common PTP header)

- Refer to Salesforce Case 176583
- Refer to **JIRA ticket SSS-545**: <https://spectracom.atlassian.net/browse/SSS-545>
- Refer to pcap and emails: [I:\Customer Service\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\PTP \(1204-12 and 1204-32\)\Model 1204-32](I:\Customer Service\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\PTP (1204-12 and 1204-32)\Model 1204-32)
- Per Denis, this is a carry-over from PTPv1. It was deprecated for v2, but 1204-32 card handles it incorrectly?
- intention is to implement this patch into the version 5.8.5 software update (~June 2019)

Emails below from Denis Reilly (Oct 2018)

I looked at a 32 card in Wireshark this morning, and was able to confirm that the control fields are swapped – see the attached trace. So I think it's always been there. I think most clients just ignore it.

I will put a JIRA case in, but as far as I know there is no maintenance update for the 1204-32 planned.

Yes, you do not see any Delay Request / Delay Response pairs. But that's not what they're asking about. They're asking about the “control field” part of the common PTP header in the Sync and Follow-Up messages.

Look at the “between Spectracom and onsite” capture in WireShark. Click on a Sync message, then open up the PTP packet. Right there, under the “Sequence ID” field, is the “control” field, and it reports a value of “02”, which corresponds to a follow-up. Likewise, when you look at a follow-up message, the control field reports a value of “00”, which corresponds to a Sync message. Somehow, the control field values on these message types have gotten switched.

Why are other switches working? Because Section 13.3.2.10 of IEEE-1588 notes that the use of this field is “deprecated”, and is only there for V1 compatibility. So everyone else is simply ignoring it. Still, we can't really tell OnTime to ignore it, because we are supposed to fill it in properly; we (as the Grandmaster) are not allowed to ignore it, and are certainly not allowed to put in the wrong value.

So why is this happening? I don't know. I suppose it might be a bug that's been there from the beginning, all the time – if that's the case, we should see the same behavior in a packet trace here. Or, it could be an intermittent bug, where the card gets in a state where it flips those values for some reason. If that's the case, then I would expect that we won't see the same behavior here, and that a reboot would fix it.

Either way, I think it's a JIRA case. Now that Dave Sohn has the source code, it is in theory fixable. But I have not heard of any action being taken by anyone to fix OC32 bugs, nor have I heard of anyone other than Dave with access to the code.

TROUBLESHOOTING 1204-32 Option Cards

Note: Also refer to the Timing board CustAssistance document for other PTP Slave interface type issues
[.I:\Customer Service\1- Cust Assist documents\TimingBoardCustAssist.pdf](I:\Customer Service\1- Cust Assist documents\TimingBoardCustAssist.pdf)

Per Denis R (6 Dec 17) ...remember that once the unit first goes into sync after a cold reboot, no messages will be transmitted until the disciplining locks (TFOM < 15)

Onboard (unpopulated) debug serial header (for internal reference/factory use only)

Q. from OGSi: On the 3B card, do you know if it should be possible to add new users or change the 'root' password?

Per Ryan Johnson (1 Dec 2022) "there is no shell access through the SFP network port, only through the (unpopulated) debug serial header."

Reply from OGSi: Sorry, I wasn't clear. I meant via the serial port. Currently I can log in as root with a password. I want to change the root password; we will be receiving a 3B card from the customer, and adding the serial port for them. We don't want to give them the default (I'm assuming it is the default) root password.

Reply from Ryan Johnson (1 Dec 2022) Oh – got it, then yes – I can't think of any reason why you wouldn't be able to change the root password and/or create a new user since it's a standard linux OS running

A) What is the status of the two LEDs near the Ethernet connector?

Get a packet capture!!!!!!

Get browser screenshots of the PTP Card's Setup and especially Status screens

B) General abnormal operation of the PTP card (such as the IP address changing on its own though DHCP is not enabled, Sync but no delay responses being sent, etc)

If any software updates have been applied, review the **Update log** for any error messages associated with the 1204-32 indicating an issue with it being updated. Example from Open Access/ASX below (Salesforce case 17977.

Issue was resolved with Force Update to same version, but could have also updated to newer version)

Apr 25 03:21:29 Spectracom Spectracom: [spupdate] Upgrading Option Card 32 Run-Time in Slot 6 (SWUE)

Apr 25 03:21:29 Spectracom Spectracom: [spupdate] **Problem writing Option Card Run-Time update (SWUE)**

C) Things to watch out for in PTP packet capture of 1204-32 cards

Domain: Are all the same domain (all 0 or all 1 for instance)? Or is there more than one domain in use?

D) Try a different SFP module (same model and different manufacturer-model)

Conditions

Enabled Checkbox wont stay enabled (keeps clearing)

- 1) Was the 32 card installed at the factory or installed in the field (did any components potentially get damaged while the 32 card was being installed)?
- 2) Is the KTS version correct for the version of main software installed?
- 3) Does the 32 card operate normally in a different slot?

Error messages associated with 1204-32 card

A) “Warning: failed to receive Announce within 12.000 seconds”

“interface resets that are associated with the port going up and down”. “Port flaps/flapping”.

Refer to Salesforce case 16084

(https://na8.salesforce.com/500C000000fPIAj#500C000000fPIAj_00NC0000005cpON_target)

16084 (for Joe Laibach) is still in progress. Appears to be related to interfacing with a **Cisco** switch.

Denis updated Joe with the following (11 Nov 2014): We’re actively working this with Cisco to figure out where the issue is. Cisco has a SecureSync with one of the Option Card 32’s, and they are testing with a **Nexus 9k switch**. Nothing new to report yet.

Conclusion- Denis updated Joe with the following (16 Dec 2014):

We just heard from Cisco this morning that they’ve found the root cause on their end.

They logged it here:

<https://tools.cisco.com/bugsearch/bug/CSCur48215/>

They say they’ve fixed it internally, and it will be pushed out to customers in 4 to 6 weeks. I presume they need to test it before they release it in their next general update.

B) If you try to access this card from “classic interface”, it will indicate the card type installed is “None”.

Email from Chris Blume (5 May 2014) “When I boot up the Spectracom, slot 5 says ‘Invalid’

No PTP packets at all in packet capture (from PTP Master or PTP Slaves)

1. Could be an issue with a switch set to IGMPv3.
2. Per Denis Reilly, if using full multicast mode on master/slaves, the slaves will go silent if the PTP Master stops transmitting
3. If using Unicast mode on Master/Slaves, the clients should still be sending PTP packets even if the Master stops transmitting.
4. Look in packet capture for ARP requests with no responses (indicating either a switch blocking the traffic or a bad PTP card)

Announce messages

- Standard **length** of Announce message is **64 bytes**

Clock Class of PTP Master should be “**6**” (indicating it’s in sync). Note that if the SecureSync goes out of sync, the clock class degrades to “**7**” (indicating it’s in not in sync) This lets the Best Master Algorithm know that it’s not in sync so it can instead make another synced master the active master and also make this a passive master.

Priority field should be set to “**1**”

Note: If Priority field is set to “0”, refer to known issues below.

TAI offset value issues when switching between both: Active to Passive Master, and from Passive to Active Master

- Refer to JIRA case SSS-465
- Refer to salesforce cases such as 162824

- in at least S/S versions 5.7.1, when the card is transitioning from Active to Passive Master, or Master to Passive mode we have seen cases of the TAI offset value temporarily switching from correct offset values (such as 36 or 37) to erratic values such as either “9216” or “9247”

One customer reported it changing from “36” to “9216” and I saw it here (in Wireshark) with our 32 card going from “37” to “9247” for a few seconds while the 32 card was transitioning from one state to the other. Then it goes back to providing the correct offset value again. Theoretically, this should only result in a temporary couple second time error until it goes back to the normal value.

‘Sync messages/issues with Sync messages

- Standard **length** of Sync message is **86 bytes**

Two_Step field can be “true” starting in version 5.2.0 which added two-step mode). this field is False when in one-step mode or always with versions below 5.2.0 installed (which didn’t support two-step mode).

Loss of Sync- Per Denis Reilly, if the SecureSync loses sync, the 1204-32 card will continue outputting Sync messages, but the clock class value in its Announce message degrades from 6 to 7 so that the best master clock algorithm can switch to a master that is in sync.

Issue associated with Sync message’s “originTimestamp” field always 0’s until reboot ~Sep 2017)

- Refer to SF case 118732
- Refer to JIRA SSS-375 (<https://spectracom.atlassian.net/projects/SSS/issues/SSS-375>)

Report: Email from Jodi to Denis R (26 Sep 17) It appears that the problem that PICO was seeing with the **Timestamp=0 has been resolved, after a power cycle. Their emails back to me indicate that they no longer see** the wrong timestamp.

They are asking for a root cause, how they can be sure it won’t happen again, etc. Could you advise on their below questions? Thanks so much.

- * Why did we lose the hardware timestamps after the powercycle?
- * Can we avoid this happening again?
- * Which method is best for monitoring situations like this?
- * Are you certain the device is functioning 100% correctly?

Reply from Denis to Jodi (26 Sep KW) You can tell them we have seen this behavior one other time besides their incident, and are unable to duplicate it in our lab. Based on the information we do have, the issue has been isolated to communication with the HW timestamping unit for outgoing Sync packets. We are currently investigating the root cause, in conjunction with our design partner who provided the timestamping IP.

We are certain that if the device is outputting Sync timestamps, that they are accurate.

We’ll continue to look into this issue and will provide a status update once the root cause is found, as well as a firmware update when the defect has been fixed and tested.

Enabling Sync messages

Multicast Sync: Disabled by default. Enable if desired to send them.

Unicast Sync: There is a checkbox for Unicast messages which is always enabled (can’t disable unicast sync)

Follow-up messages

Standard **length** of Follow-up message is **86 bytes**

Should be one message present for every Sync message if **Two Step** field (in the Sync message) is **true**

preciseOriginTimestamps (2 fields) should be reported in this message when if messages are present

Missing follow-up packets (every Sync message doesn't have a corresponding Follow-up with the same SequenceID number as the Sync message)

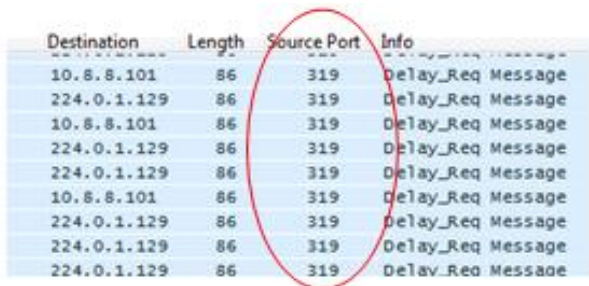
Email from Michel (16 Jan 15) I can't explain why a Follow-Up message is missing from the only whireshark capture, but the PTP Slaves shall be tolerant to the loss of PTP packets. PTP packets are transported by an untrusted transport layer (UDP). If only one synchronization packet (sync, follow-up, delay_req, delay_resp) is missing there is no consequence on the synchronization status and the synchronization is maintained by the next PTP packets.

Delay Request messages

Standard **length** of Delay Requests is **86 bytes**

All Delay Requests should on **Source/Destination** port **319**.

Example



| Destination | Length | Source Port | Info |
|-------------|--------|-------------|-------------------|
| 10.8.8.101 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |
| 10.8.8.101 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |
| 10.8.8.101 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |
| 224.0.1.129 | 86 | 319 | Delay_Req Message |

\\

Delay Response messages

- Standard **length** of Delay Response packet is **96 bytes**
- All Delay Requests should on **Source/Destination** port **320**

Issue: “receiveTimestamp” field stuck at a bogus value of 9999999697 for successive sequence numbers.”

- Refer to Salesforce Case 2476878
- Refer to JIRA SSS-1052
- Observed in v5.8.9

1. Link/network connection issues

Make sure the SFP is fully seated into its socket (put a little pressure on it)

Email from Warren Payne, 22 Oct 15 I pushed the SFP very hard into the port on slot 6 and noticed it budged a tad further. I was then able to get the link light to illuminate at both ends. I logged into the web GUI and the status for slot 6 is "Connected (1 GBPS)".

2. MAC address reported as '00:00:00:00:00' and PTP Card not responsive

- Refer to Salesforce case 1726 for Morgan Stanley
"The status of the ptp card via gui does not show an issue. However, the directly connected switch is unable to ping it and it's reporting a mac address of '00:00:00:00:00'."

Recommendation: Verify the MAC address of the Gb card reported in the web browser. If it's not all zeroes, will need a packet capture to help determine exactly what is going on.

3. Output Timing issues not necessarily due to the 1204-32 card itself.

Example issues to look for:

- A) Res-SMT-GG receiver installed with early firmware 1.06. This can result in timing issues on the PTP outputs. The software in the SecureSync should be updated so that the receiver's firmware can be updated also.

SecureSync switching between references that aren't aligned with each other.

Note: Also refer to the TSync CustAssistance document for other interface type issues.

B) PTP clients using PTPd (open source PTP software)

- Refer to "PTPD" in the [TimingBoardCustAssist.docx](#)

Issues with Delay requests affecting Delay Response messages sent from the PTP Master- poor sync issues – due to the "transportspecific" field set to 0x08 (instead of 0x00).

C) PTP Clients using Solarflare cards

Solarflare 5322 PTP Slave board has high offsets and jitter

- Refer to Salesforce case 4860
- Eric Aversa was having trouble with high offsets and jitter between a SecureSync-PTP master and their PTP slaves. They contacted solarflare and got a software update that fixed this issue.

D) Frame Check Sequence (FCS) errors in a packet capture

- Refer to http://en.wikipedia.org/wiki/Frame_check_sequence
- Some Solarflare PTP slaves send longer than usual Delay Request packets which wireshark may report as Frame Check Sequence errors.

E) Exfo PTP slaves

1. No Delay Responses being sent from 1204-32 card

1. PTP slave is trying to use Telecom profile (sending multiple TLVs)

Email from Denis Reilly, 13 Mar 2014) I think Exfo is the client that tries to connect with Multiple TLV's in one message. That's explicitly called out as a possibility in the Telecom profile, but not in the main spec.

The Actarus 1204-12 card does not support this, and the Korusys 1204-32 card does.

As far as I know, there are no plans to put that function into Actarus, because Actarus is not sold as being Telecom-profile compatible. I've copied Laurent and Michel in to confirm.

1. Issue associated with Sync message's "originTimestamp" field always 0's until reboot ~Sep 2017)

- Refer to SF case 118732
- Refer to JIRA SSS-375 (<https://spectracom.atlassian.net/projects/SSS/issues/SSS-375>)

Report - Email from Jodi to Denis R (26 Sep 17) It appears that the problem that PICO was seeing with the Timestamp=0 has been resolved, after a power cycle. Their emails back to me indicate that they no longer **see** the wrong timestamp. They are asking for a root cause, how they can be sure it won't happen again, etc. Could you advise on their below questions? Thanks so much.

- * Why did we lose the hardware timestamps after the powercycle?
- * Can we avoid this happening again?
- * Which method is best for monitoring situations like this?
- * Are you certain the device is functioning 100% correctly?

Reply from Denis to Jodi (26 Sep KW) You can tell them we have seen this behavior one other time besides their incident and are unable to duplicate it in our lab. Based on the information we do have, the issue has been isolated to communication with the HW timestamping unit for outgoing Sync packets. We are currently investigating the root cause, in conjunction with our design partner who provided the timestamping IP.

We are certain that if the device is outputting Sync timestamps, that they are accurate.
We'll continue to look into this issue and will provide a status update once the root cause is found, as well as a firmware update when the defect has been fixed and tested.

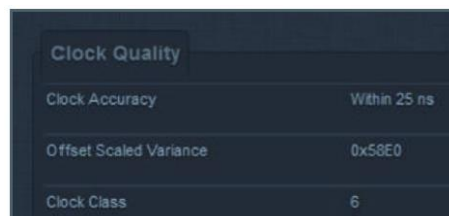
2. "Time Source" field (in "Time Properties" Section) reports "none"

In at least software versions 5.4.1 and below, there is a minor reporting issue with this field. It reports Time Source **"None"** even though SecureSync is in sync and the **Clock Class** is reporting 6.

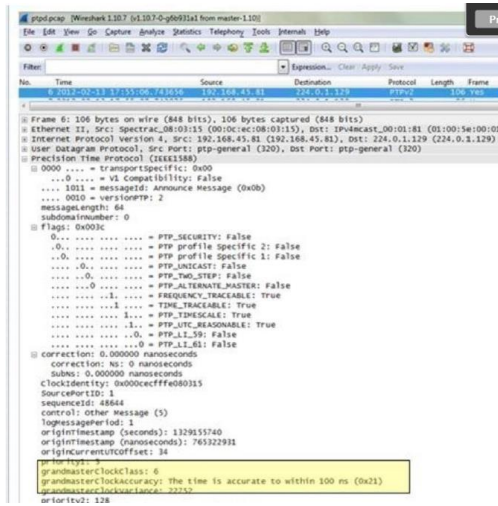
Email Keith sent to the customer (TMX) that pointed out this finding (16 Sept 2014) I now see what you are referring. I just looked at one of our SecureSyncs with a Gb PTP Option Card installed and "Time Source" is also reporting "None" (though the SecureSync is in sync).

It looks like there is a minor web browser reporting issue with this particular field. We suspect it was initially intended to report what the card was synced to, if it was configured as a PTP Slave (instead of a PTP Master). As this particular card can only operate as a PTP Master, this field should either be removed now or updated to reflect the sync state of the SecureSync. I am going to pass this along to our Product Manager to have it corrected in a future SecureSync software update.

The important info is the **"Clock Class"** information reported in the outputted Announce message, which can be easily read with a packet capture or viewed in the "Clock Quality" section of the **Advanced** tab. When the SecureSync is in sync and the PTP Card is in sync with the SecureSync, the Announce message will report the PTP Master is at "ClockClass 6" and "Time is accurate within 100 ns", as shown below in the screenshot of the **Advanced** tab and the yellow highlight of the packet capture below the screenshot.



| Clock Quality | |
|------------------------|--------------|
| Clock Accuracy | Within 25 ns |
| Offset Scaled Variance | 0x58E0 |
| Clock Class | 6 |

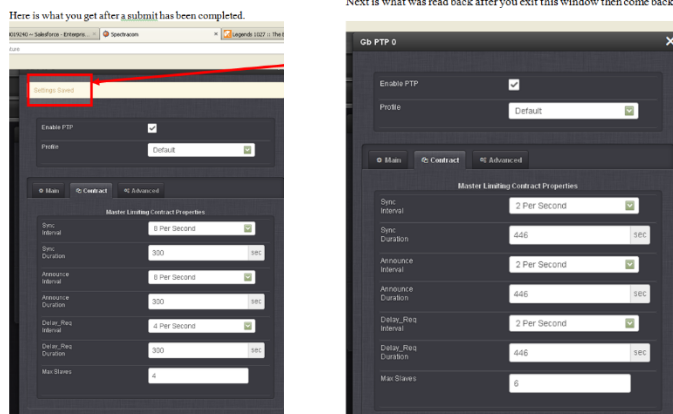


3. Issue with PTP card not correctly persisting/saving certain settings when the 1204-32 card is installed in Slot 6.

- With at least versions 5.2.1 and 5.3.0
- Refer to Mantis case 3154
- Refer to Salesforce case 19596

The “Contract” settings save- but are different after the page is refreshed/opened again.

Fix: At least temporarily swap the 1204-32 PTP card to any other slot besides Slot 6.



4. Issue with “Delay Request interval” (“logmessageperiod” field in the Delay Request packet) always being “127”

- At least Archive Version 5.1.4 and below?
- Refer to Salesforce case 14817
- Appears to be an issue when using Hybrid mode

(July 2014 KW) Important note about Hybrid mode (Refer to Salesforce case 14883): The Model 1204-12 card can be a unicast master or a multicast master. But it's not intended to service both unicast and multicast slaves together. This will cause issues with this card. All slaves should be running in multicast mode or all should be running in Unicast mode! Otherwise, if there is a mixture of both, there may be times that PTP packets aren't outputted.

If a mixture of both modes is required, a 1204-32 Gb PTP card should instead be used.

Doesn't appear to be an issue for all PTP slaves (some Slaves may have an issue with this value).

A. Email from Denis Reilly (30 May 2014)

It's unclear to me whether this is a problem with the 1204-32 Master or with his Slave. I've seen the Master send 0 in this field, but not 127.

He is right that we don't let the customer set this. But a little bit of specsmanishness is required here. I'm looking at Sections 7.7 and 13.3.2.11 as I write this.

Every PTP message has a field that contains an interval value.

This interval is expressed in powers of 2 in the standard:

0 = 1 per second,

1 = 1 every 2 seconds,

-1 = twice per second.

This is an 8-bit value using 2's complement negative numbers, so -1 may show up as 255, -2 as 254, etc.

This means that 127 is the largest positive number.

This interval also means different things depending on the message:

Sync, Follow-Up, Announce: the interval corresponds to the interval the Master transmits at.

Delay Response: specifies the *minimum* time interval that the Master will ask the Slave to transmit at when in Multicast.

for ALL OTHER PACKETS, as well as Delay Response while in Unicast, the value should be set to 127 as per the Spec.

^^^ This is something I just found this morning. We should ask Chris whether he is running Unicast or not. I've already asked which slaves he is using, but maybe we should ask again.

5. Issues switching between Active Master and Passive Master

- Refer to Mantis Case 2806 (<http://cvsmantis.int.rolia.com/mantis/view.php?id=2806>)

Q. from Vinod Kutty, CME Group After installing the 5.1.3 software, I configured the 1204-32 Gb card to take over being grandmaster from another device currently acting as grandmaster by setting priority 1 to be lower. The card sat in a listening for grandmaster state for more than 5 minutes before I turned off ptp on the other device to make the card become the grandmaster. The card had priority 1 set to 120 while the other device had priority 1 set to 128.

A. Keith's reply I checked with one of our PTP engineers about these symptoms. I understand the Model 1204-32 Gb PTP card can periodically have difficulty switching between being a passive Master and the active Master, when there is more than one Master on the network.

We are looking into the reason for this and will let you know when a SecureSync software update has been made **available that fixes this condition**.

6. No Delay Responses being sent from the Master (observed on 1204-32 but can apply to either 1204-12 or 1204-32)

Q ...You will notice there are no delay response packets coming from the SecureSync. The flags seem to be correct for the one-step mode, but that isn't affecting the behavior of the SecureSync.

A My email to Denis Reilly (8 Sept 15) 1204-32 card is interfacing with PTPd. Card is sending PTP Announce (clock class 6) and Sync (one-step) and appears it should be receiving delay requests just fine. But as Eric's customer is seeing, there are no delay responses from this PTP master,

The delay request appears to be valid, as far as I can see (other than the packet length is shorter than I thought it should be (44 instead of 72). it's a multicast packet on port 319 with a transportspecific field of 0x00 (as it should be)

Origintimestamp seconds and nanoseconds are not 0s.

A Reply from Denis Reilly (8 Sept) 44 is the proper length for Delay Requests, 54 for Delay Responses. The Delay Request packets do not have the proper UDP checksum – all checksums in those packets are reporting 0xf7df when

in reality they are all different. Could the switches be dropping the packets with invalid checksums? I doubt it. Have we seen something like this before?

A Reply from Dave L to Eric Girard (8 Sept 15) Denis had a look at the pcap and did find a problem. The Delay Request packets do not have the proper UDP checksum – all checksums in those packets are reporting 0xf7df when in reality they are all different. Could the switches be dropping the packets with invalid checksums? Can you find out what type, make and model of the switches they are using? The switch may be the source of the problem.

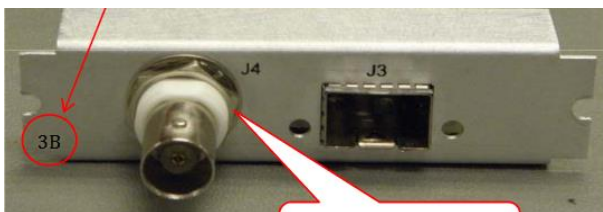
7. Incorrect Port ID (Version 5.1.2)

- Refer to Mantis 2725 (<http://cvsmantis.int.rolia.com/mantis/view.php?id=2725>)
- Issue fixed in version 5.1.3 update

8. Option Card not joining the IGMP multicast group

- Refer to Mantis 2766 <http://cvsmantis.int.rolia.com/mantis/view.php?id=2766>
- Issue fixed in 5.1.3 update

(1204-3B) GB PTP Slave Option Card



Shortcuts

- “1204-3B-PD” process detail (in Arena): <https://files.bom.com/download/MFZ16pdij7gkL2ddQ8FCSUwAddfYTzhl/pwpospkkgumxjewzvdkvshyoidqkecrf/1204-3B-PD%20Rev%201.pdf>
- “1204-3B-TP” Test Procedure (in Arena): https://app.bom.com/items/detail-spec?item_id=1244912003&version_id=10956131408

PTP Implementation for the 1204-3B (“Masterpiece” project)

- PTP functionality of the 1204-3B card is not the same “Kerberos” software used in the 1204-32 card

Internal note: PTP functionality for Prisma VelaSync is our “**Masterpiece**” PTP development (also used on VersaSyncs and Prisma Velasyncs)

Limitations of the 1204-3B PTP Slave card

1. currently, the 1204-3B module will not work well in high-traffic environments. This sensitivity is to all network traffic, and not just PTP traffic.
 - Refer to: JIRA case SSS-450
 - we recommend network cross-over cable between Master and Slave (1204-3B card)

Email from Dave Sohn (8 Apr 18) In regards to the limitations of the 1204-3B option card, currently, the 1204-3B module will not work well in high-traffic environments. This sensitivity is to all network traffic, and not just PTP traffic. We recommend that customers only use it either over a crossover cable to the PTP Master, or on a lightly loaded network.

Email from Dave Sohn to Jeremy Thomas (17 June 2020) Jean-Arnold and I have been through several installations with 3B cards. They are not in standard release as they require special considerations for each usage due to their limitations. So, in that sense you are right that each effort with the 3B card is considered a “special”. We generally start with the requirement that the 3B is used for point to point PTP connections over direct connections or isolated VLANs that emulate the direct connection. The next piece is to know information about the GM and the PTP protocol configuration required.

1204-3B Hardware changes

- For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

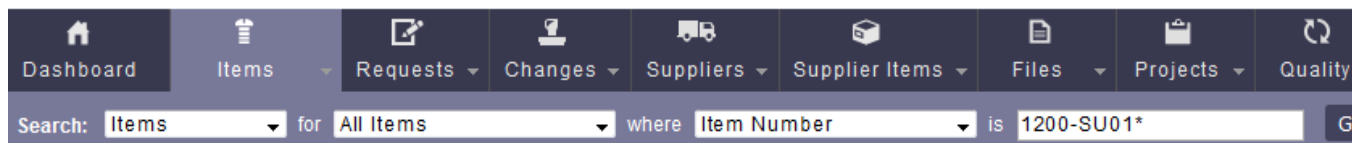
| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |

1204-3B Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



The screenshot shows the Arena software interface with a search bar. The search criteria are: Search: Items for All Items where Item Number is 1200-SU01*. The interface includes a navigation bar with tabs: Dashboard, Items, Requests, Changes, Suppliers, Supplier Items, Files, Projects, and Quality.

- **1204-3B card:** 1204-SP3B-1030

| System version | FPGA version reported | JIRA ticket | Change | approximate cut-in |
|----------------|-----------------------|-------------|--|--------------------|
| | 1.0.0 | | Initial release | |
| 5.8. | 1.0.1 | | general stability improvements | Feb 2019 |
| 5.8.3 | 1.0.4? | | | Apr 2019 |
| 5.8.7 | 1.1.0 | [SSS-764] | Release 1204-3B Version 1.1.0 on 5.8.7 | |

Firmware update version 1.0.1 (in version 5.8.4)

Q A customer with the DoD called today, and is having trouble using Unicast with their 1204-3B card. They are syncing a 1204-32 card with a 1204-3B. They use IRIG-B DCLS. They can use Multicast without difficulty. Can they use Unicast with the 1204-3B, or are there any limitations or specific configurations besides setting up contract negotiation?

A Reply from Denis Reilly (1 March 2019) There should be no issues regarding Unicast and the 3B card. Do you know which version of the SecureSync software they are using? **The latest SecureSync update included a 3B update that has general stability improvements.**

SFP Modules for use 1204-3B card

- Per Ron Dries/Tim Hammer (28 July 2022) SFPs for the 1204-3B card is NOT the same as the SFP module used in the 1204-32 GB PTP Master Card
 - There are SFPs on the list qualified for the 1204-32 card which don't work on 1204-3B
- We offer a specific Copper SFP (our P/N MP40R-0001-0002) which works with 1204-3B but is not compatible with the 1204-32 card. Info below:

MP40R-0001-0002 (SFP, GB, COPPER, 1000 MB) for 1204-3B card (not compatible with the 1204-32 card)

- Refer to ECO-002804
- This SFP is for use with the 1204-3B card.
- In Arena at: https://app.bom.com/items/detail-spec?item_id=1301184381&version_id=12017517258&orb_msg_single_search_p=1

- **Belfuse P/N SFP-1GBT-06**

PTP Multicast/PTP Unicast modes

Firmware update version 1.0.1 (in version 5.8.4)

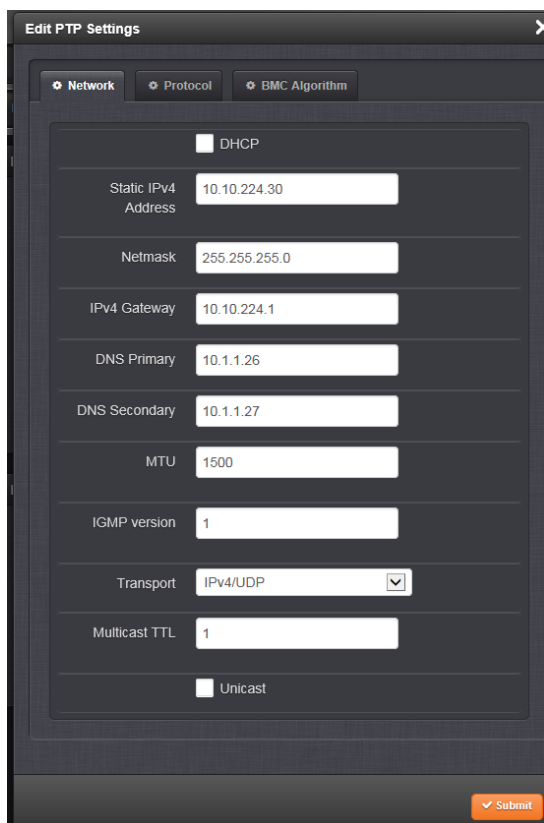
Q A customer with the DoD called today, and is having trouble using **Unicast** with their 1204-3B card. They are synchronizing a 1204-32 card with a 1204-3B. They use IRIG-B DCLS. They can use Multicast without difficulty. Can they use Unicast with the 1204-3B, or are there any limitations or specific configurations besides setting up contract negotiation?

A Reply from Denis Reilly (1 March 2019) There should be no issues regarding Unicast and the 3B card.

Do you know which version of the SecureSync software they are using? **The latest SecureSync update included a 3B update that has general stability improvements.**

PTP Slave Configuration (KTSIF.conf vs masterpiece_ptp files)

- Unlike the 1204-32 GB Master card, the 1204-3B card doesn't use the ktsif.conf file to load all its configs. It uses instead the [masterpiece_ptp](#) files (stored in the home/spectracom/config directory)
- The following screenshots show settings which worked with a 1204-32 Gb PTP card in our Engineering lab



The screenshot shows a web-based configuration interface titled "Edit PTP Settings". It has three tabs: "Network", "Protocol", and "BMC Algorithm", with "Network" selected. The "Network" tab contains several fields: a checkbox for "DHCP" (unchecked), "Static IPv4 Address" (10.10.224.30), "Netmask" (255.255.255.0), "IPv4 Gateway" (10.10.224.1), "DNS Primary" (10.1.1.26), "DNS Secondary" (10.1.1.27), "MTU" (1500), "IGMP version" (1), "Transport" (IPv4/UDP with a dropdown arrow), "Multicast TTL" (1), and a checkbox for "Unicast" (unchecked). A "Submit" button is at the bottom right.

Note: IPv4 Gateway, DNS Primary and DNS Secondary fields

With at least versions 5.8.4 and below)
IPv4 Gateway and the DNS server
fields need to be filled-in for PTP
card to work

Note: (with at least versions 5.8.4 and below) IPv4 Gateway address field and both DNS server fields need to be filled-in for PTP card to work

- **Refer to Salesforce Case 194009**
- **Refer to JIRA ticket MP-145**

Email from Dave L to Denis R (7 May 2019) The card was not working until he added the DNS addresses.

From Salesforce Case 266539, below are the associated back-to-back example log entries and a 1204-3B screenshot from Salesforce Case 266539, for DNS Server fields not being added:

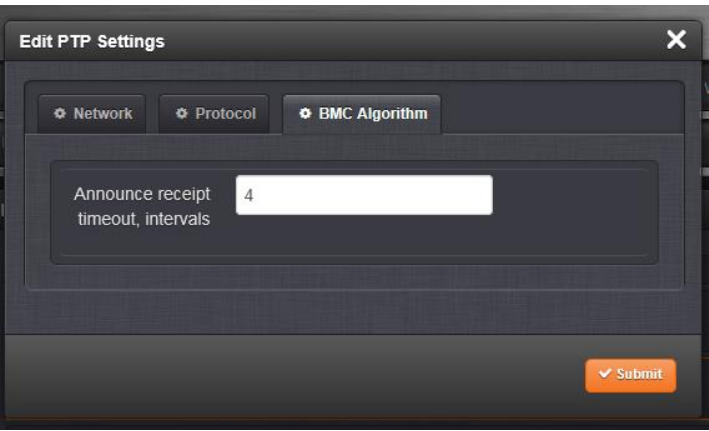
Jun 15 07:41:26 Spectracom Spectracom: [system] ERROR: failed to read configuration file /home/spectracom/config/masterpiece_ptp.conf_3 on line: LINUX.NET_DNS_PRIMARY = (MPOCD)

Jun 15 07:41:26 Spectracom Spectracom: [system] ERROR: failed to read configuration file /home/spectracom/config/masterpiece_ptp.conf_3 on line: LINUX.NET_DNS_SECONDARY = (MPOCD)

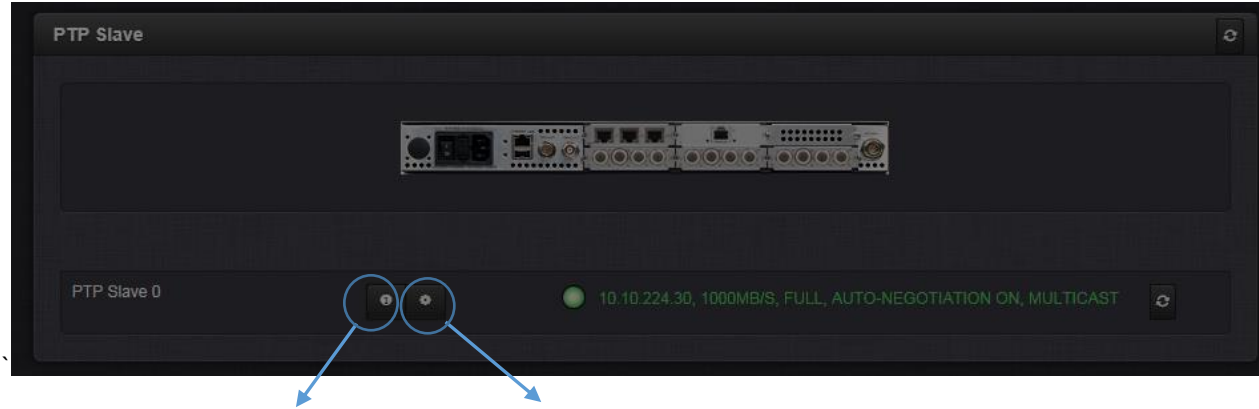


- Per following info, Primary and Secondary DNS server fields can't be left blank. If they are, the 1204-3B card won't work

A screenshot of a web interface titled "Edit PTP Settings". It has three tabs: "Network", "Protocol" (selected), and "BMC Algorithm". Under the "Protocol" tab, there are five input fields: "Version" (a dropdown menu showing "2"), "Domain" (a text box with "0"), "Sync rate, packets/s" (a text box with "1"), "Announce rate, packets/s" (a text box with "0.5"), and "Delay Request rate, packets/s" (a text box with "1"). At the bottom right is an orange "Submit" button.



The status should appear like this:



Ethernet Status

| | |
|-----------------------|-----------------|
| Current IP Address | 10.10.224.30 |
| Current Network Mask | 255.255.255.0 |
| Current Gateway | 10.10.224.1 |
| Current DHCP Setting | Off |
| Current Primary DNS | dns-nameservers |
| Current Secondary DNS | 10.1.1.26 |
| Current IGMP Version | 0 |
| Current MTU | 1500 |

Port Status

| | |
|-----------------|-------------------------------------|
| Port Number | 1 |
| Port Activity | true |
| Port State | MULTICAST SLAVE |
| Link Status | 1000Mb/s, Full, Auto-negotiation on |
| Slave Sync Mode | Off |

Note: Advanced tab Screenshot further below

PTP Slave 0

Main**Advanced**

Ethernet Status

1000MB/S, FULL, AUTO-NEGOTIATION ON

Port State

MULTICAST SLAVE

Status

SLAVE ONLY

Transmission/Clock Mode

End-to-end

Domain Number

0

Current IP Address

10.10.224.30

MAC Address

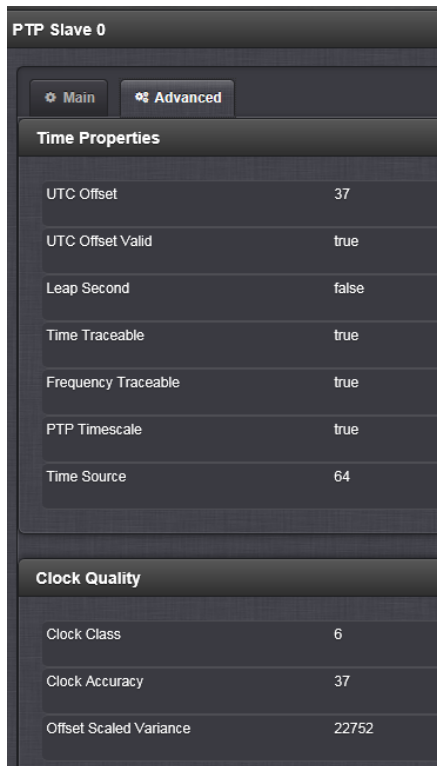
16:F0:8E:45:4C:9B

Port State: Should be “Slave”

IF it reports “PTP Not Running”

- 1) Refer to Salesforce Case 266539
- 2) Verify Primary and Secondary DNS server values in the 1204-3B card are filled-in (not left null)
- 3) Refer to “**known issues**” further below.

Status: Should report (“SLAVE ONLY”)



The screenshot displays the configuration interface for "PTP Slave 0". It features two tabs: "Main" and "Advanced". The "Advanced" tab is selected, showing two sections: "Time Properties" and "Clock Quality".

Time Properties

| Property | Value |
|---------------------|-------|
| UTC Offset | 37 |
| UTC Offset Valid | true |
| Leap Second | false |
| Time Traceable | true |
| Frequency Traceable | true |
| PTP Timescale | true |
| Time Source | 64 |

Clock Quality

| Property | Value |
|------------------------|-------|
| Clock Class | 6 |
| Clock Accuracy | 37 |
| Offset Scaled Variance | 22752 |

| Grand Master Properties | |
|-------------------------|-------------------------|
| Clock Identity | 00:11:22:ff:fe:33:44:55 |
| Clock Class | 6 |
| Clock Accuracy | 37 |
| Offset Scaled Variance | 22752 |
| Priority 1 | 1 |
| Priority 2 | 2 |
| | |
| Slave Properties | |
| Negotiation Enabled | Off |
| Contract State | |
| Contract Duration | 600 s |
| Contract Delay | 1 s |
| Message Interval | 0.5 |
| Contract State | |
| Contract Duration | 600 s |
| Contract Delay | 1 s |
| Message Interval | 1 |
| Contract State | |
| Contract Duration | 600 s |
| Contract Delay | 1 s |
| Message Interval | 1 |

=

| Module Info. | |
|---------------------------|------------|
| PTP Version | 2 |
| Software Version | 1.0.3 |
| Hardware Version | 1.0.0 |
| Software Compilation Date | 2018-01-10 |
| Software Compilation Time | 17:35:49 |

Known issues /Troubleshooting 1204-3B card

PTP functionality not working with PTP Master

- 1) With at least versions 5.8.4 and below): the IPv4 Gateway address as well as BOTH **DNS Primary** and **DNS Secondary** server fields must be filled-in for PTP card to work

- Refer to Salesforce Case 194009
- Refer to JIRA ticket MP-145

Email from Dave L to Denis R (7 May 2019) The card was not working until he added the DNS addresses.

- 2) Port State reports “PTP Not Running” (and DNS Server values are not null)

- Refer to Salesforce Case 266539
- Engineering found (excerpt from report at: [I:\Customer Service\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\PTP \(1204-12 1204-32 1204-3B\)\1204-3B \(GP PTP in\)](I:\Customer Service\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\PTP (1204-12 1204-32 1204-3B)\1204-3B (GP PTP in)))

“In troubleshooting the issue reported with the 1204-3B card the team found that there is a dependency between the **Unicast** checkbox on the first page of the configuration dialog in the WebUI and the **BMCA Algorithm Enable** checkbox on the last page. When one of those settings is on, the other one needs to be off, and if they are both on or off at the same time, the card can have unpredictable behavior.

With the following configurations the system was tested to work properly:...”

- 3) “limitations” of only working in light network traffic (recommend using network cross-over cable)

- refer to “limitations” info further above

- 4) Known software issue preventing link with certain switches

email from Denis Reilly to Dave L (26 Sept 2018) We did have to make a SW update to that PTP card. The first shipment went out with a bug where you couldn't establish link with certain switches, which the team found and fixed. So, I would have asked them to confirm the SW that is installed, but now that it is coming back we can check it in Rochester.

1204-3B card not syncing to 1204-32 card.

Email below from Keith to Nidal (15 April 2021) regarding Salesforce Case 261832

The drawing is helpful. One of the biggest concerns with the 1204-3B card is that should be no heavy network traffic (PTP or otherwise) present on its input. The drawing shows the 1204-3B connected directly to the 1204-32 card, as recommended. Hubs/Switches can be located between them, as long as there are no other network devices connected to the hubs/switches.

Email from Dave Sohn (8 Apr 18) In regards to the limitations of the 1204-3B option card, currently, the 1204-3B module will not work well in high-traffic environments. This sensitivity is to all network traffic, and not just PTP traffic. We recommend that customers only use it either over a crossover cable to the PTP Master, or on a lightly loaded network.

Email from Dave Sohn to Jeremy Thomas (17 June 2020) Jean-Arnold and I have been through several installations with 3B cards. They are not in standard release as they require special considerations for each usage due to their limitations. So, in that sense you are right that each effort with the 3B card is considered a “special”. We generally start with the requirement that the 3B is used for point to point PTP connections over direct connections or isolated VLANs that emulate the direct connection. The next piece is to know information about the GM and the PTP protocol configuration required.

Note the suggestions below were from reviewing the "1204-3B" section of the SecureSync Option Card assistance doc.

- 1) This network connection between the two Option Cards should be made with a network crossover cable (not a straight-thru cable)
 - 2) Are both PTP cards configured to be on the same subnet and same PTP domain number?
 - 3) did they buy the SFP modules from us, or are they using locally obtained SFP? If obtained locally, what mfg/model are they using
 - 4) in the 1204-3B section of the web browser, what does the Port Status show, (what is the Link Status/Port Status)? Can they send you screenshots of the "Status", as well as the "Main" and "Advanced" tabs in the browsers of both the 32 and 3B cards??
 - 5) Is the SecureSync confirmed in sync with GPS (don't want to rule out the obvious)
 - 6) which version of software is installed in the two SecureSyncs? see the note directly below
Note: (with at least versions 5.8.4 and below) IPv4 Gateway address field and both DNS server fields need to be filled-in for PTP card to work
- Refer to Salesforce Case 194009
 - Refer to JIRA ticket MP-145

Let me know if this helps resolve it, or forward me whatever they provide you with, if it doesn't!! Then we can go from there!!!
Keith

Onboard (unpopulated) debug serial header (for internal reference/factory use only)

Q. from OGSi: On the 3B card, do you know if it should be possible to add new users or change the 'root' password?

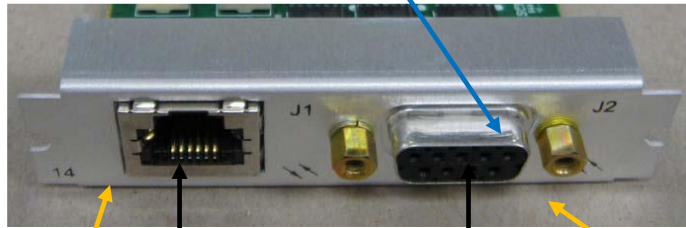
Per Ryan Johnson (1 Dec 2022) "there is no shell access through the SFP network port, only through the (unpopulated) debug serial header."

Reply from OGSi: Sorry, I wasn't clear. I meant via the serial port. Currently I can log in as root with a password. I want to change the root password; we will be receiving a 3B card from the customer, and adding the serial port for them. We don't want to give them the default (I'm assuming it is the default) root password.

Reply from Ryan Johnson (1 Dec 2022) Oh – got it, then yes – I can't think of any reason why you wouldn't be able to change the root password and/or create a new user since it's a standard linux OS running

(1204-14) Simulcast (CTCSS/Data clock) Option Card

Pin 1 is the upper-right pin. Pin 6 is below Pin 1.



J1 (RJ-12):
Data Clocks,
CTCSS freq,
1PPS, alarm

J2 (DB9): Data
Clocks, CTCSS
freq, 1PPS,
alarm

| PIN | NOTES | SIGNAL | 938x SP360 Mapping |
|-----|-------------------------------------|-------------------------|--------------------------|
| 1 | CABLE SHIELD | GROUND | GROUND |
| 2 | 5V = NORMAL GROUND = ALARM | MAJOR ALARM RELAY | MAJOR ALARM RELAY |
| 3 | RS-485 + TERMINAL | OUTPUT 3+ | + 1PPS |
| 4 | RS-485 - TERMINAL | OUTPUT 3- | - 1PPS |
| 5 | 5V = NORMAL GROUND = ALARM | MINOR ALARM RELAY | MINOR ALARM RELAY |
| | | | |
| 6 | CABLE SHIELD | GROUND | GROUND |

| PIN | NOTES | SIGNAL | 819x Mapping | 819x Option 17 Mapping |
|-----|---------------------------------------|----------------|----------------|------------------------|
| 1 | RS-485 + TERMINAL | OUTPUT 0+ | + 9.6 KHZ | + CTCSS #1 |
| 2 | RS-485 + TERMINAL | OUTPUT 1 + | +18 KHZ | +18 KHZ |
| 3 | RS-485 + TERMINAL | OUTPUT 2 + | + 1 PPS | + CTCSS #2 |
| 4 | GROUND = NORMAL OPEN = ALARM | MAJOR ALARM | MAJOR ALARM | MAJOR ALARM |
| 5 | CABLE SHIELD | GROUND | GROUND | GROUND |
| 6 | RS-485 - TERMINAL | OUTPUT 0 - | - 9.6 KHZ | - CTCSS #1 |
| 7 | RS-485 - TERMINAL | OUTPUT 1 - | -18 KHZ | -18 KHZ |
| 8 | RS-485 - TERMINAL | OUTPUT 2 - | - 1 PPS | - CTCSS #2 |
| 9 | CABLE SHIELD | GROUND | GROUND | GROUND |

Note: By default, there are no output tones present.

Schematic: (refer to 1204-00C0-F000) [I:\New Released\PCB Documentation](#)
1204-14 Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt

file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)

The screenshot shows the Arena software interface. At the top, there is a navigation bar with icons for Dashboard, Items, Requests, Changes, Suppliers, Supplier Items, Files, Projects, and Quality. Below this, there is a search bar with the following text: "Search: Items for All Items where Item Number is 1200-SU01*".

- 1204-14 card (in ascending order): rt_oc14_hw01_fpga.bin

| ECN/ECO | System version | FPGA version reported | Change | approximate cut-in |
|----------|----------------|---|---|----------------------------|
| | | 1.0.0 | Initial release of 1204-14 Option Card | |
| ECN-3395 | 5.1.2 | 1.01 (the latest rev as of at least v5.8.5) | Alarm outputs will transition away from NC/NO/Alarm state when set to "None". Addressed an anomaly that was occurring with the 9600 baud output: Once-per-second, a stray signal was being added to the 9600 baud output (if this signal was configured to be outputted). | 3 Feb, 2014 ~S/N: 05596 |
| ECO-2674 | 5.9.0 | 1.0.2 | 1204-14 to version 1.02. Upgraded option card for improved system reliability: | Jan 2021 |

1204-14 Hardware changes

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |

Outputs

A) With only one 1204-14 Option Card installed

- Four (4) CTCSS outputs (note all four are disabled by factory default)
- Three (3) Alarm outputs

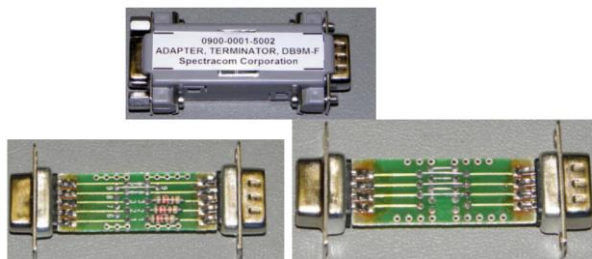
B) With two 1204-14 Option Cards installed

- Eight (8) CTCSS outputs
- Six (6) Alarm outputs

Known issues with 1204-14 Option Cards

1. Compatibility issues with Harris timing shelf

- Refer to **ECN 3183** and Salesforce **Case 8407**
- Terminator P/N: **0900-0001-5002** (DB9M to DB9F)



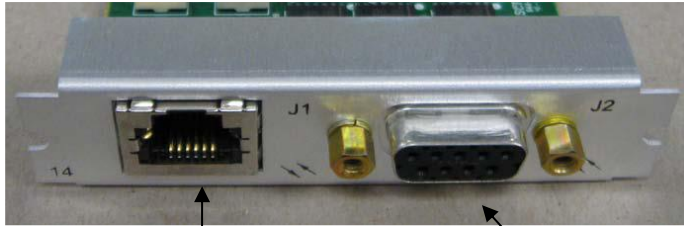
Email from Tom Richardson (15 Mar 2013) There is an issue with the RS-485 output from the option 14 option card, 1204-0140-0600, when used with Harris timing shelf. The timing shelf has pull-ups to 5 volts which latches the outputs into a high state until the connection to the timing shelf is removed, e.g. cable removed/replaced. This happens when the SecureSync loses power but the timing shelf doesn't. When the SecureSync comes back the output is latched. This pull-ups/power cycle was never anticipated in the design stage. **Fix:** we are sending them inline DB9 to DB9 terminators to install on units that have already shipped.

2. Timing issue Harris observed with 9600 baud (but also affects all other output signals)

- Harris observed anomaly with 9600 baud (refer to Salesforce case 12337 (<https://na8.salesforce.com/500C000000Ug5YM?srPos=9&srKp=500&srS=1>))
- Issue started in Archive version 4.8.5 (Q1-2012 time-frame), when we added a special mixing/heterodyning capability.
- Issue planned to be corrected in Archive version 5.1.0 (Dec 2013 time-frame). Will likely need to reconfigure 9600 baud output once the update has been applied.

New web browser (versions 5.1.2 and above)

IV. Pin-outs



| PIN | SIGNAL |
|-----|------------------------|
| 2 | ALARM Output 6 (MAJOR) |
| 3 | CTCSS OUTPUT 3+ |
| 4 | CTCSS OUTPUT 3- |
| 5 | ALARM Output 5 (MINOR) |

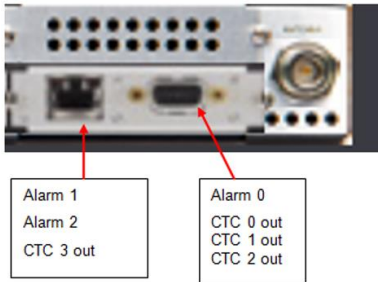
| PIN | SIGNAL | 819x Option 17 Mapping | Model 1204-14 Option card |
|-----|------------------|------------------------|---------------------------|
| 1 | CTCSS OUTPUT 0+ | + CTCSS #1 | + CTCSS #1 |
| 2 | CTCSS OUTPUT 1 + | +18 KHZ | +18 KHZ |
| 3 | CTCSS OUTPUT 2 + | + CTCSS #2 | + CTCSS #2 |
| 4 | ALARM OUTPUT 4 | MAJOR ALARM | MAJOR ALARM |
| 6 | CTCSS OUTPUT 0 - | - CTCSS #1 | + CTCSS #1 |
| 7 | CTCSS OUTPUT 1 - | -18 KHZ | +18 KHZ |
| 8 | CTCSS OUTPUT 2 - | - CTCSS #2 | + CTCSS #2 |

Software issue (at least 5.9.1 and below) CTCSS numbering starts at "3" instead of "0" like it should

- Refer to Salesforce Case 250028 (Oct 2020)
- Refer to JIRA SSS-1051

With only one 1204-14 CTCSS Card installed
Interfaces -> CTCSS output page of the browser

- Total of four (4) CTCSS outputs
- Total of three (3) Alarm outputs



Software issue (at least 5.9.1 and below) CTCSS numbering starts at "3" instead of "0" like it should

- Refer to Salesforce Case 250028 (Oct 2020)
- Refer to JIRA SSS-1051

Software Configuration

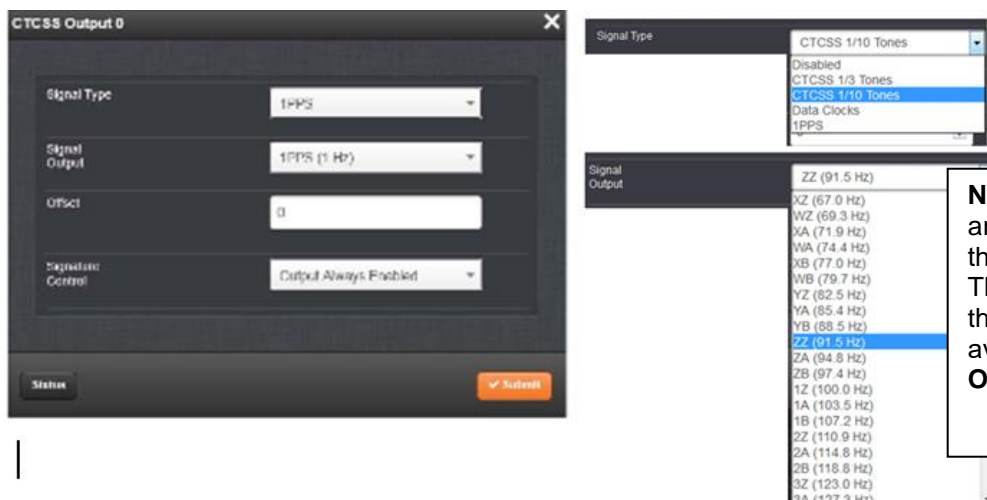
A) Basic info

- **Note:** refer to “B” further below for specific info for using the 1204-14 card with the Model 1118

Interfaces - > Simulcast -> CTCSS Output

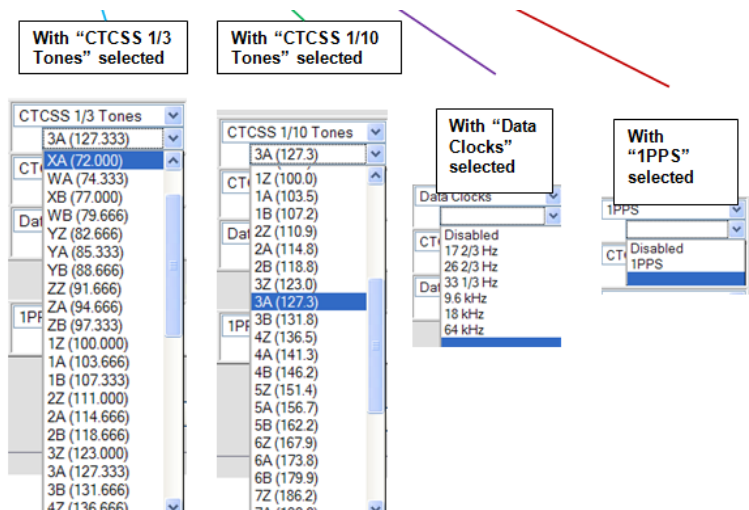
- The “**Signal Type**” drop-down selection determines the choices available for the “**Signal Output**” field.

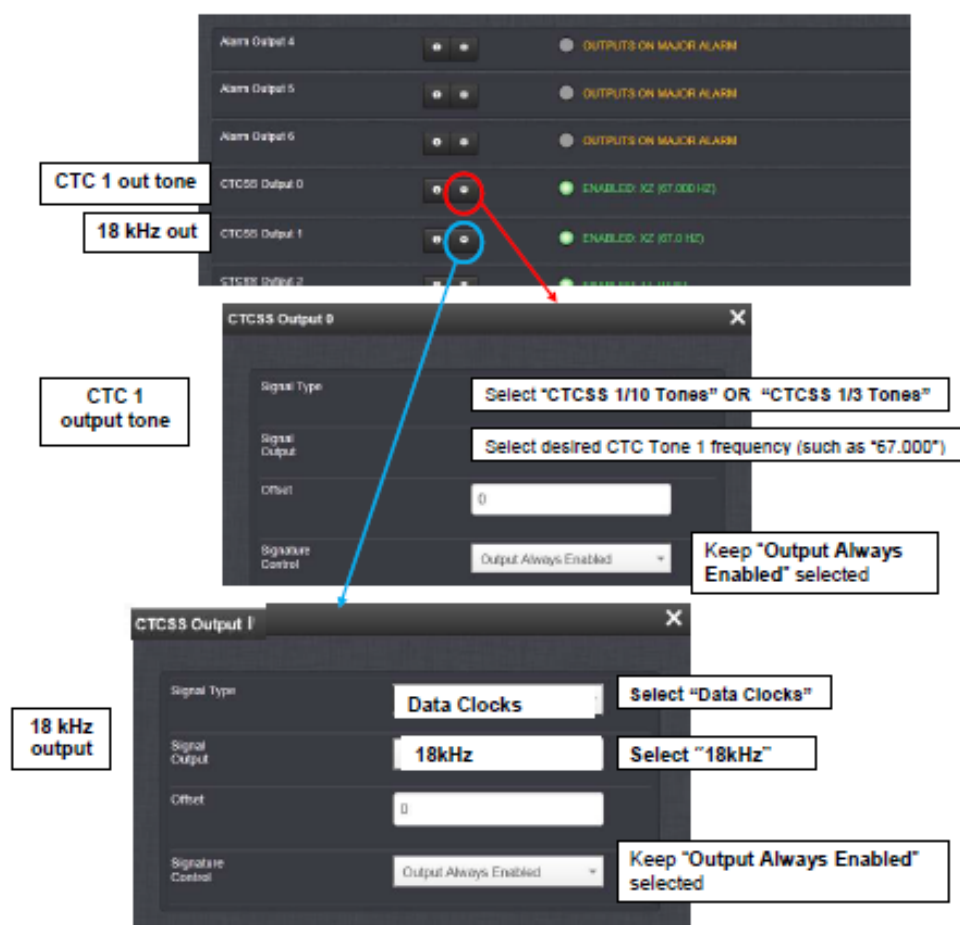
Note- example screenshot below shows the **Signal Output** field when “**CTCSS 1/10 tones**” selected. Other available selections are displayed below the screenshot.



Note: the four “boxes” at top are for the selected value on the “**Signal Type**” (top) field. The drop-downs shown below the boxes are the values available in the “**Signal Output**” (second) field

“Signal output” (Second field down from the top) selections available based on what is selected in the “Signal Type” (first drop-down field)





If a second CTCSS tone is required (Note: ignore these following steps if only one CTCSS tone is required).

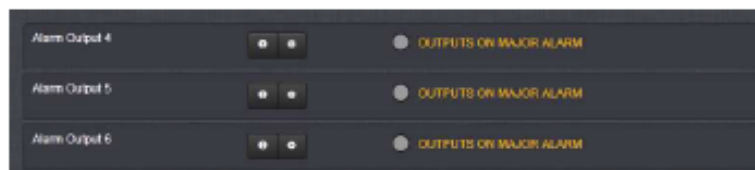
A) For "CTCSS output 2", select either "CTCSS 1/10 tones" OR "CTCSS 1/3 tones"

www.spectracomcorp.com

3 | Model 1118 CTCSS with SecureSync

spectracom

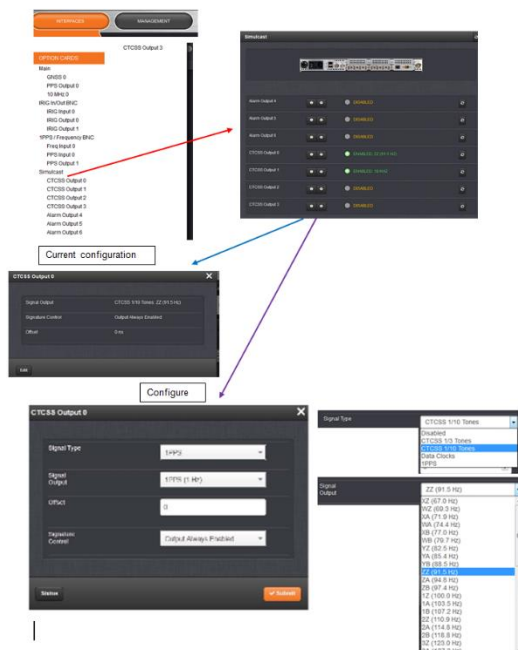
Alarm Outputs (above CTCSS Outputs 0 and 1)



Note that the "Alarm Outputs" are not used with the Model 1118 CTCSS boards

C) Desire to output 9600 Hz (such as for EDACS system for example)

- Change “Signal Type” Field to “Data Clocks”
- Change “Signal output” Field to “9.6 kHz”



Alarm Outputs

Interfaces - > Simulcast -> Alarm Outputs

Alarm Output 4

Alarm Type

None

None

Minor

Major

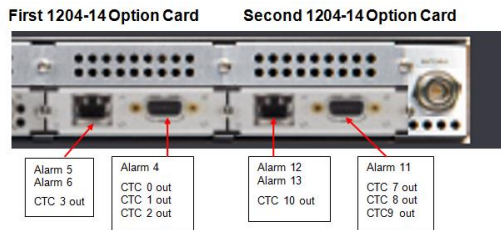
Status

✓ Submit

With **two** 1204-14 CTCSS Cards installed

Interfaces -> CTCSS output page of the browser

- Provides SecureSync with a total of **eight** (8) **CTCSS** outputs
- Provides SecureSync with a total of **six** (6) **Alarm** outputs



Browser screen mapping when two cards are installed

Q. Any help on configuring 1PPS with two Option cards installed in Secure Sync?

A. **Reply From Dave Lorah (24 Mar 15)** The Simulcast output cards will map over fairly easily when you see how the Output numbers are assigned.

The first card has seven outputs. These are numbered 0 thru 6. If a second card is installed the Securesync will number the same outputs 7 thru 13. This is a little confusing because the setup screens for each card will not show 7 thru 13 on the second card. You have to know how they are mapped.

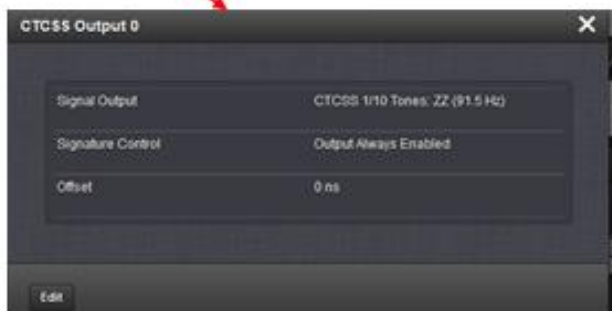
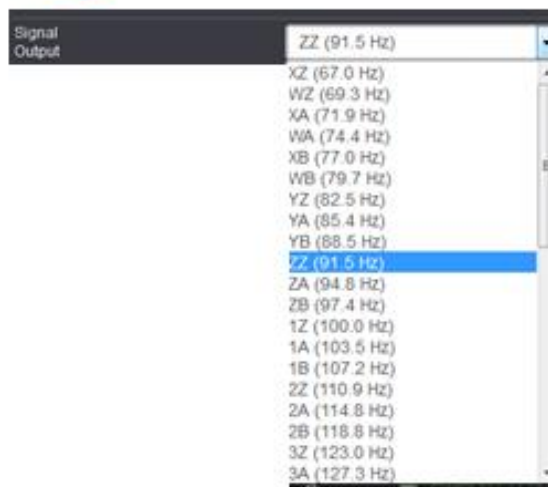
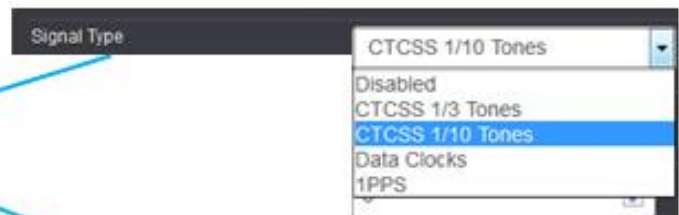
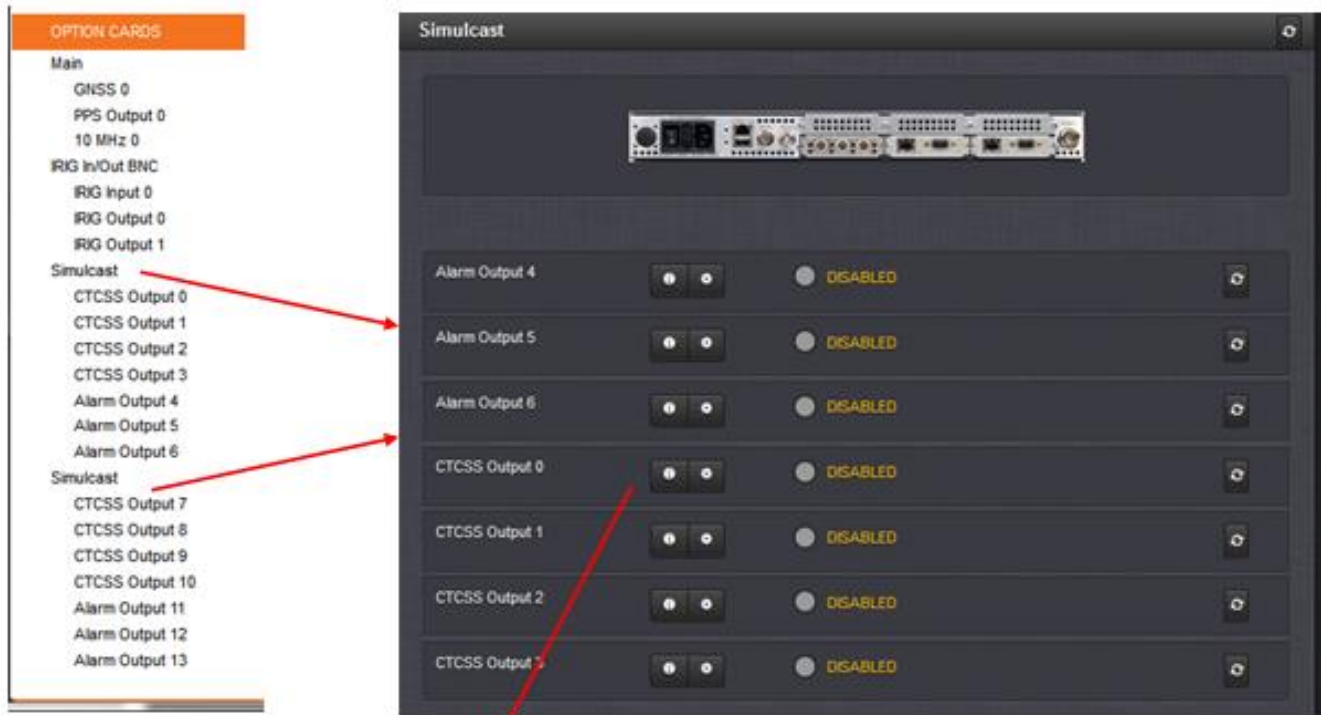
Following the first card as an example for the second will help.

This is how they are mapped in the browser:

| First card: | = | Second Card: |
|-------------|---|--------------|
| CTCSS 0 | | CTCSS 7 |
| CTCSS 1 | | CTCSS 8 |
| CTCSS 2 | | CTCSS 9 |
| CTCSS 3 | | CTCSS 10 |
| Alarm 4 | | Alarm 11 |
| Alarm 5 | | Alarm 12 |
| Alarm 6 | | Alarm 13 |

So the 1PPS on the first card Output 3 is equal to the 1PPS on the second card Output 10.

Interfaces -> Simulcast -> CTCSS Output



Alarm Outputs

Interfaces - > Simulcast -> Alarm Outputs



The screenshot shows a window titled "Alarm Output 4" with a close button (X) in the top right corner. Inside the window, there is a label "Alarm Type" followed by a dropdown menu. The dropdown menu is open, showing three options: "None" (highlighted in blue), "Minor", and "Major". At the bottom of the window, there is a "Status" button on the left and a "Submit" button on the right, which has a checkmark icon.

Classic interface (versions 5.0.2 and below)

Setup/Inputs/Simulcast

This card does not have inputs

Setup/Outputs/ Simulcast

"Signals" tab

Setup/Outputs/ Simulcast
"Signals" tab

OUTPUTS SETUP - SIMULCAST (SLOT1)

| Output Index | Pins | Signal Type | Offset (ms) | Signature Control |
|--------------|------|-----------------|-------------|-----------------------|
| 0 | DB-9 | CTCSS 1/3 Tones | 0 | Output Always Enabled |
| 1 | DB-9 | CTCSS 1/3 Tones | 0 | Output Always Enabled |
| 2 | DB-9 | CTCSS 1/3 Tones | 0 | Output Always Enabled |
| 3 | DB-9 | 1PPS | 0 | Output Always Enabled |

CTC 1
18kHz

CTC 2 (if 2nd tone needed)

1PPS out (not needed for 1118 CTCSS board)

Choices:

- Signal Type
- Disabled
- CTCSS 1/3 Tones
- CTCSS 1/10 Tones
- Data Clocks
- 1PPS
- 18 kHz

With "CTCSS 1/3 Tones" selected

| CTCSS 1/3 Tones |
|-----------------|
| 3A (127.333) |
| CT (127.000) |
| WA (74.333) |
| XB (77.000) |
| WB (79.666) |
| YZ (82.666) |
| YA (85.333) |
| YB (88.666) |
| ZZ (91.666) |
| ZA (94.666) |
| ZB (97.333) |
| 1P (100.000) |
| 1A (103.5) |
| 1B (107.0) |
| 2A (114.666) |
| 2B (118.666) |
| 3A (127.333) |
| 3B (131.666) |
| 4A (141.333) |
| 4B (145.666) |
| 5A (156.666) |
| 5B (162.666) |
| 6A (173.333) |
| 6B (179.666) |
| 7A (192.833) |
| 7B (199.666) |

With "CTCSS 1/10 Tones" selected

| CTCSS 1/10 Tones |
|------------------|
| 3A (127.3) |
| CT (127.0) |
| 1A (103.5) |
| 1B (107.2) |
| 2A (114.6) |
| 2B (118.6) |
| 3A (127.3) |
| 3B (131.8) |
| 4A (141.3) |
| 4B (145.6) |
| 5A (156.7) |
| 5B (162.2) |
| 6A (173.8) |
| 6B (179.9) |
| 7A (192.8) |
| 7B (199.2) |

With "Data Clocks" selected

| Data Clocks |
|-------------|
| Disabled |
| 17.25 kHz |
| 26.25 kHz |
| 31.5 kHz |
| 38 kHz |
| 44 kHz |

With "1PPS" selected

| 1PPS |
|----------|
| Disabled |
| 1PPS |

Note: "18 kHz" is available as a selection with either "CTCSS 1/3 Tones" or "CTCSS 1/10 Tones" selected.

"Alarms" tab

OUTPUTS SETUP - SIMULCAST (SLOT4)

Signals Alarms

| Output Index | Pins | Alarm Type |
|--------------|-------|------------|
| 0 | DB-9 | None |
| 1 | RJ-12 | None |
| 2 | RJ-12 | None |

Submit Reset

None
None
Minor
Major

Configuration for Harris radio

A) "Alarms" tab

DB-9

- 1) Pin 4 set to Major alarm

RJ-12

- 1) Pin 2: Set to **Major** alarm
- 2) Pin 5: Set to **Minor** alarm

Status/Inputs/Simulcast

This card does not have inputs

Status/Outputs/Simulcast

OUTPUTS SETUP - SIMULCAST (SLOT4)

Outputs

Alarms

| Output Index | Pins | Signal Type | Offset (ms) | Signature Control |
|--------------|------|--|-------------|----------------------------------|
| DB-9 | | | | |
| 0 | 1+16 | CTCSS 10 Tones (52.5K) <div></div> | 0 | No Signature Control <div></div> |
| 1 | 2+17 | CTCSS 10 Tones (XB 77.000) <div></div> | 0 | No Signature Control <div></div> |
| 2 | 3+18 | Data Clocks (8 kHz) <div></div> | 0 | No Signature Control <div></div> |
| RJ-12 | | | | |
| 3 | 3+18 | PPPS <div></div> <div></div> | 0 | No Signature Control <div></div> |

Submit

Reset

Outputs

Alarms

| Output Index | Pins | Alarm Type |
|--------------|------|------------------|
| DB-9 | | |
| 0 | 4 | None <div></div> |
| RJ-12 | | |
| 1 | 2 | None <div></div> |
| 2 | 5 | None <div></div> |

Submit

Reset

Programmable Square Wave (TTL) output Option Cards (1204-16 and 1204-17)

API calls associated with Square Wave Option Cards

- Refer to Tim Tetreault's "cheat sheet" at: <..\EQUIPMENT\SPECTRACOM EQUIPMENT\Timing boards\TSync family\TSync driver calls cheat sheet>
- These API calls are primarily for internal use, but the associated "get" calls are available via the CLI interface ("sets" are not available to either spadmin or user accounts)
- These are examples - additional calls may have since been added

| ASCII IN Commands |
|-------------------|
| GO_GetDvmValue |
| GO_GetEnable |
| GO_GetMatchEnable |
| GO_GetMode |
| GO_GetNumInst |
| GO_GetSigCtrl |
| GO_GetSqWave |
| GO_GetSWAlignCnt |
| GO_GetSWEdge |
| GO_GetSWOffset |
| GO_GetSWOtpPW |
| GO_GetSWPerCorr |
| GO_GetSWPeriod |
| GO_GetSWPW |
| GO_GetSWTmAlgnEn |
| GO_GetValue |
| GO_GetDvmValue |
| GO_SetEnable |
| GO_SetMatchEnable |
| GO_SetMode |
| GO_SetSigCtrl |
| GO_SetSqWave |
| GO_SetSWAlignCnt |
| GO_SetSWEdge |
| GO_SetSWInit |
| GO_SetSWOffset |
| GO_SetSWOtpPW |
| GO_SetEnable |
| GO_SetMatchEnable |
| GO_SetMode |
| GO_SetSigCtrl |
| GO_SetSqWave |
| GO_SetSWPerCorr |
| GO_SetSWPeriod |
| GO_SetSWPW |
| GO_SetSWTmAlgnEn |

Model 1204-16 (terminal block) vs Model 1204-17 (BNCs)

| Model | P/N for the card | Function | # of outputs | Output Connectors |
|---------|------------------|--|--------------|-------------------|
| 1204-16 | 1204-0160-0600 | Provides four programmable square wave outputs (not yet available) | 4 | BNC |
| 1204-17 | 1204-0170-0600 | Provides four programmable square wave outputs | 4 | Terminal block |

1204-16 (RS-485 terminal block)

Note: as of at least July, 2017, this card is not yet available

1204-16 Schematic (Refer to the “Schematics” folder in the “1204-0020-F000 board files” folder):

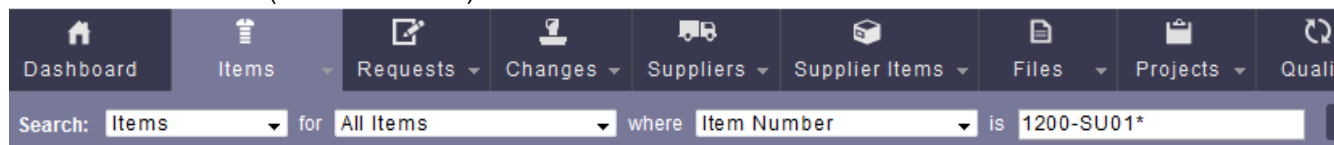
<I:\Engineering\Archive\New Released\PCB Documentation>

1204-16 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

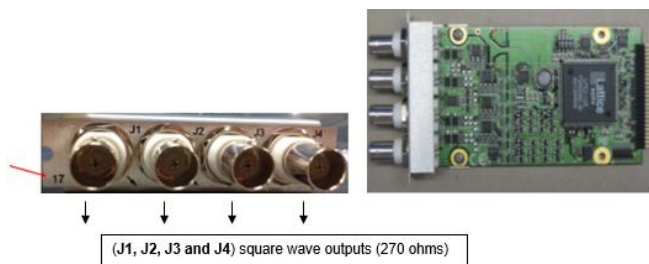
To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (Firmware) for the 1204-16 card: rt_oc16_hw01_fpga.bin

1204-17 (BNC connectors)

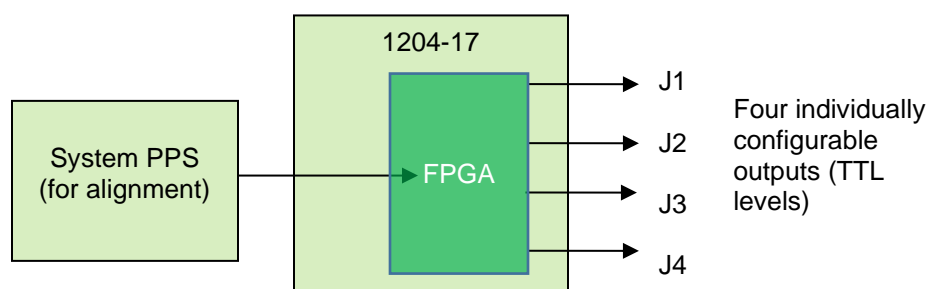


1204-17 Schematic (“1204-1101-0200”: Refer to the “Schematics” folder in the “**1204-0100-F000 board files**” folder):
<I:\Engineering\Archive\New Released\PCB Documentation>

Refer to online SecureSync manual:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/ProgrSqWav_O.htm?Highlight=1204-17

Block Diagram



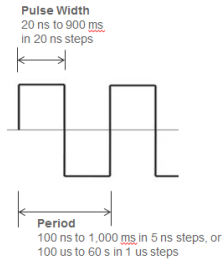
Programmable Square Wave Out [1204-17]

The Model 1204-17 Square Wave output Option Card provides four programmable square wave outputs for the SecureSync platform.

- » **Inputs/ Outputs:** (4) Programmable square wave outputs
- » **Signal Type and Connector:** TTL (BNC)
- » **Accuracy:** $\pm 50 \text{ ns}$ (1σ)
- » **Output Load Impedance:** 50Ω
- » **Rise Time to 90% of Level:** $< 10 \text{ ns}$
- » **Programmable Period:** 100 ns to $1,000,000,000 \text{ ns}$ in 5 ns steps, to $60,000,000 \mu\text{s}$ in $1 \mu\text{s}$ steps

- Can generate square wave frequencies up to 10MHz.
- Programmable Period/ Pulse Width
- Unlike the 1204-13, 1204-2F and 1204-30 Programmable Frequency output Option Cards, 1204-17 doesn't

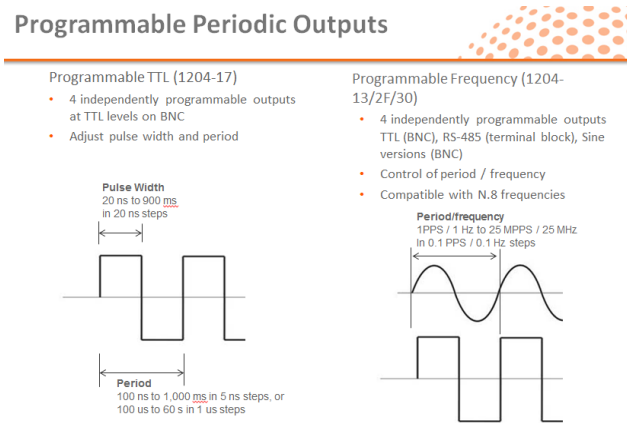
provide phase adjustment.



Difference between the Model 1204-17 versus the Models 1204-13, 1204-2F, 1204-30

Email from Dave Sohn: They are looking to be able to generate periodic square wave outputs, which is what the 1204-17 is good for. The 1204-2F is a variable frequency generator card... and it has a range of 1Hz (1PPS) to 25MHz (25MPPS).

Email from Lisa Perdue: "Both cards would work for him. With the 1204-17 card, he can adjust the pulse width of the pulse, and with the 1204-2F card. He could adjust the phase"



1204-17: Four BNC Outputs (J1 J2 J3 and J4)

TTL levels

Note: 1204-17's outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Selectable modes available for each output

- **Direct Output Value:** Output will be low or high determined by the output value selection.
- **1PPS** (1Pulse per second)
- **1PPM** (1 pulse per minute)
- **Square Wave:** Output will generate a programmable square wave determined by the configuration.
- **Custom**

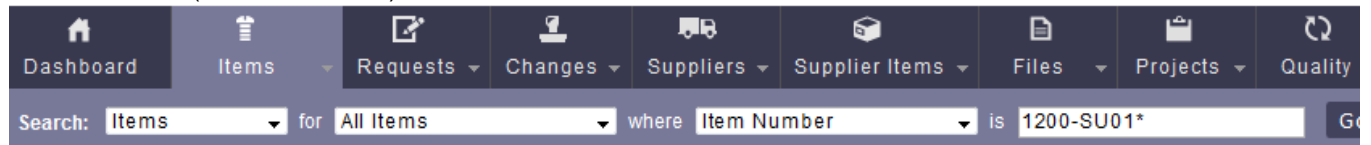
For software assembly versions, refer to: (1204-SHxx, SP1xx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

1204-17 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (Firmware) for the 1204-17 card: rt_oc17_hw01_fpga.bin

| ECN/ECO | Archive version | FPGA version reported | Change | approximate cut-in |
|--------------|-----------------|---|--|--------------------|
| | 4.5.0 | 1.00 | Added support for this Option card (first release) | |
| | 4.8.2 | 1.01 (the current rev as of at least version 5.4.1) | <p>Note: 1.01 appears to have been cut-in with the v4.8.2 update and is still current as of at least version 5.4.1.</p> <p>Added feature to support separate on-time point pulse widths from standard pulse widths for generated square wave outputs.</p> | |
| ECO 980 | 5.4.5 | 1.02? | Corrected 1PPM offset issue | Sept, 2016 |
| ECO 1686 | 5.8.0 | 1.03? | <p>Direct Value Mode issue: Per 5.8.0 Release Notes “1204-17 Square Wave Option Card can now disable direct outputs after being enabled” Note: 1.03 is still the latest Rev as of at least 5.8.5</p> | May, 2018 |
| ECO-FAI-2327 | 5.8.6 | | <p>Newly released features</p> <ul style="list-style-type: none"> • Added 1/8 Hz pulse output for use on the 1204-17 option card. | Oct, 2019 |

1204-17 Hardware changes

For Option Card software versions, refer to: (SP17) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN ECO | Archive version | New Version | Change | approximate cut-in |
|-------------|--------------------|----------------|--|-----------------------|
| 2947 | | | Changes the output impedances of all four outputs from 5.6 ohms to 270 ohms | June 2012 |
| ECO 0117 | N/A | N/A | Update SecureSync option card 10, HQ Out, 4 BNC to change Q4, Q11, Q15, and Q19 10V output transistors from SOT23 to SOT223 package. Change soldering to no clean. PCB layout changes for DFM also. | Sept 2014 |

Purpose: Provides four individually programmable output square-waves (four outputs only- no inputs).

Note: The 1204-17 Option card can generate square wave frequencies up to 10MHz

Inputs: None

Outputs:

- Four Square Wave outputs at TTL levels.

Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Selectable modes available for each output

- **Direct Output Value:** Output will be low or high determined by the output value selection.
- **1PPS** (1Pulse per second)
- **1PPM** (1 pulse per minute)
- **1/8 Hz pulse output** (starting in version 5.8.6 update, Oct 2019)
Per the 5.8.6 Release notes: "[Added 1/8 Hz pulse output for use on the 1204-17 option card.](#)"
- **Square Wave:** Output will generate a programmable square wave determined by the configuration.
- **Custom**

Alignment of each output to the System 1PPS

Slightly modified Email from Dave Sohn to Keith (28 Jul 17)

- **Outputs configured in 1PPS or 1PPM mode:** The system has mechanisms to align the signals periodically.
- **In square wave mode (which allows for the most configurations of the outputs)** the same settings can be applied by using the automatic realignment. If not used, there is no drift, the signals will output based on their defined periods starting aligned at the 1PPS when they were configured. If the periods of the signal are the same or multiples of each other, then they will maintain that relationship over time. If not, then the signal alignments will change as each signal progresses.

Output terminations for all four ports: Was 5.6 ohms, but is now 270 ohms (ECN 2947 changed outputs to 270 ohms. See "ECNs" below for more details).

Error in data sheet about the Period Range (as of at least 2/25/2011) Note the SecureSync manual is correct.

Email from Dave Sohn (2/23/2011)

The ranges described in the manual for the square wave output of the SecureSync are correct. We currently limit the available period to 100ns to 1s in 5ns steps, or 100us to 1min in 1us steps. If the opportunity exists, it is possible to update this to extend this.

Desire for a CLI command which can turn-on/off an output

- Refer to SR 6642 in SAP for an example of this request (~Sept 2016)
- Product Management was not interested in implementing this, but provided a work-around using a python script.

Configuration of 1204-16 and 1204-17 cards

Interfaces -> Sqr Wv Output **x** (where **x** is 0 through 3) under either “Option Cards” or “Outputs”

Status Edit

Enable/Disable each output

Status Edit

Frequency: - Hz

Output Mode: Direct Output Value

Output Value: Low

Re-initialize

Submit

Selections available
Direct Output
1PPS
1PPM
Square wave
Custom

Constant Low or High

Not Applicable to Direct Output Value mode

“Output Mode” choices for each output:

- **Direct Output Value**—Output will be low or high determined by the output value selection.
- **1PPS** (1Pulse per second)
- **1PPM** (1 pulse per minute)
- **Square Wave**—Output will generate a programmable square wave determined by the configuration.
- **Custom**

A) “Direct Output Value” selected

The screenshot shows a configuration window for 'Direct Output Value'. It has three main sections: 'Output Mode' with a dropdown set to 'Direct Output Value'; 'Output Value' with a dropdown set to 'Low'; and 'Re-Initialize' with an unchecked checkbox. Callout boxes provide additional context: 'Constant Low or High' points to the 'Output Value' dropdown, and 'Not Applicable to Direct Output Value mode' points to the 'Re-Initialize' checkbox. At the bottom, there is a 'Status' button and a 'Submit' button.

Fields

Output value (Direct Value mode only): Determines the constant output level (low or high)

Re-initialize (checkbox at the bottom of the window)

- **Note:** Not applicable to “Direct Output Value” Mode

known issues with Direct Value mode

1. (Square wave card cannot disable direct output after it is enabled)

- JIRA Case **SSS-447** (SalesForce case # **126731**)
- Applicable to versions prior to v5.8.0 (fixed in 5.8.0)
- Per 5.8.0 Release Notes: “1204-17 Square Wave Option Card can now disable direct outputs after being enabled”

B) “1PPS” selected

The screenshot shows a configuration window for '1PPS'. It includes several fields: 'Output Mode' (1PPS), 'Signature Control' (Output Always Enabled), 'Edge' (Rising), 'Offset' (0), 'On-Time Point Pulse Width' (200000000), and 'Pulse Width' (200000000). Callout boxes explain some fields: 'Falling or Rising on-time point' points to the 'Edge' dropdown; 'Pulse width of the first square wave pulse aligned to the 1PPS On-Time Point.' points to the 'On-Time Point Pulse Width' field; and 'When selected, realigns output to the System 1PPS' points to the 'Re-Initialize' checkbox. The window also has a 'Status' button and a 'Submit' button.

Fields

- **Offset:** Accounts for cable delays and other latencies, entered in nanoseconds
- **Re-initialize** (checkbox at the bottom of the window)
 - **When selected:** Reinitializes square wave generation and aligns to 1PPS

C) "1PPM" selected

The screenshot shows the configuration interface for the SecureSync Option Card 17. The 'Frequency' is set to '1PPM'. The 'Output Mode' is set to '1PPM'. The 'Signature Control' is set to 'Output Always Enabled'. The 'Edge' is set to 'Rising'. The 'Offset' is set to '0'. The 'On-Time Point Pulse Width' is set to '200000000'. The 'Pulse Width' is set to '200000000'. The 'Re-Initialize' checkbox is unchecked. The 'Status' button is visible at the bottom left, and the 'Submit' button is at the bottom right.

Annotations:

- Falling or Rising on-time point**: Points to the 'Edge' dropdown menu.
- Pulse width of the first square wave pulse aligned to the 1PPS On-Time Point.**: Points to the 'On-Time Point Pulse Width' input field.
- When selected, realigns output to the System 1PPS**: Points to the 'Re-Initialize' checkbox.

Fields

Offset: Accounts for cable delays and other latencies, entered in nanoseconds

On-Time Point Pulse Width (I believe this function was added in software version 4.8.2 via the 1204-17 v1.01 firmware update): The on-time point pulse width is the pulse width of the first square wave pulse aligned to the 1PPS On-Time Point. This is only active when the alignment count is non-zero (Entered in nanoseconds).

Re-initialize (checkbox at the bottom of the window)

- When selected: Reinitializes square wave generation and aligns to 1PPS

Software issue with 1PPM alignment (Offset value) between the outputs of this card

- Refer to SR 5842 in SAP for customer details
- With at least v5.4.1 and below, there is an alignment issue if the **offset value** is set **between 30ms and 40ms**
- The fix for this issue is expected to be in the version 5.4.5 software update (~Aug 2016)

Email from customer: We are concerned with the 1 Pulse Per Minute. I am trying to help another co-worker, Brian Nguyen with this issue as he is the one seeing it. Below is his statement of the issue which should be able to provide some more clarity.

"The SecureSync Option Card 17 has 4 ports that are configured to output the 1PPM signal. I use the web browser to set the offset on port 2 and monitor ports 2 and 3 on the scope. I change the offset on port 2 at 10ms step. I can see the 1PPM on port 2 moving to the left (relative to port 3) as expected with the -10ms step. However, when I change to +10ms step, I can see port 2 moving to the right (relative to port 3) up to +20ms offset. At the +30ms offset, I don't see the 1PPM on port 2. I then changed the offset on port 2 to +25ms and I can see the 1PPM on port 2 as expected, which is at 25ms to the right of the 1PPM on port 3. I think I have tried the offset at +50ms and I don't see the 1PPM on port 2 either. "

Reply from Dave Lorah (30 May, 16 regarding v5.4.1 software) I checked with engineering and they were able to duplicate the problem and have confirmed an issue when setting the offset value. There is a limit between 30 and 40 mS that results in an error. Spectracom has entered a firmware report for this issue. We examine these reports and incorporate fixes in new firmware releases four times per year. I am not certain if this will make it into the next release scheduled for the beginning of July or not. It is too early to tell at this point.

D) "Square wave" selected

The screenshot shows a configuration window for a square wave output. The settings are as follows:

- Output Mode:** Square Wave
- Signature Control:** Output Always Enabled
- Edge:** Rising
- Offset:** 0
- Pulse Width:** 200000000
- Alignment Count(s):** 0
- Period:** 1000000000
- Unit:** ns
- Re-Initialize:** (unchecked checkbox)

Callouts provide additional context:

- Falling or Rising on-time point:** Points to the Edge dropdown.
- Determines how often (in seconds) the square wave will be aligned back to the 1PPS:** Points to the Alignment Count(s) field.
- ns (nanoseconds) or us (microseconds):** Points to the unit dropdown.
- When selected, realigns output to the System 1PPS:** Points to the Re-Initialize checkbox.

Buttons at the bottom include "Status" and "Submit".

Fields

Offset: Accounts for cable delays and other latencies, entered in nanoseconds

Re-initialize (checkbox at the bottom of the window)

➤ When selected - Reinitializes square wave generation and aligns to 1PPS

Alignment Count(s): The alignment counter determines how often (in seconds) the square wave will be aligned back to the 1PPS. Setting zero will disable PPS alignment beyond the initial alignment.

- If this is set to 0, the square wave won't be realigned to the 1PPS after the initial setting.
- If this is set to 2 for example, the square wave will realign every two seconds

Note: This setting is not tied to the "System Time" clock time. Depending on when the settings were applied, the squarewave edge could either be aligned to the even or odd seconds.

Q If Leap second '60s' is added, I do not know how timing edge sync to GPS time

A. In other words, with "Time Alignment" enabled and "Alignment Count" set to 2, the squarewave edge will be aligned to the even seconds 56, 58, 00, until a leap second appears. Then the count will change such as 56, 58, 60, 01, 03, 05...

Period: Sets the period of the square wave (in ns or us scale).

Note: The wave's frequency will display at the top of the window once you have configured the output. The frequency is calculated based on the Period and Period Correction settings.

Email from Dave L (8 Mar 16) There are two settings controlling the alignment of the square wave edge to our timing.

The first is "Alignment Count".

“Alignment Count” determines how often (in seconds) the square wave will be aligned back to the 1PPS. If this is set to 0, the square wave won’t be realigned to the 1PPS after the initial setting. If this is set to 2, the square wave will realign every two seconds. This is not tied to the clock time, so for question 1 and 2, depending on when the settings were applied, the squarewave edge could either be aligned to the even or odd seconds.

The other setting is “Time Alignment”.

This works with “Alignment Count” to force the alignment to occur whenever the clock time is a multiple of the “Alignment Count”.

If “Time Alignment” is enabled with “Alignment Count” set to 2, the square wave will align at second 00, 02, 04, 06, 08, 10, etc. In the case of a leap second where the time is 60, an alignment will occur on the 60 as well.

That means with “Time Alignment” enabled and “Alignment Count” set to 2, Q1 will work as in Case 1, and Q2 will work as in Case 2.

In other words, with “Time Alignment” enabled and “Alignment Count” set to 2, the squarewave edge will be aligned to the even seconds 56, 58, 00, until a leap second appears. Then the count will change such as 56, 58, 60, 01, 03, 05...

E) “Custom” selected

The screenshot shows a configuration interface for a square wave output. The 'Output Mode' is set to 'Custom'. The 'Signature Control' is 'Output Always Enabled'. The 'Edge' is set to 'Rising'. The 'Offset' is 0. The 'On-Time Point Pulse Width' is 200000000. The 'Pulse Width' is 200000000. The 'Alignment Count(s)' is 0. The 'Time Alignment' is 'Disabled'. The 'Period' is 1000000000 ns. The 'Period Correction' section has a Numerator of 0 and a Denominator of 1. The 'Re-Initialize' checkbox is unchecked. The 'Status' button is visible at the bottom left, and the 'Submit' button is at the bottom right.

Falling or Rising on-time point

Pulse width of the first square wave pulse aligned to the 1PPS On-Time Point.

Determines how often (in seconds) the square wave will be aligned back to the System 1PPS

Enabled or Disabled

ns (nanoseconds) or **us** (micro seconds)

Period Correction: Period correction allows for the generation of more precise frequencies at the expense of additional period jitter High

When selected, realigns output to the System 1PPS

Fields

Re-initialize (checkbox at the bottom of the window)

- When selected - Reinitializes square wave generation and aligns to 1PPS

Time Alignment: (Enabled/Disabled): The time alignment enable changes the function of the alignment counter to align the square wave whenever the current time's "seconds" value is a multiple of the alignment count. For example: If time alignment is enabled and alignment count is set to 15 seconds, the square wave will be aligned to the 1PPS when the seconds value on the time display equals 00, 15, 30, 45

Alignment Count(s): The alignment counter determines how often (in seconds) the square wave will be aligned back to the 1PPS. Setting zero will disable PPS alignment beyond the initial alignment.

- If this is set to 0, the square wave won't be realigned to the 1PPS after the initial setting.
- If this is set to 2, the square wave will realign every two seconds

Note: This setting is not tied to the "System Time" clock time. Depending on when the settings were applied, the squarewave edge could either be aligned to the even or odd seconds.

Q If Leap second '60s' is added, I do not know how timing edge sync to GPS time

A. In other words, with "Time Alignment" enabled and "Alignment Count" set to 2, the squarewave edge will be aligned to the even seconds 56, 58, 00, until a leap second appears. Then the count will change such as 56, 58, **60**, 01, 03, 05...

Email from Dave L (8 mar 16) There are two settings controlling the alignment of the square wave edge to our timing.

The first is "Alignment Count".

"Alignment Count" determines how often (in seconds) the square wave will be aligned back to the 1PPS.

If this is set to 0, the square wave won't be realigned to the 1PPS after the initial setting.

If this is set to 2, the square wave will realign every two seconds.

This is not tied to the clock time, so for question 1 and 2, depending on when the settings were applied, the squarewave edge could either be aligned to the even or odd seconds.

The other setting is "Time Alignment".

This works with "Alignment Count" to force the alignment to occur whenever the clock time is a multiple of the "Alignment Count".

If "Time Alignment" is enabled with "Alignment Count" set to 2, the square wave will align at second 00, 02, 04, 06, 08, 10, etc. In the case of a leap second where the time is 60, an alignment will occur on the 60 as well.

That means with "Time Alignment" enabled and "Alignment Count" set to 2, Q1 will work as in Case 1, and Q2 will work as in Case 2.

In other words, with "Time Alignment" enabled and "Alignment Count" set to 2, the squarewave edge will be aligned to the even seconds 56, 58, 00, until a leap second appears. Then the count will change such as 56, 58, 60, 01, 03, 05...

FAQs on Re-initialize/Time Alignment

Q One of our customers uses Programmable Square Wave TTL Out[1204-17] on SecureSync. This time, they will configure period of this TTL output as '2s'.

If Leap second '60s' is added, I do not know how timing edge sync to GPS time

A (reply below from Dave Sohn, 9 Mar 16)

There are two settings controlling the alignment of the square wave edge to our timing.

A) The first is "Alignment Count".

- "Alignment Count" determines how often (in seconds) the square wave will be aligned back to the 1PPS.
- If this is set to 0, the square wave won't be realigned to the 1PPS after the initial setting.
- If this is set to 2, the square wave will realign every two seconds.

This is not tied to the clock time, so for question 1 and 2, depending on when the settings were applied, the squarewave edge could either be aligned to the even or odd seconds.

B) The other setting is “Time Alignment”.

This works with “Alignment Count” to force the alignment to occur whenever the clock time is a multiple of the “Alignment Count”.

If “Time Alignment” is enabled with “Alignment Count” set to 2, the square wave will align at second 00, 02, 04, 06, 08, 10, etc. In the case of a leap second where the time is 60, an alignment will occur on the 60 as well.

That means with “Time Alignment” enabled and “Alignment Count” set to 2, Q1 will work as in Case 1, and Q2 will work as in Case 2.

In other words, with “Time Alignment” enabled and “Alignment Count” set to 2, the squarewave edge will be aligned to the even seconds 56, 58, 00, until a leap second appears. Then the count will change such as 56, 58, 60, 01, 03, 05...

In other words, with “Time Alignment” enabled and “Alignment Count” set to 2, the squarewave edge will be aligned to the even seconds 56, 58, 00, until a leap second appears. Then the count will change such as 56, 58, **60**, 01, 03, 05...

On-Time Point Pulse Width (I believe this function was added in software version 4.8.2 via the 1204-17 v1.01 firmware update) The on-time point pulse width is the pulse width of the first square wave pulse aligned to the 1PPS On-Time Point. This is only active when the alignment count is non-zero (Entered in nanoseconds).

Period: Sets the period of the square wave (in ns or us scale).

Note: The wave's frequency will display at the top of the window once you have configured the output. The frequency is calculated based on the Period and Period Correction settings.

Period Correction: Period correction allows for the generation of more precise frequencies at the expense of additional period jitter. An additional clock cycle is added for numerator periods every denominator periods. Over a length of time, the true square wave period comes to:

$$\text{Period} + (\text{numerator/denominator}) * 5 \text{ nsec}$$

FAQs about the 1204-17 Option Card

Q (From Sylvain) Initially, they have noticed that **the signals that they have setup for the 1204-17 board was not sync with the 1PPS output of the SecureSync** after powering up the unit.

A. Per Dave Sohn (4 Dec 2013) They probably don't want to enable time alignment, just the alignment count. Time alignment will align when the second's value of the SecureSync time is a multiple of the alignment count. For 20s, it would be 14:30:00, 14:30:20, 14:20:40, ... Also, what signal are they putting out? The best way, if they want it aligned with the 1PPS, is to set the alignment count to the lowest number of seconds that aligns to the signal period. If the period is an even multiple of 1 second, then put 1 second in the alignment count. These outputs are synchronized at startup, and whenever adjustments are made. They are only synchronized once, so when the HW alignment occurs, the signal will be misaligned with the 1PPS. That is why we added the alignment count, so we can continuously align, if the customer wants.

Per Dave Sohn (6 Jan 2014): The output is always aligned once when it starts. If continued alignment is desired, then they need to use the alignment count. The issue that arises is on initial sync to a reference, the 1PPS will be aligned to the reference, which will remove alignment with the generated signals on the 1204-17 unless they are set to realign periodically.

Q (From Sylvain) so as I understand that the alignment is done at the first time but I imagine it to early and it is not efficient (and so there is a misalignment), we now have 2 solutions if we want to win the order :

A. Per Dave Sohn (20 Dec 2013) The alignment rate would depend on the signal they are trying to generate, and how long the signal could remain unaligned to the 1PPS. If it is supposed to align with the 1PPS every second, then generally use the 1 second alignment count. If every 2 seconds, then use the 2 second alignment count... and so on. How much variation can they handle? We don't have a signature control function for the 1204-17 feature, but that could be looked at also.

Data sheet (incorrect)

Manual (Correct)

8.16 Model 1204-17 Square Wave Out

The Model 1204-17 Square Wave output option module card provides four programmable square wave outputs for the SecureSync platform.

Programmable TTL Output

| | Output |
|---------------------------|-------------------|
| Quantity | 4 |
| Signal Type and Connector | TTL (BNC) 50 ohms |
| Period Range | 100 ns - 20,000 s |
| Pulse Width Range | 20 ns - 900 ms |
| Maximum Number of Cards: | 6 |

Ordering Information
1204-17: Programmable TTL output module

| | |
|----------------------------|--|
| Inputs / Outputs: | (4) Programmable square wave outputs |
| Signal Type and Connector: | TTL (BNC) |
| Output Impedance: | 50 Ω |
| Rise time to 90% of level: | <40ns |
| Programmable period: | 100ns to 1,000,000,000ns in 5 ns steps, to 60,000,000us in 1us steps |
| Programmable pulse width: | 20ns to 900ms with 20ns resolution |
| Maximum Number of Cards: | 6 |

Programmable Period/ Pulse Width

Specifications

| | Output |
|---------------------------|--|
| Quantity | 4 |
| Signal Type and Connector | TTL (BNC into 50 ohms) |
| Programmable Period | 100 ns to 1,000,000,000 ns in 5 ns steps 100 μ s to 60,000,000 μ s in 1 μ s steps |
| Pulse Width Range | 20 ns - 900 ms in 20 ns steps |
| Rise Time to 90% of Level | < 40 ns |

10 MHz to 1 Hz/1PPS (1Pulse-Per-Second) and
10 kHz to 0.0166667 Hz or 16.67 milliHertz/1PPM (1 Pulse-per-Minute)

- The 1204-17 Option card can generate square wave frequencies up to 10MHz.

Q. Is there an option to output 1PPM (1 pulse per minute)?

A. (From Dave Sohn on 10/11/11) The current Model 1204-17 (4) Square Wave Output option card is capable of outputting a 1PPM signal at TTL levels.

A Reply from Dave Lorah to another customer (1 Oct 2013) The 1204-17 can be set to output one pulse every 60,000,000 uS. Please make sure your firmware has been updated to at least version 4.8.8.

First change the Period from 1 Billion nS to 60 million nS, then change the Scale from nS to uS. This will provide a 1PPM (1 pulse per minute) pulse.

Validation errors with output greater than 1 second (changing from one “scale” to another) (not applicable to versions 4.8.8 and higher)

- Applicable to Archive versions 4.8.7 and below.

(11-28-12 David Sohn corrected and verified this fix by changing the KTS code to set both and evaluate both at the same time. This should be in the v4.8.8 update ~Dec 2012 - Mantis case 1900)

(12/15/12 KW) Status Update: This issue was fixed in 4.8.8 (Dec 2012, ECN 3099),

- Refer to Salesforce Case 6742

The 1204-17 Square wave option board is giving validation errors when trying to set the output for longer than 1 second. A customer (Spawar) reports they cannot set the output to 1PPM (1 pulse per minute)

Info from Dave Sohn (11/28/12)

In general if changing to a new scale:

- 1) Set a period valid for both the old and new scale (Submit)
- 2) Then change to the desired period and scale- (Submit)

This is an order of operation problem.

To get it to work as designed:

To go from 1PPS to 1PPM you must make two inputs:

- 1) The user must first change Period from 1Billion NSEC to 60Million NSEC.
THEN Submit.
- 2) NOW change the Scale from NSEC to MSEC.

This works because the scale must be in the range, otherwise it will fail. The order operation also fails the OTHER direction. If the current period is NOT within the new Scale range, the set will also fail.

FAQ/Example configurations for the Model 1204-17

PROGRAMMABLE RANGE/RESOLUTION (STEP SIZES)

Q. Can you please clarify what the programmable range of the 1204-17 module is in PPS? Also, the resolution (steps) that it can be programmed?

A. Reply from Lisa Perdue (16 June 2014) The frequency range is obtained by converting the period information we gave to frequency (frequency = 1/period).

We generate the signals in the time domain and the direct conversion is not always nice round numbers, so if he wants to operate in the frequency domain, it is best to determine what frequency he wants to generate the square wave output at and convert to period.

For his question, (Chuck Jones wants to know if he can program anything he wants from 1PPS to 1M PPS), the period he is asking for is to 1000ns to 1,000,000,000ns so in this range he can program it by 5ns steps.

DDM output ("5MPPS/1PPS" (DDM) outputs used by Motorola MLC8000s

- Update **version 5.6.0** added the "5MPPS/1PPS preset" drop-down selection to the 1200 SecureSyncs
- Update **version 4.8.2** updated 1204-17 FPGA from 1.00 to 1.01. Added feature to support separate on-time point pulse widths from standard pulse widths for generated square wave outputs.

Certain Simulcast Radio systems like the Motorola MLC-8000/GTR Radio System may require a 5 MHz square wave / 1PPS composite signal for synchronization. This can be produced by using the 1204-17 Square wave output option card in a SecureSync. Using the following configuration, the resulting signal will consist of a 5 MHz TTL with 50nS pulse width including a 150nS pulse on the 1PPS interval as a marker.

PPS Alignment/realignment with the 5 MHz

Q. (from Tom Richardson to Ed O'Connor with Simulcast Solutions) Is the 1PPS supposed to be in a fixed phase relationship with the 5 MHz?

A reply from Ed (25 Apr 16) "top of the second"

Configuration

- Configuration is different depending on whether using Classic or newer black/charcoal browser.
Per Dave Lorah regarding version 5.2.1: I found out the Composite Clock configuration has changed in the recent versions of SecureSync.
- Refer to "A" below for using **1200 SecureSyncs with version 5.6.0 and above** (preset available in newer browser)
- Refer to "B" below for using **1200 SecureSyncs with versions 5.1.2 to 5.5.0** (newer browser, but no preset available)
- Refer to "C" below for using **Custom** mode configuration (for **classic interface browser** and **2400 SecureSyncs with least in versions 1.6.0 and below installed**)
 - **Note:** JIRA ticket **DMND-1903** was created 4 Oct 2022, asking for the Composite Clock preset be added to 2400s (post 1.4.3 update)

A) Using the 1200 SecureSync's newer (black/charcoal browser) to configure composite clock

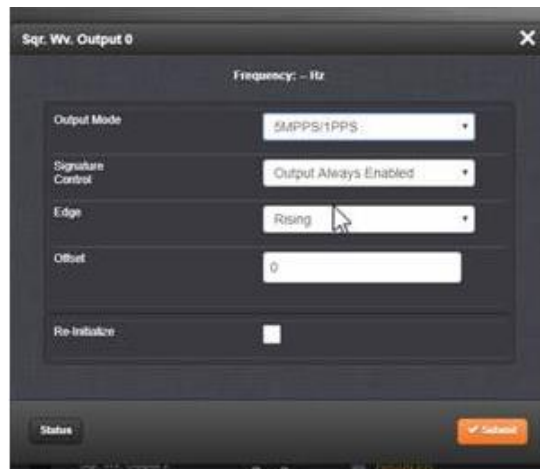
You must now configure the 1204-17 Squarewave Output card using the new web browser. The Classic web browser does not have the options needed to configure the composite clock.

1. Software Versions 5.6.0 and above

- Update **version 5.6.0** added the "5MPPS/1PPS preset" dropdown selection, to automatically configure all necessary fields.

In the new web UI, go to the [INTERFACES](#) -> [Outputs](#) and select one of the “[Sqr. Wv. Outputs](#)”. Then set it up like this (as shown in the screenshot below)

Note: The “[Re-initialize](#)” checkbox should be selected, so the Edge of the squarewave is realigned to the System PPS.



Configurations automatically set, when the “[5MPPS/1PPS preset](#)” drop-down is selected.

Output Mode: Custom
Signature Control: Output Always Enabled
Edge: Rising
Offset: 0
On-Time Point Pulse Width: 150
Pulse Width: 50
Alignment Count(s): 1
Time Alignment: Enabled
Period: 200nS
Numerator: 0
Denominator: 1

B) 1200 SecureSync Software Versions 5.1.2 to 5.6.0 (newer browser but no “[5MPPS/1PPS](#)” preset available)

- Each field needs to be manually configured

You must now configure the 1204-17 Squarewave Output card using the new web browser. The Classic web browser does not have the options needed to configure the composite clock.

In the new web UI, go to the [INTERFACES](#) -> [Outputs](#) and select one of the "Sqr. Wv. Outputs". Then set it up like this (as shown in the screenshot further below).

Note: Don't forget to select SUBMIT after the changes have been entered.

Sqr. Wv. Output 0

Settings Saved

Frequency: 500000 Hz

Output Mode: Custom

Signature Control: Output Always Enabled

Edge: Rising

Offset: 0

On-Time Point Pulse Width: 150

Pulse Width: 50

Alignment Count(s): 1

Time Alignment: Enabled

Period: 200 ns

Period Correction: Numerator: 0, Denominator: 1

Re-initialize: ☒

Output Mode: Custom
Signature Control: Output Always Enabled
Edge: Rising
Offset: 0
On-Time Point Pulse Width: 150
Pulse Width: 50
Alignment Count(s): 1
Time Alignment: Enabled
Period: 200nS
Numerator: 0
Denominator: 1
Re-initialize: Selected

This should setup the composite clock as desired.

C) Using the 2400 SecureSync (at least versions 1.6.0 and below) or the Model 1200 classic interface web browser to configure composite clock (not for use versions 5.1.2 and above)

Q. How do I configure a 5MHz/1PPS Composite clock output signal?

A. Refer to Knowledge base article: <https://na8.salesforce.com/ka4C0000000Cbqgm>

Certain Simulcast Radio systems like the Motorola MLC-8000/GTR Radio System may require a 5 MHz square wave / 1PPS composite signal for synchronization. This can be produced by using the 1204-17 Square wave output option card in a SecureSync. Using the following configuration, the resulting signal will consist of a 5 MHz TTL with 50nS pulse width including a 150nS pulse on the 1PPS interval as a marker.

Model 1204-17 setup for DDM outputs

Connect SecureSync to computer IP port with launched browser and enter correct IP address, username and password

Under "**Setup**" heading, select "**Outputs**"

Click on the slot that says "**SQUARE WAVE**" on the second text line

One the module parameters come up, here are the changes to the defaults:

Output Mode select "Square Wave" as signal type

Output Enable select "Enable"

Period enter "200" (nanoseconds)

Pulse Width (ns) enter "50" (nanoseconds)

On-Time Point Pulse Width (ns) enter "150" (nanoseconds)

Alignment Count (s) enter "1" (seconds)

Time Alignment select "Enabled"

Repeat for as many outputs as needed

Click on "**Submit**" button at bottom of page

1PPM (1 pulse per minute)

Q. Is there an option to output 1PPM (1 pulse per minute)?

A. (From Dave Sohn on 10/11/11) The current 1204-17 (4) Square Wave Output option card is capable of outputting a 1PPM signal at TTL levels.

Note: outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Q. Are the square waves generated with a clock that is fully synthesized with the internal 10MHz reference clock issued by the KTS part?

A. (From Dave Sohn on 5/20/13) The square wave outputs are generated in an FPGA from our 200MHz clock, which is based on the system 10MHz.

Q. Is there a synthesizer to generate fractional multiples of 5ns period?

A. (From Dave Sohn on 5/20/13) The square wave output cannot directly generate fractional multiples of 5ns period, but can simulate it over a longer period using the square wave period correction numerator/denominator. The corrected period = period + [(numerator / denominator) * 5 ns. This is actually done by adjusting the actual square wave period by 5ns for <numerator> number of periods every <denominator> number of periods.

Q. Does the phase of the square wave signal generated will stay aligned with the 1pps if the period generated is an integer fraction of 1Hz?

A. (From Dave Sohn on 5/20/13) The square wave outputs have different alignment mechanisms. By default, they are aligned only once to the 1PPS when the settings are changed and the signal reinitializes. If the internal 1PPS period count is adjusted (like when the HW is adjusting the 1PPS at startup), the signal will no longer be aligned. There are two mechanisms to perform periodic re-alignment. One re-aligns based every x number of seconds. The other will align whenever the clock time modulo x is zero. This uses the alignment count variable and the time alignment setting. The alignment counter determines how often in seconds the square wave will be aligned back to the 1PPS. Setting zero will disable PPS alignment beyond the initial alignment. The time alignment enable changes the

function of the alignment counter to align the square wave whenever the current time's seconds value is a multiple of the alignment count.

Q. As a consequence of the 1pps generation derived from original 10MHz frequency, if a square wave output is generated with a period equal to an integer multiple of the 1pps, can a phase difference accumulate over time when the initialization period is completed:

- With an OCXO option?
- With a Rb option?
- With a low phase noise Rb option?

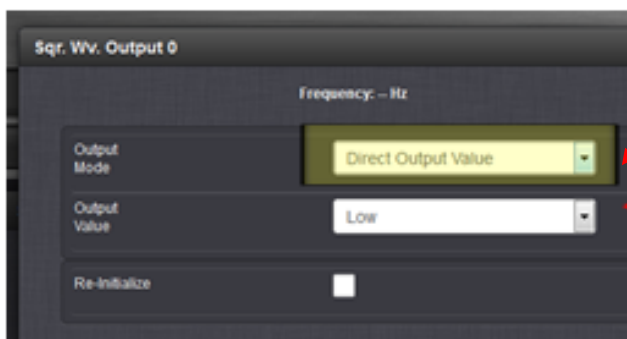
How long shall we consider the initialization period is (period when 1pps is not lock as 10,000,000 periods of 10MHz frequency)?

A. (From Dave Sohn on 5/22/12) See my previous response on alignment. Integer N alignment of the 1PPS is possible using the alignment counter capability. If you have a 1Hz signal set to 1, ip add5Hz set to 2, 0.2Hz set to 5, etc.

A) New web browser (versions 5.1.2 and above)

INTERFACES -> OPTION CARDS page of the browser

| INTERFACES | | |
|---------------------|------------------------|---------------------------|
| MANAGEMENT | | |
| REFERENCE | OUTPUTS | OPTION CARDS |
| GNSS Reference | 10 MHz Output | Main |
| GNSS 0 | 10 MHz 0 | GNSS 0 |
| PPS Reference | 10 MHz 1 | PPS Output 0 |
| PPS Input 0 | Programmable Frequency | 10 MHz 0 |
| Frequency Reference | Output | 10PPS Out 10V |
| Freq Input 0 | Prog Freq Out 0 | PPS Output 1 |
| | Prog Freq Out 1 | PPS Output 2 |
| | Prog Freq Out 2 | PPS Output 3 |
| | Prog Freq Out 3 | PPS Output 4 |
| | PPS Output | 10 MHz Out |
| | PPS Output 0 | 10 MHz 0 |
| | PPS Output 1 | Sqr Wv Out 0VDC |
| | PPS Output 2 | Sqr Wv Output 0 |
| | PPS Output 3 | Sqr Wv Output 1 |
| | PPS Output 4 | Sqr Wv Output 2 |
| | PPS Output 5 | Sqr Wv Output 3 |
| | Alarm Output | 10PPS / Frequency 100-400 |
| | Alarm Output 4 | Freq Input 0 |
| | Alarm Output 5 | PPS Input 0 |
| | Alarm Output 6 | PPS Output 5 |
| | Square Wave Output | Prog Freq Out, Sine |
| | Sqr Wv Output 0 | Prog Freq Out 0 |
| | Sqr Wv Output 1 | Prog Freq Out 1 |
| | Sqr Wv Output 2 | Prog Freq Out 2 |
| | Sqr Wv Output 3 | Prog Freq Out 3 |
| | | Global Output |



- After clicking the Setup button, for each desired output to configure, the following screenshot will be displayed.

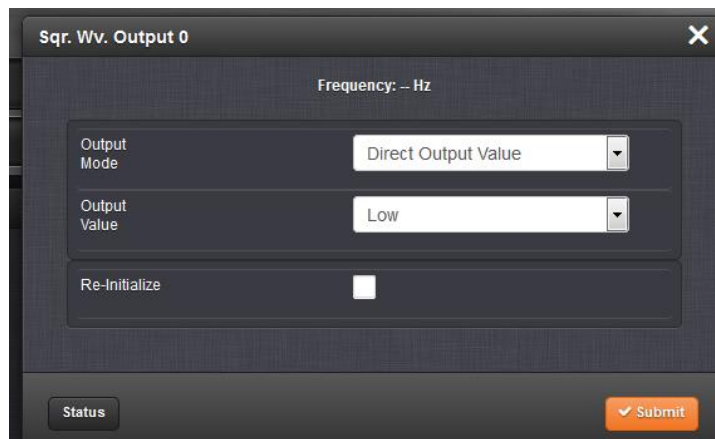
Output Mode—This is a drop-down list, offering the following options:

- **Direct Output Value**—Output will be low or high determined by the output value selection.
- 1PPS (1 pulse per second)
- 1PPM (1 pulse per minute)
- **Square Wave**—Output will generate a programmable square wave determined by the configuration.
- Custom

- In the **Output Mode** drop-down field, select the desired Output Mode to use. Even without pressing Submit, the pop-window will change, based on the selected mode (refer to the appropriate pages below for the configuration of each available mode)

A) Direct Value output mode (the default drop-down selection)

- “**Direct Output Value**” is the default Output Mode drop-down selection
- This BNC connector will be low or high determined by the output value selection



The screenshot shows a software interface window titled "Sqr. Wv. Output 0" with a close button (X) in the top right corner. Below the title bar, the text "Frequency: -- Hz" is displayed. The main control area contains three elements: a dropdown menu labeled "Output Mode" with "Direct Output Value" selected, a dropdown menu labeled "Output Value" with "Low" selected, and a "Re-Initialize" button with a small square icon. At the bottom of the window, there is a "Status" button on the left and a "Submit" button with a checkmark icon on the right.

Fields:

- **Output Value:** Determines the output level (low or high).
- **Re-Initialize:** Reinitializes square wave generation and aligns to 1PPS

A) 1PPS output mode (one pulse per second)

- This particular BNC connector will output 1PPS

Sqr. Wv. Output 0

Frequency: -- Hz

Output Mode: 1PPS

Signature Control: Output Always Enabled

Edge: Rising

Offset: 0

On-Time Point Pulse Width: 200000000

Pulse Width: 200000000

Re-Initialize ☐

Status Submit

Fields:

Signature Control: Controls when the output will be present. Options include the following:

- **Output Always Enabled:** The output is present, even when SecureSync is not synchronized to its references.
 - **Output Enabled in Holdover:** The output uses the current framing mode unless SecureSync is not synchronized to its references (the output is present while in the Holdover mode).
 - **Output Disabled in Holdover:** The output uses the current framing mode unless the SecureSync references are considered not qualified and invalid (the output is not present while in the Holdover mode).
 - **Output Always Disabled:** The output is not present, even if any SecureSync's references are present and considered qualified.
- **Edge:** Used to determine if the on-time point of the output is the rising or falling edge of the signal.
 - **Offset:** Accounts for cable delays and other latencies, entered in nanoseconds.
 - **On-Time Point Pulse Width:** The ontime point pulse width is the pulse width of the first square wave pulse aligned to the 1PPS On-Time Point. This is only active when the alignment count is non-zero (entered in 'nanoseconds').
 - **Pulse Width:** Defines the pulse width of the output (entered in nanoseconds).
 - **Re-Initialize:** Reinitializes square wave generation and aligns to 1PPS

B) 1PPM output mode (one pulse per minute)

- This BNC connector will provide one pulse per minute

Sqr. Wv. Output 0

Frequency: -- Hz

Output Mode: 1PPM

Signature Control: Output Always Enabled

Edge: Rising

Offset: 0

On-Time Point Pulse Width: 200000000

Pulse Width: 200000000

Re-Initialize: ☐

Status Submit

Fields:

- **Signature Control:** Controls when the output will be present. Options include the following:
 - **Output Always Enabled:** The output is present, even when SecureSync is not synchronized to its references.
 - **Output Enabled in Holdover:** The output uses the current framing mode unless SecureSync is not synchronized to its references (the output is present while in the Holdover mode).
 - **Output Disabled in Holdover:** The output uses the current framing mode unless the SecureSync references are considered not qualified and invalid (the output is not present while in the Holdover mode).
 - **Output Always Disabled:** The output is not present, even if any SecureSync References are present and considered qualified.
- **Edge:** Used to determine if the on-time point of the output is the rising or falling edge of the signal.
- **Offset:** Accounts for cable delays and other latencies, entered in nanoseconds.
- **On-Time Point Pulse Width:** The ontime point pulse width is the pulse width of the first square wave pulse aligned to the 1PPS On-Time Point. This is only active when the alignment count is non-zero (Entered in nanoseconds).
- **Pulse Width:** Defines the pulse width of the output (entered in nanoseconds).
- **Re-Initialize:** Reinitializes square wave generation and aligns to 1PPS

C) Square Wave output mode

- This will configure the BBC to output a continuous square wave output

Fields:

Signature Control: Controls when the output will be present. Options include the following:

- **Output Always Enabled:** The output is present, even when SecureSync is not synchronized to its references.
- **Output Enabled in Holdover:** The output uses the current framing mode unless SecureSync is not synchronized to its references (the output is present while in the Holdover mode).
- **Output Disabled in Holdover:** The output uses the current framing mode unless the SecureSync references are considered not qualified and invalid (the output is not present while in the Holdover mode).
- **Output Always Disabled:** The output is not present, even if any SecureSync References are present and considered qualified.

- **Edge:** Used to determine if the on-time point of the output is the **rising** or **falling** edge of the signal.
- **Offset:** Accounts for cable delays and other latencies, entered in nanoseconds.
- **Pulse Width:** Defines the pulse width of the output (entered in nanoseconds).
- **Alignment Count(s):** The alignment counter determines how often (in seconds) the square wave will be aligned back to the 1PPS. Setting zero will disable PPS alignment beyond the initial alignment.

Period: Sets the period of the square wave (in ns or us scale).

- **Re-Initialize:** Reinitializes square wave generation and aligns to 1PPS

Desire to turn each BNC squarewave output on and off upon command

- Refer to Salesforce case 19215
- As of at least version 5.3.0, there is no command actuator for this function. However, user can toggle each BNC output between **square wave mode** (when it's desired to turn on the signal) and **direct value mode** (when it's desired to turn off the output signal).

D) Custom mode

- Custom configuration for each BNC connector

Sqr. Wv. Output 0

Frequency: -- Hz

Output Mode: Custom

Signature Control: Output Always Enabled

Edge: Rising

Offset: 0

On-Time Point Pulse Width: 200000000

Pulse Width: 200000000

Alignment Count(s): 0

Time Alignment: Disabled

Period: 1000000000 ns

Period Correction: Numerator 0 Denominator 1

Re-Initialize: ☐

Fields:

Signature Control: Controls when the output will be present. Options include the following:

- **Output Always Enabled:** The output is present, even when SecureSync is not synchronized to its references.
 - **Output Enabled in Holdover:** The output uses the current framing mode unless SecureSync is not synchronized to its references (the output is present while in the Holdover mode).
 - **Output Disabled in Holdover:** The output uses the current framing mode unless the SecureSync references are considered not qualified and invalid (the output is not present while in the Holdover mode).
 - **Output Always Disabled:** The output is not present, even if any SecureSync References are present and considered qualified.
- **Edge:** Used to determine if the on-time point of the output is the **rising** or **falling** edge of the signal.
 - **Offset:** Accounts for cable delays and other latencies, entered in nanoseconds.
 - **On-Time Point Pulse Width:** The ontime point pulse width is the pulse width of the first square wave pulse aligned to the 1PPS On-Time Point. This is only active when the alignment count is non-zero. (Entered in nanoseconds).
 - **Pulse Width:** Defines the pulse width of the output (entered in nanoseconds).
 - **Alignment Count(s):** The alignment counter determines how often (in seconds) the square wave will be aligned back to the 1PPS. Setting zero will disable PPS alignment beyond the initial alignment.
 - **Time Alignment:** (Enabled/Disabled) The time alignment enable changes the function of the alignment counter to align the square wave whenever the current time's seconds value is a multiple of the alignment count.

For example: If time alignment is enabled and alignment count is set to 15 seconds, the square wave will be aligned to the 1PPS when the seconds value on the time display equals 00, 15, 30, 45.

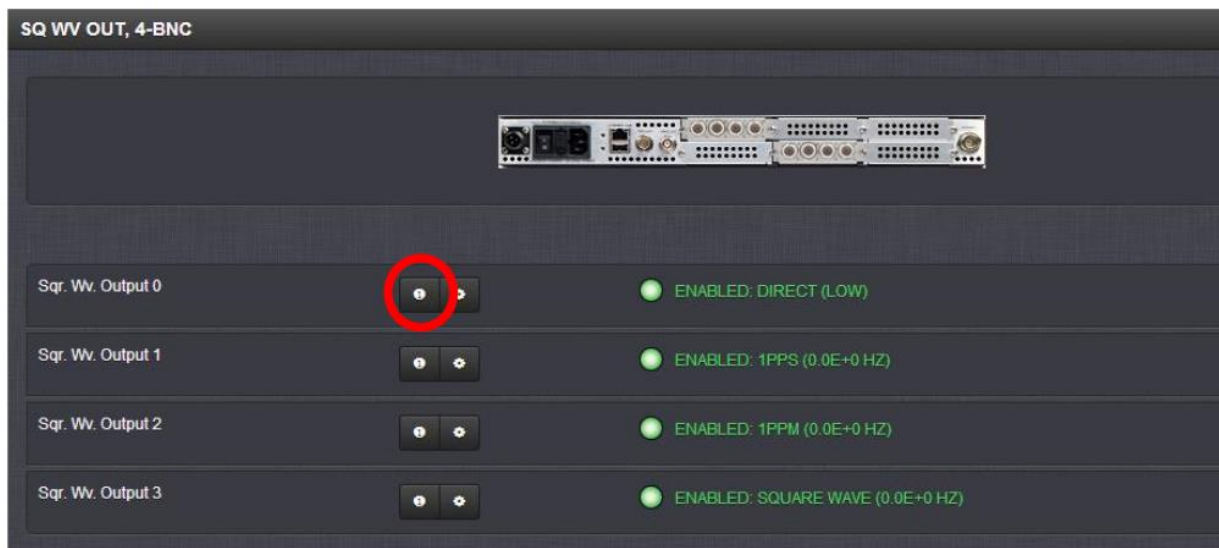
- **Period:** Sets the period of the square wave (in ns or us scale).
- **Period Correction** Period correction allows for the generation of more precise frequencies at the expense of additional period jitter. An additional clock cycle is added for numerator periods every denominator periods. Over a length of time, the true square wave period comes to:


$$\text{Period} + (\text{numerator/denominator}] * 5 \text{ nsec}$$

NOTE: The wave's frequency will display at the top of the window once you have configured the output .The frequency is calculated based on the period and Period Correction settings.

- **Re-Initialize:** Reinitializes square wave generation and aligns to 1PPS

Status



3. Click on the  button in the **SQ WV Output** row for the you want to see the settings.

Sqr. Wv. Output 3

Frequency: 0.0e+0 Hz

| | |
|----------------|-------------|
| Output Mode | Square Wave |
| Output Enabled | Enabled |

| | |
|---------------------------|-----------------------|
| Signature Control | Output Always Enabled |
| Edge | Rising |
| Offset | 0 ns |
| Pulse Width | 200 ms |
| On-Time Point Pulse Width | 200 ms |
| Alignment Count(s) | 0 |
| Time Alignment | Enabled |

| | |
|-------------------------------|-----|
| Square Wave Period Correction | 0/1 |
|-------------------------------|-----|

| | |
|--------------------|---------------|
| Square Wave Period | 1000000000 ns |
|--------------------|---------------|

Edit

B) Classic interface (versions 5.0.2 and below)



Setup/Inputs/Square Wave

This card does not have inputs

Setup/Outputs/ Square Wave

OUTPUTS SETUP - SQUARE WAVE (SLOT4)

| Output Index | 1 | 2 | 3 | 4 |
|----------------|--------------|--------------|--------------|--------------|
| Output Mode | Direct Value | Direct Value | Direct Value | Direct Value |
| Output Enabled | Disabled | Disabled | Disabled | Disabled |
| Output Value | Low | Low | Low | Low |

| | | | | |
|---------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Edge | Rising | Rising | Rising | Rising |
| Offset (ns) | 0 | 0 | 0 | 0 |
| Period | 1000000000 ns | 1000000000 ns | 1000000000 ns | 1000000000 ns |
| Period Correction | 0 | 0 | 0 | 0 |
| Frequency (Hz) | 1 | 1 | 1 | 1 |
| Pulse Width (ns) | 200000000 | 200000000 | 200000000 | 200000000 |
| Alignment Count (s) | 0 | 0 | 0 | 0 |
| Time Alignment | Disabled | Disabled | Disabled | Disabled |
| No Initiative | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Submit Reset

Direct Value or Square

Disabled or Enabled

Low or High

No, Sync, Ref Stat or Disabled

Rising or Falling

Disabled or Enabled

Note (Applicable to Versions 4.8.7 and below): Validation errors may occur when changing from one scale to another (to avoid validation errors occurring. See info on validation errors further below.

Output Mode

Direct Value: Output will be low or high determined by the output value selection (either constantly high or constantly low),

Square Wave: Output will generate a programmable square wave determined by the configuration.

Output Enable: Disables or enables the output.

Output Value: Determines the output level (low or high).

Signature control: Controls when the output will be present.

Edge: Used to determine if the on-time point of the output is the rising or falling edge of the signal.

Offset: Accounts for cable delays and other latencies, entered in nanoseconds. Available Offset range is -500 to +500ms.

Period: Sets the period of the square wave (in ns or us scale).

Period Correction: Period correction allows for the generation of more precise frequencies at the expense of additional period jitter. An additional clock cycle is added for numerator periods every denominator periods. Over a length of time, the true squarewave period comes to: $\text{Period} + (\text{numerator} / \text{denominator}) * 5 \text{ nsec}$

Frequency (Hz): Calculated based on the Period and Period Correction settings.

Pulse Width (ns): Defines the pulse width of the output (entered in nanoseconds).

Alignment Count (s): The alignment counter determines how often (in seconds) the square wave will be aligned back to the 1PPS. Setting zero will disable PPS alignment beyond the initial alignment.

Time Alignment: (Enabled / Disabled) The time alignment enable changes the function of the alignment counter to align the square wave whenever the current time's seconds value is a multiple of the alignment count. For example: If time alignment is enabled and alignment count is set to 15 seconds, the square wave will be aligned to the 1PPS when the seconds value on the time display equals 00, 15, 30, 45.

Re-initialize: Reinitializes square wave generation and aligns to 1PPS.

Validation errors with output greater than 1 second (changing from one "scale" to another)

➤ **Applicable to Archive versions 4.8.7 and below.**

(11-28-12 David Sohn corrected and verified this fix by changing the KTS code to set both and evaluate both at the same time. This should be in the v4.8.8 update ~Dec 2012)

➤ **Refer to Salesforce Case 6742**

The 1204-17 Square wave option board is giving validation errors when trying to set the output for longer than 1 second. A customer (Spawar) reports they cannot set the output to 1PPM.

Info from Dave Sohn (11/28/12)

In general if changing to a new scale

- 1) Set a period valid for both the old and new scale- Submit**
- 2) Then change to the desired period and scale- Submit.**

This is an order of operation problem.

To get it to work as designed:

To go from 1PPS to 1PPM (1 pulse per minute) you must make two inputs:

- 1) The user must first change Period from 1Billion NSEC to 60Million NSEC.
THEN Submit.
- 2) NOW change the Scale from NSEC to MSEC.

This works because the scale must be in the range, otherwise it will fail. The order operation also fails the OTHER direction. If the current period is NOT within the new Scale range, the set will also fail.

Status/Inputs/ Square Wave

This card does not have inputs

Status/Outputs/ Square Wave

| OUTPUTS STATUS - SQUARE WAVE (SLOT4) | | | | |
|--------------------------------------|----------------------|----------------------|----------------------|----------------------|
| Output Index | 1 | 2 | 3 | 4 |
| General | | | | |
| Current Value | Low | Low | Low | Low |
| Output Mode | Direct Value | Direct Value | Direct Value | Direct Value |
| Output Enable | Disabled | Disabled | Disabled | Disabled |
| Direct Value | | | | |
| Output Value | Low | Low | Low | Low |
| Square Wave | | | | |
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Edge | Rising | Rising | Rising | Rising |
| Offset (ns) | 0 | 0 | 0 | 0 |
| Period | 100000000 ns | 100000000 ns | 100000000 ns | 100000000 ns |
| Period Correction | 0 / 1 | 0 / 1 | 0 / 1 | 0 / 1 |
| Frequency (Hz) | 1 | 1 | 1 | 1 |
| Pulse Width (ns) | 200000000 | 200000000 | 200000000 | 200000000 |
| Alignment Count (s) | 0 | 0 | 0 | 0 |
| Time Alignment | Disabled | Disabled | Disabled | Disabled |

1PPS Option Cards (1204-01, 1204-03, 1204-18, 1204-19, 1204-21, 1204-28, 1204-2A, 1204-2B)

Available 1PPS (Input and/or Output) Option Cards

| Model | 1PPS Outputs | 1PPS Inputs |
|---------|------------------------------|-----------------------------|
| 1204-01 | x | One (TTL) |
| 1204-03 | x | One (RS-485 Terminal Block) |
| 1204-18 | Four (TTL) | x |
| 1204-19 | Four (10V) | x |
| 1204-21 | Four (RS-485 terminal block) | x |
| 1204-28 | Three (TTL-BNC) | One (TTL-BNC) |
| 1204-2A | Two (Fiber Optic) | One (Fiber Optic) |
| 1204-2B | Four (Fiber Optic) | x |

Q (from Josh Goh to Dave Sohn) Do you have a specifications document that explains the differences between the different types of 1PPS cards?

A Reply from Dave S (6 Mar 18) The 1204-04 is an ASCII Time Code I/O card that includes a physical connection for 1PPS input and output. The 1PPS output is a rising edge 200ms pulse with no offset.

The other cards are all 1PPS cards with individual 1PPS configurability. The difference between them is their signaling type.

1204-18 -> TTL level

1204-19 -> 10V level

1204-21 -> RS-485 level

1204-2B -> fiber-optic

Lvds/1PPS

- Refer also to “**LVDS (Low-voltage differential signaling) TIA/EIA-644**” in this document for basics on Lvds

Question from Nick Haddad’s customer

(Subject: “LVDS/1PPS clock”) Does our standard 10/100 NIC provide a LVDS output? If not, what do we need?

Reply from Keith (27 Aug 2020) Note the LVDS/1PPS output they are inquiring about is not available on any RJ45 port. These are network interfaces only and do not provide any 1PPS output capabilities.

I believe the 1204-21 card is the only one that can output 1PPS as an RS-485 differential signal. But I’m not even certain that RS-485 and LVDS is the same signaling (I believe they are different). I searched our website for Lvds and the only reference I see for it, is the 10MHz output on the TSync boards.

I suspect we don’t support LVDS/1PPS output. But I have copied in Apps Engineering to confirm either way.

1PPS output Option Card specifications

- Same as the base 1PPS output on the back of every chassis
- Refer to 1PPS output Section in: [..\SecureSync CustAssist.pdf](#)

Q. How close are the 1PPS on the module card relative to the main 1pps signal from the chassis?

A. Keith’s response: it’s specific to which 1PPS Option Card is installed (some will be more coincident

than others). But the spec which covers all PPS Option cards is the “Absolute Phase Error” spec in the Option Card data sheet- +/- 50ns (1 sigma).

Pulse width adjustment for 1PPS output cards

- refer to Salesforce Case 208383 regarding question/answer below

Q (Dave L to Apps team) Bill Dower at Raytheon phone us today asking about the 1204-19 Option card. Bill wanted to know about the **1204-19 pulse width adjustment range and is the 100nS to 900mS with 20nS** resolution was based on a FPGA being **quantized to a 50 MHz frequency reference?**

A Reply from Ron Dries (19 Sept 2019) The leading edge output is quantized to a 200MHz clock. The trailing edge for the pulse width is quantized to a 50MHz clock, which is why the pulse width is at 20ns resolution.

Desire for a 3.3v 1PPS output level

1. Neither the base 1PPS and or any of the available 1PPS output Option Cards can provide a 3.3v 1PPS output signal.
2. Recommend getting a fixed attenuator from Min-Circuits (<http://www.minicircuits.com/homepage/homepage.html>) to be used external to the SecureSync.

Q According to SecureSync Instruction Manual, the minimum output Signal level is 4.3V minimum.

I got 5.2V output when tested with the Oscilloscope, and I am wondering if this voltage is programmable to output around 3.3V?

A (from Keith 29 Feb 16) The SecureSync's 1PPS output is not adjustable in amplitude. There isn't an availability to provide a low voltage (3.3v) 1PPS signal directly from the SecureSync (via either the standard 1PPS connector on the chassis or via an installed Option Card providing a 1PPS output).

If a lower voltage signal is required, I recommend contacting Mini-circuits (<http://www.minicircuits.com/homepage/homepage.html>) to obtain a fixed attenuator to be applied external to the SecureSync itself to reduce the amplitude of the output signal as necessary for your particular application.

Option Cards providing external 1PPS input capability

- Option Card Models [1204-01](#), [1204-03](#), [1204-28](#) or [1204-2A](#) provide 1PPS input capability

| Model | 1PPS Inputs |
|---------|-----------------------------|
| 1204-01 | One (TTL) |
| 1204-03 | One (RS-485 Terminal Block) |
| 1204-18 | x |
| 1204-19 | x |
| 1204-21 | x |
| 1204-28 | One (TTL-BNC) |
| 1204-2A | One (Fiber Optic) |
| 1204-2B | x |

- 1PPS inputs can optionally be used as an input reference (1PPS 0”) for synchronization, or it can also be used to help verify/validate the phase error of other PPS input references (referred to as “**Smart Reference Monitoring**”)

- For more info, refer to “Smart Reference Monitoring” in the SecureSync tech note: [..\SecureSync-VersaSync CustAssist.pdf](#)

API calls associated with 1PPS inputs / 1PPS outputs

- Refer to Tim Tetreault’s “cheat sheet” at: [..\EQUIPMENT\SPECTRACOM EQUIPMENT\Timing boards\TSync family\TSync driver calls cheat sheet](#)
- These API calls are primarily for internal use, but the associated “get” calls are available via the CLI interface (“sets” are not available to either spadmin or user accounts)
- These are examples - additional calls may have since been added

| 1PPS IN Commands | 1PPS OUT Commands |
|------------------|-------------------|
| PR_GetEdge | PP_GetEdge |
| PR_GetNumInst | PP_GetFreq |
| PR_GetOffset | PP_GetNumInst |
| PR_GetRefId | PP_GetOffset |
| PR_GetValidity | PP_GetPulseWidth |
| PR_SetEdge | PP_GetSigCtrl |
| PR_SetOffset | PP_SetEdge |
| | PP_SetOffset |
| | PP_SetPulseWidth |
| | PP_SetSigCtr |

Troubleshooting 1PPS signal: Simple test using multimeter to check for the presence of 1PPS

- Email below was excerpted from salesforce Case 280505 (March 2022)
- Provides another way to troubleshoot 1PPS issue, in addition to swapping around cables
- No need for a service Monitor/OScope to look for the signal.

Email sent from Keith to a customer (2 March 2022)...I can also add a suggestion of a way to quickly check for the presence of the 1PPS signal on a cable or output of a device, using only a hand-held multimeter (no need for an oscilloscope, unless one is readily available).

In addition to swapping around cables, if there is access to an inexpensive hand-held multimeter, set the meter to read DC voltage, at a range above 5vdc (such as the 20vdc scale). With the red probe on the center conductor of a 1PPS output side of a cable, or directly on a device such as a SecureSync or an SAS-E, there should be a cyclic/predicable switching back and forth between 0vdc and 5vdc. With the meter I tried this test with, each second there was a burst of three DC voltage measurements, followed by a return to 0vdc.

The three voltages that I saw back-to-back in the cyclic patter were about 3, 5, 2 vdc. The exact DC voltages don't matter, but the DC should switch back and forth between 0 and 5vdc, if the 1PPS signal is present-at the connector being tested.

The pattern should be fairly similar at each point the 1PPS connection is tested.

- If the meter stays always at 0vdc, its highly likely there is no signal at all present at this connector (could be a bad/loose cable. Check another point closer to the 1PPS source, or directly on the output of the 1PPS source itself, to see if the signal is present.
- If the signal stays at constant 5vdc not returning to 0 vdc each second), this indicates its highly likely a “signal” is present, but there is an issue with the 1PPS output. It shouldn't remain a constant 5vdc.

- Or, if the max voltage reading is far less than about 5vdc (such as 3vdc for instance), its highly likely that there is too much signal loss in the 1PPS distribution (cables are too long or that particular distribution line is going to too many devices using the 1PPS signal)

Thought I would pass along this suggested simple check for a 1PPS signal, in addition to the suggestion of temporarily swapping cables to see if the observed symptoms follow the cable. Or, do they still stay exactly the same. Since an oscilloscope or service monitor aren't usually readily available, but a multimeter often is, I hope you find this info helpful

***(1204-18) 4-1PPS Output Option Card (TTL)

Function: Provides four separate 1PPS outputs

Inputs: None

Specifications

| | 1PPS Input | 1PPS Output |
|----------------------------|--|--|
| Quantity | 1 (1204-28) 1 (1204-2A) 0 (1204-18) 0 (1204-19) 0 (1204-21) 0 (1204-2B) | 3 (1204-28) 2 (1204-2A) 4 (1204-18) 4 (1204-19) 4 (1204-21) 4 (1204-2B) |
| Signal Type and Connector | TTL (BNC into 50 ohms) ST (Fiber Optic) | TTL or 10v (BNC into 50 ohms), or RS-485 (terminal block) ST (Fiber Optic) |
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable | |
| Fiber Operating Wavelength | 820/850 nm | |
| Fiber Minimum Sensitivity | -25 dBm @ 820 nm | — |
| Fiber Optical Power | — | -15 dBm average into 50/125 fiber |
| Programmable Phase Shift | — | \pm 5 ns to 500 ms with 5 ns resolution |
| Programmable Pulse Width | — | 20 ns to 900 ms with 20 ns resolution |
| Rise Time to 90% of Level | — | <10 ns (1204-18) <30 ns (1204-19) <30 ns (1294-21) |
| Absolute Phase Error | — | \pm 50 ns (1 σ) |

Outputs

(4) Outputs: Four 1PPS outputs at TTL levels (BNC Female 50 ohm)



- **Our PN for the four BNC jacks:** J047R-0040-061Q
- **Molex P/N:** 0731712360 (CONN, BNC, METAL BODY, TH, HORIZ, .272" CENTER):
Mating connector: BNC Male

Schematic: (refer to **1204-0100-F000**) <I:\New Released\PCB Documentation>

Output termination for all four ports: Was 5.6 ohms but is now 270 ohms (ECN 2947 changed outputs to 270 ohms. See "ECNs" below for more details).

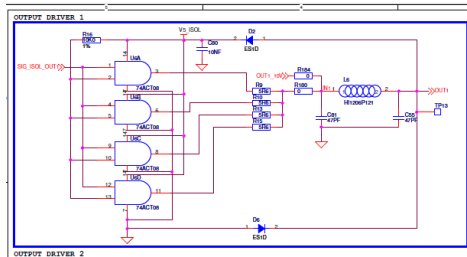
Note: outputs are TTL compatible (they are **not** LVTTTL compatible for 3.3v logic)

Rise-Time: *Per the Option Card datasheet*

Rise Time to 90% of Level
<10 ns (1204-18)

<30 ns (1204-19)
<30 ns (1294-21)

Drive capability (overshoot and undershoot)



➤ per Salesforce Case 236426

Q (per Salesforce Case 236426) I wanted to know what driver the GPS receiver, 1200-9022-0601 with option **1204-18**, is using? How much current can it source without damaging the GPS? We have seen a large over and under shoot at the termination of another COTs unit. The termination is 50 ohms.

A Reply from Mark McGregor (12 June 2020)

1204-18 output is 4 each 74ACT08 logic gates in parallel powered by 5V. Each gate can source 25mA.

1204-18 card outputs are intended to source 100mA. This is to be able drive ~5V into 50 ohms. Expect to be ~4.3V at 50 ohm load. This is because the logic gates output resistance is around 8 ohms so 5V power of the logic gate is applied to gate output resistance and 50 ohm load, about 58 ohms. 4.3V across 50 ohm load 0.7V lost in logic gate output resistance.

It will not be damaged even if output is shorted.

If more than 100mA is drawn the output voltage will be lower than it should be because the logic gate output voltage will drop if too much current is drawn because the tiny output driver transistors in logic gate will not be able to source current above 25mA each.

The circuit is shown by Keith below.

The reason it can overshoot and undershoot is because the logic gates have fast rise and fall times, which is desired. This output driver needs 50 ohm termination or else there will be a lot of ringing above and below the final value of the output voltage that can cause glitches in logic level. Also need to use 50 ohm coax cable.

The 50 ohm termination will stop ringing, but there still could be some overshoot and undershoot.

It should not be more than 0.5V if they really have 50 ohm termination at the destination. Customer needs to be more specific as to what is "large".

If there is large overshoot and undershoot, I suspect they do not have termination they think they do or they are not using 50 ohm coax cable. Termination must be internal to the COTS equipment or made with BNC "T" connector at input to COTS equipment, not at SecureSync 1204-18 BNC connector.

Pulse width adjustment for 1PPS output option cards

➤ refer to Salesforce Case 208383 regarding question/answer below

Q (Dave L to Apps team) Bill Dower at Raytheon phone us today asking about the 1204-19 Option card. Bill wanted to know about the **1204-19 pulse width adjustment range and is the 100nS to 900mS with 20nS resolution** was based on a FPGA being **quantized to a 50 MHz frequency reference**?

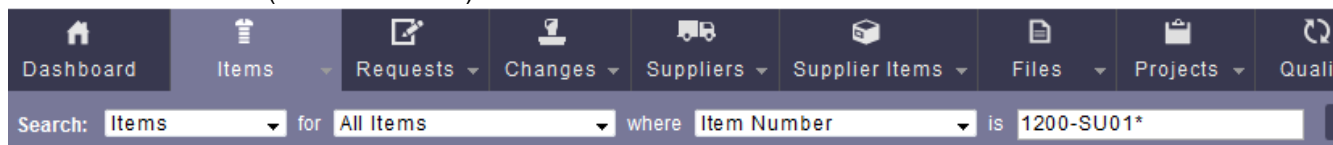
A Reply from Ron Dries (19 Sept 2019) The leading edge output is quantized to a 200MHz clock. The trailing edge for the pulse width is quantized to a 50MHz clock, which is why the pulse width is at 20ns resolution.

1204-18 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- 2204-18 card: rt_oc18_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------------|--|---|--------------------|
| | | 1.00 | Added support for this Option card (first release) | |
| | See note to the right | 1.02 (current rev as of at least v5.8.5) | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software version 5.2.1 | |

1204-18 Hardware changes

For Option Card hardware versions, refer to: (SP18, SP21, etc) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN/ ECO | Archive version | New Version | Change | approximate cut-in |
|----------|-----------------|-------------|---|--------------------|
| ECM 2947 | 4.5.0 | | Changes the four 1PPS output impedances from 5.6 ohms to 270 ohms. | (June 2012): |
| ECO 0117 | N/A | N/A | Update SecureSync option card 10, HQ Out, 4 BNC to change Q4, Q11, Q15, and Q19 10V output transistors from SOT23 to SOT223 package. Change soldering to no clean. PCB layout changes for DFM also | Sept 2014 |

FAQs

Q. Having a more precise look at the expansions modules, I was wondering whether the precision of the 1PPS outputs on a 1204-18 would be as good as the main PPS output (which is 50ns relative to UTC). Is the pulse shape going to be similar as well?

A. Performance of the 1204-18 1PPS outputs is the same as the 1PPS on the main board.

A) Newer web browser (versions 5.1.2 and above)
INTERFACES -> OPTION CARDS page

The top screenshot shows the 'PPS OUT, 4-BNC' interface with four output channels. Each channel has a 'Status' button and a 'Setup' button. A red arrow points from the 'Setup' button of PPS Output 4 to the 'PPS Output 1' configuration window below.

The 'PPS Output 1' configuration window includes the following fields:

- Signature Control:** A dropdown menu currently set to 'Output Always Enabled'.
- Offset:** A text input field containing '0' with a unit selector set to 'ns'.
- Edge:** A dropdown menu currently set to 'Rising'.
- Pulse Width:** A text input field containing '200000000' with a unit selector set to 'ns'.

Annotations on the right side of the configuration window:

- Signature Control:** A label pointing to the Signature Control dropdown.
- Offset:** A label pointing to the Offset input field.
- Edge:** A label pointing to the Edge dropdown.
- Pulse Width:** A text box containing the explanation: 'Select if the output signal is a positive (reference on the rising edge) or a negative (reference on the falling edge) pulse.'
- Configures the Pulse Width of the 1PPS output. The Pulse Width is entered and displayed in nanoseconds (ns). The default Pulse Width is 200** (This text is part of the Pulse Width annotation).

At the bottom of the configuration window, there is a 'Status' button and a 'Submit' button.

B) Classic interface browser (versions 5.0.2 and below)

Setup/Inputs

This card does not have inputs

Setup/Outputs

| OUTPUTS SETUP - 4 1PPS (SLOT2) | | | | |
|--------------------------------|----------------------|----------------------|----------------------|----------------------|
| Output Index | 1 | 2 | 3 | 4 |
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Offset (ns) | 0 | 0 | 0 | 0 |
| Edge | Rising | Rising | Rising | Rising |
| Pulse Width (ns) | 200000000 | 200000000 | 200000000 | 200000000 |
| <div>Submit Reset</div> | | | | |

Signature Control: Signature Control is used to control when the 1PPS output signal will be present. This function allows the modulation to stop in certain situations.

No Signature Control: 1PPS output is present, even when SecureSync is not synchronized to its references.

Sync State Signature Control: 1PPS output is present unless the SecureSync is not synchronized to its references (modulation is present while in the Holdover mode).

Ref State Signature Control: 1PPS output is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).

Output disabled: No 1PPS output is present, even if any SecureSync input references are present and considered qualified.

Offset: Used to account for 1PPS cable delays or other latencies in the 1PPS output. Available Offset range is -500 to +500ms in 5ns steps.

Edge: The operator can select if the output signal is a positive (reference on the rising edge) or a negative (reference on the falling edge) pulse.

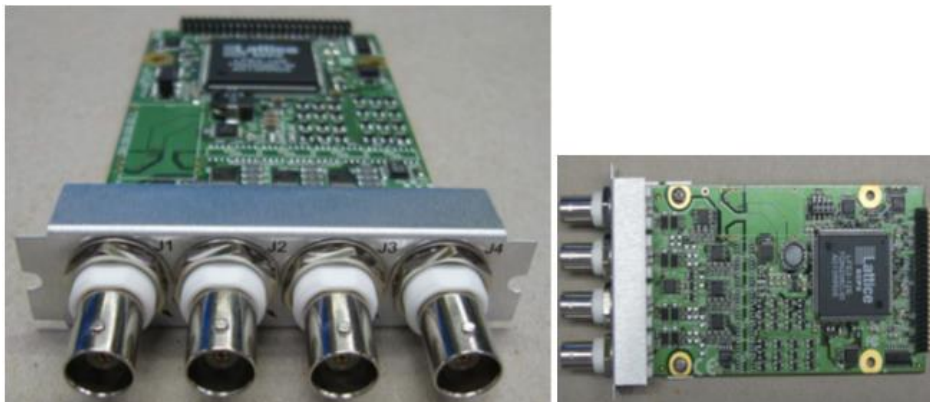
Pulse Width: Configures the Pulse Width of the 1PPS output. The Pulse Width is entered and displayed in nanoseconds (the default Pulse Width is 200 milliseconds).

Status/Inputs (This card has no inputs)

Status/Outputs

| OUTPUTS STATUS - 4 1PPS (SLOT2) | | | | |
|---------------------------------|----------------------|----------------------|----------------------|----------------------|
| Output Index | 1 | 2 | 3 | 4 |
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Offset (ns) | 0 | 0 | 0 | 0 |
| Frequency (Hz) | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Edge | Rising | Rising | Rising | Rising |
| Pulse Width (ns) | 200000000 | 200000000 | 200000000 | 200000000 |

***(1204-19) 4-1PPS 10V Output, BNC connectors



Schematic: (refer to 1204-0100-F000) [I:\New Released\PCB Documentation](#)

For software assembly versions, refer to: (1204-SHxx, SP1xx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

For Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

Inputs: None

Specifications

| | 1PPS Input | 1PPS Output |
|----------------------------|--|--|
| Quantity | 1 (1204-28) 1 (1204-2A) 0 (1204-18) 0 (1204-19) 0 (1204-21) 0 (1204-2B) | 3 (1204-28) 2 (1204-2A) 4 (1204-18) 4 (1204-19) 4 (1204-21) 4 (1204-2B) |
| Signal Type and Connector | TTL (BNC into 50 ohms) ST (Fiber Optic) | TTL or 10v (BNC into 50 ohms), or RS-485 (terminal block) ST (Fiber Optic) |
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable | |
| Fiber Operating Wavelength | 820/850 nm | |
| Fiber Minimum Sensitivity | -25 dBm @ 820 nm | — |
| Fiber Optical Power | — | -15 dBm average into 50/125 fiber |
| Programmable Phase Shift | — | \pm 5ns to 500 ms with 5ns resolution |
| Programmable Pulse Width | — | 20 ns to 900 ms with 20 ns resolution |
| Rise Time to 90% of Level | — | <10 ns (1204-18) <30 ns (1204-19) <30 ns (1294-21) |
| Absolute Phase Error | — | \pm 50 ns (1 σ) |

Maximum Number of Cards: 6

(4) Outputs: Four 1PPS outputs at **TTL levels**

Note: outputs are TTL compatible (they are **not** LVTTTL compatible for 3.3v logic)

Output termination for all four ports: Was 5.6 ohms but is now 270 ohms (ECN 2947 changed outputs to 270 ohms. See "ECNs" below for more details).

Rise-Time: *Per the Option Card datasheet*

Rise Time to 90% of Level

<10 ns (1204-18)

<30 ns (1204-19)

<30 ns (1294-21)

Pulse width adjustment for 1PPS output option cards

➤ refer to Salesforce Case 208383 regarding question/answer below

Q (Dave L to Apps team) Bill Dower at Raytheon phone us today asking about the 1204-19 Option card. Bill wanted to know about the **1204-19 pulse width adjustment range and is the 100nS to 900mS with 20nS** resolution was based on a FPGA being **quantized to a 50 MHz frequency reference?**

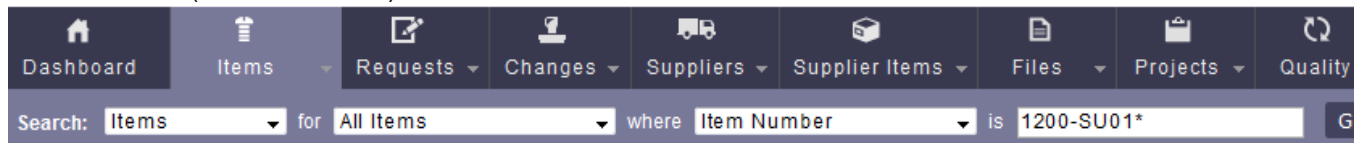
A Reply from Ron Dries (19 Sept 2019) The leading edge output is quantized to a 200MHz clock. The trailing edge for the pulse width is quantized to a 50MHz clock, which is why the pulse width is at 20ns resolution.

1204-19 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



The screenshot shows the Arena software interface with a search bar. The search criteria are: Search: Items for All Items where Item Number is 1200-SU01*. The interface includes a top navigation bar with icons for Dashboard, Items, Requests, Changes, Suppliers, Supplier Items, Files, Projects, and Quality.

FPGA (firmware) for the 1204-19 card: rt_oc19_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------------|---|---|--------------------|
| | | 1.00 | Added support for this Option card (first release) | |
| | | 1.01 | | |
| | See note to the right | 1.02 (latest rev in at least version 5.8.5) | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software version 5.2.1 | |

1204-19 Hardware versions

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN/ECO | Archive version | New Version | Change | approximate cut-in |
|-----------------|-----------------|-------------|---|--------------------|
| ECN 2947 | | | Changes the 1PPS output impedances from 5.6 ohms to 270 ohms. | June 2012 |
| ECO 0117 | N/A | N/A | Update SecureSync option card 10, HQ Out, 4 BNC to change Q4, Q11, Q15, and Q19 10V output transistors from SOT23 to SOT223 package. Change soldering to no clean. PCB layout changes for DFM also | Sept 2014 |

10V 1PPS supports applications where customers need to provide 1PPS signals conforming to the same specifications that cover our Havequick signals (STANAG 4246, 4372, 4430, ICD-GPS-060). This card is supported by a different population of the already released (4) 1PPS TTL output option card. It uses the same FPGA load as that card. The currently released SW already includes support for this card. Improve rise times on 1PPS TTL outputs by removing EMI filter to replicate circuit on main board.

1204-19 Inputs: None

1204-19 Outputs:

- Four 1PPS outputs

- 10v-peak into 50 ohms (Per Ron D: “**The output tolerance is 9.5V +/- 0.5V** (into a 50 ohm load)”)

Specifications

| | 1PPS Input | 1PPS Output |
|----------------------------|--|--|
| Quantity | 1 (1204-28) 1 (1204-2A) 0 (1204-18) 0 (1204-19) 0 (1204-21) 0 (1204-2B) | 3 (1204-28) 2 (1204-2A) 4 (1204-18) 4 (1204-19) 4 (1204-21) 4 (1204-2B) |
| Signal Type and Connector | TTL (BNC into 50 ohms) ST (Fiber Optic) | TTL or 10v (BNC into 50 ohms), or RS-485 (terminal block) ST (Fiber Optic) |
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable | |
| Fiber Operating Wavelength | 820/850 nm | |
| Fiber Minimum Sensitivity | -25 dBm @ 820 nm | — |
| Fiber Optical Power | — | -15 dBm average into 50/125 fiber |
| Programmable Phase Shift | — | \pm 5 ns to 500 ms with 5ns resolution |
| Programmable Pulse Width | — | 20 ns to 900 ms with 20 ns resolution |
| Rise Time to 90% of Level | — | <10 ns (1204-18) <30 ns (1204-19) <30 ns (1294-21) |
| Absolute Phase Error | — | \pm 50 ns (1 σ) |

Maximum Number of Cards: 6

Output termination: Was 5.6 ohms but is now 270 ohms (ECN 2947 changed outputs to 270 ohms. See “ECNs” below for more details).

Q. Is it correct to understand that the Low level means DC0V? **Yes, this is correct. Low Level is DC 0V +/- 0.25V**

1PPS Signal rise-time

Rise-Time: *Per the Option Card datasheet*

Rise Time to 90% of Level

<10 ns (1204-18)

<30 ns (1204-19)

<30 ns (1294-21)

Q Is it correct to understand that the signal raising time is within 30ns?

A per Ron D: Yes, this is correct. The rise time of the 1PPS pulse is confirmed to be within 30ns.

Pulse Width

Can we understand that the pulse width of the 1PPS signal to output can be adjusted in 20ns steps in the range of 20ns - 900ms? **Close. The pulse width of the 1PPS signal can be adjusted in 20ns steps in the range of 100ns – 900ms.**

Pulse width adjustment for 1PPS output option cards

- refer to Salesforce Case 208383 regarding question/answer below

Q (Dave L to Apps team) Bill Dower at Raytheon phone us today asking about the 1204-19 Option card. Bill wanted to know about the **1204-19 pulse width adjustment range and is the 100nS to 900mS with 20nS** resolution was based on a FPGA being **quantized to a 50 MHz frequency reference?**

A Reply from Ron Dries (19 Sept 2019) The leading edge output is quantized to a 200MHz clock. The trailing edge for the pulse width is quantized to a 50MHz clock, which is why the pulse width is at 20ns resolution.

Pulse delay

Can we understand that the raising start time of the 1PPS signal to output can be adjusted in 5ns steps in the range of +/-5ns - 500ms, based on the 1PPS signal (true value)? The phase, where the 1PPS starts, can be adjusted from +/-5ns to 500 ms in 5ns steps.

Would you please send us a screenshot showing how the setting of 5. above is made? The phase, where the 1PPS starts, is adjusted using the "Offset" field for each individual output, as shown in the screenshot below (from the **Interfaces -> 1PPS Output** page of the web browser):



Troubleshooting 1PPS output issues/known issues with 1204-19

1. Outputs are 12v levels on a scope, instead of 10v

- Scope channel is highly likely configured as high impedance input instead of 50 ohm impedance
- Refer to Salesforce case 201808 (excerpt below)

Q ...We were testing out the 10v 1PPS card (1204-19) and noticed with our Oscilloscope that the 10v card is putting out 12v instead. Our requirement is 10v (+1/-2v), therefore 12v output will not suffice. Is there another setting I'm missing through the web browser to adjust the output voltage of that card? We checked all four outputs (5-8) of that 10v card and they all read the same. See attached readings from our oscillator; readings were 12v at 20u pulse width. Let me know your thoughts.

A **Reply from Keith (2 Jul 2019)** To begin, the output levels of the 1204-19 Option Card aren't adjustable. But each output is 10Vpeak, when terminated into 50 ohms. From the pictures, it appears your scope channel is configured for high input impedance (instead of 50 ohm termination). This will inherently affect the output level being observed.

The output tolerance for each output is: 9.5V +/- 0.5V (into a 50 ohm load)"

Each output is designed to drive 50 ohm loads. If the device the output is connected to has a high input impedance (instead of a 50 ohm input), a 50 ohm load should also be placed at the device's end of the distribution cable (via a BNC "T" connector, with the load being attached to the open end of the T connector). This 50 ohm load will then properly terminate the signal.

Other devices having high input impedance allows the output signal to be connected to more than one device. Devices having a 50 ohm input impedance need to be limited to just one device per 1204-19 output, to prevent loading the signal down below 10v levels (the lower the impedance value, the lower the signal will become). High impedance provides little load to the output, which causes that output to have a higher output level than the specified value.

Note that only the outputs being used need to be terminated into 50 ohms. But the output connectors not in use (no cable attached) are a good place to "store" any additional terminators, in case it's ever desired to start using another available output in the future.

Please let me know the scope shows 10v output levels, when the scope termination is changed to 50 ohm load.

2. Outputs are 5v level, instead of 10v into 50 ohms

The PCB is modified from a 5v 1PPS Option Card, with some parts added and other removed. All of these components are mounted on the component side and the side closest to the BNC connectors. Have customer send a close-up of this side of the board to verify proper parts have been added/removed to make it a Model 1204-19 Option Card. Refer to the PD for the 1204-19 board for more info.

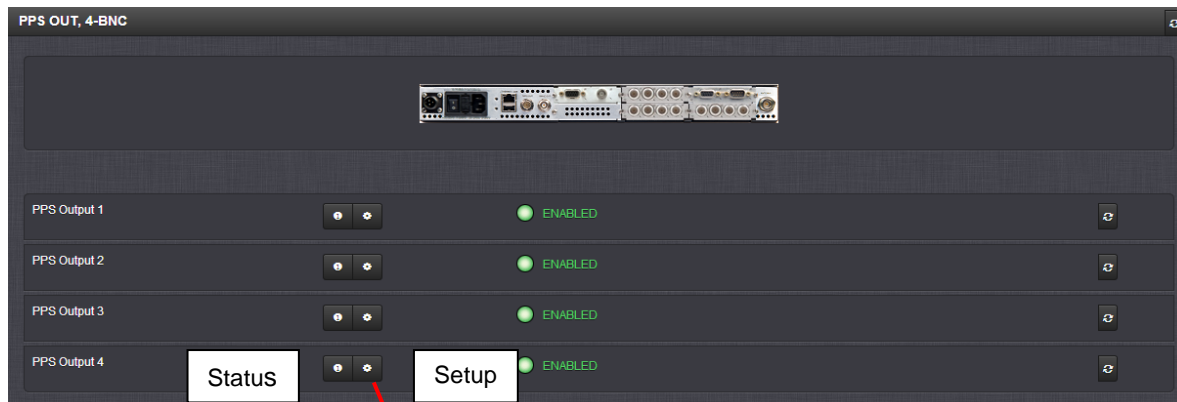
Known issues with 1204-19

ECO 117: Hardware issue with the Model 1204-19 (Sept 2014)

- ECO 117 is re-spinning the PCB to fix an issue with the amount of source current for the 10Vdc of the 1PPS outputs. If the pulse width is too long or if the port is disabled, it can easily burn up transistors.

A) Newer web browser (versions 5.1.2 and above)

INTERFACES -> OPTION CARDS page



PPS Output 1

Signature Control: Output Always Enabled

Offset: 0 ns

Edge: Rising

Pulse Width: 200000000 ns

Status Submit

Offset

Rising/Falling” Select if the output pulse is a positive (reference on the **Rising** edge) or a negative (reference on the **Falling** edge) pulse.

Configures the Pulse Width of the 1PPS output. The Pulse Width is entered and displayed in nanoseconds (ns). The default Pulse Width is 200 milliseconds

Status screen

PPS Output 0

| | |
|-------------------|-----------------------|
| Signature Control | Output Always Enabled |
| Frequency | 1 Hz |
| Offset | 0 ns |
| Edge | Rising |
| Pulse Width | 200 ms |

Edit

Signature Control

B) Classic interface web browser (versions 5.0.2 and below)

Setup/Inputs (NA)

Setup/Outputs

| OUTPUTS SETUP - 4 1PPS (SLOT2) | | | | |
|--------------------------------|----------------------|----------------------|----------------------|----------------------|
| Output Index | 1 | 2 | 3 | 4 |
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Offset (ns) | 0 | 0 | 0 | 0 |
| Edge | Rising | Rising | Rising | Rising |
| Pulse Width (ns) | 200000000 | 200000000 | 200000000 | 200000000 |

Signature Control: Signature Control is used to control when the 1PPS output signal will be present. This function allows the modulation to stop in certain situations.

No Signature Control: 1PPS output is present, even when SecureSync is not synchronized to its references.

Sync State Signature Control: 1PPS output is present unless the SecureSync is not synchronized to its references (modulation is present while in the Holdover mode).

Ref State Signature Control: 1PPS output is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).

Output disabled: No 1PPS output is present, even if any SecureSync input references are present and considered qualified.

Offset: Used to account for 1PPS cable delays or other latencies in the 1PPS output. Available Offset range is -500 to +500ms in 5ns steps.

Edge: The operator can select if the output signal is a positive (reference on the rising edge) or a negative (reference on the falling edge) pulse.

Pulse Width: Configures the Pulse Width of the 1PPS output. The Pulse Width is entered and displayed in nanoseconds (the default Pulse Width is 200 milliseconds).

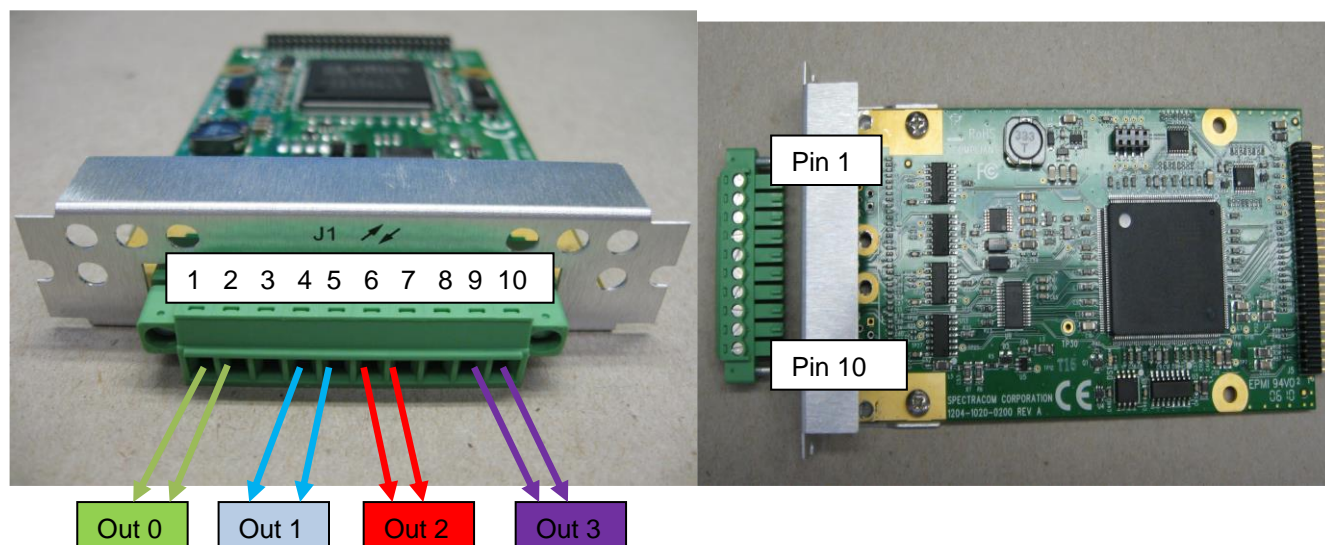
Status/Inputs

This card does not have inputs

Status/Outputs

| OUTPUTS STATUS - 4 1PPS (SLOT2) | | | | |
|---------------------------------|----------------------|----------------------|----------------------|----------------------|
| Output Index | 1 | 2 | 3 | 4 |
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Offset (ns) | 0 | 0 | 0 | 0 |
| Frequency (Hz) | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Edge | Rising | Rising | Rising | Rising |
| Pulse Width (ns) | 200000000 | 200000000 | 200000000 | 200000000 |

***(1204-21) 4-1PPS OUT (RS-485/RS-422) terminal block Option Card



| Pin. No. | Function |
|----------|-----------------|
| 1 | 1PPS Output 0 + |
| 2 | 1PPS Output 0 - |
| 3 | GND |
| 4 | 1PPS Output 1 + |
| 5 | 1PPS Output 1 - |
| 6 | 1PPS Output 2 + |
| 7 | 1PPS Output 2 - |
| 8 | GND |
| 9 | 1PPS Output 3 + |
| 10 | 1PPS Output 3 - |

Schematic: (refer to 1204-0020-F000) <I:\Engineering\Archive\New Released\PCB Documentation>

For software assembly versions, refer to: (1204-SHxx, SP1xx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

10 Pin Terminal block connector for 1204-21 card



Our P/N: J900R-0101-022J (in Arena) https://app.bom.com/items/detail-spec?item_id=1202843926&version_id=10303495198

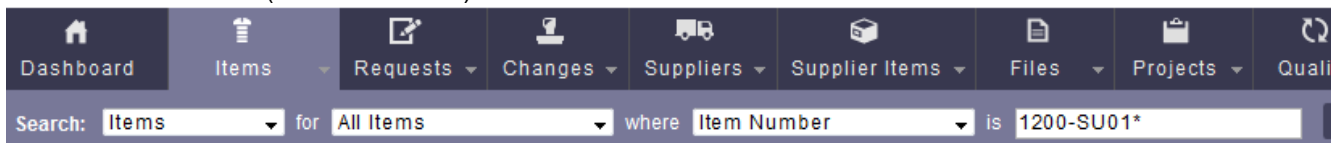
Manufacturer and MFG P/N: Phoenix Contact 1827787 Refer to: <https://www.phoenixcontact.com/online/portal/us/?uri=pxc-oc-itemdetail:pid=1827787&library=usen&pcck=P-11-02-11&tab=1&selectedCategory=ALL>

1204-21 Firmware versions

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- FPGA (firmware) for the 1204-21 card: rt_oc21_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------------|---|---|--------------------|
| | 4.8.2 | 1.00 | Added support for this Option card (first release) | |
| | See note to the right | 1.01 (still the latest rev in at least version 5.8.5) | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software version 5.2.1 | |

Note: Software support for the Model 1204-21 started in Archive version 4.8.2.

1204-21 hardware changes

For Option Card hardware versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|------------------------|--------------------|
| | 4.8.2 | 1.00 | Added support for this | |

| | | | | |
|--|--|--|-----------------------------|--|
| | | | Option card (first release) | |
|--|--|--|-----------------------------|--|

The RS-485 output is no larger than 3.3vdc on a terminal block connector, into 120 ohms. Can be used in either single-ended or differential mode.

1PPS Outputs

Specifications

| | 1PPS Input | 1PPS Output |
|----------------------------|--|--|
| Quantity | 1 (1204-28) 1 (1204-2A) 0 (1204-18) 0 (1204-19) 0 (1204-21) 0 (1204-2B) | 3 (1204-28) 2 (1204-2A) 4 (1204-18) 4 (1204-19) 4 (1204-21) 4 (1204-2B) |
| Signal Type and Connector | TTL (BNC into 50 ohms) ST (Fiber Optic) | TTL or 10v (BNC into 50 ohms), or RS-485 (terminal block) ST (Fiber Optic) |
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable | |
| Fiber Operating Wavelength | 820/850 nm | |
| Fiber Minimum Sensitivity | -25 dBm @ 820 nm | — |
| Fiber Optical Power | — | -15 dBm average into 50/125 fiber |
| Programmable Phase Shift | — | \pm 5 ns to 500 ms with 5 ns resolution |
| Programmable Pulse Width | — | 20 ns to 900 ms with 20 ns resolution |
| Rise Time to 90% of Level | — | <10 ns (1204-18) <30 ns (1204-19) <30 ns (1294-21) |
| Absolute Phase Error | — | \pm 50 ns (1 σ) |

Maximum Number of Cards: 6

RS-485/RS-422 compatible (we use Maxim Max3076E drivers which are RS-485/RS-422 compatible)
Common mode voltage is less than 3vdc

Can be used in either single-ended or differential mode.

Pulse width adjustment for 1PPS output option cards

- refer to Salesforce Case 208383 regarding question/answer below

Q (Dave L to Apps team) Bill Dower at Raytheon phone us today asking about the 1204-19 Option card. Bill wanted to know about the **1204-19 pulse width adjustment range and is the 100nS to 900mS with 20nS** resolution was based on a FPGA being **quantized to a 50 MHz frequency reference?**

A Reply from Ron Dries (19 Sept 2019) The leading edge output is quantized to a 200MHz clock. The trailing edge for the pulse width is quantized to a 50MHz clock, which is why the pulse width is at 20ns resolution.

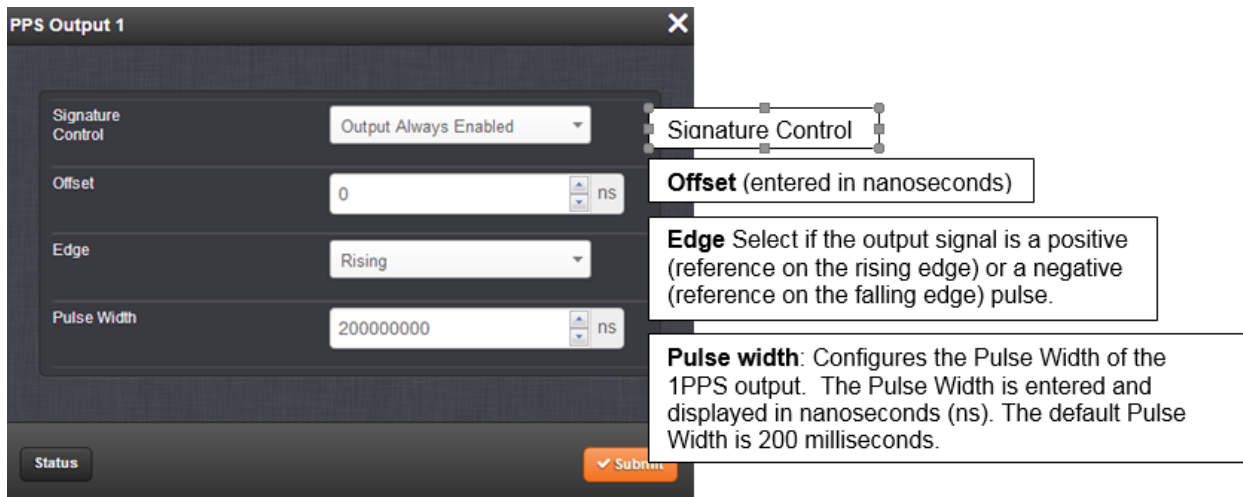
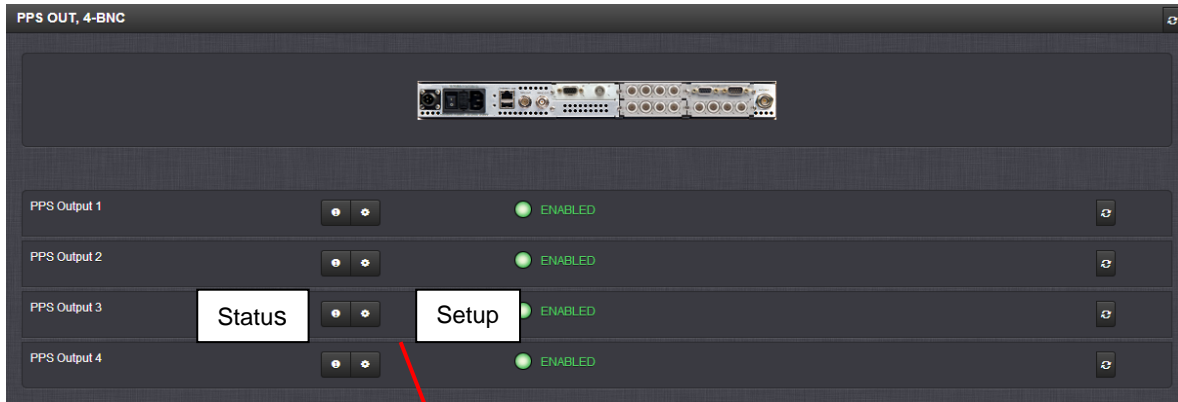
1PPS Signal rise-time

Rise-Time: Per the Option Card datasheet

Rise Time to 90% of Level

<10 ns (1204-18)
<30 ns (1204-19)
<30 ns (1294-21)

A) Newer web browser (versions 5.1.2 and above)
INTERFACES -> OPTION CARDS page

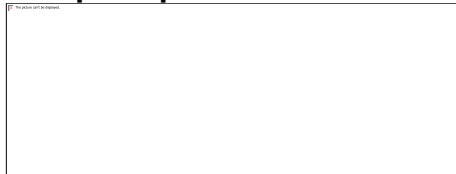


B) Classic interface browser (versions 5.0.2 and below)

Setup/Inputs

This card does not have inputs

Setup/Outputs



Signature Control: Signature Control is used to control when the 1PPS output signal will be present. This function allows the modulation to stop in certain situations.

No Signature Control: 1PPS output is present, even when SecureSync is not synchronized to its references.

Sync State Signature Control: 1PPS output is present unless the SecureSync is not synchronized to its references (modulation is present while in the Holdover mode).

Ref State Signature Control: 1PPS output is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).

Output disabled: No 1PPS output is present, even if any SecureSync input references are present and considered qualified.

Offset: Used to account for 1PPS cable delays or other latencies in the 1PPS output. Available Offset range is -500 to +500ms in 5ns steps.

Edge: The operator can select if the output signal is a positive (reference on the rising edge) or a negative (reference on the falling edge) pulse.

Pulse Width: Configures the Pulse Width of the 1PPS output. The Pulse Width is entered and displayed in nanoseconds (the default Pulse Width is 200 milliseconds).

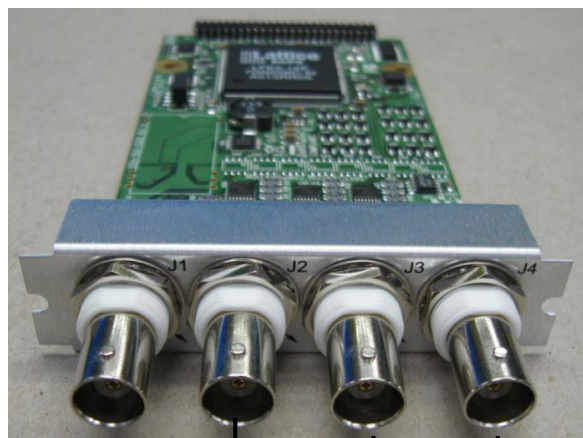
Status/Inputs

This card does not have inputs

Status/Outputs

| OUTPUTS STATUS - 4 1PPS (SLOT2) | | | | |
|---------------------------------|----------------------|----------------------|----------------------|----------------------|
| Output Index | 1 | 2 | 3 | 4 |
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Offset (ns) | 0 | 0 | 0 | 0 |
| Frequency (Hz) | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Edge | Rising | Rising | Rising | Rising |
| Pulse Width (ns) | 200000000 | 200000000 | 200000000 | 200000000 |

*****(1204-28) (1) 1PPS Input/(3) IPPS Outputs TTL levels 4-BNC Option Card**



↑
J1 (1PPS
input)

↓ J2 ↓ J3 ↓ J4 (1PPS outputs)

Links/Shortcuts

1204-28 in online SecureSync user guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/PPS_InOut.htm

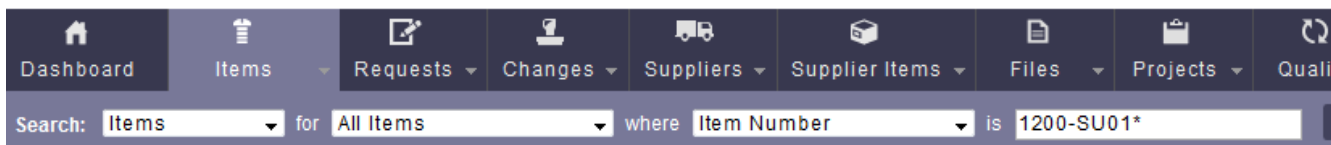
Schematic: (refer to 1204-0050-F000) [I:\New Released\PCB Documentation](#)

1204-28 Firmware versions

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the 1204-28 card: rt_oc28_hw01_fpga.bin

| ECN/ECO | Archive version | FPGA version reported | Change | approximate cut-in |
|-----------------|-----------------------|--|---|--------------------|
| | 4.8.2 | 1.00 | Added support for this Option card (first release) | |
| | See note to the right | 1.01 (current rev as of at least v5.8.5) | Note: Not sure at what version 1.01 was cut-in at, but it's in at least software version 5.2.1 through 5.8.5 | |
| ECO-2674 | 5.9.0 | 1.0.2 | 1204-28 to version 1.02. Upgraded option card for improved system reliability | Jan 2021 |

Note: Software support for the Model 1204-28 started in Archive version 4.8.2.

1204-28 Hardware versions

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN ECO | Archive version | New Version | Change | approximate cut-in |
|-------------|--------------------|----------------|---|-----------------------|
| 3099 | 4.8.8 | | Added control for the third 1PPS output Earlier software versions did not display configuration selections for all three separate 1PPS outputs that are available from this Option Card. Instead, it displayed only two (The 3rd 1PPS output was still present, but it was not configurable). | Dec 2012 |
| 2947 | | | Changes 1PPS input impedance from 50 ohms to high impedance. | (June 2012): |
| ECO 0117 | N/A | N/A | Update SecureSync option card 10, HQ Out, 4 BNC to change Q4, Q11, Q15, and Q19 10V output transistors from SOT23 to SOT223 package. Change soldering to no clean. PCB layout changes for DFM also | Sept 2014 |

Inputs

(1) 1PPS input

TTL levels

1PPS Input connector (1): J1

Input termination: Was 50 ohms (ECN 2947 changes this to high impedance. See “ECNs” below)

Outputs

(3) 1PPS outputs

TTL levels

Note: 1204-17's outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)

Specifications

| | 1PPS Input | 1PPS Output |
|----------------------------|--|--|
| Quantity | 1 (1204-28) 1 (1204-2A) 0 (1204-18) 0 (1204-19) 0 (1204-21) 0 (1204-2B) | 3 (1204-28) 2 (1204-2A) 4 (1204-18) 4 (1204-19) 4 (1204-21) 4 (1204-2B) |
| Signal Type and Connector | TTL (BNC into 50 ohms) ST (Fiber Optic) | TTL or 10v (BNC into 50 ohms), or RS-485 (terminal block) ST (Fiber Optic) |
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable | |
| Fiber Operating Wavelength | 820/850 nm | |
| Fiber Minimum Sensitivity | -25 dBm @ 820 nm | — |
| Fiber Optical Power | — | -15 dBm average into 50/125 fiber |
| Programmable Phase Shift | — | \pm 5ns to 500 ms with 5ns resolution |
| Programmable Pulse Width | — | 20 ns to 900 ms with 20 ns resolution |
| Rise Time to 90% of Level | — | <10 ns (1204-18) <30 ns (1204-19) <30 ns (1294-21) |
| Absolute Phase Error | — | \pm 50 ns (1 σ) |

Maximum Number of Cards: 2

Output connectors (3): J2, J3 and J4

Output termination: 50 ohms

Pulse width adjustment for 1PPS output option cards

- refer to Salesforce Case 208383 regarding question/answer below

Q (Dave L to Apps team) Bill Dower at Raytheon phone us today asking about the 1204-19 Option card. Bill wanted to know about the **1204-19 pulse width adjustment range and is the 100nS to 900mS with 20nS** resolution was based on a FPGA being **quantized to a 50 MHz frequency reference?**

A Reply from Ron Dries (19 Sept 2019) The leading edge output is quantized to a 200MHz clock. The trailing edge for the pulse width is quantized to a 50MHz clock, which is why the pulse width is at 20ns resolution.

1PPS Signal rise-time

Rise-Time: *Per the Option Card datasheet*

Rise Time to 90% of Level

<10 ns (1204-18)

<30 ns (1204-19)

<30 ns (1294-21)

Firmware version info

FAQ's if Model 1204-28 Option Card is not working:

Loopback one of the output connectors back into the input connector. See if 1PPS input becomes valid.

Limitation on the number of 1PPS output Option Cards that can be installed in a SecureSync

- ✓ As of at least 23 Jan 2013 with version 4.8.8 software installed, only TWO 1PPS output option cards can be installed in a SecureSync

Email from Dave Lorah to Andy Roalstad (23 Jan 2013)

It turns out the root cause is a problem in the firmware which will not allow three 1PPS boards to be installed at the same time. You can install up to two 1PPS boards but if three or more are installed it has problems.

This will be addressed in the next scheduled firmware release. However it will not be ready until approximately March 2013, so at this point we can reinstall all the option cards except one of the 1PPS cards and return the unit to you, so you can continue your testing. When the firmware is released we will let you know and the unit can be updated easily in the field.

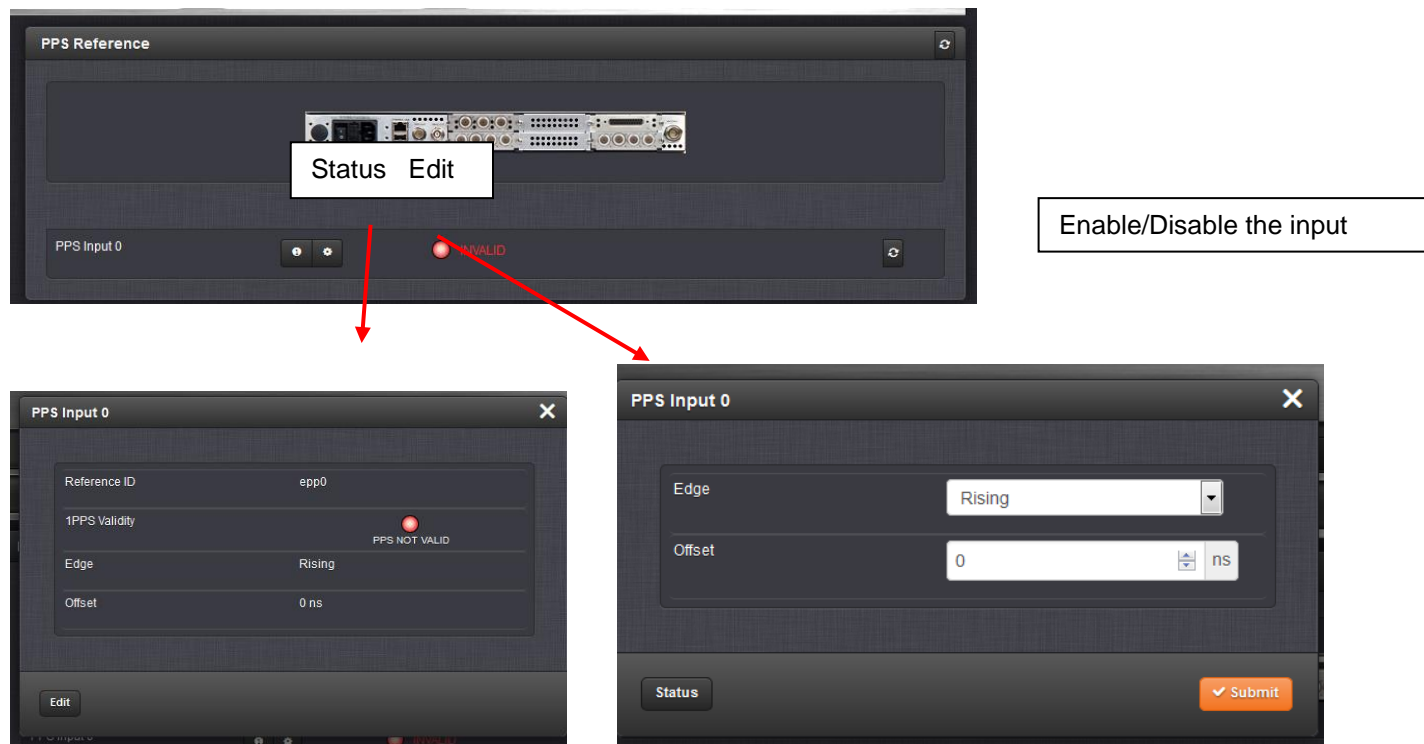
Temporary work-around to two-Option Card limit

Email Dave Lorah sent to Andy Roalstad: I tested the 1204-17 board and it does work with two 1204-18 1PPS cards installed.

Configuration

A) Newer web browser (versions 5.1.2 and above)

Interfaces -> PPS Input 0



B) Classic interface browser

Setup/Inputs

Offset: It is possible to add an offset to the input signal (to account for cable delays), with a resolution of 20ns and a positive or negative value of +/- 500ms maximum.

Edge: The operator can select either the rising or the falling edge as the input time reference (defines the on-time point of the signal).

Setup/Outputs

Signature Control: Signature Control is used to control when the 1PPS output signal will be present. This function allows the modulation to stop in certain situations.

No Signature Control: 1PPS output is present, even when SecureSync is not synchronized to its references.

Sync State Signature Control: 1PPS output is present unless the SecureSync is not synchronized to its references (modulation is present while in the Holdover mode).

Ref State Signature Control: 1PPS output is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).

Output disabled: No 1PPS output is present, even if any SecureSync input references are present and considered qualified.

Offset: Used to account for 1PPS cable delays or other latencies in the 1PPS output. Available Offset range is -500 to +500ms in 5ns steps.

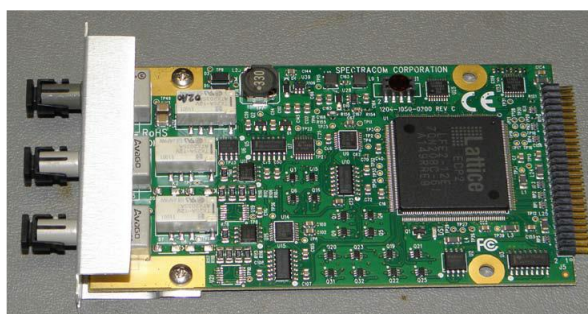
Edge: The operator can select if the output signal is a positive (reference on the rising edge) or a negative (reference on the falling edge) pulse.

Pulse Width: Configures the Pulse Width of the 1PPS output. The Pulse Width is entered and displayed in nanoseconds (the default Pulse Width is 200 milliseconds).

Status/Inputs

Status/Outputs

***1204-2A) Fiber Optic (1) 1PPS in (2) 1PPS out Option Card



Shortcuts/links

1204-2A in online SecureSync user guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/PPS_InOut.htm

Schematic: (refer to 1204-0050-F000) [I:\New Released\PCB Documentation](#)

1204-2A Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



- **FPGA (firmware) for the 1204-2A card (in ascending order):** `rt_oc2a_hw01_fpga.bin`

Note: Software support for the Model 1204-2A started in Archive version 4.8.7.

| ECN/ECO | Archive version | FPGA version reported | Change | approximate cut-in |
|-----------------|-----------------|-----------------------|---|--------------------|
| | 4.8.7 | 1.00 | Added support for this Option card (first release) | |
| | | 1.01 | Note: Not sure at what version 1.01 was cut-in at, but it's in at least software versions 5.2.1, 5.3.0 and 5.3.1, through at least 5.8.5 | |
| | ? | 1.02? | ? | |
| ECO-2674 | 5.9.0 | 1.03 | 1204-2A to version 1.03. Upgraded option card for improved system reliability: | Jan 2021 |

1204-2A hardware changes

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.8.7 | 1.00 | Added support for this Option card (first release) | |
| | | | | |
| | | | | |

Inputs

(1) 1PPS in
1PPS Input connector (1): J3
Optical Connector: ST

Outputs

(2) 1PPS out
1PPS Output connectors (2): J1 and J2
Optical Connector: ST

Fiber information

| | | |
|-----------------------------------|---|---|
| Signal Type and Connector | TTL (BNC into 50 ohms) ST (Fiber Optic) | TTL or 10v (BNC into 50 ohms), or RS-485 (terminal block) ST (Fiber Optic) |
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable | |
| Fiber Operating Wavelength | 820/850 nm | |
| Fiber Minimum Sensitivity | -25 dBm @ 820 nm | — |
| Fiber Optical Power | — | -15 dBm average into 50/125 fiber |

FAQ's if Model 1204-2A Option Card is not working:

Loopback one of the output connectors back into the input connector. See if 1PPS input becomes valid.

Setup/Inputs

Offset: It is possible to add an offset to the input signal (to account for cable delays), with a resolution of 20ns and a positive or negative value of 500ms maximum. Available Offset range is -500 to +500ms in 5ns steps.

Edge: The operator can select either the rising or the falling edge as the input time reference (defines the on-time point of the signal).

Setup/Outputs

Signature Control: Signature Control is used to control when the 1PPS output signal will be present. This function allows the modulation to stop in certain situations.

No Signature Control: 1PPS output is present, even when SecureSync is not synchronized to its references.

Sync State Signature Control: 1PPS output is present unless the SecureSync is not synchronized to its references (modulation is present while in the Holdover mode).

Ref State Signature Control: 1PPS output is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).

Output disabled: No 1PPS output is present, even if any SecureSync input references are present and considered qualified.

Offset: Used to account for 1PPS cable delays or other latencies in the 1PPS output. Available Offset range is -500 to +500ms in 5ns steps.

Edge: The operator can select if the output signal is a positive (reference on the rising edge) or a negative (reference on the falling edge) pulse.

Pulse Width: Configures the Pulse Width of the 1PPS output. The Pulse Width is entered and displayed in nanoseconds (the default Pulse Width is 200 milliseconds).

***1204-2B) Fiber Optic (4) 1PPS outputs Option Card

Note: As of 29 Oct 2012, this new Option Card is now available.

Outputs only. This card has no inputs

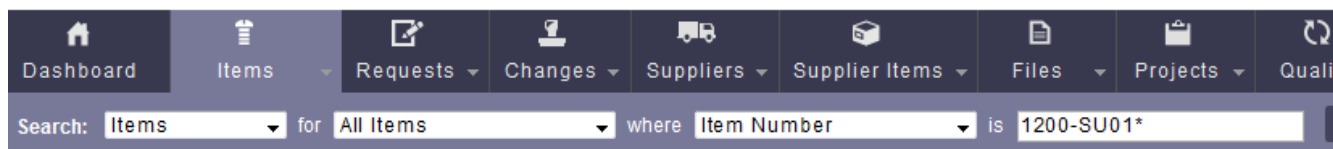
Schematic: (refer to 1204-0150-F000) [I:\New Released\PCB Documentation](#)

1204-2B Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the Model 1204-2B card: rt_oc2b_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-------------------|--|---|--------------------|
| | 4.8.7 | 1.00 | Added support for this Option card (first release) | |
| | See note on right | 1.01 (current rev as of at least v5.4.1) | Note: Not sure at what version 1.01 was cut-in at, but it's in at least software versions 5.2.1, 5.3.0 and 5.3.1 | |

1204-2B hardware versions

For Option Card hardware versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.8.7 | 1.00 | Added support for this Option card (first release) | |

Note: Software support for the Model 1204-2B started in Archive version 4.8.7.

Inputs: None

Outputs (4) 1PPS out

1PPS Output connectors (2): J1, J2, J3 and J4

Optical Connector: ST

Fiber information

| | | |
|----------------------------|---|---|
| Signal Type and Connector | TTL (BNC into 50 ohms) ST (Fiber Optic) | TTL or 10v (BNC into 50 ohms), or RS-485 (terminal block) ST (Fiber Optic) |
| Fiber Optic Compatibility | 50/125 μ m, 62.5/125 μ m multi-mode cable | |
| Fiber Operating Wavelength | 820/850 nm | |
| Fiber Minimum Sensitivity | -25 dBm @ 820 nm | — |
| Fiber Optical Power | — | -15 dBm average into 50/125 fiber |

Pulse width adjustment for 1PPS output option cards

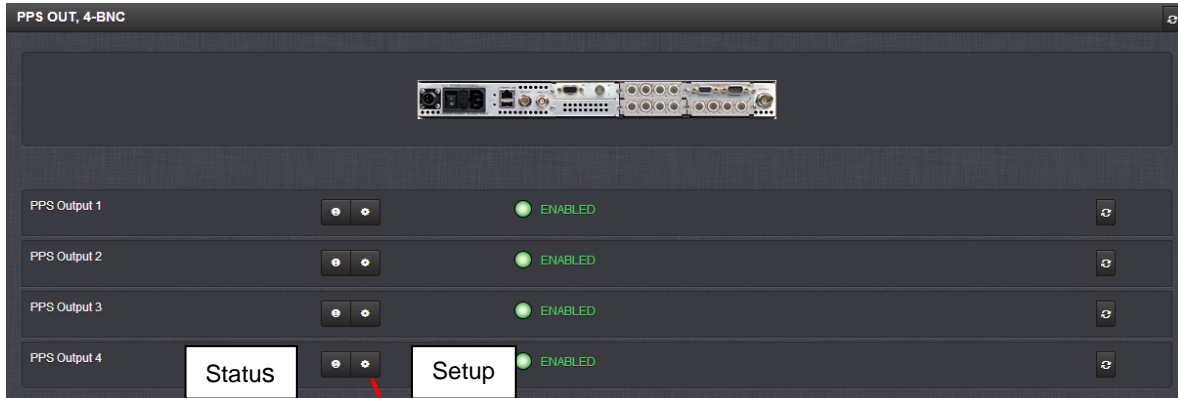
- refer to Salesforce Case 208383 regarding question/answer below

Q (Dave L to Apps team) Bill Dower at Raytheon phone us today asking about the 1204-19 Option card. Bill wanted to know about the **1204-19 pulse width adjustment range and is the 100nS to 900mS with 20nS** resolution was based on a FPGA being **quantized to a 50 MHz frequency reference?**

A Reply from Ron Dries (19 Sept 2019) The leading edge output is quantized to a 200MHz clock. The trailing edge for the pulse width is quantized to a 50MHz clock, which is why the pulse width is at 20ns resolution.

ECN Changes incorporated.

A) Newer web browser (versions 5.1.2 and above)
INTERFACES -> OPTION CARDS page



PPS Output 1

Signature Control: Output Always Enabled

Offset: 0 ns

Edge: Rising

Pulse Width: 200000000 ns

Status

Submit

Signature Control

Offset

Edge: Select if the output signal is a positive (reference on the rising edge) or a negative (reference on the falling edge) pulse.

Pulse Width: Configures the Pulse Width of the 1PPS output. The Pulse Width is entered and displayed in nanoseconds (ns). The default Pulse Width is 200 milliseconds.

B) Classic interface browser (versions 5.0.2 and below)

Setup/Inputs

(This card has no inputs)

Setup/Outputs

| OUTPUTS SETUP - 4 1PPS (SLOT2) | | | | |
|--------------------------------|----------------------|----------------------|----------------------|----------------------|
| Output Index | 1 | 2 | 3 | 4 |
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Offset (ns) | 0 | 0 | 0 | 0 |
| Edge | Rising | Rising | Rising | Rising |
| Pulse Width (ns) | 200000000 | 200000000 | 200000000 | 200000000 |
| <div>Submit Reset</div> | | | | |

Signature Control: Signature Control is used to control when the 1PPS output signal will be present. This function allows the modulation to stop in certain situations.

Output Always Enabled: 1PPS output is present, even when SecureSync is not synchronized to its references.

Output Enabled in Holdover: 1PPS output is present unless the SecureSync is not synchronized to its references (modulation is present while in the Holdover mode).

Output Disabled in Holdover: 1PPS output is present unless the SecureSync references are considered not qualified and invalid. (Modulation is not present while in the Holdover mode).

Output Always Disabled: No 1PPS output is present, even if any SecureSync input references are present and considered qualified.

Offset: Used to account for 1PPS cable delays or other latencies in the 1PPS output. Available Offset range is -500 to +500ms in 5ns steps.

Edge: The operator can select if the output signal is a positive (reference on the rising edge) or a negative (reference on the falling edge) pulse.

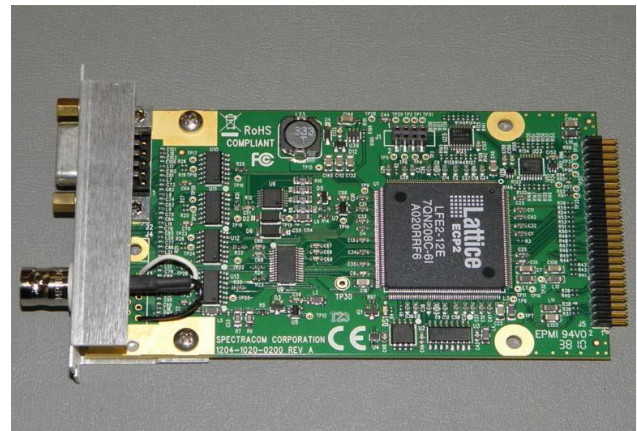
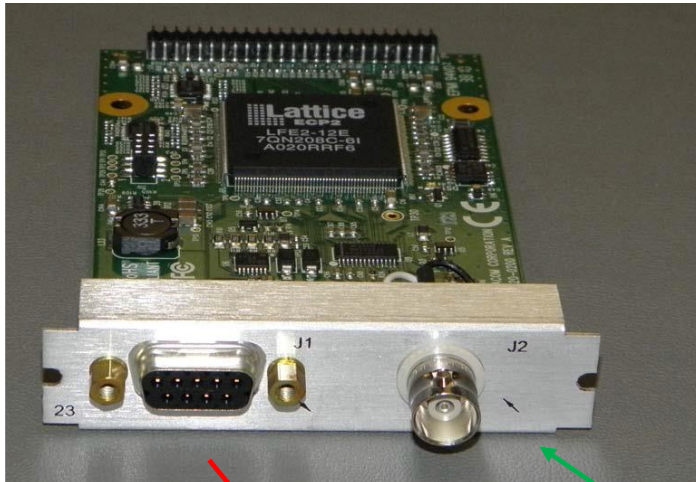
Pulse Width: Configures the Pulse Width of the 1PPS output. The Pulse Width is entered and displayed in nanoseconds (the default Pulse Width is 200 milliseconds).

Status/Inputs (This card has no inputs)

Status/Outputs

| OUTPUTS STATUS - 4 1PPS (SLOT2) | | | | |
|---------------------------------|----------------------|----------------------|----------------------|----------------------|
| Output Index | 1 | 2 | 3 | 4 |
| Signature Control | No Signature Control | No Signature Control | No Signature Control | No Signature Control |
| Offset (ns) | 0 | 0 | 0 | 0 |
| Frequency (Hz) | 1.000000 | 1.000000 | 1.000000 | 1.000000 |
| Edge | Rising | Rising | Rising | Rising |
| Pulse Width (ns) | 200000000 | 200000000 | 200000000 | 200000000 |

(1204-23) Event capture with broadcast over RS-232 Option Card



ASCII output messages
(DB9F connector)

Event Input (BNC connector)

| Pin Number | Signal Name | Function |
|----------------------|---------------|----------------------|
| Top row of 5 pins | | |
| 1 | NC | No Connection |
| 2 | SERIAL_OUT_TX | RS-232 Transmit data |
| 3 | SERIAL_OUT_RX | RS-232 Receive data |
| 4 | NC | No connection |
| 5 | GND | Ground |
| Bottom row of 4 pins | | |
| 6 | NC | No connection |
| 7 | NC | No connection |
| 8 | NC | No connection |
| 9 | NC | No connection |

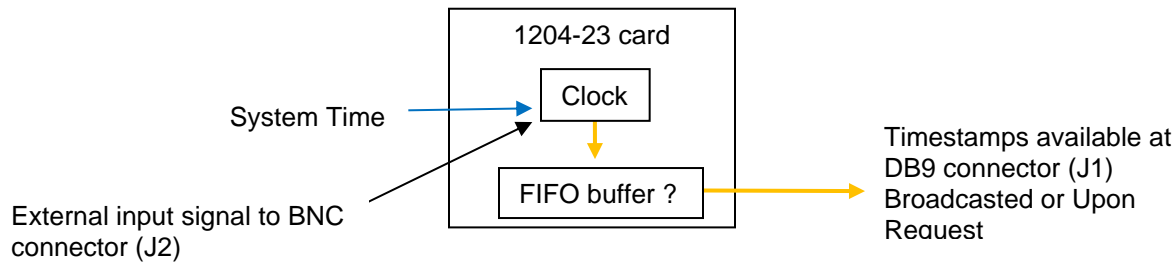
Table 8-22: Output DB9 Connector Pinout

Refer to the online SecureSync user guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/Event_Broadcast.htm?Highlight=1204-23

Schematic: (refer to 1204-0020-F000) in Arena: https://app.bom.com/items/detail-spec?item_id=1202845082&version_id=10512024148&orb_msg_single_search_p=1

Block diagram (not finalized/confirmed yet)



Notes:

- This was initially a proposed special Option Card for Lockheed Martin / China Lake.
- Requires SecureSync version 4.7.0 or above software installed (This Option Card was released as part of the version 4.7.0 software update on ECN 2750).
- Operates similarly as the Symmetricom XLI's internal Event Time feature
- Also provides streaming time stamp capability.

Function of the Model 1204-23: The function of the card is to allow an event input to trigger a time stamp to be sent "real time" via an RS-232 Serial port, as soon as an event is received or upon demand.

1204-23 Specs/Accuracy specs

- **TTL level input** (refer to "Event Trigger input" further below for more info)
- **5 ns resolution**

Q. What is the exact meaning of our spec, Event Resolution 5ns?

A. **Per Dick Fox:** Event Resolution this refers to the least significant digit the in the event broadcast format 1 section 11.17.2

We provide 9 digits of sub-second resolution. The 5 nanoseconds represent the least significant digits I believe.

- **~50ns accuracies to UTC**

Q. What is the accuracy of RS232 the event's time stamp output?

A. **Per Dick Fox:** The accuracy of the RS-232 time stamp is the same as the accuracy of the SS timing engine. So, it would be the same as the 1PPS accuracy on the SS datasheet something like 50 nanoseconds to UTC with OCXO

Version info

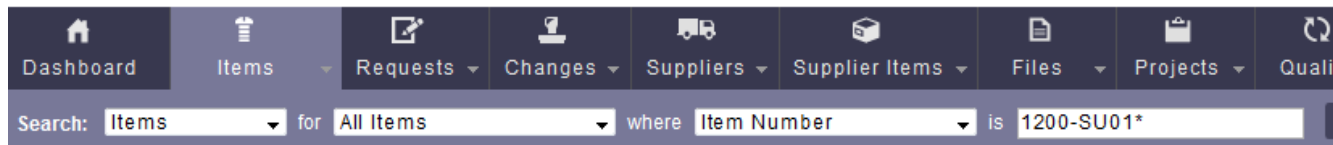
- For software assembly versions, refer to: (1204-SHxx, SP1xx) [I:\New Released\Firmware_Software\1204-XXXX-XXXX](#)

1204-23 Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware_Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the 1204-23 card: rt_oc23_hw01_fpga.bin

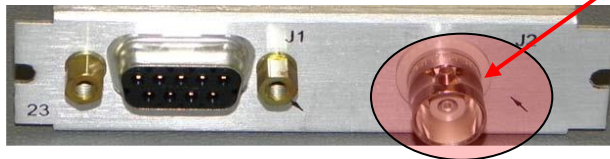
| ECN | System version | FPGA version reported | Change | approximate cut-in |
|-----|----------------------------|---|--|--------------------|
| | 4.70 | 1.00 | Added support for this Option card (first release) | |
| | ?? (see note to the right) | 1.01(in at least v5.4.1) | Note: Not sure at what version 1.01 was cut-in at, but it's in at least software versions 5.2.1 | |
| | ?? (see note to the right) | 1.02(current rev as of at least v5.8.5) | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software versions 5.8.5 | |

1204-23 Hardware changes

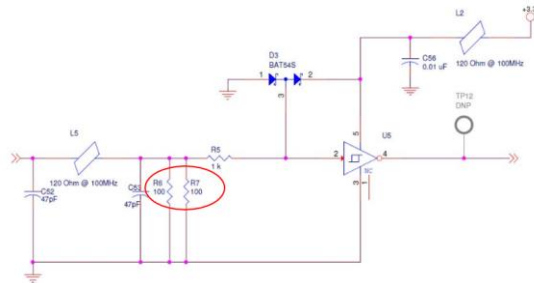
For Option Card hardware versions, refer to: (SPxx) [I:\New Released\Firmware_Software\1204-xxxx-xxxx](#)

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.7.0 | | Added support for this Option card (first release) | |
| | | | | |
| | | | | |

Event Trigger **input** (BNC Connector **J2**)



- BNC connector (J2)
- 50 ohm input impedance (as confirmed by Dave Sohn below)
Per Dave Sohn (6 Nov 2018) If it helps, here is the schematic for the input circuit showing the 50ohm (2x100ohm in parallel) termination. The option card has always had 50ohm termination from what I can see in PLM.



Note: its ok to distribute the schematic snippet above

- TTL level input (**Note:** Not CMOS level input - Refer to SR 5455 in SAP)
Q. Is there any requirement to the event's BNC input pulse signal? All TTL is ok?
A. Per Dick Fox: Event Broadcast Trigger – Spec is TTL levels

Interfacing our Event input connector to another device having a relay output

- Refer to Salesforce Case 214826
- A relay output itself can't provide a TTL level signal to the 1204-23 card. The device providing the event signal to the option card needs to provide +5vdc through the relay when the relay is energized/de-energized (for a logic "High") with a pull-down resistor (to prevent it from floating) when the relay is in the opposite state.

Email Keith sent (15 Nov 2019) I confirmed with the SecureSync Product Manager that the event input is a TTL signal. It can be used with a relay, but not without some minor modification external to the Option Card.

A relay closure by itself isn't able to provide the TTL input signal requirements of the Option Card's event input. The external event relay needs to provide 5vdc to the Option Card (for the TTL "high") with also a pull-down resistor added (to keep the "low" from being a "floating" input to the card).

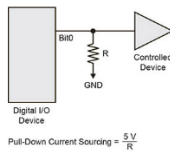
Per <https://www.mccdaq.com/TechTips/TechTip-2.aspx>

Pull-down Resistor

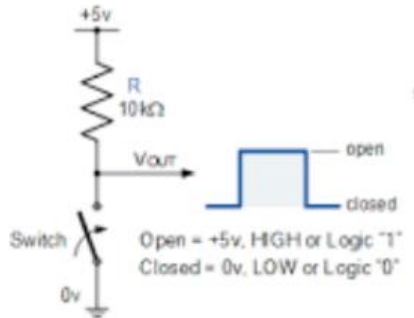
With a pull-down configuration, I/O lines connect to logic *ground* through resistors.

When the digital I/O device is reset, it enters high impedance input mode, and the I/O lines are pulled *low*.

The digital I/O device and attached devices sense the low signal. A board that is in output mode has enough power to override the pull-down resistor's low signal and drive the lines high to 5 volts.



Here's an even better example of using a pull-up resistor to +5vdc on the relay's output to generate the "high" to provide into the Event input of the Option Card.

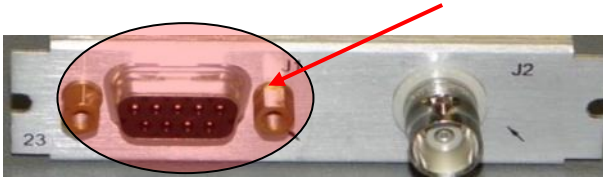


- **20 nanoseconds** minimum time between events
- **FIFO (First In First out) Buffer size 512 entries**

From the SecureSync manual):

When the defined signal edge is detected on the Event Input BNC Connector (J2) an ASCII message is created containing the current time. ASCII messages are stored in a Message Buffer. The message buffer can store 512 entries before overflowing. Messages may be lost if the buffer overflows.

Event Broadcast Card's **Output** (DB9 connector **J1**)



ASCII output messages
(DB9F connector)

| Pin Number | Signal Name | Function |
|----------------------|---------------|----------------------|
| Top row of 5 pins | | |
| 1 | NC | No Connection |
| 2 | SERIAL_OUT_TX | RS-232 Transmit data |
| 3 | SERIAL_OUT_RX | RS-232 Receive data |
| 4 | NC | No connection |
| 5 | GND | Ground |
| Bottom row of 4 pins | | |
| 6 | NC | No connection |
| 7 | NC | No connection |
| 8 | NC | No connection |
| 9 | NC | No connection |

Table 8-22: Output DB9 Connector Pinout

- RS-232 ASCII Output, via DB9F connector (J1)
- Most recent timestamp message can be viewed in the web browser
- Configurable to output time stamp(s) immediately or upon request (512 entry time stamp buffer)
- **Two event time stamp output formats:** Either **Format 0** or **Format 1**
- **Two available Modes:** “**Broadcast**” and “**Request**” (details below)

*(From the SecureSync manual): (note my additions for clarification are in red)
Messages can be output in one of two ways (Broadcast or Request)*

A) Broadcast

If the Mode is set to “**Broadcast**”, messages in the Message Buffer will be output immediately through the RS-232 Output port. If another event is captured while a message is being sent, it will be queued in the buffer until the first message completes, then the next message will be sent.

The event is received, the associated timestamp is generated and then that time stamp is outputted without waiting for the request to be received.

B) Request

If the Mode is set to “**Request**”, messages in the Message Buffer are only sent when the Request Character is received.

The event is received, the associated timestamp is generated and then that timestamp stays in the storage buffer until the request character has been sent to the Serial port for it to be outputted (or until the timestamp has been overwritten because the buffer has 512 time stamps that haven't been read out yet).

- The customer needs to be advised that there are only two ASCII timecodes supported on the Event Broadcast card. They are documented in Section 11.17 of the SecureSync manual.

Event Broadcast Format 0

Example message:

SSSSSSSSS.XXXXXXXXXX<CR><LF>

Where:

| | |
|------------|--|
| SSSSSSSSS | 10-digit Seconds Time (references from January 1 st , 1970) |
| . | Decimal Point Separator |
| XXXXXXXXXX | 9-digit Sub-Seconds Time (5 ns resolution) |
| CR | Carriage Return |
| LF | Line Feed |

Event Broadcast Format 1

Example message

YYYY DDD HH:MM:SS.XXXXXXXXXX<CR><LF>

Where:

| | |
|------------|--|
| YYYY | Year |
| | Space Separator |
| DDD | Day of Year (001-366) |
| | Space Separator |
| HH | Hour of the Day (00-23) |
| : | Colon Separator |
| MM | Minutes of the Hour (00-59) |
| : | Colon Separator |
| SS | Seconds (00-59), (00-60 for leap second) |
| . | Period Separator |
| XXXXXXXXXX | 9-digit Sub-Seconds Time (5 ns resolution) |
| CR | Carriage Return |
| LF | Line Feed |

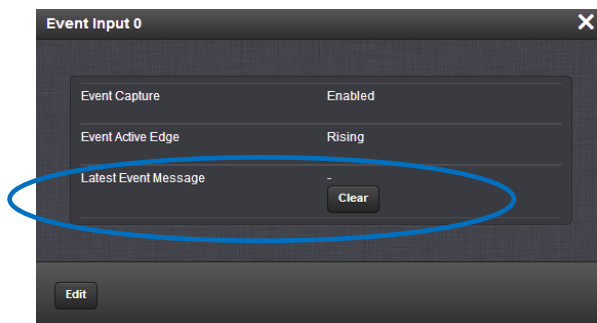
Desire for timestamps to be sent over ethernet, instead of over RS-232/" Latest Event Message" display in web browser

Q Do you folks have any plans to send the timestamp out of the Event Broadcast 1204-23 module over Ethernet verses the RS-232 that it does now?

A Tony DiFlorio sent to customer, per input from Apps team (22 July 2020) "Not at this time but it could be added to our roadmap in the future"

A Follow-up Email Tony DiFlorio sent to same customer (23 July 2020) Here's some additional info from our eng team that could be used instead of an Ethernet output; *The latest timestamp values should be readable from the REST API.*

Event Input 0" (Status Window)



Latest Event Message: The last message sent. This can be cleared with the Clear button.

Storing/retaining of the generated event time stamps

- The time stamps are not "stored/retained" for long-term storage. They are placed in a temporary FIFO storage

buffer for read-out. They are erased when overwritten by other timestamps being placed in the buffer (and likely lost upon reboot- note this is not confirmed w/engineering)

(Salesforce Case 185410) desire for generated timestamps to be placed in a log file, accessible via the browser

Email Keith sent to Dave Sohn (21 FEB 2019) Morgan's customer, Jason Vest with the US Navy (reference case 185410) is desiring the ability to obtain the generated timestamps from a log file, via the SecureSync's interfaces, such as the browser (instead of using the dedicated port on the card)??

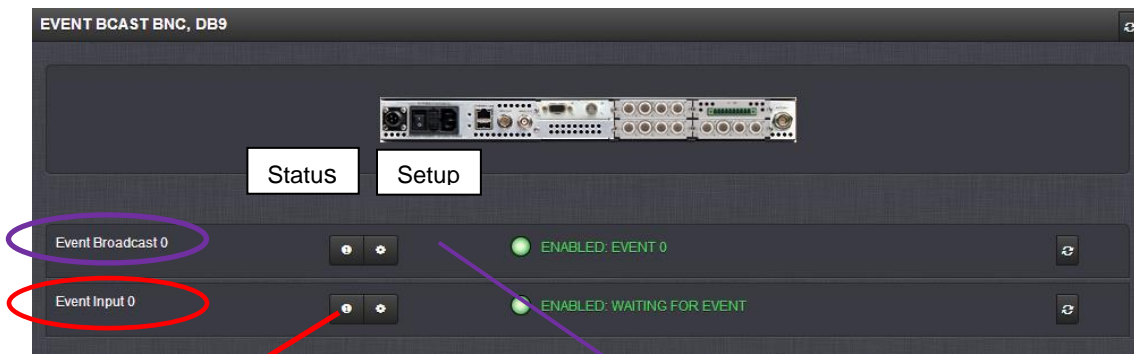
Jason's response to Morgan from further below:

Thanks for the reply. I see the event timestamp can be output via the serial port, but I was hoping for a more modern solution of capturing the most recent timestamp to another computer. The UI has access to the last event timestamp (via Event Broadcast menu). If I can't access the timestamp via a log file through ssh into the Spectracom, is there a way to automatically query the UI for the timestamp?

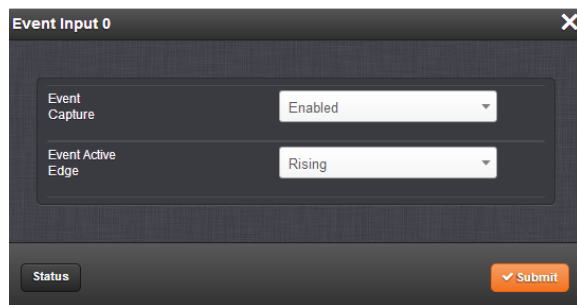
I'm not real familiar with this particular card (I didn't realize there was any timestamp info displayed in the browser- I thought they were only just outputted via the dedicated port and that was it). Is his desired capability already available? if not, would you be interested in pursuing this additional functionality as a potential special??

A) Newer web browser (versions 5.1.2 and above)

INTERFACES -> OPTION CARDS page



“Event Input 0” (Setup Window)



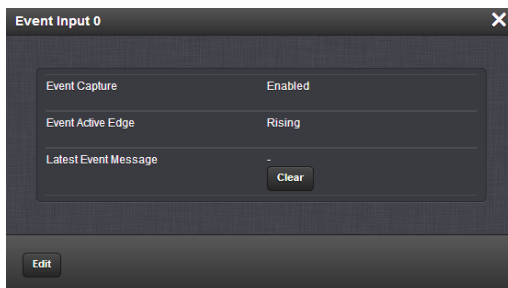
Event Enable: Enables the processing of events on the Event Input port J2.

- When set to **“Disabled”**, no event messages will be queued.
- When set to **“Enabled”**, event messages will be triggered (if a valid Format is selected).

Event Active Edge: Selects the signal edge used for triggering events on Event Input port J2.

Reset Event Buffer: When set to “Enabled”, will discard all messages waiting in the Event Buffer.

“Event Input 0” (Status Window)



Event Capture: The processing of events on the Event Input port J2. When set to “Disabled”, no event messages will be queued. When set to “Enabled”, event messages will be triggered (if a valid Format is selected).

Event Active Edge: The signal edge used for triggering events on Event Input port J2.

Latest Event Message: The last message sent. This can be cleared with the **Clear** button.

- Customer report about the **Clear** button, per Case 239275 (Aug 2020): “I tried using the Clear button but it does not clear the messages, and it does not clear the message in the dialog window either”.

“Event Broadcast 0” Setup window

The screenshot shows the 'Event Broadcast 0' Setup window with the following fields and callouts:

- Signature Control:** Set to 'Output Always Enabled'. Callout: Signature Control
- Format:** Set to 'None'. Callout: Format: ASCII Data Format of the message to be outputted (0 or 1) ("none" causes no output)
- Output Mode:** Set to 'Event Broadcast'. Callout: Output mode: Select either **Broadcast** or **Request**
- Timescale:** Set to 'UTC'. Callout: Timescale: desired Time Scale for the outputted time stamps
- Baud Rate:** Set to '9600'
- Data Bits:** Set to '5 data bits'
- Parity:** Set to 'Parity none'
- Stop Bits:** Set to '1 Stop Bit'

At the bottom, there is a 'Status' button and a 'Submit' button.

Signature Control: Signature Control controls when messages will be broadcast in response to events on the Event Input (J2) port when events are enabled, and the card is in “broadcast” mode. (Events are still queued even if they are not broadcast, and are transmitted once the signature control conditions permit.)

- **No Signature Control:** All events are broadcast, even when SecureSync is not synchronized to its references.
- **Sync State Signature Control:** All events are broadcast unless SecureSync is not synchronized to its references.
- **Ref State Signature Control:** All events are broadcast unless the SecureSync references are considered not qualified and invalid.
- **Output disabled:** No events are broadcast even if any SecureSync references are present and considered qualified.

Format (ASCII Format): Selects the format (0 or 1) of the message to be outputted. Refer to section 12 (ASCII formats) of the SecureSync manual for a description of the two available formats.

The Event Broadcast card only supports two formats (**Event Broadcast Format 0** and **Event Broadcast Format 1**), and only supports the output of one message per event. If format is set to “None”, no messages will be queued in the Message Buffer.

Please note: all of the time stamps can be outputted in only one of two formats, Event Formats 0 and 1:

Event Broadcast Time Code Formats

The following ASCII-based time code formats are used with the Event Broadcast option card (see "Event Broadcast [120423]" on page 479).

Event Broadcast Format 0

Example message:

```
SSSSSSSSSS.XXXXXXXX<CR>=LF>
```

Where:

| | |
|------------|---|
| SSSSSSSSSS | 10digit Seconds Time (inferences from January 1 st , 1970) |
| . | Decimal Point Separator |
| XXXXXXX | 9digit Sub-Seconds Time (5 ns resolution) |
| CR | Carriage Return |
| LF | Line Feed |

Event Broadcast Format 1

Example message:

```
YYYY.DDD.HH.MM.SS.XXXXXXXX<CR>=LF>
```

Where:

| | |
|---------|---|
| YYYY | Year |
| . | Space Separator |
| DDD | Day of Year (001-366) |
| . | Space Separator |
| HH | Hour of the Day (00-23) |
| . | Colon Separator |
| MM | Minutes of the Hour (00-59) |
| . | Colon Separator |
| SS | Seconds (00-59), (0040 for leap second) |
| . | Period Separator |
| XXXXXXX | 9digit Sub-Seconds Time (5 ns resolution) |
| CR | Carriage Return |
| LF | Line Feed |

Mode: This field determines when the output data will be provided. Available Mode selections are as follows:

- **Broadcast:** Event Messages are automatically broadcast when they are created by an event. If a new event happens while an older message is being broadcast, the new message will be queued in a "First-in, First-out" manner. When the message has finished, the next message out of the queue will be broadcast.
- **Request:** Event Messages are only broadcast in response to a Request Character. New messages will be queued in a "First-in, First-out" manner.

Time Scale: Used to select the time base for the output messages. The entered Timescale is used by the system to convert the time in the incoming data stream to UTC time for use by the System Time.

The available choices are UTC, TAI (Temps Atomique International), GPS and Local. UTC is also referred to as ZULU time. GPS is the raw GPS time as transmitted by the GPS satellites (as of April, 2011, this is currently 15 seconds ahead of UTC time). If GPS or TAI time is used, then the proper timescale offsets must be set on the **Setup / Time Management** page. (Please refer to SecureSync manual for more information). Local timescale allows a Local Clock to apply a time offset for Time Zone and DST correction.

Local Clock: The incoming time information may be provided as local time, but System Time may be configured as UTC time, so internal computations need to be performed. With the Timescale field set to "Local", select the name of a previously created Local Clock. The Time Zone and DST rules, as configured in the Local Clock will be applied to the event messages.

Request character: This field defines the character that SecureSync needs to receive in order for a message to be provided when in "Request" mode.

Baud Rate: Determines the speed that the output port will operate at.

Data Bits: Defines the number of Data Bits for the output port.

Parity: Configures the parity checking of the output port.

Stop Bits: Defines the number of Stop Bits for the output.

B) Classic interface browser (versions 5.0.2 and below)

Setup/Inputs

Setup/Outputs

Setup -> Outputs page and select the Slot labeled **"EVENT BROADCAST"**

Event Enable: Enables the processing of events on the Event Input port J2.
When set to **"Disabled"**, no event messages will be queued.
When set to **"Enabled"**, event messages will be triggered (if a valid Format is selected).

Event Active Edge: Selects the signal edge used for triggering events on Event Input port J2.

Reset Event Buffer: When set to **"Enabled"**, will discard all messages waiting in the Event Buffer.

Signature Control: Signature Control controls when messages will be broadcast in response to events on the Event Input (J2) port when events are enabled and the card is in **"broadcast"** mode. (Events are still queued even if they are not broadcast, and are transmitted once the signature control conditions permit.)

No Signature Control: All events are broadcast, even when SecureSync is not synchronized to its references.

Sync State Signature Control: All events are broadcast unless SecureSync is not synchronized to its references.

Ref State Signature Control: All events are broadcast unless the SecureSync references are considered not qualified and invalid.

Output disabled: No events are broadcast even if any SecureSync references are present and considered qualified.

ASCII Format: Selects the format of the message to be outputted. Refer to section 12 (ASCII formats) of the SecureSync manual for a description of all of the available formats.

The Event Broadcast card only supports two formats (**Event Broadcast Format 0** and **Event Broadcast Format 1**), and only supports the output of one message per event. If format is set to **"None"**, no messages will be queued in the Message Buffer.

Mode: This field determines when the output data will be provided. Available Mode selections are as follows:

Broadcast: Event Messages are automatically broadcast when they are created by an event. If a new event happens while an older message is being broadcast, the new message will be queued in a **"First-in, First-out"** manner. When the message has finished, the next message out of the queue will be broadcast.

Request: Event Messages are only broadcast in response to a Request Character. New messages will be queued in a **"First-in, First-out"** manner.

Time Scale: Used to select the time base for the output messages. The entered Timescale is used by the system to convert the time in the incoming data stream to UTC time for use by the System Time.

The available choices are UTC, TAI (Temps Atomique International), GPS and Local. UTC is also referred to as ZULU time. GPS is the raw GPS time as transmitted by the GPS satellites (as of April, 2011, this is currently 15 seconds ahead of UTC time). If GPS or TAI time is used, then the proper timescale offsets must be set on the **Setup / Time Management** page. (Please refer to SecureSync manual for more information). Local timescale allows a Local Clock to apply a time offset for Time Zone and DST correction.

Local Clock: The incoming time information may be provided as local time, but System Time may be configured as UTC time, so internal computations need to be performed. With the Timescale field set to **"Local"**, select the name of a previously created Local Clock. The Time Zone and DST rules, as configured in the Local Clock will be applied to the event messages.

Request character: This field defines the character that SecureSync needs to receive in order for a message to be provided when in **"Request"** mode.

Baud Rate: Determines the speed that the output port will operate at.

Data Bits: Defines the number of Data Bits for the output port.

Parity: Configures the parity checking of the output port.

Stop Bits: Defines the number of Stop Bits for the output.

Status/Inputs

Status/Outputs

Status -> Outputs page and select the Slot labeled **"EVENT BROADCAST"**

REST API interface for the 1204-23 card

- Refer to Salesforce cases such as 276309 and 232847

A) Questions from Case 276309

- 1) What is the URL to determine the Event Trigger time zone this via the API?
- 2) Assuming the Event Trigger time zone is set to a user-defined time zone (e.g., "local"), what is the URL to query the API what the user-defined timescale is defined as? (e.g., via web, Management Menu, Time Management->Local Clock)
- 3) A more general question, is there a list/table of REST API URLs that correspond to web interface functionality of the SecureSync so I can answer these questions myself, or am I limited to using the 41 example REST API files and querying Orolia tech support with additional requests?

B) Desire to automatically read the Event Broadcast time stamp

- Refer to Salesforce Case 232847

I need help accessing and reading the status of Option Cards, specifically the Module 1204-23. I'd like to automatically read the Event Broadcast time stamp. I read on the Orolia blog dated August 20, 2018 that "any functionality that can be done manually through the web GUI can also be scripted", so since I can access the event time stamp via the web gui, I should be able to programmatically access the same info. I didn't notice any hints in the REST API I downloaded via your website. My guesses even failed (e.g., `{{url}}/Features?Slot=4/status.json`). How do I access the Event Broadcast time stamp via json?

My response (22 May 2020)

I had forwarded your desired functionality over to our Apps Engineering team for their review. I received the following info from them, this morning:

Below is the endpoint, event string and the array they need.

Endpoint = Error! Hyperlink reference not valid. Address>/Features/status/0000-2338-00.json

Variable "event_message" =

```
"status": [
  {
    "FidGpEventInput": {
      "id": "0000-2338-00",
      "event_en": 1,
      "edge": 1,
      "event_message": ""
    }
  }
],
```

Data

```
{
  "status": [
    {
      "FidGpEventInput": {
        "id": "0000-2338-00",
        "event_en": 1,
        "edge": 1,
        "event_message": ""
      }
    }
  ],
  "schema": {
    "event_en": {
      "id": 2,
      "name": "event_en",
      "title": "Event Capture",
      "readable": true,
      "getParams": "",
      "isStatus": true,
      "isSetting": true,
      "setBasic": false,
      "logBasic": true,
    }
  }
}
```

```

    "parentName": false,
    "type": "enum",
    "null": true,
    "default": null,
    "length": 0,
    "range": "enumEnableDisable"
  },
  "edge": {
    "id": 1,
    "name": "edge",
    "title": "Event Active Edge",
    "readable": true,
    "getParams": "",
    "isStatus": true,
    "isSetting": true,
    "setBasic": false,
    "logBasic": true,
    "parentName": false,
    "type": "enum",
    "null": true,
    "default": null,
    "length": 0,
    "range": "enumPulseEdge"
  },
  "event_message": {
    "id": 5,
    "name": "event_message",
    "title": "Latest Event Message",
    "readable": true,
    "getParams": "",
    "isStatus": true,
    "isSetting": false,
    "setBasic": false,
    "logBasic": true,
    "parentName": false,
    "type": "string",
    "null": true,
    "default": null,
    "length": 0
  }
},
"feature": {
  "SysFeature": {
    "id": 9016,
    "visible": true,
    "is_reference": true,
    "is_output": false,
    "model": "FidGpEventInput"
  },
  "Feature": {
    "bi": 0,
    "fid": 9016,
    "version": 0,
    "slot_id": 1,
    "card_id": 35,
    "card_version": 1,
    "instance": 0,
    "sys_instance": 0,
    "kts_ref": "",
    "sys_ref": "Event Input 0",
    "id": "0000-2338-00",
    "description": "Event General Purpose Input 0"
  }
},
"license": false
}

```

Troubleshooting the 1204-23 event capture card

A) General Troubleshooting

Email from Morgan to a customer (15 Feb 2019)

Thank you for the case. From your description I have a few more questions on your setup:

1. Do you have the output from J1 going to a PC?
2. In the GUI what is your "format " set to? If it is "none" then you need to change it (1 or 0).
3. Is the "Event Input" set to "Disabled"? If so, change it to Enabled.

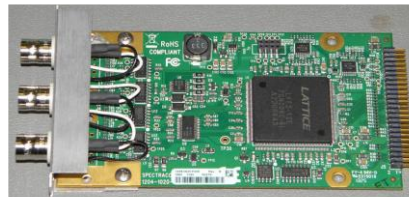
B) Specific 1204-23 Troubleshooting

No ASCII output when events are being inputted

- Make sure customer has a PC (running terminal emulator software, such as HyperTerminal) connected to the dedicated DB9 port on the 1204-23 card itself, and is looking on this PC/Program for the ASCII timestamps (not looking for them to be present inside the SecureSync itself).
- Make sure the "**format**" selection (in the browser) is not set "**None**" (it needs to be set to either "0" or "1" in order to have ASCII time stamps outputted).

"Specials" Option Cards

(1204-34) Frequency Monitoring Option Card



Links/shortcuts

- SecureSync manual addendum for 1204-34 card: [\\rocfnp02\drive\Customer Service\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\1204-34 Freq Measurement input](#)

Function of the 1204-34 Option card


Note: info below is from the manual addendum (a link to this brief document is above)

The Spectracom Frequency Monitoring option card for the SecureSync system allows for the monitoring of up to three frequencies. The option card is configured and monitored via the SecureSync Web User Interface (UI).

In the event that a monitored frequency drifts outside of the frequency accuracy window, an alarm is triggered, indicated by a status icon on the webpage.

The signals to be monitored are fed into the option card via three BNC connectors.

1.1.1 Card specifications

| | |
|-----------------------------|--|
| Inputs | (3) sine wave inputs |
| Frequency range (min./max.) | 1 Hz to 10 MHz |
| Connectors | BNC:  |
| Accuracy | $\leq \pm 5.0e-9$ Hz |
| Input voltage | 0 V to 5 V unbalanced. |
| Input impedance | > 96 K Ω |
| Maximum number of cards | 6 |

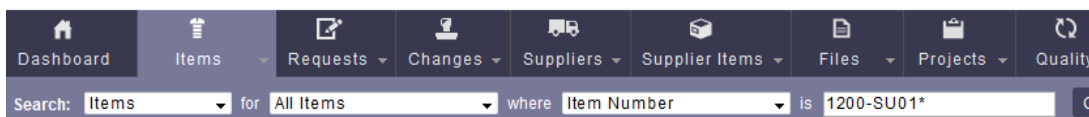
Note (Per Keith): the three arrows should be pointing inward (not outward). The three connectors are inputs-not outputs.

1204-34 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the 1204-34 card: rt_oc34_hw01_fpga.bin

| ECO | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|------------------------------------|-----------------------|--|--------------------|
| | All versions up to at least v5.4.1 | 1.00 | Added support for this Option card (first release) | |
| | | | | |

Hardware

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN/ECO | Archive version | New Version | Change | Approximate cut-in |
|----------|-----------------|-------------|--|--------------------|
| | | 1.00 | Added support for this Option card (first release) | |
| ECO-2674 | 5.9.0 | 1.01 | 1204-34 to version 1.01. Upgraded option card for improved system reliability: | Jan 2021 |

Outputs: None

INPUTS (Frequency Measurement Input)

3 BNC inputs
1 Hz – 10 MHz
0 – 5 VDC TTL

email from Dave Sohn (15 Oct 2018) The original requirement was to be able to provide measurements of 400Hz @ +/- 1e-7 for Go / No Go applications. Our measurement is better, but can't remember how much.

I'm also attaching an addendum we had done previously for this customer.

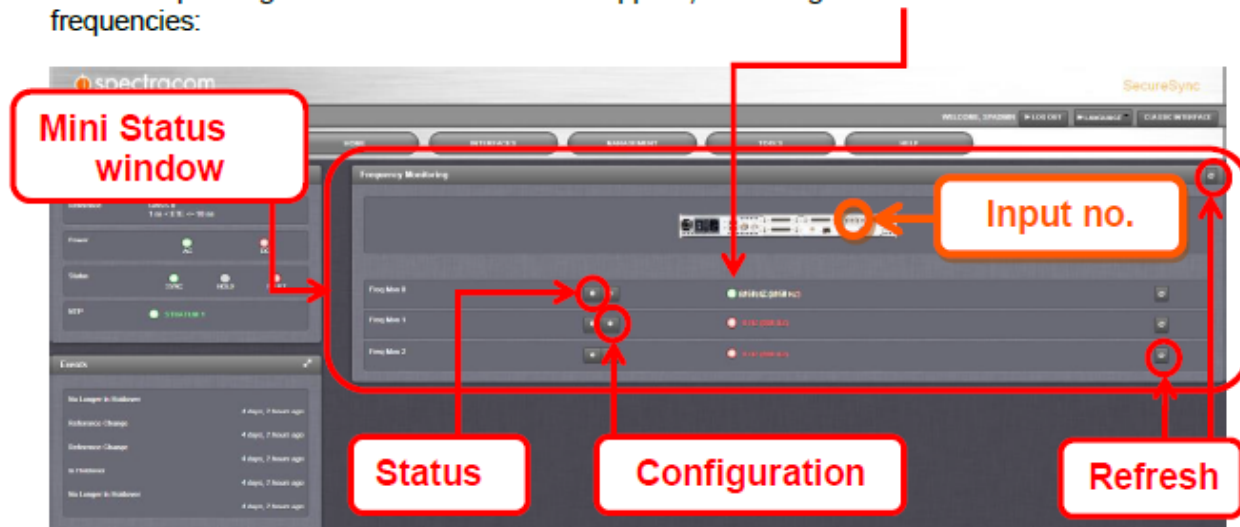
- SecureSync manual addendum for 1204-34 card: <U:\rocfnp02\drive\Customer Service\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\1204-34 Freq Measurement input>

Web browser (not available in classic web browser)

1.1.2 Configuration and Monitoring


Once the card has been installed (at the factory, or by you, see separate *Installation Guide*) and detected by the SecureSync, follow the steps below to configure and monitor the card:

1. Select **INTERFACES > OPTION CARDS > Frequency Monitoring**.
2. The corresponding **Mini status window** will appear, indicating the **Status** of the monitored frequencies:



A **green** status lamp indicates that a frequency is monitored, and that the frequency is within its accuracy window. The first value shown next to the status light refers to the value measured by the card, and the second value (in parentheses) is the reference frequency.

A **red** lamp indicates that a frequency is either not monitored (first number = 0), or that a fault has been detected, i.e. the measured frequency is outside its accuracy window.



3. Click the **Configuration button**  for one of the three monitor frequencies (0, 1, 2).



The **Configuration window** will be displayed:

Click on the displayed number in the **Reference frequency** field, and enter the reference value for the frequency to be monitored (between 1 Hz and 10,000 Hz).

Click on the displayed number in the **Accuracy limit** field, and enter a frequency value for the permitted variation. The best possible accuracy is $\leq \pm 5.0e-9$ Hz. You may also enter "0" instead of the maximum accuracy value.

4. Click **Submit**. The **Mini status window** will indicate the new settings (possibly with a delay of up to 30 seconds. Click the **Refresh button**  to refresh the status instantaneously).
5. Click the **Status button**  to view comprehensive status information for one of the monitored frequencies:



The screenshot shows a window titled "Freq Mon 0" with a close button (X) in the top right corner. Inside the window, there is a section for "Current Status" with three fields: "Available" (indicated by a red dot), "Frequency (Hz)" (0), and "Accuracy" (0). Below this is a section titled "Previous Measurements" containing a table with two columns: "FREQUENCY (HZ)" and "ACCURACY". The table lists four measurements labeled T-1, T-2, T-3, and T-4. At the bottom left of the window is an "Edit" button.

| | FREQUENCY (HZ) | ACCURACY |
|-----|----------------|-------------|
| T-1 | 798.996718 | -1.60419E-6 |
| T-2 | 798.998657 | -1.68857E-6 |
| T-3 | 798.998657 | -1.68857E-6 |
| T-4 | 798.998596 | -1.75806E-6 |

Under **Previous measurements**, the frequency data and accuracy data of previous measurements will be displayed at 1-second increments (e.g., T-4 = 4 seconds before current measurement).

(1204-35) ASCII Time Code RS-232 Output Option Card

(1204-37) RS-423 1PPS output Option Card

- Special Option Card for SPAWAR (via Elotek)

Note: software update version 5.2.1 added software support for RS-423.

- **Shortcut to BOM (1204-0370-0600) in Arena:** https://app.bom.com/items/detail-spec?item_id=1209857053&version_id=10356876398

Northrop Grumman (Rolling Meadows, IL)

RS-423 is like RS-232 (unbalanced signal) but different voltage/amplitude.

| ECO | Date | Change |
|--------|-------------|---|
| 000356 | | This ECO will update the serial option card (1204-0020-F000) to include a RS423 driver |
| 000438 | 11 Jun 2015 | After customer reviewed demo unit, they have requested BNC outputs instead of terminal. This will only effect the 0600 BOM for the "37" option card. No PCB change or other BOM changes are required. |

Description:

Inputs: no inputs

Outputs:

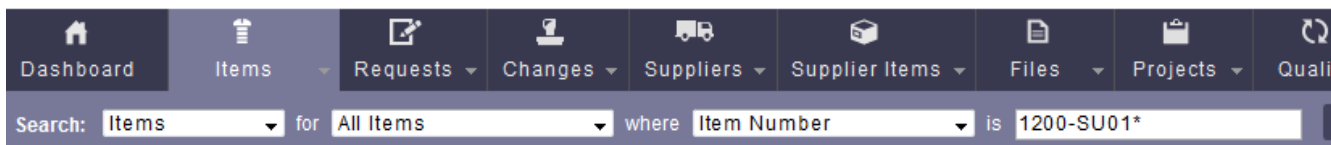
Three (3) BNC connectors for RS-423 out

1204-37 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



Search: Items for All Items where Item Number is 1200-SU01*

FPGA (Firmware) for the 1204-37 card: rt_oc37_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|----------------------------|--|---|--------------------|
| | | 1.00 | Added support for this Option card (first release) | |
| | ?? (See note to the right) | 1.01 | Note: Not sure at what version 1.02 was cut-in at (but it was superseded by 1.02 no later than 5.4.1) | |
| | ?? (See note to the right) | 1.02 (current rev as of at least 5.8.5) | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software version 5.4.1, through at least 5.8.5 | |

Hardware

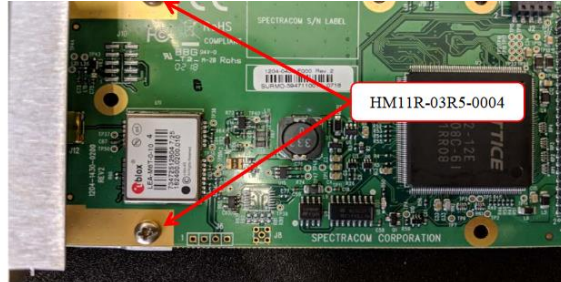
For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | | | Added support for this Option card (first release) | |
| | | | | |
| | | | | |

(1204-43/1204-44) Single/Dual GNSS Reference Option Cards

- refer to **ECO-1520** (in Arena): https://app.bom.com/changes/detail-approvals?change_id=2392082039
and **ECO-1730** (in Arena) https://app.bom.com/changes/detail-summary?change_id=2393879641&

- **1204-43 Single GNSS Option Card** (in Arena): https://app.bom.com/items/detail-spec?item_id=1234650230&version_id=10771836588



- **1204-44: Dual GNSS Option Card** (in Arena): https://app.bom.com/items/detail-spec?item_id=1234665507&version_id=10778736748



Links

Online SecureSync user guide:

A) 1204-43 (single SMA)

Schematic (1204-1431-0200) in Arena: https://app.bom.com/items/detail-spec?item_id=1233549607&version_id=10914119298

PCB (1204-1430-0200) in Arena: https://app.bom.com/items/detail-spec?item_id=1233549619&version_id=10914119268

PD (1204-43-PD) in Arena: https://app.bom.com/items/detail-spec?item_id=1247272034&version_id=10979020778

B) 1204-44 (dual SMA)

Schematic (1204- -0200) in Arena:

PCB (1204-200) in Arena

PD (1204-44-PD) in Arena: https://app.bom.com/items/detail-spec?item_id=1247272215&version_id=10979024038

Software version requirements for both 1204-43 and 1204-44

Both cards Introduced in **Version 5.8.0** update (~end of May, 2018)

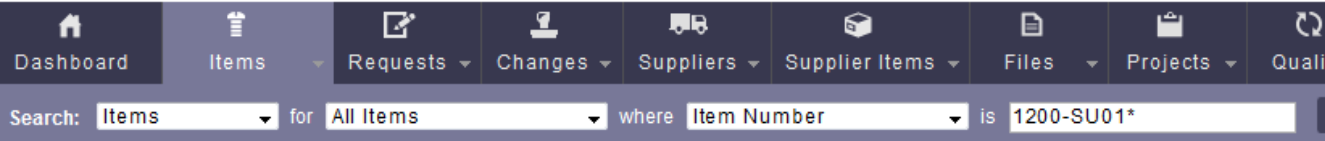
Note this is the minimum software required for these cards to be installed.

1204-43 Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware_Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (Firmware) for the 1204-43 card: rt_oc43_hw01_fpga.bin

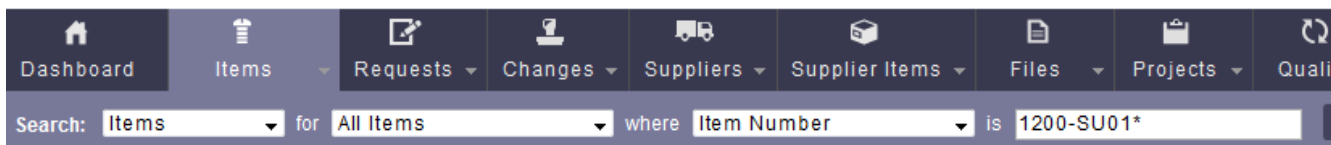
| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|---|--|--------------------|
| | | 1.00 (Still the latest rev as of at least v5.8.5) | Added support for this Option card (first release) | |

1204-44 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



Search: for where is

FPGA (Firmware) for the 1204-44 card: rt_oc44_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|---|--|--------------------|
| | | 1.00 (Still the latest rev as of at least v5.8.5) | Added support for this Option card (first release) | |

(1204-45) Delay Line, Fiber Optic

- Refer to **ECO 1375** in Arena https://app.bom.com/changes/detail-affected?change_id=2389677107)

Description:

Inputs:

Outputs:

1204-45 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the 1204-45 card: rt_oc45_hw01_fpga.bin ?

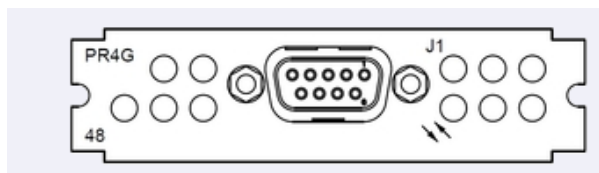
| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|---|--|--------------------|
| | | 1.00 (still the latest rev in at least 5.8.5) | Added support for this Option card (first release) | |

Hardware

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
|-----|-----------------|-------------|--------|--------------------|

(1204-48) for Les Ulis PR4G special?



- **PR4G Special:** Refer to ECO 1482 in Arena: https://app.bom.com/changes/detail-affected?change_id=2391234861 (~Jan/Feb 2018)
- **1204-48:**

Links

1204-48 plate for PR4G special (1204-1480-0803) in Arena: https://app.bom.com/items/detail-spec?item_id=1247276132&version_id=10997265298&

Process detail for PR4G special (1200-9030-0600-PD) in Arena: https://app.bom.com/items/detail-spec?item_id=1247400512&version_id=10981674198

Description: Les Ulis special for PR4G? Adds a 1204-48 Option Card having a DB9 I/O connector to a SecureSync (for unknown function)??

Inputs: DB9?

Outputs: DB9?

1204-48 Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)

Dashboard

Items

Requests

Changes

Suppliers

Supplier Items

Files

Projects

Quality

Search:

Items

for

All Items

where

Item Number

is

1200-SU01*

FPGA (firmware) for the 1204-48 card: rt_oc48_hw01_fpga.bin ?

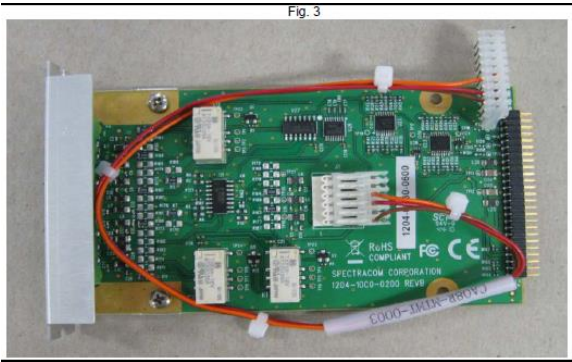
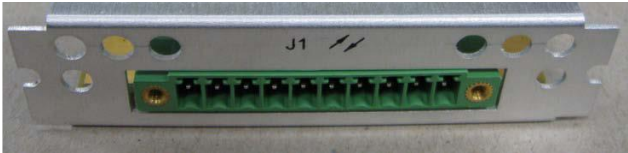
| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|-----------------------|--|--------------------|
| | | 1.00 | Added support for this Option card (first release) | |
| | | | | |

Hardware

For Option Card hardware versions, refer to: (SPxx) [I:\New Released\Firmware_Software\1204-xxxx-xxxx](#)

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
|-----|-----------------|-------------|--------|--------------------|

(1204-0B) RS-485 Comm Protocol Option Card



1204-0B pinout

| Pin Number | Signal Name | Function |
|------------|-------------|----------------------|
| 1 | GND | Ground |
| 2 | RS-485 IN+ | RS-485 Data Input + |
| 3 | RS-485 IN- | RS-485 Data Input - |
| 4 | GND | Ground |
| 5 | RS-485 OUT+ | RS-485 Data Output + |
| 6 | RS-485 OUT- | RS-485 Data Output - |
| 7 | GND | Ground |
| 8 | NC | No Connect |
| 9 | NC | No Connect |
| 10 | GND | Ground |

Input from RS-485
to Ethernet adapter

Output to RS-485 to
Ethernet adapter

From the Model 8195B manual (pin-outs from the Model 8195 series Master Oscillator)

3.2.6 RS-485 COM

The RS-485 communication port permits remote configuration control and monitoring of performance and status. The RS-485 Com port uses a protocol and command set described in Section 4.3 of this manual. The Com connector pin numbering is shown in Figure 3-9. Table 3-7 lists the Com pin assignments.



FIGURE 3-9 COM CONNECTOR

| PIN | SIGNAL | NOTES |
|-----|------------|-------------------|
| 1 | - Transmit | RS-485 A Terminal |
| 2 | + Transmit | RS-485 B Terminal |
| 3 | - Receive | RS-485 A Terminal |
| 4 | + Receive | RS-485 B Terminal |
| 5 | Ground | Cable Shield |
| 6 | Ground | Cable Shield |

Output to RS-485 to Ethernet Adapter

Input from RS-485 to Ethernet Adapter

TABLE 3-7 RS-485 COM PIN ASSIGNMENTS

Links

- **online S/S Guide:**
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/BidirComm.htm?Highlight=1204-0b
- **Schematic:** (refer to 1204-00C0-F001 in Arena: https://app.bom.com/items/detail-attach?item_id=1203165704&version_id=10221246338&orb_msg_single_search_p=1 or I:\Engineering\Archive\New Released\PCB Documentation (Refer to the "Schematics" folder in 1204-00C0-F000 board files)
- **Shortcut to Contract Book and RS-485 protocol documents:** [I:\Customer Service\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\1204-0B \(RS-485 comm protocol\)](I:\Customer Service\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\1204-0B (RS-485 comm protocol))

Software/Firmware changes

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search "Items" for "Item number" and search for "1200-SU01*" (as shown below)



FPGA (Firmware) 1204-0B card: rt_oc0b_hw01_fpga.bin

I don't believe this Option Card has an FPGA

| ECN | Archive/System version | FPGA version reported | Software Change | approximate cut-in |
|------|------------------------|-----------------------|---|--------------------|
| | 4.5.0 | N/A | Added support for this Option card (first release) | |
| 3099 | 4.8.8 | N/A | Modified rgcs command to output support for up to 12 satellites. (8 or more satellites display as a value of "8"). raeh output message contained an extra linefeed 0x0A value. Removed to make message 39 characters long. | Dec, 2012/Jan 2013 |

Hardware

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.5.0 | | Added support for this Option Card (first release) | |

For additional software update info, refer to Release Notes: [PSB, PSP software updates\948x and SecureSync\948x and SecureSync Software updates](#)

Purpose/function of the 1204-0B Option Card

- Provides GPS and other status info via RS-485 data to the Harris IEA/Network Sentry
- It provides this function which was available for earlier Harris systems, on the earlier Model 8195s/8197s,

Email Keith sent to a non-Harris customer that desires to use this card to obtain info from the SecureSync

To begin, this particular Option Card is to add to SecureSync a “proprietary” interface that was available on our earlier Model 8195/8197 series Master Oscillators. This interface is used by one of our customers for them to be able to query the Master Oscillators for status information, via an RS-485 to Ethernet adapter. As the SecureSync replaces this earlier series of master Oscillators, they continue to need this capability in the SecureSync. This port receives RS-485 query/configure commands that the SecureSync responds to with specific information. It is very similar to the operation of the front panel Serial port, but the Option Card is R-485 instead of RS-232 and the command strings are slightly different (the Serial port on the front can provide similar information via RS-232 data).

The RS-485 Address configuration in the web browser (a DIP switch setting on the earlier Master Oscillators) allows them to be able to communicate with two different SecureSync at the same site, by assigning each of the two a different address identifier. The commands can be sent to both units, but the Address lets the units know which one the command was intended for.

Below is a table for the pin-outs of this Option Card:

1204-0B pinout

| Pin Number | Signal Name | Function |
|------------|-------------|----------------------|
| 1 | GND | Ground |
| 2 | RS-485 IN+ | RS-485 Data Input + |
| 3 | RS-485 IN- | RS-485 Data Input - |
| 4 | GND | Ground |
| 5 | RS-485 OUT+ | RS-485 Data Output + |
| 6 | RS-485 OUT- | RS-485 Data Output - |
| 7 | GND | Ground |
| 8 | NC | No Connect |
| 9 | NC | No Connect |
| 10 | GND | Ground |

another Email Keith sent to a non-Harris customer desiring to use this card to retrieve information

Regarding the Model 1204-0B RS-485 Comm Protocol Option Card, I have some additional information for you that I hope will help.

To begin, this particular Option Card is to add to SecureSync a “proprietary” interface that was available on our earlier Model 8195/8197 series Master Oscillators. This interface is used by one of our customers for them to be able to query the Master Oscillators for status information, via an RS-485 to Ethernet adapter. As the SecureSync replaces this earlier series of master Oscillators, they continue to need this capability in the SecureSync. This port receives RS-485 query/configure commands that the SecureSync responds to with specific information. It is very similar to the operation of the front panel Serial port, but the Option Card is R-485 instead of RS-232 and the command strings are slightly different (the Serial port on the front can provide similar information via RS-232 data).

The RS-485 Address configuration in the web browser (a DIP switch setting on the earlier Master Oscillators) allows them to be able to communicate with two different SecureSync at the same site, by assigning each of the two a different address identifier. The commands can be sent to both units, but the Address lets the units know which one the command was intended for.

1204-88 pinout

| Pin Number | Signal Name | Function |
|------------|-------------|----------------------|
| 1 | GND | Ground |
| 2 | RS-485 IN+ | RS-485 Data Input + |
| 3 | RS-485 IN- | RS-485 Data Input - |
| 4 | GND | Ground |
| 5 | RS-485 OUT+ | RS-485 Data Output + |
| 6 | RS-485 OUT- | RS-485 Data Output - |
| 7 | GND | Ground |
| 8 | NC | No Connect |
| 9 | NC | No Connect |
| 10 | GND | Ground |

Signal: F

Connector: B.I-11 rear panel

Impedance: $H_i Z / 120 \text{ ohms}$. s

Bit Rate: 9600 baud

Address: 0 - 31 swi

Character Structure: ASCII 1 star

Message Format: Start word, source address, destination address, data, control, and CRC.

length message check word stop word

The GPS Signal Status Command, *rgcs*, lists the parameters used in qualifying the received GPS signal. This command can be used to verify proper antenna placement and receiver performance. The total message length is 118 bytes.

rgcsQSDD.DIISSSCCCCIISSSCCCCCIISSSCCCCI|ISSSCCCCIISSSCCCCCI
|SSSCCCCCI|SSSCCCCCI|SSSCCCCCI|SSSCCCCCI|SSSCCCCCI|SSSCCCCCI

Ω – quads

S = Receiver status

DD D = Dilution of position. Indicates the degree of uncertainty in a

II = Satellite ID number

SSS = Signal strength v

CCCC = Channel status flag 0000 to ffff

Convert the hexadecimal code word to binary

(MSB) Bit 15: Reserved

Bit 14: Reserved

Bit 13: Reserved

Bit 12: Reserved

Bit 11: Used for T

Bit 10: Differential Co

Bit 9: Invalid date

Bit 8: Parity Error

Bit 7: Used for Po

Bit 6: Satellite Momentum A

Bit 5: Satellite Anti-Spoof Flag Set

Bit 4: Satellite Reported Unhealthy

Bit 3-0: Satellite Accuracy as follow

RS-485 Input / Output connector and pinout info

10 Pin Terminal block connector for 1204-0B card



Our P/N: J900R-0101-022J (in Arena) https://app.bom.com/items/detail-spec?item_id=1202843926&version_id=10303495198

Manufacturer and MFG P/N: Phoenix Contact 1827787 Refer to:
<https://www.phoenixcontact.com/online/portal/us/?uri=pxc-oc-itemdetail:pid=1827787&library=usen&pcck=P-11-02-11&tab=1&selectedCategory=ALL>

Connector Pinout info

1204-0B pinout

| Pin Number | Signal Name | Function |
|------------|-------------|----------------------|
| 1 | GND | Ground |
| 2 | RS-485 IN+ | RS-485 Data Input + |
| 3 | RS-485 IN- | RS-485 Data Input - |
| 4 | GND | Ground |
| 5 | RS-485 OUT+ | RS-485 Data Output + |
| 6 | RS-485 OUT- | RS-485 Data Output - |
| 7 | GND | Ground |
| 8 | NC | No Connect |
| 9 | NC | No Connect |
| 10 | GND | Ground |

Protocols for RS-485 commands to and from this Option Card

- Refer to Contract Book and RS-485 protocol documents: [I:\Customer Service\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Option Cards\1204-0B \(RS-485 comm protocol\)](#)

RS-485 Com specs

Signal: RS-485, 1 pair Transmit, 1 pair Receive

Connector: RJ-11,

Impedance: Hi Z /120 ohms, switch selectable

Bit Rate: 9600 baud

Address: 0 - 31, software configuration selectable

Character Structure: ASCII, 1 start, 8 data, 1 stop, no parity

Message Format: Start word, source address, destination address, message length, message, check word, stop word

RS-485 Command Structure:

The commands described here must conform to a specific command protocol. The protocol is shown in Table 4-5.

| FIELD | SIZE | DESCRIPTION |
|---------------------|----------------|---|
| Start Word | 2 Bytes | Unique characters <#> <\$> used to synchronize with data stream |
| Source Address | 1 Byte | 0-31= unit address 32-254= reserved 255= broadcast |
| Destination Address | 1 Byte | 0-31= unit address 32-254=reserved 255= broadcast |
| Message Length | 2 Bytes | Variable length from 1 to 502 bytes |
| Message | 1 to 502 Bytes | 4 character commands plus parameters |
| Check Word | 2 Bytes | Running sum including all bytes after the start word through the last message byte. |
| Stop Word | 2 Bytes | Unique characters (<cr><lf>) used to synchronize with data stream |

Table 4-5 RS-485 Command Protocol

All inputs via the RS-485 port must follow this format, or they will be ignored. The descriptions that follow are for the Message field of the commands. When the first character of a command is 'w' this indicates the controller is writing information to the unit. If the first character is 'r' the controller is reading information. The RS-485 Com port operates at 9600 baud, character structure is 1 start, 8 data, 1 stop, and no parity.

Available RS-485 commands

- List of available RS-485 commands with the Section of the Model 8195B manual that discusses each command.

4.5 RS-485 Command Descriptions

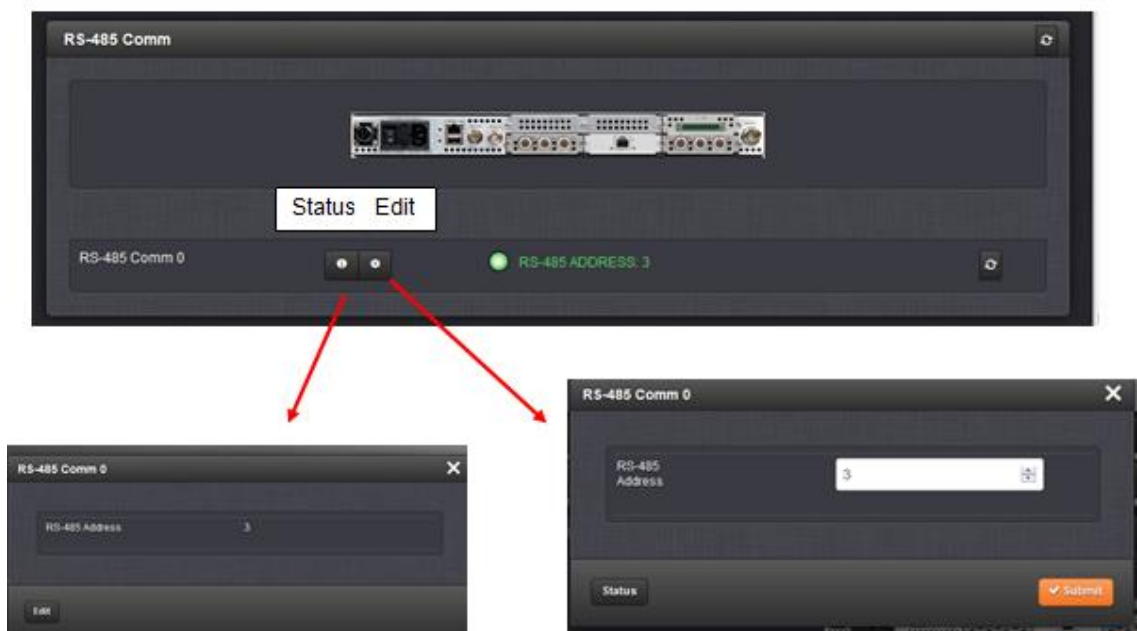
Table 4-6 provides an alphabetical listing of the *RS-485 Command set*.

| | DESCRIPTION | READ | WRITE | SECTION |
|------|----------------------|------|-------|---------|
| acd | Antenna Cable Delay | √ | √ | 4.5.1 |
| aeH | Alarm Event History | √ | | 4.5.2 |
| ast | Alarm Status Display | √ | | 4.5.3 |
| at1 | Alarm Time Out 1 | √ | √ | 4.5.4 |
| at2 | Alarm Time Out 2 | √ | √ | 4.5.4 |
| at3 | Alarm Time Out 3 | √ | √ | 4.5.4 |
| caH | Clear Alarm History | | √ | 4.5.5 |
| gcs | GPS Signal Strength | √ | | 4.5.6 |
| loc | Full location | √ | √ | 4.5.7 |
| rrsn | Signal Selection | √ | | 4.5.8 |
| sts | Short Status Display | √ | | 4.5.9 |
| tad | Time and Date | √ | | 4.5.10 |
| tzo | Time Zone | | √ | 4.5.11 |
| who | Vendor, Version | √ | | 4.5.12 |
| 1fo | Ten MHz Offset | √ | √ | 4.5.13 |
| 1po | One PPS Offset | √ | √ | 4.5.14 |

Web browser

A) Newer web browser (versions 5.1.2 and above)

Interfaces -> RS-485 Comm



B) Classic interface browser (versions 5.0.2 and above)

Setup/Inputs/RS485 COMM

This card does not have inputs

Setup/ Outputs/RS485 COMM

SETUP - SIMULCAST RS-485 (SLOT5)

| | |
|----------------|---|
| RS-485 Address | 3 |
|----------------|---|

Submit Reset

Status/Inputs/RS485 COMM

This card has no viewable status

Status/Outputs/RS485 COMM

This card has no viewable status

Troubleshooting 1204-0B Option Card

- Refer to Salesforce cases such as 160801

Typical installation for SecureSyncs having a 1204-0B installed: There are usually two SecureSyncs at each of the sites, with each unit having one 1204-0B, a 1204-14, at least one 1204-1C and a 1204-0A. The 1204-0B cards are usually daisy-chained together with termination at the end. The cabling is attached at the other end to a Harris IEA or Network Sentry.

SecureSync configuration: there is only one configuration associated with this Option Card- its RS-485 address

General suggestions/ questions to ask:

- 1) Make sure the cable to the IEA/Network Sentry is attached to the 1204-0B card's terminal block connector and not inadvertently connected to the co-installed 1204-0A card (which has the same style connector as the 1204-0B)
Note the 1204-0A card is not usually connected to anything at transmitter sites.
- 2) Search the System log for "rs485d" to find all log entries associated with the daemon for this card.
- 3) Try a spare SecureSync with 1204-0B card at the site (verify the configured address is correct)
- 4) Use a meter or scope to look at RS-485 signals.

I have some "general" questions for you, to better help with this reported condition (and to make sure we don't overlook anything):

- 1) How was this condition first observed? Is this a new site being brought online, or a site that's already been online for a while now?
- 2) Just to confirm, this same issue is occurring with the associated 1204-0B card in both SecureSyncs at this site?
- 3) If it's being observed with both 1204-0B cards, have you tried temporarily disconnecting one of the two, so that each one is tested without the other one being connected at the same time?
- 4) Assuming this isn't a "newer install" and the interface was working at one point- but has since failed- has anything recently been changed at the site (such as the software installed in the IEA/Network sentry)?
- 5) When you were using the spare SecureSync (which was working as expected) were you using the same interface cable that is normally connected to the two SecureSyncs at that site? (or were you using a spare cable in place of the existing cable?) Was the spare unit connected with the other two units, or were the other two units temporarily disconnected altogether while the spare was working fine?
- 6) What is the version of software installed in the two SecureSyncs normally at the site? Does the spare SecureSync have the same version of software installed as these other two SecureSyncs?

If you aren't sure what version of software is currently installed, there are a few different ways to obtain the version:

Note the software version of the SecureSync will be either a 4.x.x or 5.x.x number:

- A. With a CLI connection (telnet, ssh or front panel RS-232 cable) type: **version** <enter>. The version command will respond with the current version of software installed.
- B. With the newer black and charcoal web browser (starting in software version 5.1.2), the System version is reported in the **Tools -> Upgrade/Backup** page.
- C. With earlier software versions (which the web browser has a white/gray background and is now referred to as the "classic interface") the Archive software version is reported at the top of the **Tools -> Versions** page.

- 7) The two SecureSync's at the site should also have a Model 1204-0A Option Card installed in the back panel of each unit. The 1204-0A card has the same style connector as the 1204-0B card has. Is it possible the cable to the IEA is plugged into this other Option Card, instead of the 1204-0B Option Card?

Let me know what you find in the System log when searching it for "rs485d" and the answers to the above questions. Then we can go from there.

A) Known software issues with 1204-0B (versions 4.8.7 and below).

- Refer to Mantis case 1784

Mantis case 1784 notes added by Paul Myers

1. I saw a note that the IEA did not implement the rgcs command – hence the reason we did not catch this sooner.
2. It appears the secure sync is only reporting information from 8 channels; the 8195B reports for all 12 channels. I suspect the network sentry is getting stuck waiting for the rest of the satellite status. Odd that it is uses the 8195B protocol but the number of channels corresponds to the 8195A limit. I have a recollection of Ed mentioning something about the number of satellites reported....but this did not affect the IEA for reason mentioned above. It appears to affect the network sentry.

B) One or more of the three relays on the Option Card are chattering when installed and SecureSync is powered-up

- Refer to SR 5589 for example
- Hardware issue- not a configuration issue
- I don't believe the relays on this Option Card are used, but the PCB assembly is the same as the one used for the Model 1204-0F Alarm Relay Option Card (ID and other resistors are removed/changed to make the 1204-0B but the relays remain on the board)
- Issues with the ID or other resistors could potentially cause this to occur

Try this Option card in a different slot. Or if another 1204-0B card is available, try swapping it with the questionable card- to determine if it's a problem with the Option Card or a problem with the Slot inside the SecureSync.

C) No comms with the RS-485 interface port:

Email to Donald Harris (with Harris 8/29/12) Refer to Salesforce case 6181 for more info.

As you mentioned, the only configuration for this card is the address setting. Since your system isn't communicating with this Option Card, but is communicating fine with the Model 8195 Master Oscillator, we had a couple of questions for you, to help determine why it's not working for you.

First, do you happen to have more than just this one SecureSync with the 1204-0B card available for testing? Or, do you currently have just this one unit available? If you happen to have any other SecureSyncs with this particular card installed, can you try connecting to the other one, just to see if it's related to something specific to this one unit? Also, our engineer suggested reviewing the System Log entries (**Tools -> Logs** page of the browser, "System" tab).

After each "system reboot" (power-up), logs are asserted into this **System** Log to report that many daemons have been started (some of these daemons will then stop after being started, depending on the specific unit's Option Card configuration). The following System log entry should be present for the 1204-0B card, indicating its daemon has been started:

Spectracom spectracom: [system] Simulcast 485 daemon has started (485D)

The two following entries should not be present in this log, for any SecureSync which has the 1204-0B Option Card installed in the rear panel slot:

Spectracom spectracom: [system] Simulcast 485 daemon has terminated (485D)

Spectracom spectracom: [system] Simulcast 485 daemon - no Simulcast RS-485 card found (485D)

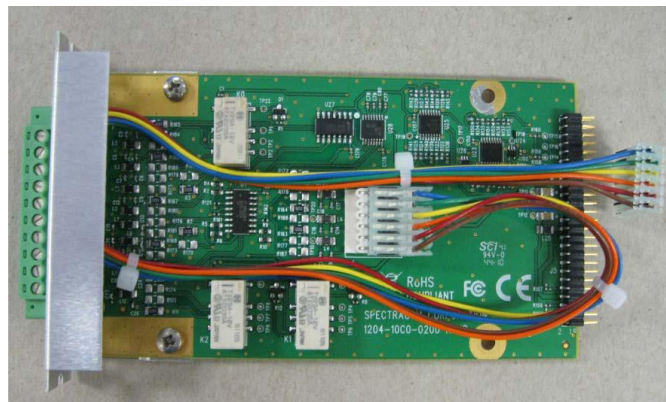
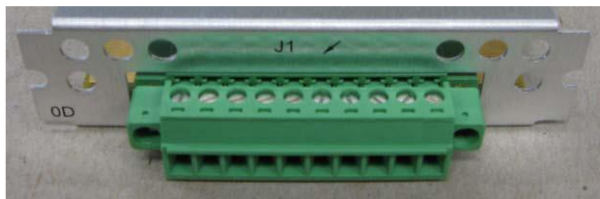
Let me know what you find and then we can go from there!

Reply from Donald Harris regarding this same issue: On the log I'm getting the following statement.

Invalid SC 485 src address 70 (485D)

Dave Sohn replied: This log entry is stating that the daemon received a message with a source address of 70, which is greater than our range of 0 - 31. It doesn't have to do with the address set in the SecureSync. What is the address of their monitor?

(1204-0D) Event, Terminal Block Option Card



For additional software update info, refer to Release Notes: [PSB, PSP software updates\948x and SecureSync\948x and SecureSync Software updates](#)

Note: The Event Relay Option Card is not yet available (as of at least 6 Feb 2013)

- Unless there is significant potential, there are no current plans to release this module.
- Available work-around is to add a Model 1204-04 RS-485 Option Card to sync a Model 9388. The Model 9388 has three Event relays.

Schematic: (refer to 1204-00C0-F000) [I:\New Released\PCB Documentation](#)

10 Pin Terminal block connector for 1204-0D card



Our P/N: J900R-0101-022J (in Arena) https://app.bom.com/items/detail-spec?item_id=1202843926&version_id=10303495198

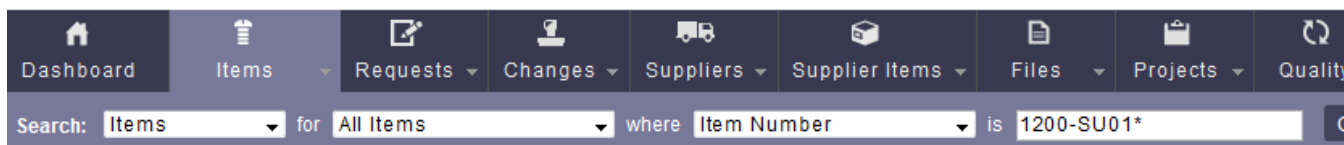
Manufacturer and MFG P/N: Phoenix Contact 1827787 Refer to:
<https://www.phoenixcontact.com/online/portal/us/?uri=pxc-oc-itemdetail:pid=1827787&library=usen&pcck=P-11-02-11&tab=1&selectedCategory=ALL>

1204-0D Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the 1204-0D: rt_oc0d_hw01_fpga.bin

I don't believe this card has an FPGA onboard

| ECN | Archive version | FPGA FPGA version reported | Change | approximate cut-in |
|-----|-----------------|----------------------------|--|--------------------|
| | 4.5.0 | | Added support for this Option card (first release) | |
| | | | | |

1204-0D Hardware

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.5.0 | | Added support for this Option card (first release) | |
| | | | | |

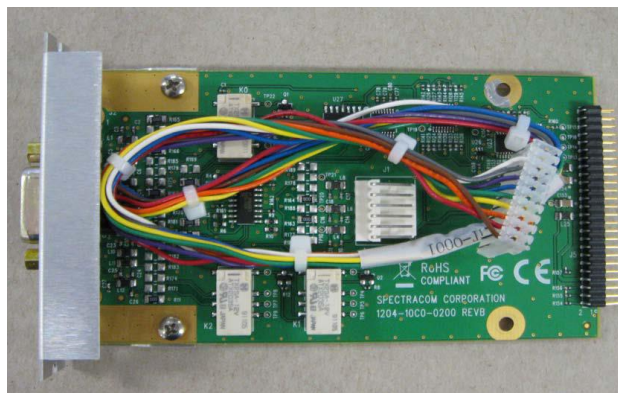
Setup/Inputs

Setup/Outputs

Status/Inputs

Status/Outputs

(1204-0E) Modem Option Card



Important Note: This Option Card does not currently exist and there is no schedule to add it.

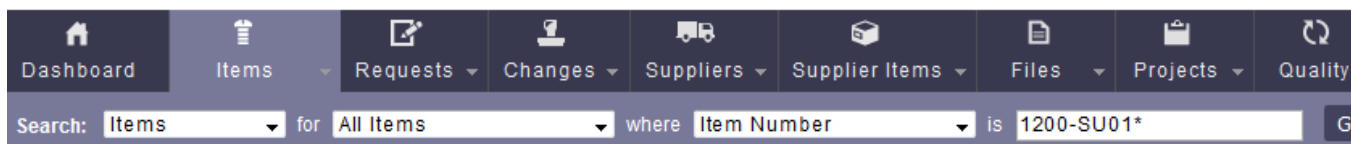
Schematic: (refer to 1204-00C0-F000) [I:\New Released\PCB Documentation](#)

Firmware

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware_Software\1204-xxxx-xxxx](#)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the 1204-0E card: rt_oc0e_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|-----------------------|--|--------------------|
| | 4.5.0 | | Added support for this Option card (first release) | |
| | | | | |

Hardware

For Option Card hardware versions, refer to: (SPxx) [I:\New Released\Firmware_Software\1204-xxxx-xxxx](#)

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.5.0 | | Added support for this Option card (first release) | |
| | | | | |

Setup/Inputs
Setup/Outputs
Status/Inputs
Status/Outputs

Email from Paul Myers about designing this card (8/29/13)

Keith,

Are they asking for CACHACA NTP Servers which are NIST ACTS compatible servers?

Or are they asking for ACTS clients which Dial-up to get the time?

The infrastructure for the NIST ACTS SERVERS could be reused, however, we made modifications to drivers which would not be compatible with the GENTOO Linux and would have to be ported.

CACHACA was 'different' than typical modems because we designed optimizations which increased the accuracy drastically over typical ACTS software because we took time stamps and echoed back characters to reduce time errors to as low as ≤ 1 msec versus 15-25 msec of a typical ACTS Client.

The software for the NIST ACTS SERVER could be re-used and re-integrated.

The software for the NIST ACTS client was a mess and probably would have to be re-implemented.

There are 4 ways to make ACTS Clients this in my order of preference.

- 1) MAKE more 9383's – don't we have 9388 main boards still. If we run out of HC11's DON'T put them on the 9383's – these customer do not sue the outputs anyway I think.
- 2) Use NTP to dial NIST – see how accurate it is!
- 3) Write a ACTS client in the KTS – very precise
- 4) Write a client on the network processor – Basically get a get or write client and optimize it for accuracy.

(1204-0F) Alarm Relay output Option Card (SecureSync only)



From the online SecureSync user guide

Terminal block pin-out, alarm relay out

| PIN | SIGNAL |
|-----|----------------|
| 1 | GND |
| 2 | Relay 0 NO |
| 3 | Relay 0 NC |
| 4 | Relay 0 COMMON |
| 5 | Relay 1 NO |
| 6 | Relay 1 NC |
| 7 | Relay 1 COMMON |
| 8 | Relay 2 NO |
| 9 | Relay 2 NC |
| 10 | Relay 2 COMMON |

| PIN | SIGNAL | |
|-----|----------------|---------|
| 1 | GND | |
| 2 | Relay 0 NO | Relay 0 |
| 3 | Relay 0 NC | |
| 4 | Relay 0 COMMON | |
| 5 | Relay 1 NO | Relay 1 |
| 6 | Relay 1 NC | |
| 7 | Relay 1 COMMON | |
| 8 | Relay 2 NO | Relay 2 |
| 9 | Relay 2 NC | |
| 10 | Relay 2 COMMON | |

Links

- Refer to online SecureSync user guide at:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/Alrm_Rlay_O.htm

Number of 1204-0F Option cards that can be installed: 1 per SecureSync/NetClock

10 Pin Terminal block connector for 1204-0F card (plugs into the Option Card)



Our P/N: J900R-0101-022J (in Arena) https://app.bom.com/items/detail-spec?item_id=1202843926&version_id=10303495198

Manufacturer and MFG P/N: Phoenix Contact P/N 1827787 Refer to: <https://www.phoenixcontact.com/online/portal/us/?uri=pxc-oc-itemdetail:pid=1827787&library=usen&pcck=P-11-02-11&tab=1&selectedCategory=ALL>

For more information on this connector, please refer to (<http://www.mouser.com/ProductDetail/Phoenix-Contact/1827787/?qs=UV0HhPI4yOE%252b2ewyLbDZJg%3d%3d>).

Note: The terminal block connector is supplied with this Option Card.

- This Option Card provides three Alarm (Major/Minor) relays

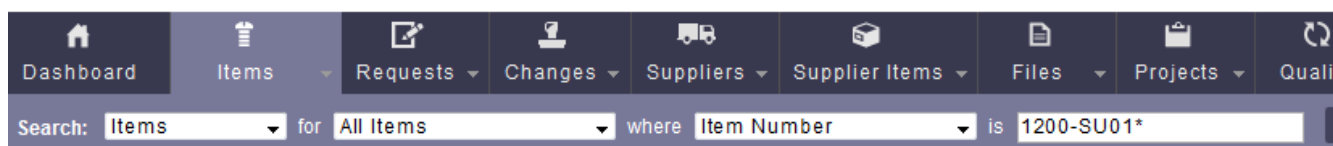
Note: This Option Card does not provide Event Relay (Timer/Event Schedule) output capability (Refer to 1204-0D: [Event Relay Option Card](#))

- There is a single Terminal block connector on Relay Option Card for all three relay connections.

Firmware

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the 1204-0F card: rt_oc0f_hw01_fpga.bin

I don't believe this card has an FPGA onboard

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|-----------------------|--|--------------------|
| | 4.5.0 | N/A | Added support for this Option card (first release) | |
| | | N/A | | |

Hardware

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--|--------------------|
| | 4.5.0 | | Added support for this Option card (first release) | |
| | | | | |

Schematic P/N 1204-1071-0200 (Refer to PCB documentation in 1204-0070-F000
<\\rocfnp01\drivedata\Engineering\Archive\New Released\PCB Documentation>

Refer to the relay section in the 1204-0C schematic: <..\..\..\..\Engineering\Schematic\1204-10C1-0200>

Relay specs (same for all three relays)

Mfg/Model: Panasonic TX2SA-12V (see email from Dave L further below)

- Contacts Switch under max. load of 30VDC, 2A
- Contacts rated to switch 220VDC
- Breakdown voltage of 1000VDC between contacts
- Switch time 4 msec, max.

Q some relays don't work well with small signals across their contacts so I wanted to know if the Alarm Relay Out would work with a small signal across the relay contacts. Specifically, the proposed usage of the relay would be to change the state of an A/D input on a device that uses a 10K ohm 5V pull up on the A/D input. We would use a the Normally Closed pins of one of the relays on the Alarm Relay Out card and upon an alarm or loss of power the relay would close driving the A/D input to ground. The current across the relay will be only 0.5 ma and I'm wondering if the relays in the option card will work reliably with this small current across the relay. Thanks

A Reply from Dave L (27 Sept 2019) The relay used is a Panasonic TX2SA-12V. It looks like the Max Contact Resistance is 100 mOHM. The Min switching capacity is rated at 10uA so switching 0.5 mA at 5V should be fine.

Relay pin-out/operation

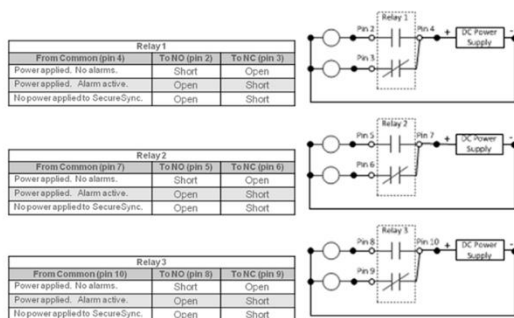
Available ground connection (pin 1 of the terminal block)

Email Keith sent to Homer w/Roots after talking to Tom Richards on (29 Jul2014) The GND ground connection is typically not used with the relays. It was added as a convenient location to ground another device so they are tied to the same ground potential. It can also be used to make Common a ground and use the relay as a pull-up to voltage supplied by another device. Both of these are rare conditions. It is not needed for protection.

Drawing below is from Sam Otto

Alarm relay Interfacing Considerations

- Relays may use the same power source or separate ones.



SecureSync Product Update

FAQs

- ⇒ All contacts are labeled as in their de-energized state (power removed or alarm asserted).
- ⇒ “Normal” state is the relays energized (no alarm state and input power present).
- ⇒ The applicable relay(s) (Minor or Major, as configured in the browser) is /are de-energized when a Minor or Major alarm is asserted.
- ⇒ Both the Minor and Major alarms are active (relays de-energized and in their alarm state) when input power is removed from SecureSync.

Testing the relays:

When input power is applied to SecureSync and all alarms have eventually cleared (as indicated by the front panel Fault LED no longer being lit. Please note that this can take several minutes to clear, once power has been restored, assuming at least one input reference is valid) all three relays will be in their energized (no alarm) state. In the energized (no alarm) state, the three commons to NO pins for the three relays will be shorts and the commons to NC pins for the 3 relays will be open.

When power is not applied to SecureSync, both the Minor and Major alarms are active (all relays are de-energized). Since this is the opposite of the normal state (for the labeling of the pins). Each of the Common to NO connections for the 3 relays will be an open and each of the Common to NC pins for the 3 relays will be a short.

When one (or more) of the three relays is configured as either a Minor or a Major alarm, and while that particular alarm is active, the associated relay(s) is de-energized (alarm state). Since this is the opposite of the normal state (for the labeling of the pins). Each of the Common to NO connections for the 3 relays will be an open and each of the Common to NC pins for the 3 relays will be a short.

To generate a Minor alarm for test purposes, if a GPS receiver is installed in the SecureSync, temporarily disconnect the GPS antenna from the SecureSync. This will assert the Antenna Problem alarm, which is classified as a Minor alarm condition. To generate a Major alarm, power cycle the SecureSync with no inputs connected. This will cause the Major alarm (and also the Minor alarm) to be asserted while power is removed and while the SecureSync is powering back up (alarms will continue to be active until SecureSync syncs and the associated alarm clear).

“Alarm Active” (in the tables below) means the applicable alarm condition that the relay is configured as, is currently active. For example, “Alarm Active” indicates that if the relay is configured as a Major alarm relay, the Major alarm is asserted. The same applies to a relay that is configured as a Minor alarm.

For Relay 1, continuity should first be checked between pins 4 and 2. Then between pins 4 and 3 (pin 4 is the Common for relay 1).

| Relay 1 | | |
|---------------------------------|---------------|---------------|
| From Common (pin 4) | To NO (pin 2) | To NC (pin 3) |
| Power applied. No alarms. | Short | Open |
| Power applied. Alarm active. | Open | Short |
| No power applied to SecureSync. | Open | Short |

For Relay 2, continuity should first be checked between pins 7 and 5. Then between pins 7 and 6 (pin 7 is Common for relay 2).

| Relay 2 | | |
|---------------------------------|---------------|---------------|
| From Common (pin 7) | To NO (pin 5) | To NC (pin 6) |
| Power applied. No alarms. | Short | Open |
| Power applied. Alarm active. | Open | Short |
| No power applied to SecureSync. | Open | Short |

For Relay 3, continuity should first be checked between pins 10 and 8. Then between pins 10 and 9 (pin 10 is Common for relay 3).

| Relay 3 | | |
|---------------------------------|---------------|---------------|
| From Common (pin 10) | To NO (pin 8) | To NC (pin 9) |
| Power applied. No alarms. | Short | Open |
| Power applied. Alarm active. | Open | Short |
| No power applied to SecureSync. | Open | Short |

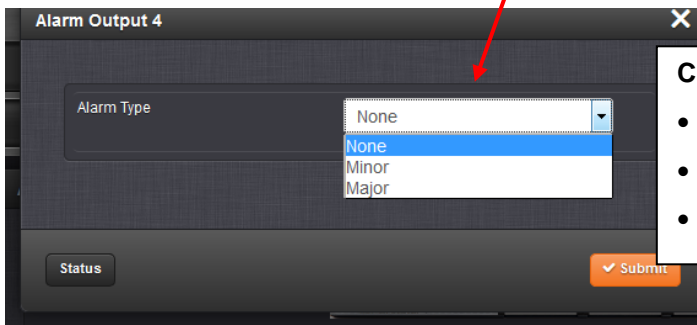
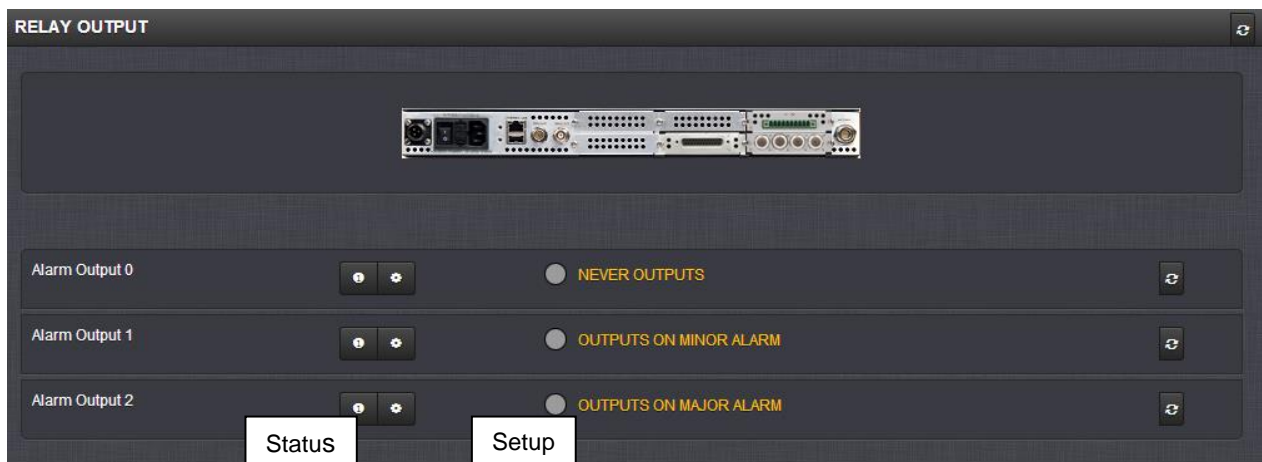
Desire for SecureSync's relays to be connected to multiple systems.

Only one Model 1204-0F card can be installed in each SecureSync, but more than one system can likely be connected to each relay on this Option Card.

As for the ability to install only one of these Option Cards in each SecureSync, there is likely the possibility to be able to parallel more than one system to each relay. The relays on this Option Card are just a switch that routes whatever signal that is applied to the input of the relay. This can be a DC voltage or a waveform, for instance. As long as the supplied input can be paralleled to more than one system (and as long as the input signal doesn't exceed the ratings of the relay, of course), the SecureSync places no limit on the number of systems that the relay's output can be connected to. So being limited to one Option Card does not automatically limit the number of systems that can use the relay functionality.

A) Newer web browser interface (versions 5.1.2 and above)

[INTERFACES](#) -> OPTION CARDS page



Choices:

- **None:** Will not output for an alarm.
- **Minor:** Will output on a minor alarm.
- **Major:** Will output on a major alarm.

B) Classic interface browser (versions 5.0.2 and below)

Setup/Inputs/ “Relay Output”

This card does not have inputs

Setup/Outputs/“Relay Output”

OUTPUTS SETUP - RELAYS (SLOT6)

| Output Index | Pins (NO/NC/CMN) | Alarm Type |
|--------------|------------------|------------|
| 0 | 2/3/4 | Major |
| 1 | 5/6/7 | Major |
| 2 | 8/9/10 | Major |

Submit Reset

“Choices” are:

- “None”
- “Major”
- “Minor”

Fields:

Alarm Type: “None”, “Major” or “Minor”

Status/Inputs / “Relay Output”

This card does not have inputs

Status/Outputs / “Relay Output”

OUTPUTS STATUS - RELAYS (SLOT6)

| Output Index | Pins (NO/NC/CMN) | Alarm Type |
|--------------|------------------|------------|
| 0 | 2/3/4 | Major |
| 1 | 5/6/7 | Major |
| 2 | 8/9/10 | Major |

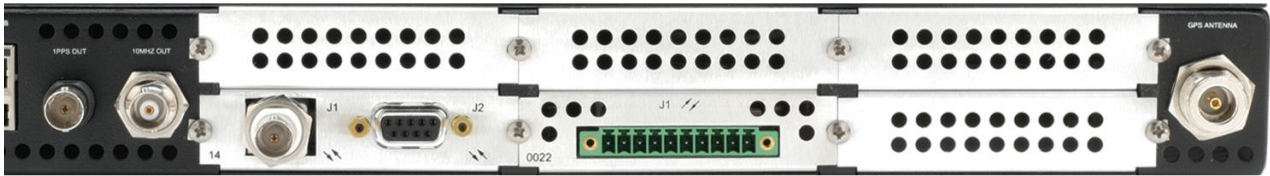
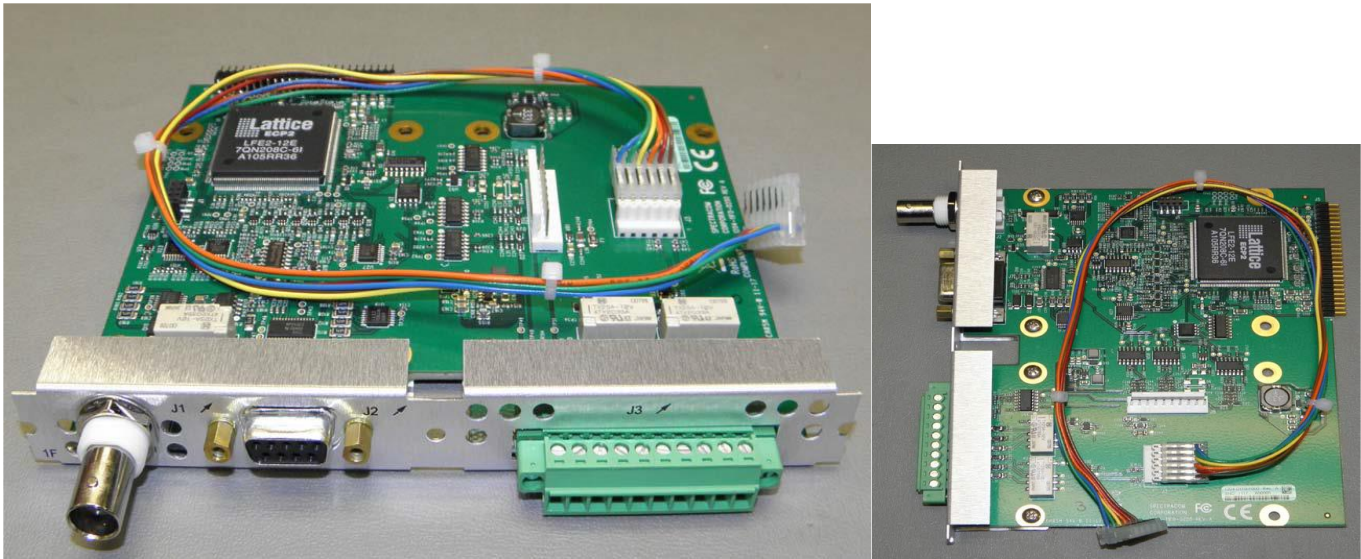
FAQs about the Model 1204-0F Option Card

Q. How can the alarms be programmed on both SecureSync and with the GUI? Customer is looking for audible alarms and alarms that occur when GPS lost and possible when the back-up oscillator is lost. Is that possible?

A. SecureSync has LED status lights on the front panel and can also send traps to SNMP managers on the network. There are no audible alarms directly available. However, with the Model 1204-0F (Relay output) Option Card installed, the SecureSync will then have three relays available with each relay being able to be configured as either a Minor or Major alarm relay. The customer can attach their own alarm circuitry (such as a light or buzzer) to the desired Minor or Alarm relay.

With this Option Card installed and with a relay configured as a Minor alarm, any Minor alarm condition (such as the GPS antenna cable being disconnected and SecureSync going into Holdover mode, for example), will cause relays that are configured as a Minor alarm relay to activate. When a Minor alarm condition occurs, and the relay is activated, the change in states of the relay causes their alarm circuitry to be activated. The same is true when one or more of the relays are configured as Major alarm. When a Major alarm condition occurs (such as loss of Time Sync, for example), relays configured as a Major alarm will be activated and the change in the state of the relay will cause their alarm circuitry to be activated.

(1204-1F) NENA Option Card (IRIG, ASCII, Alarm Relays)



**IRIG out (1) RS-232 output (1) RS-485 out / (2) Relays
(Slot 1)**

Back of the TimeView display clock

| RS-485 Input/Output | | | RS-485 Repeater | | |
|---------------------|---|-----|-----------------|---|-----|
| + | - | GND | + | - | GND |
| 1 | 2 | 3 | 4 | 5 | 6 |
| | | | | | |



Insert supplied 120 ohm resistor into holes 1 and 2 of this terminal block connector

| PIN | SIGNAL |
|-----|----------------|
| 1 | RS-485 TX+ |
| 2 | RS-485 TX- |
| 3 | GND |
| 4 | Relay 1 NO |
| 5 | Relay 1 NC |
| 6 | Relay 1 COMMON |
| 7 | Relay 2 NO |
| 8 | Relay 2 NC |
| 9 | Relay 2 COMMON |
| 10 | GND |

10 Pin Terminal block connector for 1204-1F (NENA) card



Our P/N: J900R-0101-022J (in Arena) https://app.bom.com/items/detail-spec?item_id=1202843926&version_id=10303495198

Manufacturer and MFG P/N: Phoenix Contact 1827787 Refer to:
<https://www.phoenixcontact.com/online/portal/us/?uri=pxc-oc-itemdetail:pid=1827787&library=usen&pcck=P-11-02-11&tab=1&selectedCategory=ALL>

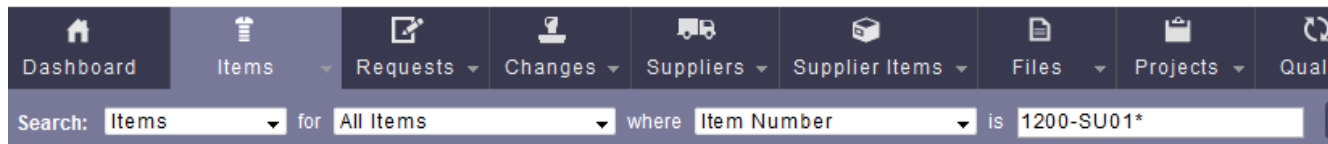
Schematic: (refer to 1204-01F0-F000) <I:\Engineering\Archive\New Released\PCB Documentation>

1204-1F Firmware versions

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the Model 1204-1F card: rt_oc1f_hw01_fpga.bin

| ECN | Archive version | FPGA FPGA version reported | Change | approximate cut-in |
|-----|-----------------------|--|--|--------------------|
| | | 1.00 | | |
| | | 1.01 | | |
| | See note to the right | 1.02 (current rev as of at least v5.4.1) | Note: Not sure at what version 1.02 was cut-in at, but it's in at least software version 5.2.1 | |
| | | 1.03 | Note: Not sure at what version 1.03 was cut-in at, but it was sometime after 5.2.1 and before 5.8.5 | |
| | | 1.04 | Note: Not sure at what version 1.04 was cut-in at, but it's in at least software version 5.8.5 | |

SecureSync software updates/issues associated with the NENA Option Card

First version of software for the Model 9483: The Model 9483 was first cut-in with the version 4.6.0 release.

A) When a local clock is selected, the RS-485 and RS-232 ports output time adjusts to UTC (+8 seconds) offset

- Refer to Mantis case 2760 <http://cvsmantis.int.rolia.com/mantis/view.php?id=2760>
- Started in version 5.1.2 - Fixed in version 5.2.0.
- Affects only the new browser (classic interface browser is fine).

I have entered NC 7724 as a Yellow NC for a 5.1.2 bug:

SecureSync 5.1.2 new web browser will not properly configure the Local Clock setting for the 9483 RS-232 and RS-485 ports. When a local clock is configured to these ports the time adjusts to UTC+ 8 seconds offset.

After configuring the local clock setting to the RS-232 port in the new web browser, when switching to the Classic Interface the TimeScale field is selected as "Local" but there is no entry in the Local Clock field.

I have duplicated this in the 9483 RS-232 and RS-485 interfaces. Not sure how many other option cards this affects. Should not need a "stop shipment" since the classic interface allows the local clock to be correctly entered. I entered this in Mantis 0002760.

Hardware changes

For Option Card hardware versions, refer to: (SP21) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |
| | | | | |

Inputs to this card: None

Outputs from this card:

- (1) IRIG (TTL single-ended)
Note: 1204-17's outputs are TTL compatible (they are not LVTTTL compatible for 3.3v logic)
- (1) ASCII RS-232 (DB9)
- (1) ASCII RS-485 (terminal block)

Setup/Inputs

This card does not have inputs

Setup/Outputs

SLOT 1
IRIG ASCII

SLOT 3
ASCII RELAY

- Slot 1: IRIG output and RS-232 Serial port
- Slot 3: RS-485 output port and Relays (Minor and Major)

(Slot 1 IRIG and RS-232 output - Two tabs)

IRIG output (1) (Slot 1)

OUTPUTS SETUP - IRIG AND ASCII RS-232 TIMECODE (SLOT1)

IRIG

ASCII RS-232

| | |
|-------------------|----------------------|
| Signature Control | No Signature Control |
| Format | IRIG B |
| Modulation | (1) IRIG AM |
| Coded Expression | (1) BCD TOY/CF |
| Control Field | RCC 200-04 |
| Time Scale | UTC |
| Local Clock | |
| Amplitude | 128 |
| Offset (ms) | 0 |

RS-232 Serial Port (One per NENA card) (Slot 1)

Important Note: Serial output has no default Format selected. Must configure the “First Format” before the port will provide data (all three default to “None”).

Note: The RS-232 Serial output port is normally installed in Slot 1.

OUTPUTS SETUP - IRIG AND ASCII RS-232 TIMECODE (SLOT1)

| | |
|-------------------|----------------------|
| IRIG ASCII RS-232 | |
| Signature Control | No Signature Control |
| First Format | None |
| Second Format | None |
| Third Format | None |
| Mode | Broadcast |
| Time Scale | UTC |
| Local Clock | |
| Request Character | T |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |

(Slot 3: RS-485 and Relays- Two tabs)

Remote RS-485 output (1)

Note: The RS-485 Remote port is normally installed in Slot 3.

Important Note: Remote output has no default Format selected. Must configure the “First Format” before the port will provide data (all three default to “None”).

OUTPUTS SETUP - IRIG AND ASCII RS-232 TIMECODE (SLOT1)

| | |
|-------------------|----------------------|
| IRIG ASCII RS-232 | |
| Signature Control | No Signature Control |
| First Format | None |
| Second Format | None |
| Third Format | None |
| Mode | Broadcast |
| Time Scale | UTC |
| Local Clock | |
| Request Character | T |
| Baud Rate | 9600 |
| Data Bits | 8 Data bits |
| Parity | Parity none |
| Stop Bits | 1 Stop bit |

Troubleshooting ASCII output conditions

A) “**Offset Error: Error 12 (KTSAL)**” error message reported when trying to change ASCII output settings

- refer to Salesforce Case196586
- reported with more recent version installed (5.8.4) but it was an older unit updated to 5.8.4
- suspect CF card writes/erases reaching end- and needs to be replaced
 - I sent link for customer to download Compact Flash health check patch

NENA Option Card Relay outputs (2) (not for 1204-0F card)

- Refer to the 9483 user guide at:
http://manuals.spectracom.com/NC/Content/NC_and_SS/NC/Topics/NetClock/NENA_Card.htm
- The two Relays can only be configured (as Minor alarm relay or Major Alarm relay) via web browser. They cannot be configured via CLI /Serial port.
- For details on the relay operation (such as pinouts) refer to

From the Model 9483 manual

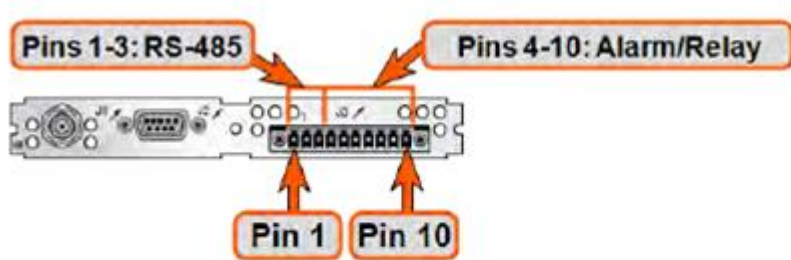


Figure 5-4: RS-485 connector "J3"

| Connector Pin | Signal | Direction | Characteristics |
|---------------|----------------|-----------|--|
| 1 | RS-485 TX+ | Out | 0V to 3V _{DC} differential, 120 Ω load |
| 2 | RS-485 TX- | Out | 0V to 3V _{DC} differential, 120 Ω load |
| 3 | GROUND | N/A | GROUND |
| 4 | Relay 1 NO | Out | Normally Open 30 V _{DC} , 2A max. switching power |
| 5 | Relay 1 NC | Out | Normally Closed 30 V _{DC} , 2A max. switching power |
| 6 | Relay 1 COMMON | Out | Common Contact 30 V _{DC} , 2A max. switching power |
| 7 | Relay 2 NO | Out | Normally Open 30 V _{DC} , 2A max. switching power |
| 8 | Relay 2 NC | Out | Normally Closed 30 V _{DC} , 2A max. switching power |
| 9 | Relay 2 COMMON | Out | Common Contact 30 V _{DC} , 2A max. switching power |
| 10 | GROUND | N/A | GROUND |

Available ground connection (pin 1 of the terminal block)

Email Keith sent to Homer w/Roots after talking to Tom Richardson (29 Jul 2014) The GND ground connection is typically not used with the relays. It was added as a convenient location to ground another device, so they are tied to the same ground potential. It can also be used to make Common a ground and use the relay as a pull-up to voltage supplied by another device. Both of these are rare conditions. It is not needed for protection.

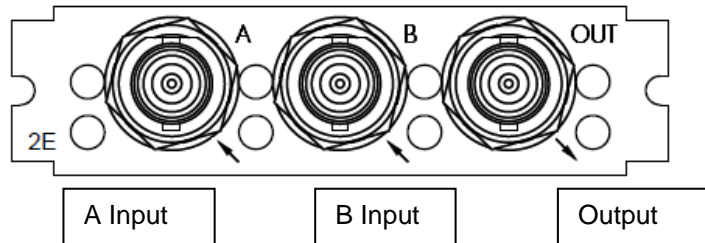
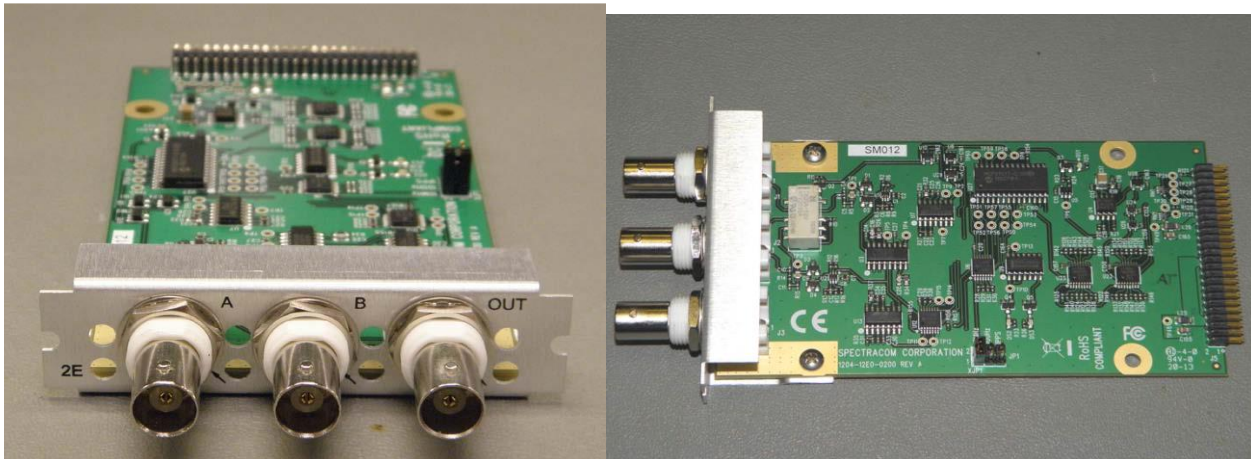
Interfaces -> Alarm Output 0 /Alarm Output 1 page of the browser

The screenshot shows a web interface for configuring 'Alarm Output 0'. It features a dropdown menu labeled 'Alarm Type' with 'None' selected. Below the menu are two buttons: 'Status' and 'Submit'.

Alarm Type options displayed/to choose from are:

- **None:** Will not output for an alarm.
- **Minor:** Will output on a minor alarm.
- **Major:** Will output on a major alarm.

(1204-2E) Revertive Failover Option Card

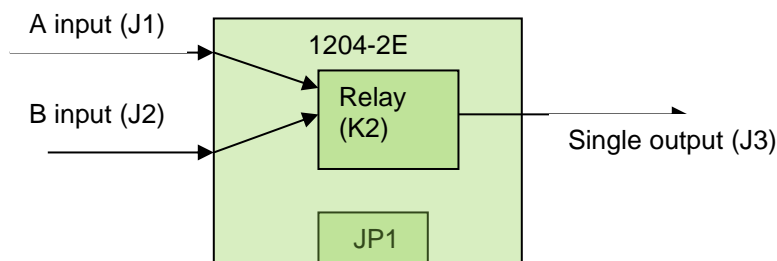


- **Link to schematic: (1204-12E1-0200)** in Arena: https://app.bom.com/items/detail-spec?item_id=1202846050&version_id=10212763328
- **Link to BOM (1204-02E0-F000):** In Arena: https://app.bom.com/items/detail-whereused?item_id=1202846050&version_id=10212763328
- **For software assembly versions, refer to: (1204-SHxx, SP1xx)** [I:\New Released\Firmware_Software\1204-xxxx-xxxx](#)

Purpose:

- (1204-2E) provides automatic failover capability in SecureSync using one option card slot for a single output signal.
- The option card is intended to work over a range of frequencies (over 100 Hz) with either sine wave or digital signals

Block diagram



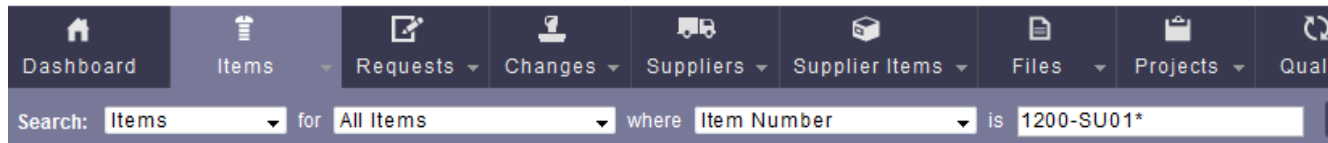
Note: JP1 is jumpers for selecting in/out as 1PPS, 100Hz or 10MHz

1204-2E Firmware versions

For Option Card firmware versions, refer to: (1204-SHxx, SP1xx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the 1204-2E card: rt_oc2e_hw01_fpga.bin

I don't believe this Option Card has an FPGA onboard

Note: as of at least version 5.2.1, there is no firmware associated with the 1204-2E yet (though it's planned to be added at some point in the future)

Hardware

- For Option Card hardware versions, refer to: (SP21) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|------|-----------------|-------------|--|--------------------|
| 3334 | | | Two resistor changes (more info further below) | |

Inputs (A and B)

- The card automatically fails over to the secondary B input on loss of signal or power.
- It prefers the primary A input in all other conditions

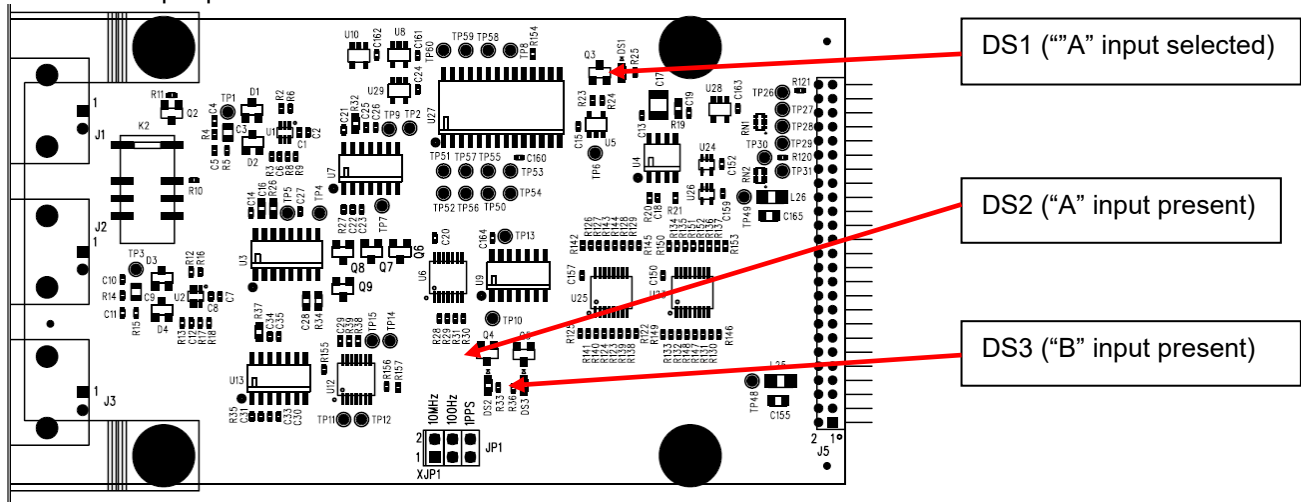
Outputs (1) / Output Relay

- The one Relay on the board switches paths from Inputs A to B or from Inputs B to A.
- Output signal follows the selected input signal (such as 1PPS, 5 MHz or 10 MHz)
- A input is always selected if it's present and valid.
- If A input is lost or not valid, B input becomes selected. When A is present and valid again, A is selected again.

Debug LEDs on the board

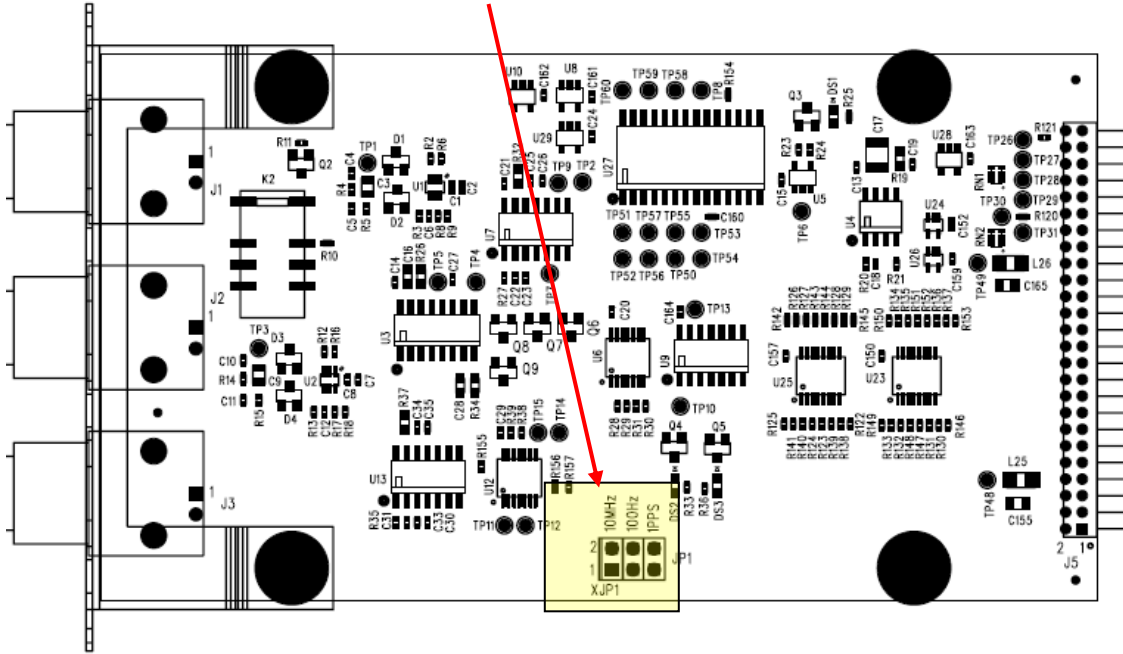
- There are three LEDs on the PCB board (not on the edge of the card so you can't see them from the back panel)
- DS1: “A” input selected
- DS2: “A” input present

- DS2: "B" input present



Jumper configuration for 1PPS, 100Hz and 10 MHz input

There is a (3) position jumper on the side of the board to configure the speed of the input. See drawing below.



A) Newer web browser and Classic Interface web browser

- **Note (15 Oct 2014):** As of at least Archive version 5.1.5, there is no software associated with this Option Card. So there are no setup screens at this time.

Setup/Inputs None as of at least version 5.1.7

Setup/Outputs None as of at least version 5.1.7

Status/Inputs None as of at least version 5.1.7

Status/Outputs None as of at least version 5.1.7

Troubleshooting 1204-2E cards

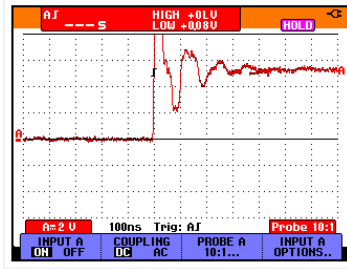
- Refer to known issues below
- Find out pulse width/frequency and amplitude of input signals

Known issues

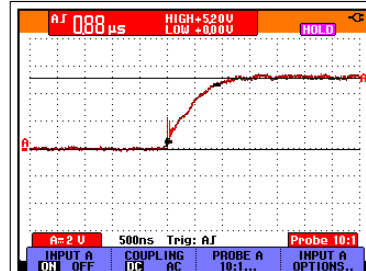
1. (May 2017): 1204-2E affecting rise-time of the pass-through 1PPS signal

- Refer to Salesforce case 25319
- “It has been reported (by LA County, via Ed O’Connor) the 1204-2E Revertive Selector module is affecting rise time of 1PPS Signal and causing problems for their systems.”

1PPS without 1204-2E selector



1PPS with 1204-2E selector



2. (Oct 2013): Relay switches states about every 2 to 3 seconds whenever 1PPS input is applied to the A input

- Tolerance issue -Refer to ECN 3334 for two resistor change to add more tolerance to 1PPS input.

(1204-3C) FAA Timestamping Module



- **Link to schematic: (1204-12E1-0200)** in Arena: https://app.bom.com/items/detail-spec?item_id=1203784279&version_id=10331257488
- **Link to BOM (1204-02E0-F000):** In Arena: https://app.bom.com/items/detail-spec?item_id=1203784279&version_id=10331257488
- **Link to PD (1204-3C-PD)** In Arena: https://app.bom.com/items/detail-spec?item_id=1229494516&version_id=10679308398&

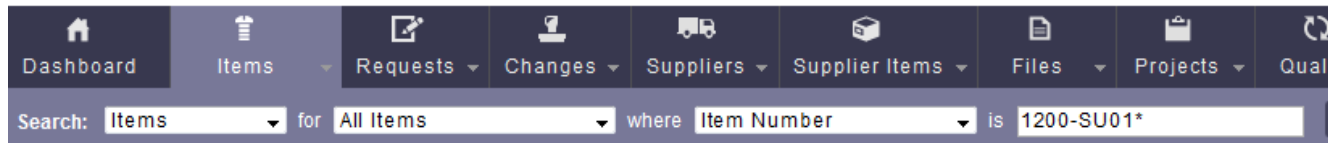
Refer to the “FAA Timestamping Module Application Note”: [..\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\1204-3C \(FAA TIMESTAMPING CARD\)\FAA_TimestampMod_AppNote.pdf](..\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\1204-3C (FAA TIMESTAMPING CARD)\FAA_TimestampMod_AppNote.pdf) For software assembly versions, refer to: (1204-SHxx, SP1xx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

Firmware

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



Dashboard Items Requests Changes Suppliers Supplier Items Files Projects Qual

Search: Items for All Items where Item Number is 1200-SU01*

- **FPGA (firmware) for the Model 1204-3C card:** rt_oc3c_hw01_fpga.bin

| ECO | Archive version | FPGA version reported | Change | approximate cut-in |
|--------------|---------------------------|---|---|--|
| 1108 | v5.5.2 | Likely 1.0.0 | First release to include support of 1204-3C card | v5.5.2 Not cut-in. But first units to include this Option Card were S/Ns 14975-14978, shipped 1 Feb 2017 |
| 2171 | (patch release for 5.8.4) | 1.01? | 1204-3C daemon hotpatch for FAA (Release “ 1200-SU02-FAA0 ” hotfix to production) | Not before 6/26/2019 |
| ECO-FAI-2174 | 5.8.5 | Likely 1.01 (latest rev as of at least 5.8.5) | Per the 5.8.5 Release Notes “1204-3C FAA performance enhancements.” | Sometime shortly after 12 July 2019 |

Hardware

For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |

Purpose” (per the “**FAA Timestamping Module Application Note**”) [I:\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option_Cards\1204-3C \(FAA TIMESTAMPING CARD\)\FAA_TimestampMod_AppNote.pdf](I:\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option_Cards\1204-3C (FAA TIMESTAMPING CARD)\FAA_TimestampMod_AppNote.pdf)

The Spectracom Timestamping Module model 1204-3C, custom-built for the U.S. Federal Aviation Administration, consists of one Ethernet port with a configurable IP address. The module accepts incoming positional pulse data from two sources on one DB15 connector. The positional pulse data consists of 16384 positional pulses and one north mark reference.

The module outputs a timestamp for each of the 16384 positional pulses. The output consists of a pulse counter value with an associated UTC timestamp. The pulse counter value will be reset to pulse 0 at the channel north mark reference.

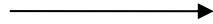
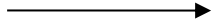
Block diagram

INPUTS (to the 1204-3C card):

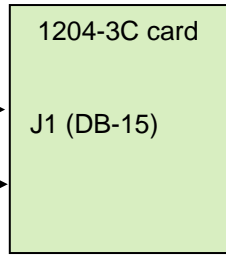
The iACP pulses occurs **every 732 microseconds**.

The ARP pulse occurs once **every 12 seconds**.

Source A: Incoming positional pulse data (16384 positional pulses and one north mark reference)



Source B: Incoming positional pulse data (16384 positional pulses and one north mark reference)



OUTPUTS (timestamps for each of the 16384 pulses are sent out SecureSync's ethernet interfaces)

"pulse counter value": with an associated UTC timestamp via ethernet interfaces (*eth0*, *eth1*, *eth2*, *eth3*)

FAA Pulse rates/FIFO buffer in 1204-3C card

Q At what rate are you controlling the pulses being sent to the SecureSync (and what is the maximum rate they can be sent at)?

A reply from Greg Barker with FAA (29 May 2019) The rate of the pulses never change. The iACP pulses occurs every 732 microseconds. The ARP pulse occurs once every 12 seconds.

FIFO buffer

Excerpt below from [..\TimingBoardCustAssist.pdf](#)

Time stamping has a 512 deep FIFO buffer (First In / First Out) that covers all inputs. In the host driver, we maintain 512 deep FIFOs for timestamp inputs individually. So, as long as overall they can keep up with **2k/s reading of timestamps**, they can allow up to 512 timestamps to be collected before reading. After 512 entries, the oldest one will be discarded.

Inputs

- DB15 Male connector on edge of Option Card
- Consists of Four (4) RS422 inputs
 - Incoming positional pulse data (16384 positional pulses and one north mark reference)

DB-15 connector



| OC3C DB-15 Pin | Customer Designation | Interface General Purpose Pins |
|----------------|----------------------|--------------------------------|
| Pin 2 | iACPA+ | GP Input 0 + |
| Pin 9 | iACPA- | GP Input 0 - |
| Pin 4 | ARPA+ | GP Input 1 + |
| Pin 11 | ARPA- | GP Input 1 - |
| Pin 3 | iACPB+ | GP Input 2 + |
| Pin 10 | iACPB- | GP Input 2 - |
| Pin 5 | ARPB+ | GP Input 3 + |
| Pin 12 | ARPB- | GP Input 3 - |
| Pin 8 | (GND) | (GND) |
| Pin 15 | (GND) | (GND) |

Outputs

- No outputs on this Option Card itself
 - Timestamp packets outputted via the **unit's Ethernet interfaces Eth 0 (and Eth1, eth2 and Eth3, if 1204-06 card is also installed)**
-

Example of good timestamp outputs (each/every entry reports “prev=16283”)

```
[2019/05/22 22:00:26]: Daemon running
[2019/05/22 22:00:26]: CScheduler::Initialize START
[2019/05/22 22:00:26]: CScheduler::CreateTimer START
[2019/05/22 22:00:26]: CScheduler::CreateTimer END
[2019/05/22 22:00:26]: CScheduler::Initialize END
[2019/05/22 22:00:26]: prev=0,cur=7554 [0,1,0.000000,0.000000,0.000000]
[2019/05/22 22:00:32]: prev=16383,cur=0 [0,2,6.421307,1.868778,0.000000]
[2019/05/22 22:00:44]: prev=16383,cur=0 [0,3,18.420197,1.302918,0.000000]
[2019/05/22 22:00:56]: prev=16383,cur=0 [0,4,30.374469,1.185206,0.000000]
[2019/05/22 22:01:08]: prev=16383,cur=0 [0,5,42.381396,1.132572,0.000000]
[2019/05/22 22:01:20]: prev=16383,cur=0 [0,6,54.418084,1.102575,0.000000]
[2019/05/22 22:01:32]: prev=16383,cur=0 [0,7,66.404639,1.084262,0.000000]
[2019/05/22 22:01:44]: prev=16383,cur=0 [0,8,78.371727,1.071815,0.000000]
[2019/05/22 22:01:56]: prev=16383,cur=0 [0,9,90.375491,1.062235,0.000000]
[2019/05/22 22:02:08]: prev=16383,cur=0 [0,10,102.418283,1.054499,0.000000]
[2019/05/22 22:02:20]: prev=16383,cur=0 [0,11,114.381241,1.049123,0.000000]
[2019/05/22 22:02:32]: prev=16383,cur=0 [0,12,126.368080,1.044568,0.000000]
[2019/05/22 22:02:44]: prev=16383,cur=0 [0,13,138.371368,1.040678,0.000000]
[2019/05/22 22:02:56]: prev=16383,cur=0 [0,14,150.373995,1.037413,0.000000]
[2019/05/22 22:03:08]: prev=16383,cur=0 [0,15,162.396039,1.034508,0.000000]
[2019/05/22 22:03:20]: prev=16383,cur=0 [0,16,174.366819,1.032306,0.000000]
[2019/05/22 22:03:32]: prev=16383,cur=0 [0,17,186.375654,1.030177,0.000000]
[2019/05/22 22:03:44]: prev=16383,cur=0 [0,18,198.366420,1.028400,0.000000]
[2019/05/22 22:03:56]: prev=16383,cur=0 [0,19,210.367634,1.026774,0.000000]
[2019/05/22 22:04:08]: prev=16383,cur=0 [0,20,222.383125,1.025258,0.000000]
[2019/05/22 22:04:20]: prev=16383,cur=0 [0,21,234.413739,1.023831,0.000000]
[2019/05/22 22:04:32]: prev=16383,cur=0 [0,22,246.419479,1.022651,0.000000]
[2019/05/22 22:04:44]: prev=16383,cur=0 [0,23,258.411193,1.021628,0.000000]
[2019/05/22 22:04:56]: prev=16383,cur=0 [0,24,270.386424,1.020761,0.000000]
[2019/05/22 22:05:08]: prev=16383,cur=0 [0,25,282.432093,1.019714,0.000000]
[2019/05/22 22:05:20]: prev=16383,cur=0 [0,26,294.433829,1.018905,0.000000]
[2019/05/22 22:05:32]: prev=16378,cur=0 [0,27,306.411105,1.018240,0.000000]
[2019/05/22 22:05:44]: prev=16380,cur=0 [0,28,318.425914,1.017505,0.000000]
[2019/05/22 22:05:56]: prev=16383,cur=0 [0,29,330.427663,1.016864,0.000000]
[2019/05/22 22:06:08]: prev=16382,cur=0 [0,30,342.425188,1.016280,0.000000]
[2019/05/22 22:06:20]: prev=16383,cur=0 [0,31,354.431838,1.015710,0.000000]
[2019/05/22 22:06:32]: prev=16383,cur=0 [0,32,366.436692,1.015182,0.000000]
[2019/05/22 22:06:44]: prev=16383,cur=0 [0,33,378.408678,1.014240,0.000000]
[2019/05/22 22:06:56]: prev=16383,cur=0 [0,34,390.463569,1.014179,0.000000]
[2019/05/22 22:07:08]: prev=16383,cur=0 [0,35,402.608399,1.013392,0.000000]
[2019/05/22 22:07:20]: prev=16383,cur=0 [0,36,414.608237,1.013004,0.000000]
[2019/05/22 22:07:32]: prev=16383,cur=0 [0,37,426.608155,1.012639,0.000000]
[2019/05/22 22:07:44]: prev=16383,cur=0 [0,38,438.468395,1.012161,0.000000]
[2019/05/22 22:07:56]: prev=16383,cur=0 [0,39,450.610187,1.011961,0.000000]
[2019/05/22 22:08:08]: prev=16383,cur=0 [0,40,462.614654,1.011641,0.000000]
[2019/05/22 22:08:20]: prev=16381,cur=0 [0,41,474.614033,1.011348,0.000000]
[2019/05/22 22:08:32]: prev=16383,cur=0 [0,42,486.414632,1.011483,0.000000]
[2019/05/22 22:08:44]: prev=16383,cur=0 [0,43,498.379418,1.011278,0.000000]
[2019/05/22 22:08:56]: prev=16383,cur=0 [0,44,510.362024,1.011047,0.000000]
[2019/05/22 22:09:08]: prev=16383,cur=0 [0,45,522.368333,1.010781,0.000000]
[2019/05/22 22:09:20]: prev=16383,cur=0 [0,46,534.376314,1.010524,0.000000]
[2019/05/22 22:09:32]: prev=16383,cur=0 [0,47,546.363075,1.010317,0.000000]
[2019/05/22 22:09:44]: prev=16383,cur=0 [0,48,558.368207,1.010086,0.000000]
[2019/05/22 22:09:56]: prev=16383,cur=0 [0,49,570.377149,1.009858,0.000000]
[2019/05/22 22:10:08]: prev=16383,cur=0 [0,50,582.363264,1.009679,0.000000]
[2019/05/22 22:10:20]: prev=16378,cur=0 [0,51,594.364246,1.009482,0.000000]
[2019/05/22 22:10:32]: prev=16383,cur=0 [0,52,606.375323,1.009276,0.000000]
[2019/05/22 22:10:44]: prev=16383,cur=0 [0,53,618.404962,1.009047,0.000000]
[2019/05/22 22:10:56]: prev=16383,cur=0 [0,54,630.410953,1.008866,0.000000]
[2019/05/22 22:11:08]: prev=16383,cur=0 [0,55,642.402848,1.008713,0.000000]
[2019/05/22 22:11:20]: prev=16383,cur=0 [0,56,654.373182,1.008599,0.000000]
[2019/05/22 22:11:32]: prev=16383,cur=0 [0,57,666.399212,1.008405,0.000000]
[2019/05/22 22:11:44]: prev=16383,cur=0 [0,58,678.400539,1.008254,0.000000]
[2019/05/22 22:11:56]: prev=16383,cur=0 [0,59,690.358781,1.008171,0.000000]
[2019/05/22 22:12:08]: prev=16383,cur=0 [0,60,702.402017,1.007970,0.000000]
[2019/05/22 22:12:20]: prev=16383,cur=0 [0,61,714.399353,1.007840,0.000000]
[2019/05/22 22:12:32]: prev=16383,cur=0 [0,62,726.402335,1.007706,0.000000]
[2019/05/22 22:12:44]: prev=16383,cur=0 [0,63,738.403876,1.007579,0.000000]
[2019/05/22 22:12:56]: prev=16383,cur=0 [0,64,750.400970,1.007461,0.000000]
[2019/05/22 22:13:08]: prev=16383,cur=0 [0,65,762.396809,1.007349,0.000000]
[2019/05/22 22:13:20]: prev=16383,cur=0 [0,66,774.357083,1.007287,0.000000]
[2019/05/22 22:13:32]: prev=16383,cur=0 [0,67,786.401962,1.007119,0.000000]
[2019/05/22 22:13:44]: prev=16383,cur=0 [0,68,798.399679,1.007014,0.000000]
[2019/05/22 22:13:56]: prev=16383,cur=0 [0,69,810.400012,1.006910,0.000000]
```

Example of **bad** timestamp outputs (not all entries are reporting “prev=16283”, such as “prev=16279”)

```
[2019/05/22 22:31:33]: Daemon running
[2019/05/22 22:31:33]: CScheduler::Initialize START
[2019/05/22 22:31:33]: CScheduler::CreateTimer START
[2019/05/22 22:31:33]: CScheduler::CreateTimer END
[2019/05/22 22:31:33]: CScheduler::Initialize END
[2019/05/22 22:31:33]: prev=0, cur=571 [0,1,0.000000,0.000000,0.000000]
[2019/05/22 22:31:44]: prev=16383, cur=0 [0,2,11.566473,1.037481,0.000000]
[2019/05/22 22:31:54]: prev=16383, cur=0 [0,3,23.572990,1.018132,0.000000]
[2019/05/22 22:32:08]: prev=16383, cur=0 [0,4,35.576907,1.011892,0.000000]
[2019/05/22 22:32:20]: prev=16383, cur=0 [0,5,47.538417,1.009710,0.000000]
[2019/05/22 22:32:32]: prev=16383, cur=0 [0,6,59.573500,1.007159,0.000000]
[2019/05/22 22:32:44]: prev=16383, cur=0 [0,7,71.576136,1.005922,0.000000]
[2019/05/22 22:32:56]: prev=16382, cur=0 [0,8,83.566433,1.005188,0.000000]
[2019/05/22 22:33:08]: prev=16383, cur=0 [0,9,95.570825,1.004491,0.000000]
[2019/05/22 22:33:20]: prev=16383, cur=0 [0,10,107.559178,1.004098,0.000000]
[2019/05/22 22:33:32]: prev=16379, cur=0 [0,11,119.539099,1.003856,0.000000]
[2019/05/22 22:33:44]: prev=16379, cur=0 [0,12,131.522017,1.003634,0.000000]
[2019/05/22 22:33:56]: prev=16383, cur=0 [0,13,143.523248,1.003322,0.000000]
[2019/05/22 22:34:08]: prev=16383, cur=0 [0,14,155.535861,1.002984,0.000000]
[2019/05/22 22:34:20]: prev=16383, cur=0 [0,15,167.520677,1.002861,0.000000]
[2019/05/22 22:34:32]: prev=16383, cur=0 [0,16,179.525514,1.002643,0.000000]
[2019/05/22 22:34:44]: prev=16383, cur=0 [0,17,191.525953,1.002475,0.000000]
[2019/05/22 22:34:56]: prev=16383, cur=0 [0,18,203.533541,1.002292,0.000000]
[2019/05/22 22:35:08]: prev=16380, cur=0 [0,19,215.528502,1.002188,0.000000]
[2019/05/22 22:35:20]: prev=16383, cur=0 [0,20,227.520266,1.002109,0.000000]
[2019/05/22 22:35:32]: prev=16377, cur=0 [0,21,239.519504,1.002006,0.000000]
[2019/05/22 22:35:44]: prev=16376, cur=0 [0,22,251.545900,1.001813,0.000000]
[2019/05/22 22:35:56]: prev=16383, cur=0 [0,23,263.510726,1.001857,0.000000]
[2019/05/22 22:36:08]: prev=16383, cur=0 [0,24,275.505840,1.001794,0.000000]
[2019/05/22 22:36:20]: prev=16383, cur=0 [0,25,287.504058,1.001725,0.000000]
[2019/05/22 22:36:32]: prev=16383, cur=0 [0,26,299.517910,1.001610,0.000000]
[2019/05/22 22:36:44]: prev=16383, cur=0 [0,27,311.517075,1.001550,0.000000]
[2019/05/22 22:36:56]: prev=16383, cur=0 [0,28,323.516380,1.001495,0.000000]
[2019/05/22 22:37:08]: prev=16382, cur=0 [0,29,335.517786,1.001437,0.000000]
[2019/05/22 22:37:20]: prev=16381, cur=0 [0,30,347.518499,1.001386,0.000000]
[2019/05/22 22:37:32]: prev=16383, cur=0 [0,31,359.514992,1.001349,0.000000]
[2019/05/22 22:37:44]: prev=16381, cur=0 [0,32,371.519566,1.001283,0.000000]
[2019/05/22 22:37:56]: prev=16383, cur=0 [0,33,383.519168,1.001254,0.000000]
[2019/05/22 22:38:08]: prev=16383, cur=0 [0,34,395.505372,1.001251,0.000000]
[2019/05/22 22:38:20]: prev=16383, cur=0 [0,35,407.516556,1.001186,0.000000]
[2019/05/22 22:38:32]: prev=16382, cur=0 [0,36,419.519359,1.001146,0.000000]
[2019/05/22 22:38:44]: prev=16383, cur=0 [0,37,431.503163,1.001151,0.000000]
[2019/05/22 22:38:56]: prev=16383, cur=0 [0,38,443.523534,1.001074,0.000000]
[2019/05/22 22:39:08]: prev=16381, cur=0 [0,39,455.512807,1.001070,0.000000]
[2019/05/22 22:39:20]: prev=16383, cur=0 [0,40,467.518531,1.001030,0.000000]
[2019/05/22 22:39:32]: prev=16383, cur=0 [0,41,479.544771,1.000949,0.000000]
[2019/05/22 22:39:44]: prev=16383, cur=0 [0,42,491.511388,1.000994,0.000000]
[2019/05/22 22:39:56]: prev=16382, cur=0 [0,43,503.516245,1.000961,0.000000]
[2019/05/22 22:40:08]: prev=16383, cur=0 [0,44,515.497579,1.000975,0.000000]
[2019/05/22 22:40:20]: prev=16380, cur=0 [0,45,527.522248,1.000906,0.000000]
[2019/05/22 22:40:32]: prev=16382, cur=0 [0,46,539.527429,1.000876,0.000000]
[2019/05/22 22:40:44]: prev=16383, cur=0 [0,47,551.509345,1.000890,0.000000]
[2019/05/22 22:40:56]: prev=16380, cur=0 [0,48,563.509376,1.000871,0.000000]
[2019/05/22 22:41:08]: prev=16382, cur=0 [0,49,575.547861,1.000786,0.000000]
[2019/05/22 22:41:20]: prev=16383, cur=0 [0,50,587.544298,1.000776,0.000000]
[2019/05/22 22:41:32]: prev=16379, cur=0 [0,51,599.517578,1.000805,0.000000]
[2019/05/22 22:41:44]: prev=16383, cur=0 [0,52,611.508936,1.000803,0.000000]
[2019/05/22 22:41:56]: prev=16383, cur=0 [0,53,623.507456,1.000790,0.000000]
[2019/05/22 22:42:08]: prev=16383, cur=0 [0,54,635.524678,1.000748,0.000000]
[2019/05/22 22:42:20]: prev=16383, cur=0 [0,55,647.509206,1.000758,0.000000]
[2019/05/22 22:42:32]: prev=16381, cur=0 [0,56,659.511296,1.000741,0.000000]
[2019/05/22 22:42:44]: prev=16383, cur=0 [0,57,671.549174,1.000671,0.000000]
[2019/05/22 22:42:56]: prev=16383, cur=0 [0,58,683.506541,1.000722,0.000000]
[2019/05/22 22:43:08]: prev=16383, cur=0 [0,59,695.545038,1.000684,0.000000]
[2019/05/22 22:43:20]: prev=16383, cur=0 [0,60,707.510366,1.000692,0.000000]
[2019/05/22 22:43:32]: prev=16383, cur=0 [0,61,719.498346,1.000697,0.000000]
[2019/05/22 22:43:44]: prev=16382, cur=0 [0,62,731.519407,1.000657,0.000000]
[2019/05/22 22:43:56]: prev=16383, cur=0 [0,63,743.519418,1.000646,0.000000]
[2019/05/22 22:44:08]: prev=16383, cur=0 [0,64,755.506427,1.000653,0.000000]
[2019/05/22 22:44:20]: prev=16383, cur=0 [0,65,767.513144,1.000634,0.000000]
[2019/05/22 22:44:32]: prev=16383, cur=0 [0,66,779.508006,1.000631,0.000000]
```

1223-SS00-0FS1: LAF GPI TimeStamper Option

- Software license associated with 1204-3C card
- refer to (In Arena): https://app.bom.com/items/detail-spec?item_id=1230088220&version_id=10817184988

Description: License for GPI TimeStamper Option used with 1204-3C, RS422 4-IN, DB15 MALE option card.

Example from Manifest log of FAA unit with 1204-3C card installed: “available Licenses : **License 0: GPI Timestamp**”

Q Email from Dave L to Apps (4 Apr 2019) FAA called today reporting they could not restore a configuration file saved that will indicate General Purpose Input Time Stamping is enabled. They enabled General Purpose Input Time Stamping and saved a config file, Then restored the file but the General Purpose Input Time Stamping was disabled.

I tested this on two SecureSyncs v5.7.0 and 5.8.2. There is a bug. but it has nothing to do with saving the config files.

- In the v5.7.0 unit the General Purpose Input Time Stamping will not remain enabled after I turn it on from the web UI. After a short time or screen refresh the switch indicated OFF.
- In v5.8.2 General Purpose Input Time Stamping AND System Time Message will not remain ON after turning them on in the Network Setup page.

Please enter a JIRA for this and let me know if you need more information. I will contact FAA and ask if they are REALLY using the General Purpose Input Time Stamping or not.

BTW, I cannot find any information on General Purpose Input Time Stamping at all anywhere. What is General Purpose Input Time Stamping anyway???

A Reply from Ron Dries (5 Apr 2019) The General Purpose Input Time Stamping is a feature which requires a license to be present to run. Do they have the license installed?

Screenshots/configuration

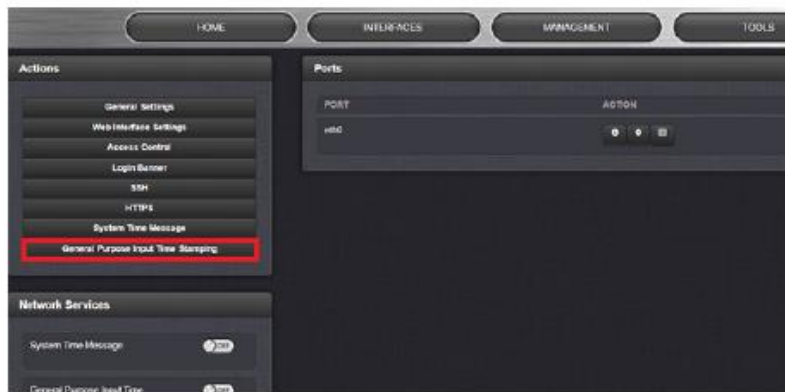
Web browser (newer browser only) (from the **"FAA Timestamping Module Application Note"**)

[..\\..\\EQUIPMENT\\SPECTRACOM EQUIPMENT\\SecureSync\\Option Cards\\1204-3C \(FAA TIMESTAMPING CARD\)\\FAA TimestampMod_AppNote.pdf](..\\..\\EQUIPMENT\\SPECTRACOM EQUIPMENT\\SecureSync\\Option Cards\\1204-3C (FAA TIMESTAMPING CARD)\\FAA TimestampMod_AppNote.pdf)

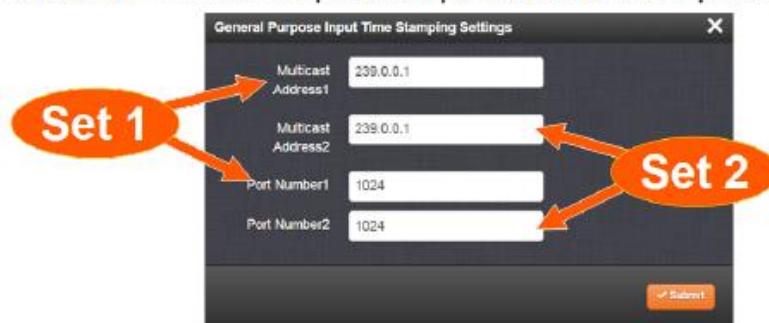
1.3 Changing the Time Stamping Settings

To review or edit the Time Stamping Settings:

1. Open the Web UI, and navigate to **Management > Network Setup**.
2. In the Actions panel, select **General Purpose Input Time Stamping**.



3. Change the settings for the **Multicast Address** and the **Port** that is associated with it.
Note that **Set 1** is tied to GP Input 0/GP Input 1, and **Set 2** to GP Input 2/GP Input 3.



System Operation

System Operation

On startup the system will clear timestamps.

The count for GP Input 0 is incremented for and the Timestamp is collected. The count is reset when GP Input 1 is activated.

The count for GP Input 2 is incremented for and the Timestamp is collected. The count is reset when GP Input 3 is activated.

The system will log an error in `system.log` if the count is not reset and reaches the maximum value of 65535.

Due to limitations of the system NIC, the driver sends a multicast packet every 64 timestamps.

Ethernet Settings:

MTU = 1500

UDP packet Time-to-live = 1

The expected UDP packet size is 1028 bytes, not including the UDP datagram header for the timestamp count of 64.

Packet Structure (via the standard Ethernet interfaces- no Ethernet connector on the card)

.4 Packet Structure

All data is transmitted in network byte order, therefore use `htons()` and `htohl()` to convert it correctly.

Example (C):

```
typedef struct
{
    UINT16    numTs; // 64 size
    UINT16    id;    // 0 for set GPIO/GPI1
                // 1 for set GPIO2/GPI3
    MSG       pl[64];
} MSG_BUFFER;
typedef struct
{
    NET_TIMESTAMP ts;
    UINT16    count;
    UINT16    spare;
} MSG;
typedef struct
{
    UINT16    year;
    UINT16    month_day;
    UINT16    hour_minute;
    UINT16    second;
    UINT32    nanosecond;
} NET_TIMESTAMP;
```

MSG_BUFFER: size of 1028 bytes

| | | | | | | | |
|--------|-----------------|-----------------|-----------------|-----|-----|-----|------------------|
| Header | TS+count [1] | TS+count [2] | TS+count [3] | ... | ... | ... | TS+count [64] |
|--------|-----------------|-----------------|-----------------|-----|-----|-----|------------------|

Header: (MSG_BUFFER.numTs, MSG_BUFFER.id) size of 4 bytes

| | | | |
|-------|-------|----|----|
| numTs | NumTs | id | id |
|-------|-------|----|----|

Timestamp and count (TS+count[]): MSG_BUFFER.pl[], MSG_BUFFER.pl[].count size 16 bytes

| | | | |
|------------|------------|------------|------------|
| Year | Year | Month | Day |
| Hour | Minute | Second | Second |
| Nanosecond | Nanosecond | Nanosecond | Nanosecond |
| Count | Count | Spare | Spare |

Troubleshooting/issues associated with Model 1204-3C Timestamping cards

- Refer to “known issues” below
- Get logs and config bundles
- get timestamps output report

Issues associated with 1204-3C Option Card

1) System log entries: “**ERROR: OVERFLOW DETECTED FIFO IS FULL (GPITSD)**” and “**ERROR: CLEARING OVERFLOW FLAG (GPITSD)**”

- Refer to case **196266** (May 2019)
- Initially fixed with a patch for 5.8.4.
- Patch was added into 5.8.5.

Symptoms: Not all timestamps indicate “**prev=16283**”, as they should (FIFO overflow errors present in System log, such as with v5.8.4 installed)

Example of **good** timestamp outputs (each/every entry reports “**prev=16283**”) with v5.5.2 installed

```
[2019/05/22 22:00:26]: Daemon running
[2019/05/22 22:00:26]: CScheduler::Initialize START
[2019/05/22 22:00:26]: CScheduler::CreateTimer START
[2019/05/22 22:00:26]: CScheduler::CreateTimer END
[2019/05/22 22:00:26]: CScheduler::Initialize END
[2019/05/22 22:00:26]: prev=16283, cur=0 [0,1,0.000000,0.000000,0.000000]
[2019/05/22 22:00:32]: prev=16283, cur=0 [0,2,6.421307,1.848778,0.000000]
[2019/05/22 22:00:44]: prev=16283, cur=0 [0,3,18.420197,1.302918,0.000000]
[2019/05/22 22:00:56]: prev=16283, cur=0 [0,4,30.374469,1.185206,0.000000]
[2019/05/22 22:01:08]: prev=16283, cur=0 [0,5,42.381396,1.132572,0.000000]
[2019/05/22 22:01:20]: prev=16283, cur=0 [0,6,54.418054,1.102575,0.000000]
[2019/05/22 22:01:32]: prev=16283, cur=0 [0,7,66.404639,1.084262,0.000000]
[2019/05/22 22:01:44]: prev=16283, cur=0 [0,8,78.371727,1.071815,0.000000]
[2019/05/22 22:01:56]: prev=16283, cur=0 [0,9,90.375491,1.062235,0.000000]
[2019/05/22 22:02:08]: prev=16283, cur=0 [0,10,102.418283,1.054499,0.000000]
[2019/05/22 22:02:20]: prev=16283, cur=0 [0,11,114.381241,1.049123,0.000000]
[2019/05/22 22:02:32]: prev=16283, cur=0 [0,12,126.368080,1.044568,0.000000]
[2019/05/22 22:02:44]: prev=16283, cur=0 [0,13,138.371368,1.040678,0.000000]
[2019/05/22 22:02:56]: prev=16283, cur=0 [0,14,150.373995,1.037413,0.000000]
[2019/05/22 22:03:08]: prev=16283, cur=0 [0,15,162.396039,1.034508,0.000000]
[2019/05/22 22:03:20]: prev=16283, cur=0 [0,16,174.366819,1.032306,0.000000]
[2019/05/22 22:03:32]: prev=16283, cur=0 [0,17,186.375654,1.030177,0.000000]
[2019/05/22 22:03:44]: prev=16283, cur=0 [0,18,198.366420,1.028400,0.000000]
[2019/05/22 22:03:56]: prev=16283, cur=0 [0,19,210.367634,1.026774,0.000000]
[2019/05/22 22:04:08]: prev=16283, cur=0 [0,20,222.383125,1.025258,0.000000]
[2019/05/22 22:04:20]: prev=16283, cur=0 [0,21,234.413739,1.023831,0.000000]
[2019/05/22 22:04:32]: prev=16283, cur=0 [0,22,246.418479,1.022651,0.000000]
[2019/05/22 22:04:44]: prev=16283, cur=0 [0,23,258.411193,1.021628,0.000000]
[2019/05/22 22:04:56]: prev=16283, cur=0 [0,24,270.386424,1.020761,0.000000]
[2019/05/22 22:05:08]: prev=16283, cur=0 [0,25,282.432093,1.019714,0.000000]
[2019/05/22 22:05:20]: prev=16283, cur=0 [0,26,294.433829,1.018905,0.000000]
[2019/05/22 22:05:32]: prev=16283, cur=0 [0,27,306.411105,1.018240,0.000000]
[2019/05/22 22:05:44]: prev=16283, cur=0 [0,28,318.425914,1.017505,0.000000]
[2019/05/22 22:05:56]: prev=16283, cur=0 [0,29,330.427663,1.016864,0.000000]
[2019/05/22 22:06:08]: prev=16283, cur=0 [0,30,342.425188,1.016280,0.000000]
[2019/05/22 22:06:20]: prev=16283, cur=0 [0,31,354.431838,1.015710,0.000000]
[2019/05/22 22:06:32]: prev=16283, cur=0 [0,32,366.436692,1.015182,0.000000]
[2019/05/22 22:06:44]: prev=16283, cur=0 [0,33,378.608678,1.014240,0.000000]
[2019/05/22 22:06:56]: prev=16283, cur=0 [0,34,390.463569,1.014179,0.000000]
[2019/05/22 22:07:08]: prev=16283, cur=0 [0,35,402.608399,1.013392,0.000000]
[2019/05/22 22:07:20]: prev=16283, cur=0 [0,36,414.608237,1.013004,0.000000]
[2019/05/22 22:07:32]: prev=16283, cur=0 [0,37,426.608155,1.012639,0.000000]
[2019/05/22 22:07:44]: prev=16283, cur=0 [0,38,438.468395,1.012616,0.000000]
[2019/05/22 22:07:56]: prev=16283, cur=0 [0,39,450.610187,1.011961,0.000000]
[2019/05/22 22:08:08]: prev=16283, cur=0 [0,40,462.614654,1.011641,0.000000]
[2019/05/22 22:08:20]: prev=16283, cur=0 [0,41,474.614033,1.011348,0.000000]
[2019/05/22 22:08:32]: prev=16283, cur=0 [0,42,486.414632,1.011243,0.000000]
[2019/05/22 22:08:44]: prev=16283, cur=0 [0,43,498.379418,1.011278,0.000000]
[2019/05/22 22:08:56]: prev=16283, cur=0 [0,44,510.362024,1.011047,0.000000]
[2019/05/22 22:09:08]: prev=16283, cur=0 [0,45,522.368333,1.010781,0.000000]
[2019/05/22 22:09:20]: prev=16283, cur=0 [0,46,534.376314,1.010524,0.000000]
[2019/05/22 22:09:32]: prev=16283, cur=0 [0,47,546.369075,1.010317,0.000000]
[2019/05/22 22:09:44]: prev=16283, cur=0 [0,48,558.368207,1.010086,0.000000]
[2019/05/22 22:09:56]: prev=16283, cur=0 [0,49,570.377149,1.009858,0.000000]
[2019/05/22 22:10:08]: prev=16283, cur=0 [0,50,582.363264,1.009679,0.000000]
[2019/05/22 22:10:20]: prev=16283, cur=0 [0,51,594.364246,1.009482,0.000000]
[2019/05/22 22:10:32]: prev=16283, cur=0 [0,52,606.375323,1.009276,0.000000]
[2019/05/22 22:10:44]: prev=16283, cur=0 [0,53,618.404982,1.009047,0.000000]
[2019/05/22 22:10:56]: prev=16283, cur=0 [0,54,630.410953,1.008866,0.000000]
[2019/05/22 22:11:08]: prev=16283, cur=0 [0,55,642.402848,1.008713,0.000000]
[2019/05/22 22:11:20]: prev=16283, cur=0 [0,56,654.373182,1.008599,0.000000]
[2019/05/22 22:11:32]: prev=16283, cur=0 [0,57,666.399212,1.008405,0.000000]
[2019/05/22 22:11:44]: prev=16283, cur=0 [0,58,678.400539,1.008254,0.000000]
[2019/05/22 22:11:56]: prev=16283, cur=0 [0,59,690.358781,1.008171,0.000000]
[2019/05/22 22:12:08]: prev=16283, cur=0 [0,60,702.402017,1.007970,0.000000]
[2019/05/22 22:12:20]: prev=16283, cur=0 [0,61,714.399353,1.007840,0.000000]
[2019/05/22 22:12:32]: prev=16283, cur=0 [0,62,726.402335,1.007706,0.000000]
[2019/05/22 22:12:44]: prev=16283, cur=0 [0,63,738.403876,1.007579,0.000000]
[2019/05/22 22:12:56]: prev=16283, cur=0 [0,64,750.400970,1.007461,0.000000]
[2019/05/22 22:13:08]: prev=16283, cur=0 [0,65,762.396809,1.007349,0.000000]
[2019/05/22 22:13:20]: prev=16283, cur=0 [0,66,774.357083,1.007287,0.000000]
[2019/05/22 22:13:32]: prev=16283, cur=0 [0,67,786.401962,1.007119,0.000000]
[2019/05/22 22:13:44]: prev=16283, cur=0 [0,68,798.399679,1.007014,0.000000]
[2019/05/22 22:13:56]: prev=16283, cur=0 [0,69,810.400012,1.006910,0.000000]
```

A) Example of *bad* timestamp outputs (not all entries are reporting “prev=16283”, such as “prev=16279”) with v5.8.4 installed

```
[2019/05/22 21:28:27]: Daemon running
[2019/05/22 21:28:27]: CScheduler::Initialize START
[2019/05/22 21:28:27]: CScheduler::CreateTimer START
[2019/05/22 21:28:27]: CScheduler::CreateTimer END
[2019/05/22 21:28:27]: CScheduler::Initialize END
[2019/05/22 21:28:27]: prev=0,cuz=8462 [0,1,0.000000,0.000000,0.000000]
[2019/05/22 21:28:32]: prev=16383,cuz=0 [0,2,5.792516,2.071639,0.000000]
[2019/05/22 21:28:44]: prev=16383,cuz=0 [0,3,17.778192,1.349969,0.000000]
[2019/05/22 21:28:56]: prev=16383,cuz=0 [0,4,29.801989,1.207973,0.000000]
[2019/05/22 21:29:03]: prev=8467,cuz=0 [1,5,35.963490,1.334687,0.333672]
[2019/05/22 21:29:08]: prev=7916,cuz=0 [2,6,41.808545,1.435113,0.574045]
[2019/05/22 21:29:20]: prev=16383,cuz=0 [2,7,53.788103,1.338586,0.446195]
[2019/05/22 21:29:29]: prev=11226,cuz=0 [3,8,62.007159,1.354682,0.580578]
[2019/05/22 21:29:32]: prev=5155,cuz=0 [4,9,65.797384,1.459025,0.729512]
[2019/05/22 21:29:44]: prev=16383,cuz=0 [4,10,77.774643,1.388627,0.617168]
[2019/05/22 21:29:56]: prev=16383,cuz=0 [4,11,89.800806,1.336291,0.534516]
[2019/05/22 21:30:08]: prev=16383,cuz=0 [4,12,101.779447,1.296922,0.471608]
[2019/05/22 21:30:20]: prev=16383,cuz=0 [4,13,113.803686,1.265315,0.421772]
[2019/05/22 21:30:32]: prev=16383,cuz=0 [4,14,125.777803,1.240282,0.381625]
[2019/05/22 21:30:44]: prev=16383,cuz=0 [4,15,137.806582,1.219100,0.348314]
[2019/05/22 21:30:56]: prev=16383,cuz=0 [4,16,149.784181,1.201729,0.320461]
[2019/05/22 21:31:08]: prev=16383,cuz=0 [4,17,161.801945,1.186636,0.296659]
[2019/05/22 21:31:20]: prev=16383,cuz=0 [4,18,173.769933,1.173966,0.276227]
[2019/05/22 21:31:32]: prev=16383,cuz=0 [4,19,185.788969,1.162609,0.258388]
[2019/05/22 21:31:44]: prev=16383,cuz=0 [4,20,197.774866,1.152826,0.242700]
[2019/05/22 21:31:56]: prev=16383,cuz=0 [4,21,209.774295,1.144087,0.228817]
[2019/05/22 21:32:08]: prev=16383,cuz=0 [4,22,221.796044,1.136179,0.216415]
[2019/05/22 21:32:20]: prev=16383,cuz=0 [4,23,233.764344,1.129342,0.205335]
[2019/05/22 21:32:32]: prev=16383,cuz=0 [4,24,245.790898,1.122906,0.195288]
[2019/05/22 21:32:44]: prev=16383,cuz=0 [4,25,257.800838,1.117141,0.186190]
[2019/05/22 21:32:56]: prev=16383,cuz=0 [4,26,269.771214,1.112083,0.177929]
[2019/05/22 21:33:08]: prev=16383,cuz=0 [4,27,281.797806,1.107177,0.170335]
[2019/05/22 21:33:20]: prev=16383,cuz=0 [4,28,293.772701,1.102893,0.163392]
[2019/05/22 21:33:32]: prev=16383,cuz=0 [4,29,305.785575,1.098809,0.156973]
[2019/05/22 21:33:40]: prev=9850,cuz=0 [5,0,313.001263,1.111817,0.181693]
[2019/05/22 21:33:44]: prev=6531,cuz=0 [6,1,317.795980,1.132802,0.226560]
[2019/05/22 21:33:56]: prev=16383,cuz=0 [6,2,329.787907,1.127998,0.218322]
[2019/05/22 21:34:04]: prev=9849,cuz=0 [7,3,337.005861,1.139446,0.249254]
[2019/05/22 21:34:08]: prev=6533,cuz=0 [8,4,341.798851,1.158576,0.280867]
[2019/05/22 21:34:20]: prev=16383,cuz=0 [8,5,353.787826,1.153234,0.271349]
[2019/05/22 21:34:24]: prev=7102,cuz=0 [9,6,359.002147,1.169909,0.300834]
[2019/05/22 21:34:32]: prev=9280,cuz=0 [10,7,365.795899,1.180966,0.328052]
[2019/05/22 21:34:36]: prev=4402,cuz=0 [11,8,368.956839,1.203393,0.357765]
[2019/05/22 21:34:44]: prev=11980,cuz=0 [12,9,377.762707,1.207107,0.381192]
[2019/05/22 21:34:56]: prev=13303,cuz=0 [13,10,389.000855,1.203082,0.401027]
[2019/05/22 21:34:56]: prev=1079,cuz=0 [14,11,389.790999,1.231429,0.431000]
[2019/05/22 21:35:08]: prev=16383,cuz=0 [14,12,401.767482,1.224589,0.418152]
[2019/05/22 21:35:20]: prev=16383,cuz=0 [14,13,413.785297,1.218023,0.406008]
[2019/05/22 21:35:32]: prev=16383,cuz=0 [14,14,425.757752,1.211957,0.394591]
[2019/05/22 21:35:44]: prev=16383,cuz=0 [14,15,437.780471,1.206084,0.383754]
[2019/05/22 21:35:56]: prev=16383,cuz=0 [14,16,449.803108,1.200525,0.373497]
[2019/05/22 21:36:08]: prev=16383,cuz=0 [14,17,461.774296,1.195389,0.363814]
[2019/05/22 21:36:13]: prev=5772,cuz=0 [15,18,465.998282,1.210305,0.386268]
[2019/05/22 21:36:15]: prev=2698,cuz=0 [16,19,467.947757,1.230907,0.410302]
[2019/05/22 21:36:20]: prev=7910,cuz=0 [17,20,473.795861,1.241041,0.430565]
[2019/05/22 21:36:21]: prev=266,cuz=0 [18,21,473.945041,1.265943,0.455739]
[2019/05/22 21:36:32]: prev=16116,cuz=0 [19,22,485.762528,1.259875,0.469365]
[2019/05/22 21:36:39]: prev=8467,cuz=0 [20,23,491.946980,1.268429,0.487857]
[2019/05/22 21:36:44]: prev=7914,cuz=0 [21,24,497.801879,1.277617,0.506225]
[2019/05/22 21:36:56]: prev=16383,cuz=0 [21,25,509.774707,1.271150,0.494336]
[2019/05/22 21:37:04]: prev=9854,cuz=0 [22,26,517.000114,1.276595,0.510638]
[2019/05/22 21:37:08]: prev=6527,cuz=0 [23,27,521.791718,1.287870,0.528947]
[2019/05/22 21:37:20]: prev=16383,cuz=0 [23,28,533.778689,1.281430,0.517068]
[2019/05/22 21:37:23]: prev=2995,cuz=0 [24,29,535.939113,1.298655,0.537374]
[2019/05/22 21:37:28]: prev=6864,cuz=0 [25,30,541.003720,1.308679,0.554525]
[2019/05/22 21:37:28]: prev=3,cuz=0 [26,31,541.003815,1.330859,0.574706]
[2019/05/22 21:37:32]: prev=6518,cuz=0 [27,32,545.795794,1.341154,0.593625]
[2019/05/22 21:37:44]: prev=16383,cuz=0 [27,33,557.762726,1.333901,0.580892]
[2019/05/22 21:37:53]: prev=11214,cuz=0 [28,34,565.989807,1.335713,0.593650]
[2019/05/22 21:37:56]: prev=5147,cuz=0 [29,35,569.782791,1.347882,0.610759]
[2019/05/22 21:38:08]: prev=16383,cuz=0 [29,36,581.755356,1.340770,0.598190]
[2019/05/22 21:38:20]: prev=16383,cuz=0 [30,37,593.771097,1.333847,0.586084]
```

Example System log entries (with 5.8.4 installed)

```
May 24 16:46:43 Spectracom Spectracom: [system] ERROR: OVERFLOW DETECTED FIFO IS FULL (GPITSD)
May 24 16:46:43 Spectracom Spectracom: [system] ERROR: CLEARING OVERFLOW FLAG (GPITSD)
May 24 16:47:00 Spectracom Spectracom: [system] ERROR: OVERFLOW DETECTED FIFO IS FULL (GPITSD)
May 24 16:47:00 Spectracom Spectracom: [system] ERROR: CLEARING OVERFLOW FLAG (GPITSD)
```

May 24 16:47:43 Spectracom Spectracom: [system] ERROR: OVERFLOW DETECTED FIFO IS FULL (GPITSD)
May 24 16:47:43 Spectracom Spectracom: [system] ERROR: CLEARING OVERFLOW FLAG (GPITSD)
May 24 16:47:50 Spectracom Spectracom: [system] ERROR: OVERFLOW DETECTED FIFO IS FULL (GPITSD)
May 24 16:47:50 Spectracom Spectracom: [system] ERROR: CLEARING OVERFLOW FLAG (GPITSD)
May 24 16:48:12 Spectracom Spectracom: [system] ERROR: OVERFLOW DETECTED FIFO IS FULL (GPITSD)
May 24 16:48:12 Spectracom Spectracom: [system] ERROR: CLEARING OVERFLOW FLAG (GPITSD)
May 24 16:49:59 Spectracom Spectracom: [system] ERROR: OVERFLOW DETECTED FIFO IS FULL (GPITSD)
May 24 16:49:59 Spectracom Spectracom: [system] ERROR: CLEARING OVERFLOW FLAG (GPITSD)
May 24 16:52:15 Spectracom Spectracom: [system] ERROR: OVERFLOW DETECTED FIFO IS FULL (GPITSD)
May 24 16:52:15 Spectracom Spectracom: [system] ERROR: CLEARING OVERFLOW FLAG (GPITSD)
May 24 16:54:01 Spectracom Spectracom: [system] ERROR: OVERFLOW DETECTED FIFO IS FULL (GPITSD)

(1204-3E/1204-3D) STL (Satelles) “Resilient PNT” Option Cards

- 1204-3E (STL Phase 2)
- 1204-3D (STL Phase 1)

Satelles Contact Info

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Email:

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703-723-4599

Referred to as “Earth Station” or Ground Station”

Note: Scott Z works with **Pete Johnson** regarding subscriptions/signal enabling, etc



Pete Johnson
Sr. Product Engineer

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STL (General info for both variants of STL Option Cards)

Links/shortcuts for STL

*** STL Getting Started Guide (1200-5000-0054) in Arena: https://app.bom.com/items/detail-spec?item_id=1243473577&version_id=11045676248&orb_msg_single_search_p=1

- Detailed Satellites info in the online SecureSync user guide: <http://manuals.spectracom.com/SS/Content/KB/STL-3E.htm>

And STL Blog: <https://spectracom.com/resources/blog/lisa-perdue/2017/stl-and-timing-systems>

- Satellites info in the CustService folder: <..\EQUIPMENT\SPECTRACOM EQUIPMENT\Satellites>
- For general info on STL, refer also to STL tech note: <I:\Customer Service\1- Cust Assist documents\Satellites resilient PNT.pdf>
- General info STL info on our website (search for “STL” as there are several sites, such as the following): <https://spectracom.com/resources/essential-education/what-is-stl>
- STL Ancillary Kit (STL-ANC-KIT) in Arena: https://app.bom.com/items/detail-bom?item_id=1246960646&version_id=11045676258

STL= Satellite Time and Location

STL for Military/DOD and defense integrators (such as LMCO and Raytheon)

- Important Note: Do not discuss STL with the Dept of Defense/Military or integrators (such as Lockheed Martin, Raytheon, etc) Forward these calls/emails over to Hiro Sasaki, VP or PNT Technologies (585-250-1545 ext 110 hiro.sasaki@oroliads.com)

Minimum requirements for STL

- Requires monthly subscription fee to use the service.

Countries allowed to obtain the STL signal

- Not all countries are legally able to obtain licensing to use the STL signal.
- Refer to list of authorized countries: [I:\Customer Service\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Option Cards\STL cards \(1204-3D and 1204-3E\)](I:\Customer Service\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Option Cards\STL cards (1204-3D and 1204-3E))
- See Sadie/Andrew or Product Management for any changes which may have since been made to this list.

Satelles info /Iridium satellites

- Frequency band: 1620 MHz

STL – SATELLITE TIME AND LOCATION SIGNAL



NEW SIGNAL AVAILABLE TODAY

- Broadcast on the Iridium sats

>30 DB STRONGER THAN GPS

- Higher jamming and interference resistance
- Operates indoors

ENCRYPTED SIGNAL

- Inherently anti-spoof
- Subscription based service
- Available for civilian use

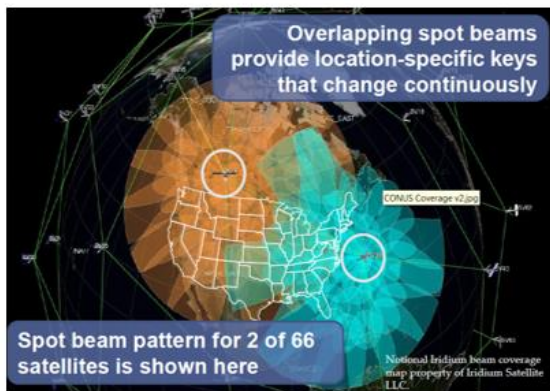
What is STL: Satellite Time and Location (STL) is a revolutionary new source for precision time based on the Iridium® constellation of satellites. With the reliance upon GPS and other GNSS signals becoming more and more common for critical applications, STL provides an ideal augmentation for these applications where "it just has to work." And with signal strengths approximately 1000x stronger, it can also provide high accuracy timing indoors where GPS and other **GNSS signals can't typically be reached**

- Satellites transmit at 1.6125 GHz
- Various types of bursts are sent out every 20ms
 - **Subscription bursts:** checks length of subscription.

| STL | GPS |
|---------------------------|------------------------|
| □ 66 Iridium Satellites | □ 24 GPS Satellites |
| □ Global coverage | □ Global coverage |
| □ 500 mile altitude | □ 12,500 mile altitude |
| □ 1000x stronger than GPS | □ 25x further away |

| SIGNAL COMPARISON TO GPS | | |
|----------------------------------|--|--|
| | GPS L1 | STL |
| Timing accuracy to UTC | ~20 ns | ~200 ns |
| Positioning accuracy | ~3 meters | 30-50 meters |
| Time To First Fix -- Timing | ~100 seconds | ~few seconds |
| Time To First Fix -- Positioning | ~100 seconds | ~10 minutes |
| Anti-spoofing | No, only for military use | Yes, encrypted signal |
| Coverage | Global | Global |
| Availability Outdoors | With view of horizon to get accurate position with low DOP | Limited view of sky lengthens convergence time |
| Availability Indoors | No | Yes: 30 – 40 dB stronger |

STL - HOW IT WORKS



Re-purposed paging channels

- 1620 MHz band, 25 KHz BW, QPSK
- Spread Spectrum coded signal, 90 msec frame, ~1.4 sec burst on average

UTC synchronized timing

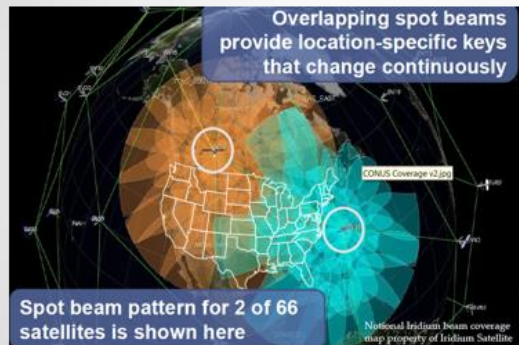
- +/- 500 nsec spec
- 100-200 nsec typical
- Updates to a precision local oscillator for continuous time and frequency

Positioning 20 – 50 meters

- Range and high Doppler from 2-3 fast moving satellites over time
- Spot beam for initial location
- Updates to IMU for slow vehicles

PNT Principles | 6/6/2018 20 orolida

LOW EARTH ORBIT (LEO) => STRONG SIGNAL WITH SPOT BEAMS



ORBITS

- Iridium: ~100 minute
- GPS: 12 hour

ENCRYPTED SIGNAL WITH SUBSCRIBER KEYS

POSITIONING DETERMINATION

- Spot beam location (gross)
- Range and Doppler updates
- Convergence over minutes

GEO-LOCATION SECURITY

STL coverage Map

- Refer also to: [I:\Customer Service\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Option Cards\STL cards \(1204-3D and 1204-3E\)\STL coverage map](I:\Customer Service\EQUIPMENT\SPECTRACOM EQUIPMENT\SecureSync\Option Cards\STL cards (1204-3D and 1204-3E)\STL coverage map)

STL Leap Second insertion

- Refer to Salesforce case 163668

I have another response for you. This response below is regarding the great question of whether the STL signal contains Leap Second insertion pending information which the SecureSync can use. Note this information below applies to both the 1204-3D and 1204-3E Option Cards

Q Does STL also send leap second information to the SecureSync? We would like to know the behavior when leap second will insert next time (Regarding of 1204-3D and 3E module)

A For your information, the transmitted STL signal does not currently contain any information about Pending Leap Seconds being inserted. However, there is allotted space within the STL signal and the Satelles team intends on adding this info to the signal, sometime in the future (it's not planned to be added to the signal within the near future. But it's intended to eventually be added to the signal).

As there are no Leap second assertions planned for the end of this coming June (one for the end of this June would've needed to have started being announced quite some time ago, if it was intended for a leap second to be added). So, there is no need for any concern about the STL signal before next December, at the very earliest!

If the STL signal has not been by December, 2018 to include Leap Second pending info, AND if by chance it's decided that a Leap Second is to be inserted at the end of this December, we intend on proactively notifying all STL subscription customer s before then, that a Leap Second is pending assertion.

The SecureSync does not require the GPS or STL signals notify the SecureSync of a pending Leap Second being asserted. A leap second insertion can be easily and manually scheduled ahead of time by a user, for it to be automatically applied. If a leap second happens to be scheduled for the end of December 2018 (or a later date) before the STL signal has been modified to include Leap Second pending notification, we will likely even provide a small file which can help automate this easy user interface of manually scheduling a leap second to be automatically performed (even if the SecureSync has no external inputs available at the time of the Leap Second being asserted, if it's been scheduled by a user, it will be asserted appropriately).

For information on how to manually schedule a leap second to be automatically applied at the correct time, please refer to the following link to the online SecureSync user guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/TIME/Leap_Seconds.htm (scroll down to "Configuring a Leap Second" on this page).

Iridium Satellite year rollover (Iridium rollover)

- Refer to Salesforce Case 213725 (Oct 2019)

Q We are completing a survey in response to the upcoming Iridium ½ and eventually full time roll over, I have been asked to reach out to and pose the question "is there anything within the 1200 software or system hardware that use Iridium Time and could be affected when the Iridium time rolls over?"

I don't think the 1200 uses Iridium time in any form, but since this is a new product for us to have during our rollover, I have to ask.

If there is someone else I should check with, please advise. I don't yet know your engineering and technical support team.

A Reply from Dave Lorah (30 Oct 2019) This is the first I have heard of an IRIDIUM Rollover. We would like to investigate. Do you have any more information about this? Any links or documentation?

The SecureSync does not use any IRIDIUM information unless you have the STL Option installed. This uses a special Option card and indoor antenna to receive IRIDIUM Satellite signals. There is a monthly subscription fee for the service.

***STL (Satelles) Purchased Licenses/Subscription/Subscription Expiry

Purchased license/subscription is required to use this Option Card!

- Subscriptions are purchased in monthly increments, one month minimum

1) STL-SS-M: License for 1 month of Satelles Service for SecureSync (our P/N: STL-SS-M)

- In Salesforce at: <https://orolia.my.salesforce.com/01t0h000004XJuU?srPos=1&srKp=01t>
- in Arena at:

(OBSOLETE) STL-SS-1Y: License for 1 year of Satelles Service for SecureSync

- In Salesforce at: <https://na28.salesforce.com/01t1A000004xn7w?srPos=0&srKp=01t>
- in Arena at: https://app.bom.com/items/detail-spec?item_id=1231935531&version_id=10720487068

Subscription/License expiry

- Refer to online user manual ("Reviewing the STL Status):
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/STL-3D.htm



STL license info

- Per Scott Z: ALL STL sub-keys are 28 characters in length

"STL STANDARD SUBSCRIPTION REQUEST FORM"

- Scott Z sends this form from Salesforce to customer.
- Reports the receiver's S/N and 28 character subkey
- Customer fills out this form and sends it to Pete Johnson with Satelles: PJohnson@satellesinc.com

28
character
subkey



STL STANDARD SUBSCRIPTION REQUEST FORM
Carefully complete this request form

| | |
|----------------------------|-------------------------|
| Requested By: Scott Zmuda | Date: Mar 18, 2019 |
| End User: BOX Technology | Type: Timing |
| Term Start Date: 4/16/2019 | Duration (term): 12 mos |
| Price: \$2700 | P.O: 26649 |

Subscription Request For:

| | |
|--------------------------------------|-----------------------|
| Location # 1: Secaucus, NJ (Renewal) | Location # 2: |
| Receiver S/N: OPTSTL- 0017 | Receiver S/N: OPTSTL- |
| Latitude: 40.777261 | Latitude: |
| Longitude: 74.009560 | Longitude: |
| Subkey: 64633850008D2B80581519F6C7C | Subkey: |

| | |
|-----------------------|-----------------------|
| Location # 3: | Location # 4: |
| Receiver S/N: OPTSTL- | Receiver S/N: OPTSTL- |
| Latitude: | Latitude: |
| Longitude: | Longitude: |
| Subkey: | Subkey: |

**If more locations are required please fill out additional forms.

When all of the fields have been populated, please forward to Pete Johnson @ PJohnson@satellesinc.com, copy Pascal Laplante @ Pascal@satellesinc.com

Thank you for completing this form, if you have any questions or concerns regarding this request please contact:

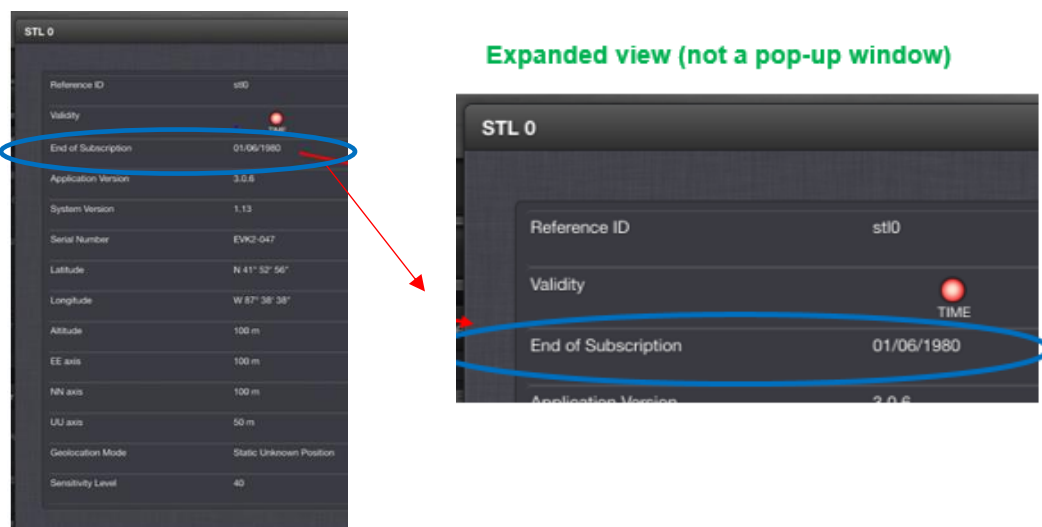
Scott Zmuda
Customer Support Manager
scott.zmuda@orolia.com Direct: +1.585.321.5826

Entering the 28 character subkey to activate/renew activation

- **Note for renew activation**, this info about manually entering the key is only applicable to either:
 - 1204-3E option cards having poor signal reception (so Over- The-Air rekey can't work)
 - And to the 1204-3D cards, which, unlike the 1204-3E cards, don't support Over-The-Air rekeying for renewals)
- Refer to “**Configuring STL Settings**” in online SecureSync user guide:
<http://manuals.spectracom.com/SS/Content/KB/STL-3E.htm>

A) Via the web browser

- “**End of Subscription**” is displayed in the **Interfaces** -> **STL 0 “Status”** page of the browser



GetSubscription 0 0

B) Via the CLI interface (**STR_GetSubscription 0 0** or **AR_stlGetSubscription 0 0** command, as shown below)

Note the beginning of every STL CLI calls are dependent upon software version installed (5.8.3 or below vs 5.8.4 and above) and also dependent on whether 1204-3D or 1204-3E STL card is installed. refer also to: [CLI commands associated with the 1204-3D and 1204-3E cards](#) for details

1. “**STR_GetSubscription 0 0**” (1204-3E any software version, and v5.8.4 and above for 1204-3D)

```
Begin of Subscription: 07/01/2017
End of Subscription: 08/01/2018
Subscription OK
admin@10 ~ $
```

2. “**AR_stlGetSubscription 0 0**” (v5.8.3 and below, 1204-3D)

```
admin@10 ~ $ AR_StlGetSubscription 0 0
Begin of Subscription: 07/01/2017
End of Subscription: 08/01/2018
Subscription OK
admin@10 ~ $
```

Note the subkey field is the only value not polled from the STL receiver (if the page shows the registration is expired, the expiration has since expired)

Storage and display of subkey/replacing CF card in a STL unit (per Brent, 2 April 2019)

- The 28 character subkey is stored in the STL receiver for receiver operation
- The key is also apparently stored in the CF card – just to be displayed in the browser (the browser doesn't pull it from the STL receiver each time, for displaying it in the browser)
- If the CF card is replaced, the key will not be displayed in the browser, unless/until a user re-enters it in the browser (the browser will continue to display a null field unless the key is re-entered, but the STL receiver will continue to operate normally, even without the key being re-entered).

Subscription renewals (Over-The-Air rekeying)

Below info as described to us by Scott Zmuda (24 Oct 2019)

1204-3E Cards (not the few 1204-3D cards which were initially shipped) support **Over-The-Air re-keying**. So, most customers do not need to manually enter their new license key every year. the receiver will be automatically update with the new key, when applicable, as long as the receiver has good STL reception

All 1204-3D Option Cards and 1204-3E cards with poor STL signal reception: Over-The-Air re-keying is not available for the 1204-3D receivers, and is not available for 1204-3E cards with poor reception. in these rare instances, customers will need to manually enter a new key each year,

STL-ANC-KIT




STL Antenna kit consists of STL antenna and a copy of the Quick Start guide)

- **STL-ANC-KIT (in Salesforce):** <https://orolia.my.salesforce.com/01t0h000004XMQu?srPos=2&srKp=01t>
- **Our P/N: “STL-ANC-KIT” (in Arena):** https://app.bom.com/items/detail-bom?item_id=1246960646&version_id=10971703948

Includes:

Item #STL-ANC-KIT

In Production

STL Ancillary Kit

Revision:

>1 - In Production

| Effective as of 02/01/2018 10:08:07 AM, Unshared

Specs

Bill of Materials

Where Used

Sourcing

Costing

Files

Compliance

Revisions

Notifications

Supplier Access

Projects

Qual

Indented

Sourcing

Flat

Costing

Purchasing








Custom

Redline

Compare

Lookup

Contains 4 first-level Items, 4 line Items, 4 unique Items, 0 of which are shared.

| <input type="checkbox"/> | # | Item Number | Item Name | Category |
|--------------------------|---|--|--|---|
| <input type="checkbox"/> | 1 | 1200-1006-0813 rev 1  | ANC KIT LABEL, STL OPTION CARD |  Label |
| <input type="checkbox"/> | 2 | 1200-5000-0054 rev 1  | GETTING STARTED GUIDE, STL OPTION CARD -3E |  Manual |
| <input type="checkbox"/> | 3 | E050-0001-0001 rev 1  | ANTENNA, IRIDIUM, 96" CABLE | Antenna / Ferrite Core / Insulator |
| <input type="checkbox"/> | 4 | MP02-0003-0002 rev 1  | LABEL STOCK |  Label |

- **STL Getting Started Guide (1200-5000-0054) in Arena:** https://app.bom.com/items/detail-spec?item_id=1243473577&version_id=10905937288&orb_msg_single_search_p=1
- **Iridium antenna** with 96 inch (2.4 meter) cable (details further below)
 - A) **Starting 11 June 2018 (Rev 4 and above)** started shipping with **Active** STL antenna (not compatible with any 1204-3D cards or 1204-3E cards produced before June 2018)
 - B) **Prior to 11 June 2018 (Rev 3 and below):** “STL-Anc-kit” shipped with **Passive** STL antenna (for all 1204-3D cards and 1204-3E cards produced before June 2018)

STL Antenna cable length/available STL extension cable

- A) **Standard length:** 96 inches
- B) **Available 50Ft STL extension cable** “**RG-58 Cable SMA Extension**”

Our P/N: **CA01R-SASA-2050**

- **In Salesforce:** <https://orolia.my.salesforce.com/01t0h000005V299?srPos=0&srKp=01t>
- **In Arena:** https://app.bom.com/items/detail-spec?item_id=1251367637&version_id=11068666848&orb_msg_single_search_p=1

STL antenna- Iridium antenna (required with 1204-3D and 1204-3E cards) and STL antenna install

Recommendations for STL antenna location/placement

- Refer to the STL Getting Started Guide (1200-5000-0054) in Arena: https://app.bom.com/items/detail-spec?item_id=1243473577&version_id=10905937288&orb_msg_single_search_p=1

Install the supplied STL satellite antenna: The antenna is designed for indoor use. The ideal location for the antenna is near the ceiling of the room in which your SecureSync unit is located, or near an outside wall. In general, a higher location is preferable over a lower location. Do not cover the antenna with electronic equipment or other metal objects.

- Don't install the STL antenna in a faraday cage.
- locate the antenna as high-up as possible
- A 50ft extension cable is available, if necessary (refer to "STL Antenna cable length" info further above)

STL antenna variants

A) Available rooftop STL antenna (E050-0006-0001)



- Refer to ECO-002645 (Oct 2020) in Arena at https://app.bom.com/items/detail-sourcing?item_id=1290400154&version_id=11795833158
- Our P/N: E050-0006-0001
 - In Salesforce: <https://orolia.lightning.force.com/lightning/r/Product2/01t0h000005oo9EAAQ/view>
- **MFG/Model:** Tallysman Model TW3600 P/N 33-3600-14-01 (Datasheet: <https://www.digikey.com/en/products/detail/tallysman-wireless-inc/33-3600-01-11/4862790>)
- **STL signal only**
- Type N female connector

TW3600 Permanent Mount Iridium® Antenna

Specifications V_{oc} = 3V, over full bandwidth, T=25°C

| | |
|--|---|
| Antenna | |
| Architecture | Dual, quadrature feeds |
| Antenna Gain (100mm ground plane) | 4.25 dBi |
| Axial Ratio (over full bandwidth) | ≤3 dB |
| Radiated Bandwidth (-0.5 dB) | 1605 MHz to 1635 MHz |
| Electrical | |
| Architecture | Hybrid 90° phase signal splitter |
| Frequency Bandwidth | 1616 to 1626.5 MHz |
| Polarization | RHCP |
| Gain flatness | ±0.5 dB, from 1616 to 1626.5 MHz |
| VSWR (at antenna) | <1.5:1 |
| Return Loss (-10 dB bandwidth) | >20 MHz |
| ESD circuit protection | 15 kV air discharge |
| Mechanicals & Environmental | |
| Mechanical Size | 66.5 mm dia. x 21 mm H |
| Cable (Option) | Custom cable assembly available. |
| Operating Temp. Range | -40 to +85 °C |
| Enclosure | Radome: EXL9330, Base: Zamak White Metal |
| Weight | 150 g |
| Attachment Method | Permanent ¼" (19mm) through hole mount |
| Environmental | IP67 and RoHS compliant |
| Shock | Vertical axis: 50 G, other axes: 30 G |
| Vibration | 3 axis, sweep = 15 min, 10 to 200 Hz sweep: 3 G |
| Warranty | One year, parts and labour |
| Salt Spray | MIL-STD-883C Method 596.4 |

Ordering Information

TW3600 - Iridium® antenna 33-3600-xx-yy-zzzz
Where xx = connector type, yy = shape and colour of radome and zzzz = cable length in mm (where applicable)

Please refer to the Ordering Guide (<https://www.tallysman.com/orderingguide.php>) for the current and complete list of available radomes and connectors.

Tallysman Wireless Inc

36 Steacie Drive
Ottawa ON K2K 2A9 Canada Canada
Tel 613 591 3131 Fax 613 591 3121
sales@tallysman.com

B) Active STL antenna (E050-0004-0001) for 1204-3E Option cards shipped after ~Jun 2018



- Started being shipped with 1204-3E Option Cards around 7 June, 2018 (upon completion of ECO-1705, additional info on this ECO is further below) with an inductor (L1) now being populated in the 1204-3E Option Cards.
- Note this antenna wasn't shipped with the first STL variant 1204-3D Option. It started shipping with 1204-3E cards sometime after the change from shipping 1204-3D to shipping 1204-3E cards.

Our P/N for Active Antenna: E050-0004-0001

MFG/MFG P/N for the Active Antenna: Tallysman P/N: 33-2600A-00-2500 (AKA "TW2600A")

- Shortcut to MFG Datasheet: <http://www.tallysman.com/index.php/gnss/products/antennas-iridium/tw2600a/>
 - magnetic mount antenna
 - Includes 96-inch (2.4 meter) cable (we don't recommend extending this cable) ??
 - This antenna is Iridium only (not GPS/Iridium)
 - Attached 96 inch (8ft) RG-174 cable.
 - The cable delay is about 1.5ns/foot x 8 foot cable= ~12 nanoseconds (refer to: <https://www.timesmicrowave.com/Calculator?Product=RG-174&RunLength=8&Frequency=999>)

Note the RG-174 cable is only rated for 1GHz, with STL at like 1620 MHz. The Times Microwave calculator won't let you use 1600 MHz in the tool.

I don't believe the STL Option Card has any fields available to enter a cable delay value to compensate for it.

TW2600A Active Magnet Mount Iridium® Antenna

Specifications

Vcc = 3V, over full bandwidth, T=25°C

Antenna

| | |
|---|------------------------|
| Architecture | Dual, quadrature feeds |
| Antenna Gain (dBic, 100mm ground plane) | 4.5 |
| Axial Ratio (over full bandwidth) | ≤2 dB |

Electrical

| | |
|------------------------------|---------------------|
| Frequency Bandwidth | 1615 to 1626.5 MHz |
| Polarization | RHCP |
| LNA Gain | 26dB (min) |
| Input voltage | 2.5-12VDC |
| Current | 19mA |
| Cross Polarization Rejection | typically 20dB |
| VSWR (at antenna) | <1.5:1 typ |
| ESD Circuit protection | 15 KV air discharge |
| Noise Figure | 1dB typical |

Mechanicals & Environmental

| | |
|-----------------------|---|
| Mechanical Size | 57 mm dia. x 15 mm H |
| Cable | RG174 |
| Operating Temp. Range | -40 to +85 °C |
| Enclosure | Radome: EXL9330, Base: Zamak white metal |
| Weight | 160 g |
| Attachment Method | Magnet or permanent (pre-tapped 4 x 6-32UNC) |
| Environmental | IP67 and RoHS compliant |
| Shock | Vertical axis: 50 G, other axes: 30 G |
| Vibration | 3 axis, sweep = 15 min, 10 to 200 Hz sweep: 3 G |

Ordering Information

TW2600A - Active Iridium™ Antenna, 33-2600A-xx-yyyy
Where xx = connector type and yyyy = cable length in mm

Please refer to the Ordering Guide (<http://www.tallysman.com/wp-content/uploads/Current-Ordering-Guide.pdf>) for the current and complete list of available connectors.

Tallysman Wireless Inc

36 Steacie Drive
Ottawa ON K2K 2A9 Canada
Tel +1 613 591 3131 Fax 613 591 3121 sales@tallysman.com

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IP rating: IP67 compliant

Gain: **26dB** (minimum)

Compliance ratings (per datasheet): “TW2600 is RoHS, RED, and REACH compliant”

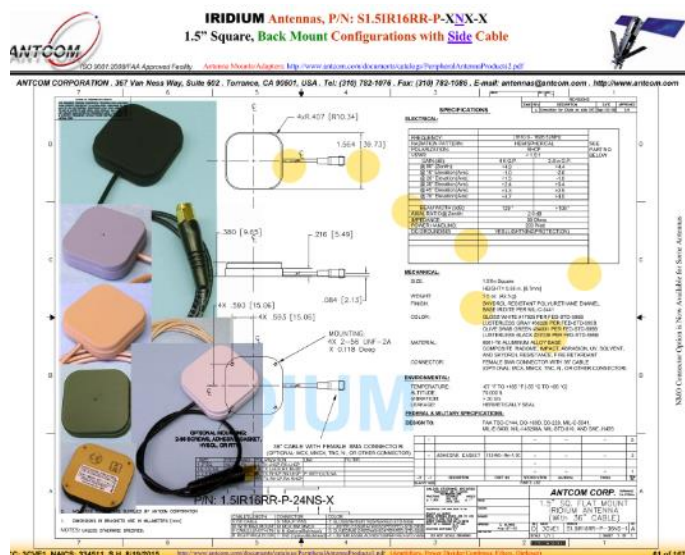
ECO-1705 changes to 1204-3E Option Card to support the more recent Active antenna (E050-0004-0001)

- **in Arena:** https://app.bom.com/changes/detail-summary?change_id=2393726969
- **Completed/implemented** ~11 June 2018

The new STL configuration moving forward will include the use (and shipment) of an Active Antenna. There is a required BOM change for the 1204-3E card to incorporate this (populating L1).

The active Antenna, **E050-0004-0001** should be used as the correct antenna moving forward when shipping this item. This item has been added to the STL ANC Kit which is also a part of this ECO.

C) Earlier passive STL antenna (E050-0001-0001): for all 1204-3D and earliest 1204-3E boards (shipped prior to ~ 7 June, 2018)



- (our P/N for the earlier passive antenna E050-0001-0001) in Arena at: https://app.bom.com/items/detail-spec?item_id=1230586692&version_id=10696861268
- Antcom P/N: S1.5IR16RR-P-96NS-2
 - Includes 96-inch (2.4 meter) cable (we don't recommend extending this cable)
 - This antenna is Iridium only (not GPS/Iridium)

CLI commands associated with the 1204-3D and 1204-3E cards

- versions 5.8.4 and above: both 1204-3D/1204-3E support "STR_" commands
- versions 5.8.3 and below: 1204-3E supports "STR_" calls, while 1204-3D require all calls begin with "AR_stl"

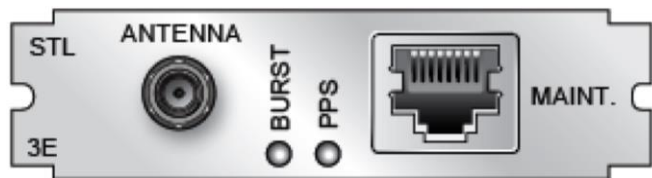
Q (Keith to Brent Abbott) To confirm, are all the STL associated API calls (such as "STR_GetSubscription 0 0") compatible with all 1204-3D and 1204-3E cards?

"long" story short, I just tried polling our 1204-3D card installed in a v5.8.3 SecureSync (10.2.192.230) with "STR_GetSubscription 0 0" (I'm pretty sure this command has worked fine in this unit, with an earlier version installed). It's now responding with an error message (this same error message is occurring with all the STR commands I issue, as shown below).

A Reply from Brent (2 Apr 2019) That's a good question. In 5.8.3, the -3D and -3E cards used different API calls. The -3E card uses the STR_ commands that you mentioned. However, in 5.8.3 and prior versions, the -3D card uses AR_Stl commands (for example AR_StlGetSubscription). This is due to the way the -3D and -3E card were handled in the SecureSync. The AR_Stl commands will return the same information as the STR_ commands but are specific to 5.8.3 and earlier SecureSync software versions.

As of 5.8.4, both the -3D and -3E use the STR set of commands.

1204-3E Option Card (STL phase 2)



STL info in SecureSync online user manual: <http://manuals.spectracom.com/SS/Content/KB/STL-3E.htm>

Links/shortcuts

- Our P/N 1204-03E0-F000 (in Arena): https://app.bom.com/items/detail-spec?item_id=1237408585&version_id=10948757108&
- Schematic (1204-13E1-0200) in Arena: https://app.bom.com/items/detail-spec?item_id=1237408644&version_id=10971540838&
- Process detail (1204-3E-PD): https://app.bom.com/items/detail-spec?item_id=1245040687&version_id=10936786878
- STL Getting Started Guide (1200-5000-0054) in Arena: https://app.bom.com/items/detail-spec?item_id=1243473577&version_id=10905937288&orb_msg_single_search_p=1

Associated STL Part Numbers

Satellites Module MODULE, SOM MityDSP, OMAPL138F, XC6SLX45, 3.3V (our P/N: MP20R-0003-0012) in Arena at: https://app.bom.com/items/detail-spec?item_id=1230649413&version_id=10697837228&

- STL Ancillary Kit (STL-ANC-KIT) in Arena: https://app.bom.com/items/detail-bom?item_id=1246960646&version_id=10971703948
- Iridium antenna (our P/N E050-0001-0001) in Arena at: https://app.bom.com/items/detail-spec?item_id=1230586692&version_id=10696861268

1204-3E replaces the 1204-3D/ improvements over 1204-3E

- 1204-3E released to production Aug 2018 (ECO-FAI-001599 in Arena): https://app.bom.com/changes/detail-summary?change_id=2392979181&
- First 1204-3E card shipped in a SecureSync (as a "Special") ~ 7 Feb, 2018
- SecureSync needs to be returned to the factory to update from 1204-3D to 1204-3E
- Adds Burst and PPS LEDs to the edge of the card
- Improved OCXO reference clock
- Smaller, more compact design
- Fits into single slot SecureSync option card

Available "in-house" SecureSyncs with 1204-3E STL card installed

- Customer Service SecureSync which should have 1204-3D STL available: 10.2.192.230 (as of Dec 2017- 176 and 177 do not currently have it)
- Engineering SecureSyncs which may be available with STL: 10.10.128.37

Specifications

- **Inputs:** One STL antenna input, one Ethernet maintenance input
- **Antenna input connector:** SMA
- **Ethernet connector:** RJ45
- **Frequency band:** 1620 MHz
- **Positioning accuracy:** 30-50 m
- **Coverage:** Global
- **Time-to-first-fix (Timing):** Several seconds (the PPS pulse will become available once the positioning fix has been obtained)
- **Time-to-first-fix (Positioning):** Approximately 10 minutes
- **Jamming resilience:** Signal is 30 to 40 dB stronger than GPS signal
- **Spoofing resilience:** Encrypted signal
- **Maximum number of cards:** 1
- **Ordering information:** 1204-3E: STL module
- **Ordering notes:** The STL module 1204-3E cannot be combined with a Rubidium oscillator.
 - **Timing synchronization accuracy to UTC:** ± 500 ns (specified); ± 200 ns (typical)

Per Dave S: (25 Apr 18) the spec is +/- 500ns, but we say that typically we can see +/- 200ns. We generally would present both to a customer.

We would not guarantee the +/- 200ns typical spec. The +/- 500ns is also dependent on having enough strong signal bursts for the solution.

Minimum requirements

- 1204-3E (phase 2) This satellite receiver/Option Card requires either software version 5.6C or **post version 5.7.0 (5.7B)** be installed??
- The STL module 1204-3D (and as of at least April, 2018, the 1204-3E also) **cannot** be combined with a Rubidium oscillator.

Model “1204-3E-SA” (Stand-alone STL Option Card)

- “This option card is for customers who want to buy the STL option card and install it themselves.”
- in Arena at: https://app.bom.com/items/detail-spec?item_id=1246960640&version_id=10971703848&orb_msg_single_search_p=1

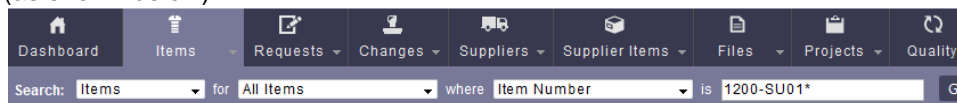
FPGA/Firmware requirements

SecureSync Software version requirements

- This receiver/option card requires either **version 5.7E** or **post version 5.7.0** be installed (officially released with update version 5.8.0, May 2018)

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01**” (as shown below)



FPGA (firmware) for the Model 1204-3E card (ascending order): rt_oc3E_hw01_fpga.bin

| ECO | Main version | FPGA version reported | Change | approximate cut-in |
|----------|--------------|---|--|--------------------|
| 1577 | 5.7.E | 1.0.0 | First Engineering release of the 1204-3E STL Option Card (see additional info below) | ~1 March 2018 |
| | 5.8.0 | 1.01 (1.01 is the latest rev in at least 5.8.9 and below) | First full release to support 1204-3E card | End of May, 2018 |
| ECO-2674 | 5.9.0 | 1.0.2 | Per 5.9.0 Release Notes “1204-3E to 1.02 firmware”. Upgraded option card for improved system reliability | Jan 2021 |

Release details (descending order)

A) Version 5.9.0 to 1.02 (Jan 2021)

- Upgraded Option Card for improved system reliability

B) Version 5.8.0 (~end of May, 2018)

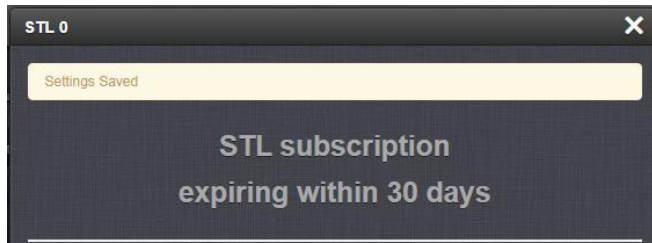
- Added support for 1204-3E-STL option card
- incorporated changes from version 5.7E (listed below)

C) Update v5.7.E (not released to Manufacturing) ~1 March 2018

- shortcut to 5.7E (in Arena): https://app.bom.com/changes/detail-summary?change_id=2392764439

Newly released features in 5.7E

- Added support for the 1204-3E STL option card.
- Added capability to update/apply an STL subscription through the web UI with a subscription key.
- 30, 60, 90 day expiration notifications in the browser



Note: Keith submitted recommendation (~March 2018) to add this also to Notifications/email

Enhancements and fixes in 5.7E

The following improvements were applied to existing features and functions:

- Updated the STL status page to display both the start and end subscription dates.
- Improved the subscription reporting on the STL status page. A subscription state is now displayed showing if the current subscription is valid or invalid(expired). The subscription state will also display if the subscription will expire within 90, 60, 30, or 7 days.

The following defects were corrected:

- Corrected bug with the STL feature where messages would be logged in the timing.log file stating communication had been established and lost with the STL receiver even though communication was still present.
- Corrected a bug where the STL subscription start date was shown as the subscription end date.

Hardware/Chassis/Processor

Hardware Changes

For Option Card hardware versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#)

| ECO | Software version | New Version | Change | approximate cut-in |
|------|------------------|-------------|--|--------------------|
| 1508 | ----- | ----- | First release of the 1204-3E STL Option Card | 7 Feb 18 |
| 1705 | n/a | ----- | Update 1204-3E STL Card to allow for Active Antennas. The active Antenna, E050-0004-0001 should be used as the correct antenna moving forward when shipping this item. This item has been added to the STL ANC Kit which is also a part of this ECO. | 11 June 2018 |
| 2015 | n/a | n/a | Pushes new aluminum spacer HM54R-03R5-0003 to production. | 26 Feb 2019 |

Satelles Antenna requirements/Active antenna

ECO-1705 changes to Active Antenna (E050-0004-0001)

- Refer to ECO-1705 (in Arena): https://app.bom.com/changes/detail-summary?change_id=2393726969&

The new STL configuration moving forward will include the use (and shipment) of an Active Antenna. There is a required BOM change for the 1204-3E card to incorporate this (populating L1).

The active Antenna, **E050-0004-0001** should be used as the correct antenna moving forward when shipping this item. This item has been added to the STL ANC Kit which is also a part of this ECO.

Processor: STL receiver has its own processor

- **Satelles Module** (our P/N: MP30-0SAT-0001) in Arena at: https://app.bom.com/items/detail-spec?item_id=1230586066&version_id=10696849618



Iridium antenna input jack on rear panel: SMA connector

“Maintenance” (“MAINT.” Ethernet connector on rear panel)

- **DHCP only** – no static address possible (in at least v5.6C)
 - In at least v5.6C, the assigned IP address is not displayed anywhere.
- Requires open Internet connection (for our Engineering team to be able to reach)
- Port is used for receiver firmware updates/troubleshooting (for our Engineers to talk directly to the receiver).

“Burst” and “PPS” LEDs on edge of 1204-3E

- These two LEDs were not present with 1204-3D cards

A) Burst LED (Blue):

- Illuminates as bursts are being received
- More bursts = faster receiver convergence
- The receiver will still see bursts and this LED will still illuminate even if there is no subscription or if subscription has expired. But the green PPS LED will not illuminate and there will be no 1PPS output to sync the system.

B) PPS LED (Flashing Green):

- Only illuminates after the STL receiver has converged, and therefore has started outputting its 1PPS
- Will not illuminate if there is no subscription or if subscription has expired (there will be no 1PPS output to sync the system)

1204-3E Setup and Subscriptions

- Unlike 1204-3D, STL subscription being active or inactive is now internal to the STL receiver.
- Units ship with the 1204-3E **unsubscribed**



- Customer shall contact Customer Service to receive subscription., after receiving/installing the time server
- Takes about 5 minutes to generate the hash key which is then sent to the customer
- Keys receiver without any loss of operation (the receiver doesn't reset when loading hash key)

Subscription data is stored in the STL receiver, on the 1204-3E card.

Configuring the 1204-3E receiver's Subscription key ("subkey")

- refer to "**Configuring STL Settings**" in online SecureSync user guide:
<http://manuals.spectracom.com/SS/Content/KB/STL-3E.htm>

A) Via the web browser (*INTERFACES > OPTION CARDS: STL 0*)

B) Configure "subkey" using the CLI interface

1. Configure the 1204-3E receiver's subkey via the CLI interface

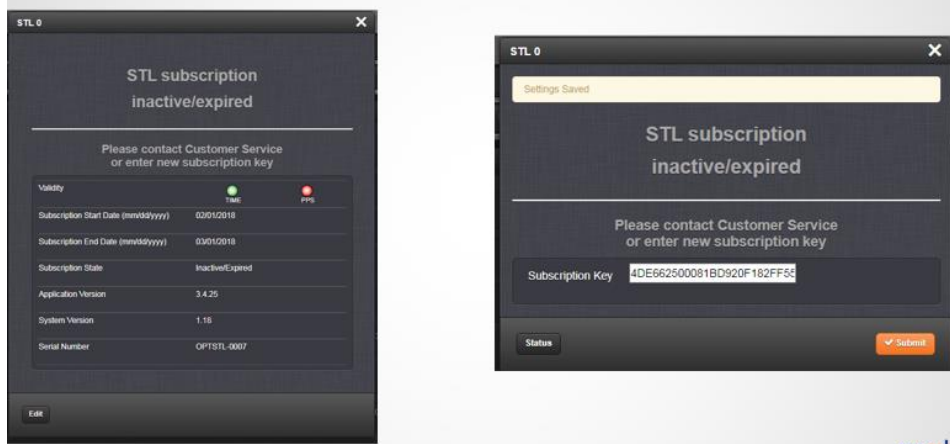
STR_SetSubk 0 0 12345678<enter> (where 12345678 is the 28 character subkey)

2. Get/Verify the subkey via the CLI interface

STR_GetSubk 0 0<enter>

```
spadmin@10 ~ $ AR_StlGetSubk 0 0
STR (0) Subscription Key:
Key: 12345678
spadmin@10 ~ $
```

STL – INACTIVE SUBSCRIPTION PAGE



STL SUBSCRIPTION INTERFACE

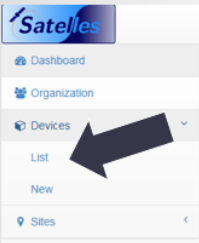
Dashboard

| Organization Summary | | | |
|---|------|---------------------|--------------------------|
| Organization Details | | | |
| Name: Spectracore | | | |
| Type: MANUFACTURER | | | |
| Address: 1565 Jefferson Rd., Suite 400, Rochester, NY 14623 | | | |
| Phone: 585-321-0800 | | | |
| Organization devices activity | | | |
| Time | Type | Device SN | Activity |
| 2016-03-06 17:57:47 UTC | DB | OPTSTL-0010 | added device in Database |
| 2016-03-02 16:16:44 UTC | DB | deleted-OPTSTL-0007 | added device in Database |
| 2016-02-27 19:09:20 UTC | DB | OPTSTL-0009 | added device in Database |
| 2016-02-27 19:07:35 UTC | DB | OPTSTL-0008 | added device in Database |
| 2016-02-22 20:37:35 UTC | DB | OPTSTL-0007 | added device in Database |
| 2017-11-22 00:04:38 UTC | DB | OPTSTL-0006 | added device in Database |

DASHBOARD INTERFACE

CONTAINS ORGANIZATION DETAILS AND NEWLY ADDED RECEIVERS

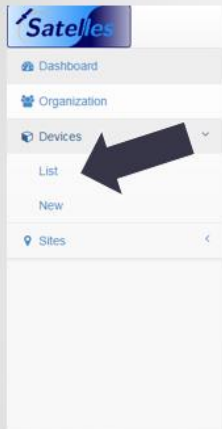
STL SUBSCRIPTION INTERFACE



SIDEBAR

- The sidebar information let's you navigate to the list of available receivers you wish you update

STL SUBSCRIPTION INTERFACE



SIDEBAR

- The sidebar information let's you navigate to the list of available receivers you wish you update

Devices

| Devices for account: Spectracom | | | | |
|---------------------------------|---------------|------------|--------------|-------------------------|
| ID # | Serial Number | Owner | Manufacturer | Received |
| 108 | OPTSTL-0205 | Satelles | Spectracom | 2018-01-15 15:15:44 UTC |
| 114 | OPTSTL-0010 | Spectracom | Spectracom | 2018-03-06 17:57:47 UTC |
| 112 | OPTSTL-0009 | Spectracom | Spectracom | 2018-03-06 21:57:59 UTC |
| 101 | OPTSTL-0008 | Spectracom | Spectracom | 2018-03-07 16:57:55 UTC |
| 102 | OPTSTL-0007 | Spectracom | Spectracom | 2018-03-07 20:57:55 UTC |
| 103 | OPTSTL-0006 | Spectracom | Spectracom | 2017-11-22 00:04:58 UTC |
| 107 | OPTSTL-0005 | Satelles | Spectracom | 2017-11-21 23:42:03 UTC |
| 106 | OPTSTL-0004 | Satelles | Spectracom | 2017-11-21 23:41:58 UTC |
| 100 | OPTSTL-0003 | Satelles | Spectracom | 2017-11-21 23:41:47 UTC |
| 104 | OPTSTL-0002 | Satelles | Spectracom | 2018-01-05 00:55:03 UTC |
| 105 | OPTSTL-0001 | Satelles | Spectracom | 2018-01-15 15:15:35 UTC |
| 01 | EV42-000 | Satelles | Spectracom | 2018-01-15 22:21:25 UTC |

STL SUBSCRIPTION INTERFACE – DEVICE NAVIGATION

DEVICE NAVIGATION

- Farther down this page you'll find the Subscriptions table.

subscriptions

| Feature | Start Date | End Date | Time Left |
|-----------------|-------------------------|-------------------------|-----------|
| Location Timing | 2018-03-01 00:00:00 UTC | 2018-04-01 00:00:00 UTC | 1 month |
| Timing | 2018-02-01 00:00:00 UTC | 2018-03-01 00:00:00 UTC | None |

★ Add Subscription

subscription History:





| Date | Type | Features | Duration |
|---------------------|--------|-----------------|----------------------------|
| 2018-03-01 19:20:29 | (edit) | Location Timing | 1 month End: 2018-04-01 |
| 2018-03-01 13:17:40 | (new) | Timing | 1 month End: 2018-04-01 |
| 2018-02-22 20:38:10 | (new) | Timing | 1 month End: 2018-03-01 |

STL SUBSCRIPTION INTERFACE – DEVICE NAVIGATION

DEVICE NAVIGATION




- Farther down this page you'll find the Subscriptions table.

subscriptions

| Feature | Start Date ↕ | End Date ↓ | Time Left | |
|-----------------|-------------------------|-------------------------|-----------|---|
| Location Timing | 2018-03-01 00:00:00 UTC | 2018-04-01 00:00:00 UTC | 1 month |    |
| Timing | 2018-02-01 00:00:00 UTC | 2018-03-01 00:00:00 UTC | None |  |

★ Add Subscription

Subscription History:





| Date | Type | Features | Duration | |
|---------------------|--------|-----------------|----------------------------|---|
| 2018-03-01 19:20:29 | (edit) | Location Timing | 1 month End: 2018-04-01 |  |
| 2018-03-01 13:17:40 | (new) | Timing | 1 month End: 2018-04-01 |  |
| 2018-02-22 20:38:10 | (new) | Timing | 1 month End: 2018-03-01 |  |

STL SUBSCRIPTION INTERFACE – SUBSCRIPTION HASH KEY

DEVICE NAVIGATION




- Clicking on the Key icon will provide the hashkey

Subscriptions

| Feature | Start Date ↕ | End Date ↓ | Time Left | |
|-----------------|-------------------------|-------------------------|-----------|---|
| Location Timing | 2018-03-01 00:00:00 UTC | 2018-04-01 00:00:00 UTC | 1 month |    |
| Timing | 2018-02-01 00:00:00 UTC | 2018-03-01 00:00:00 UTC | None |  |

★ Add Subscription

Subscription History:

| Date | Type | Features | Duration | |
|---------------------|--------|-----------------|----------------------------|---|
| 2018-03-01 19:20:29 | (edit) | Location Timing | 1 month End: 2018-04-01 |  |
| 2018-03-01 13:17:40 | (new) | Timing | 1 month End: 2018-04-01 |  |
| 2018-02-22 20:38:10 | (new) | Timing | 1 month End: 2018-03-01 |  |

Subscription Key
4f805A5000C127A64DB08732E304

STL ANTENNA LOCATION



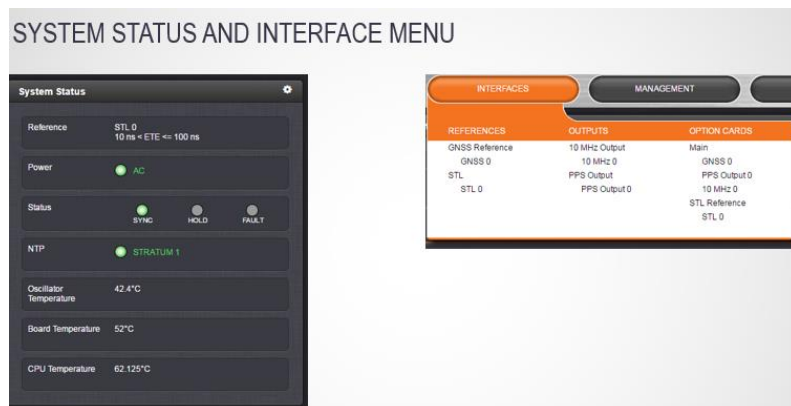
WHERE SHOULD WE PLACE THE ANTENNA

- *The antenna should be placed above rack mounts and as close to an outward facing wall/window as possible.*
- *Each installation is different and unique and will take some testing prior to the final decision is made*
- *Due to burst variation, it's best to set up the antenna in one location and test for an extended period of time (an hour or more).*

orolla

System Status

A) via web browser



B) Via CLI interface

“STR_” vs AR_Stl”

Note the beginning of every STL CLI calls are dependent upon software version installed 5.8.3 or below vs 5.8.4 and above) and also dependent on whether 1204-3D or 1204-3E STL card is installed. refer also to: [CLI commands associated with the 1204-3D and 1204-3E cards](#) for details

1. “STR_” (1204-3E any software version, and v5.8.4 and above for 1204-3D)

```
spadmin@10 ~ $ STR_
STR_GetActFeat      STR_GetRefId      STR_GetValidity
STR_GetConf         STR_GetStatus     STR_GetVersion
STR_GetIpAddr       STR_GetSubk       STR_SetConf
STR_GetNumInst      STR_GetSubscription STR_SetSubk
spadmin@10 ~ $ STR_
```

2. “AR_Stl” (v5.8.3 and below, 1204-3D)

```
spadmin@10 ~ $ AR_Stl
AR_StlGetActFeat    AR_StlGetStatus   AR_StlGetVersion
AR_StlGetConf       AR_StlGetSubk     AR_StlSetConf
AR_StlGetIpAddr     AR_StlGetSubscription AR_StlSetSubk
```

Reviewing the Status of 1204-3E CARD /qualifying the STL receiver/STL signal

- Refer to the online SecureSync user guide at: <http://manuals.spectracom.com/SS/Content/KB/STL-3E.htm?Highlight=1204-3e> (especially to the “Reviewing the STL Status” section further down this page).

Specific to your question about where in the logs is it indicated the STL receiver is able to obtain the STL signal, and as alluded to above, the Timing log (Management -> Timing log page of the browser) provides status info about the received STL signal. Below for your convenience is an excerpt of the Timing log entries included in the bundle you sent to us (keep in mind the time at the beginning of each entry is in UTC time – not local time).

For additional info on verifying the status of the STL receiver and the signal its receiving, please refer to the online SecureSync user guide at: <http://manuals.spectracom.com/SS/Content/KB/STL-3E.htm?Highlight=1204-3e> (especially to the “Reviewing the STL Status” section further down this page).

A) To obtain detailed STL status information for 1204-3E card via browser:

1. Navigate to **INTERFACES > REFERENCES: STL 0**. The STL 0 status panel will be displayed.

2. In the **STL 0 status panel**, click the **INFO** button. The STL 0 status window will open:



Besides STL system data, the window also displays STL validity and the subscription status. For a description of the other parameters, see [Configuring STL Settings](#).

- **Subscription status reminder banner:** Lists your current subscription state.
- **Validity** – **TIME:** Should always be green; if red, the -3E card is not installed correctly, or there is a defect; – **PPS:** If green, indicates the STL receiver is sending a PPS signal to SecureSync.
- **Subscription Start Date, End Date:** Day the STL subscription began and will end.
- **Application Version, System Version:** Receiver software versions.
- **Serial Number:** Receiver serial number.
- **IP address [button]: Maintenance port** – opens a separate browser window indicating the IP address of the Maintenance port (if a cable is plugged into the MAINT. port). NOTE: This functionality is only required if Spectracom Service personnel request access to the STL receiver directly.
- **Strong Burst:** Indicates color-coded burst rate. For more information see [Burst Rate](#).
- **Latitude, Longitude, Altitude:** Position data, as entered under [Configuring STL Settings](#).

To determine your GNSS position, using Google Maps/ Converting degrees/minutes/seconds to decimal

- Refer to online tools such as: www.earthpoint.us, or <https://www.fcc.gov/media/radio/dms-decimal>:

To determine your GNSS position, using Google Maps™:

1. On your computer, open [Google Maps](#).

2. In Google Maps, locate your building, and the location of your antenna.
3. Right-click on the location. Select What's here? At the bottom, you will see a card with the coordinates.
4. Take note of your decimal position (e.g., 43.083191, -77.589718).

Note: Should you prefer to determine your position in a different way, and as a result, have your latitude & longitude data in degrees/minutes/ seconds, you need to convert this data to the decimal format e.g., by using a conversion tool, such as Earth Point www.earthpoint.us, or <https://www.fcc.gov/media/radio/dms-decimal>:

- **Geolocation Mode: Static Known Position/Static Unknown Position [default]/Pseudo Static/Dynamic:** Position estimation setting, as entered under [Configuring STL Settings](#).

This parameter refers to how the STL receiver handles position estimation. The default setting is recommended for most applications.

- **Sensitivity Level** [default = 40]: STL receiver sensitivity setting, as entered under [Configuring STL Settings](#). This value determines the sensitivity of the STL receiver towards the STL signal bursts transmitted by the satellites. The lower the number, the more responsive the receiver will be to acknowledge the bursts. The default value is optimized for an indoor antenna. A higher value can be used for outdoor antenna installations (not typical). A value lower than (40) is not recommended.

B) To obtain detailed STL status information for 1204-3E card via CLI interface:

```
spadmin@10 ~ $ STR_
STR_GetActFeat      STR_GetRefId       STR_GetValidity
STR_GetConf         STR_GetStatus      STR_GetVersion
STR_GetIpAddr       STR_GetSubk        STR_SetConf
STR_GetNumInst      STR_GetSubscription STR_SetSubk
spadmin@10 ~ $ STR_
```

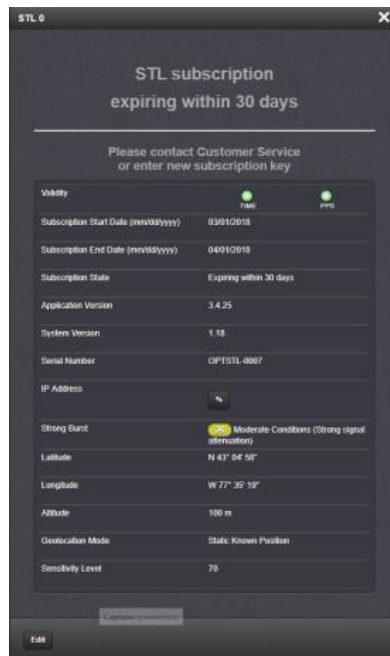
STR_Get Status <enter>

```
STR (0) Status:
Strong Burst in last 60s: 99
Total Burst in last 60s: 139
spadmin@10 ~ $
```

STL Bursts/Signal Strengths with 1204-3E card

A) Via web browser

1. Navigate to [INTERFACES](#) > [REFERENCES: STL 0](#). The STL 0 status panel will be displayed.
2. In the **STL 0 status panel**, click the **INFO** button. The STL 0 status window will open:



B) burst info via CLI interface for 1204-3E card

STR_GetStatus 0 0 <enter>

```
STR (0) Status:
Strong Burst in last 60s: 191
Total Burst in last 60s: 291
spadmin@10 ~ $
```

STL BURSTS

| Strong Bursts | Conditions | Typically experienced | Receiver lock status | Troubleshooting |
|---------------|---------------------------------------|------------------------------|--|---|
| 80+ | Excellent, minimal signal attenuation | ... outdoors | Short time to convergence | No action required |
| 33-55 | Good, some signal attenuation | ... indoors near windows | Short time to convergence | No action required |
| 15-30 | Moderate, strong signal attenuation | ... indoors far from windows | Longer time to convergence | Wait a couple of minutes for better satellite geometry; relocate antenna |
| 5-15 | Marginal, major signal attenuation | ... deep indoors | Significantly longer time to convergence | Wait several minutes for better satellite geometry; relocate antenna |
| 0 | Poor, severe signal attenuation | ... very deep indoors | No convergence | Verify that STL service is enabled in your area; wait several minutes for better satellite geometry; relocate antenna |

WHAT DOES THE STRONG BURST INDICATOR MEAN?

- Most implementations should see 15-30 in order to sync. It will take a long time to sync so we recommend 50+ for guaranteed success.
- Burst rate can vary over a 15 minute window due to attenuation and the movement of the satellites.

Suggestions to potentially improve the signal

- Move antenna to top of rack.
- Update lat/long for the location of the SecureSync/antennas
- Take the outside of the building and waiting at least 25min to verify operation

From SF case 119335

Email from Morgan (5 Oct 17) I looked at the logs and talked to engineering and you will need to check the antenna placement. You will need to check for a Strong Burst Signal under **Interface STL 0** the higher the better. A Strong Burst Signal, (anything over 15) will aid in maximizing the antenna location. You should place the antenna as high as possible which should help with signal strength as well.

Other suggestions

Send a picture of where the antenna is placed

Log entries associated with STL

A) events.log

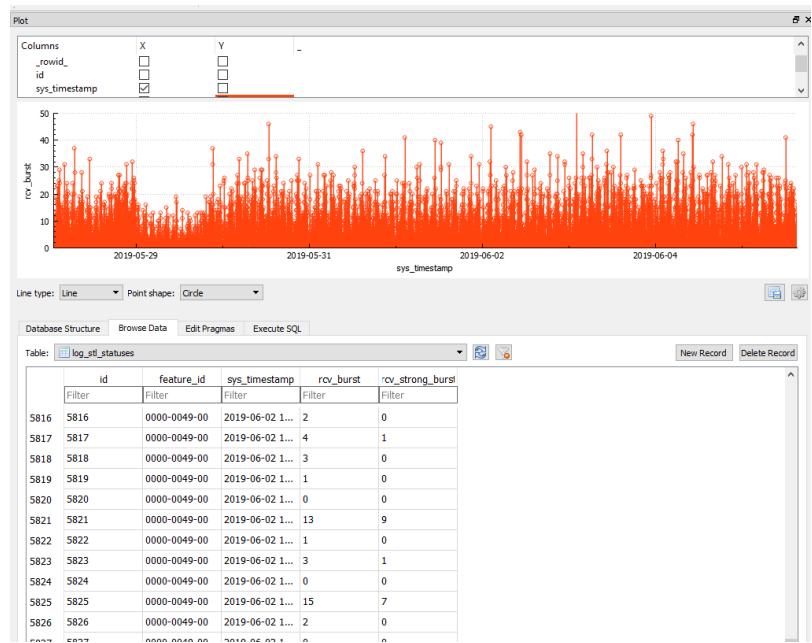
Example entry from a Sales demo SecureSync/STL at their site
Mar 27 16:52:48 Spectracom Spectracom: [system] 2018 086 16:52:47 000 SS: Reference changed to Time Ref: stl0
PPS Ref: stl0

B) timing.log

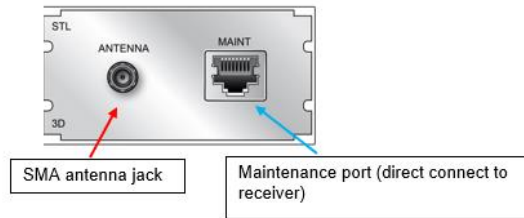
Example entries from a Sales demo SecureSync/STL at their site

```
Apr 18 14:00:29 Spectracom Spectracom: [system] 2018 108 14:00:29 000 STL Status: Total Burst:22 Strong Burst:10
Apr 18 14:00:34 Spectracom Spectracom: [system] 2018 108 14:00:34 000 STL Status: Total Burst:21 Strong Burst:8
Apr 18 14:00:39 Spectracom Spectracom: [system] 2018 108 14:00:39 000 STL Status: Total Burst:19 Strong Burst:6
Apr 18 14:00:44 Spectracom Spectracom: [system] 2018 108 14:00:44 000 STL Status: Total Burst:19 Strong Burst:5
Apr 18 14:00:49 Spectracom Spectracom: [system] 2018 108 14:00:49 000 STL Status: Total Burst:18 Strong Burst:5
Apr 18 14:00:54 Spectracom Spectracom: [system] 2018 108 14:00:54 000 STL Status: Total Burst:15 Strong Burst:4
Apr 18 14:00:59 Spectracom Spectracom: [system] 2018 108 14:00:59 000 STL Status: Total Burst:13 Strong Burst:3
Apr 18 14:01:04 Spectracom Spectracom: [system] 2018 108 14:01:04 000 STL Status: Total Burst:11 Strong Burst:3
Apr 18 14:01:09 Spectracom Spectracom: [system] 2018 108 14:01:09 000 STL Status: Total Burst:9 Strong Burst:1
Apr 18 14:01:19 Spectracom Spectracom: [system] 2018 108 14:01:19 000 STL Status: Total Burst:7 Strong Burst:0
Apr 18 14:01:29 Spectracom Spectracom: [system] 2018 108 14:01:29 000 STL Status: Total Burst:6 Strong Burst:0
Apr 18 14:01:34 Spectracom Spectracom: [system] 2018 108 14:01:34 000 STL Status: Total Burst:5 Strong Burst:0
Apr 18 14:01:39 Spectracom Spectracom: [system] 2018 108 14:01:39 000 STL Status: Total Burst:3 Strong Burst:0
Apr 18 14:01:44 Spectracom Spectracom: [system] 2018 108 14:01:44 000 STL Status: Total Burst:2 Strong Burst:0
Apr 18 14:02:14 Spectracom Spectracom: [system] 2018 108 14:02:14 000 STL Status: Total Burst:1 Strong Burst:0
Apr 18 14:02:44 Spectracom Spectracom: [system] 2018 108 14:02:44 000 STL Status: Total Burst:2 Strong Burst:0
Apr 18 14:02:49 Spectracom Spectracom: [system] 2018 108 14:02:49 000 STL Status: Total Burst:3 Strong Burst:0
Apr 18 14:02:54 Spectracom Spectracom: [system] 2018 108 14:02:54 000 STL Status: Total Burst:4 Strong Burst:0
Apr 18 14:02:59 Spectracom Spectracom: [system] 2018 108 14:02:59 000 STL Status: Total Burst:5 Strong Burst:1
Apr 18 14:03:25 Spectracom Spectracom: [system] 2018 108 14:03:25 000 STL Status: Total Burst:4 Strong Burst:1
Apr 18 14:03:35 Spectracom Spectracom: [system] 2018 108 14:03:35 000 STL Status: Total Burst:5 Strong Burst:1
Apr 18 14:03:45 Spectracom Spectracom: [system] 2018 108 14:03:45 000 STL Status: Total Burst:5 Strong Burst:2
Apr 18 14:03:50 Spectracom Spectracom: [system] 2018 108 14:03:50 000 STL Status: Total Burst:4 Strong Burst:2
Apr 18 14:04:00 Spectracom Spectracom: [system] 2018 108 14:04:00 000 STL Status: Total Burst:3 Strong Burst:1
Apr 18 14:04:25 Spectracom Spectracom: [system] 2018 108 14:04:25 000 STL Status: Total Burst:4 Strong Burst:1
Apr 18 14:04:35 Spectracom Spectracom: [system] 2018 108 14:04:35 000 STL Status: Total Burst:3 Strong Burst:1
Apr 18 14:04:45 Spectracom Spectracom: [system] 2018 108 14:04:45 000 STL Status: Total Burst:2 Strong Burst:0
Apr 18 14:04:55 Spectracom Spectracom: [system] 2018 108 14:04:55 000 STL Status: Total Burst:1 Strong Burst:0
```

“log_stl_Statuses” (sqlite database table for STL strength graphing data)



1204-3D Option Card (STL phase 1)



Note: 1204-3D card is no longer being shipped. Replaced by 1204-3E card

STL info in SecureSync online user manual:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/STL-3D.htm

Info on the Satelles signal itself: <I:\Customer Service\1- Cust Assist documents\Satelles resilient PNT.pdf>

Refer to ECO 1211/1217 for first release of the STL Receiver/Option Card (March, 2017)

https://app.bom.com/changes/detail-affected?change_id=2387977384

Some associated STL Part Numbers (https://app.bom.com/changes/detail-affected?change_id=2387977384)

- **Model 1204-3D Option Card** for SecureSync in Arena at: https://app.bom.com/items/detail-spec?item_id=1230577230&version_id=10696664478
- **Schematic:** (P/N: 1204-1021-0200) in Arena:
- **Satelles Module** (our P/N: MP30-0SAT-0001) in Arena at: https://app.bom.com/items/detail-spec?item_id=1230586066&version_id=10696849618
- **Iridium antenna** (our P/N E050-0001-0001) in Arena at: https://app.bom.com/items/detail-spec?item_id=1230586692&version_id=10696861268

Available SecureSyncs with 1204-3D STL card installed

- Customer Service SecureSync which should have STL available: (as of Feb 2018: 176 and 177 do not currently have it)
- Engineering SecureSyncs which may be available with STL: 10.10.128.37

Specifications

- Inputs: One STL antenna input, one Ethernet maintenance input
- Antenna input connector: SMA
- Ethernet connector: RJ45
- Frequency band: 1620 MHz
- Timing synchronization accuracy to UTC: ± 500 ns (specified); ± 200 ns (typical)
- Positioning accuracy: 30-50 m
- Coverage: Global
- Time-to-first-fix (Timing): Several seconds (the PPS pulse will become available once the positioning fix has been obtained)

- Time-to-first-fix (Positioning): Approximately 10 minutes
- Jamming resilience: Signal is 30 to 40 dB stronger than GPS signal
- Spoofing resilience: Encrypted signal
- Maximum number of cards: 1
- Ordering information: 1204-3D: STL module
- Ordering notes: The STL module 1204-3D cannot be combined with a Rubidium oscillator.

Minimum requirements

- 1204-3D (phase 1) This satellite receiver/Option Card requires either software version 5.6C or **post version 5.7.0 (5.7B)** be installed
- **The STL module 1204-3D cannot be combined with a Rubidium oscillator.**

FPGA/Firmware requirements

SecureSync Software version requirements

- **Special release:** version 5.6C (derived from version 5.6.0).
 - This was for our first STL customer (Gelato)
- This receiver/option card requires either version 5.6C or **post version 5.7.0** be installed

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “**Items**” for “**Item number**” and search for “**1200-SU01***” (as shown below)

The screenshot shows the top navigation bar of the Arena software with tabs: Dashboard, Items, Requests, Changes, Suppliers, Supplier Items, Files, Projects, and Quality. Below the navigation bar is a search filter bar. The search is set to 'Items' for 'All Items' where 'Item Number' is '1200-SU01*'. A 'Go' button is visible on the right.

FPGA (firmware) for the Model 1204-XX card: rt_ocXX_hw01_fpga.bin

| ECO | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|-----------------------|--------|--------------------|
| | | | | |
| | | | | |

Hardware

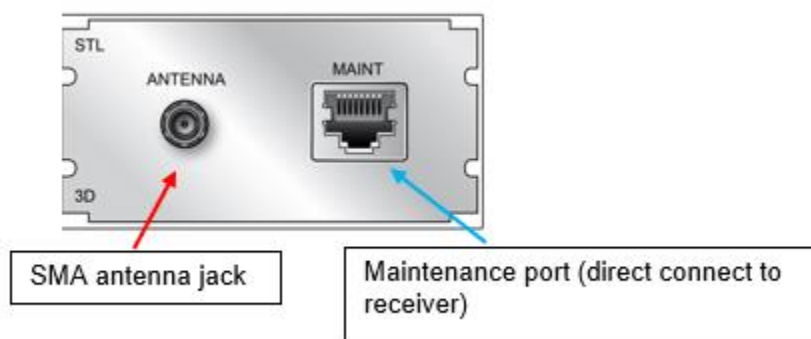
For Option Card hardware versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

| ECO | Software version | New Version | Change | approximate cut-in |
|-----------|------------------|-------------|--|----------------------|
| 1211/1217 | ----- | ----- | First release of the 1204-3D STL Option Card | (March, 2017) |
| 1413 | ----- | ----- | add Y200R-0002-XS02 to STL Option Card. | (Nov, 2017) |
| | | | | |

Hardware/Chassis/Processor

Processor: STL receiver has its own processor

- **Satelles Module** (our P/N: MP30-0SAT-0001) in Arena at: https://app.bom.com/items/detail-spec?item_id=1230586066&version_id=10696849618



Iridium antenna input jack on rear panel: SMA connector

“Maintenance” (Ethernet connector on rear panel)

- **DHCP only** – no static address possible (in at least v5.6C)
 - In at least v5.6C, the assigned IP address is not displayed anywhere.
- Requires open Internet connection (for our Engineering team to be able to reach)
- Port is used for receiver firmware updates/troubleshooting (for our Engineers to talk directly to the receiver).

STL Antenna Installation and Configuring the STL card

1. Refer to/Send the “STL Getting Started Guide” (1200-5000-0054)

- (1200-5000-0054) in Arena (direct link): https://app.bom.com/items/detail-spec?item_id=1243473577&version_id=10905937288&orb_msg_single_search_p=1
- Link to Arena is also in 1204-3E/1204-3D folder: [I:\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\1204-3E and 1204-3D \(Satelles STL\)](I:\EQUIPMENT\SPECTRACOM\EQUIPMENT\SecureSync\Option Cards\1204-3E and 1204-3D (Satelles STL))

2. Refer to online SecureSync user guide (“installing the STL antenna” and “Configuring STL Settings”): <http://manuals.spectracom.com/SS/Content/KB/STL-3E.htm>

Configuring the subkey for 1204-3D

NOTE: Web Browser for 1204-3D (not 1204-3E) truncates the subkey to only 20 characters (instead of the 28 needed)

- as mentioned by Morgan (April 2019) with a 1204-3D card installed, the browser window truncates the 28 character key to only 20 characters (the receiver needs all 28 characters)
- this prevents the 1204-3D receiver from accepting its full key and so it can't operate
- The work-around is to enter the subkey via the cli interface (instead of using the

3. Configure the 1204-3D receiver's subkey via the CLI interface

4. **STR_SetSubk 0 0**<enter> or **AR_StlSetSubk 0 0**<enter>

- **Versions 5.8.4 and above with 1204-3D:** **STR_SetSubk 0 0 12345678**<enter> (where 12345678 is the 28 character subkey)
- **Versions 5.8.3 and below with 1204-3D:** **AR_StlSetSubk 0 0 12345678**<enter> (where 12345678 is the 28 character subkey)

```
spadmin@10 ~ $ AR_StlSetSubk 0 0
Usage: AR_StlSetSubk <device index> <index> <key>
spadmin@10 ~ $
```

```
spadmin@10 ~ $ AR_StlSetSubk 0 0 12345678
STR (0) Subscription Key: 12345678
```

5. Get/Verify the subkey via the CLI interface

STR_GetSubk 0 0<enter> or **AR_StlGetSubk 0 0**<enter>

- **Versions 5.8.4 and above with 1204-3D:** **STR_GetSubk 0 0**<enter>
- **Versions 5.8.3 and below with 1204-3D:** **AR_StlGetSubk 0 0** <enter>

```
spadmin@10 ~ $ AR_StlGetSubk 0 0
STR (0) Subscription Key:
Key: 12345678
spadmin@10 ~ $
```

Installing the STL Antenna

- **Time-to-first-fix (Positioning):** Approximately 10 minutes

The supplied STL satellite antenna is designed for indoor use. The ideal location for the antenna is near the ceiling of the room in which your SecureSync unit is located, or near an outside wall. In general, a higher location is preferable over a lower location. Do not cover the antenna with electronic equipment or other metal objects.

- Time-to-first-fix (Positioning): Approximately 10 minutes
- Antenna connector is an SMA connector.
- Antenna includes 96-inch cable (we don't recommend extending this cable)
- The higher the antenna is located, the better the reception.
- Should be located closer to outside wall if possible, but as long as the satellite beam is not physically blocked, will work just about anywhere (except in basement or deep within the center of a building for instances)
- Only needs to track one satellite beam to be sufficient.

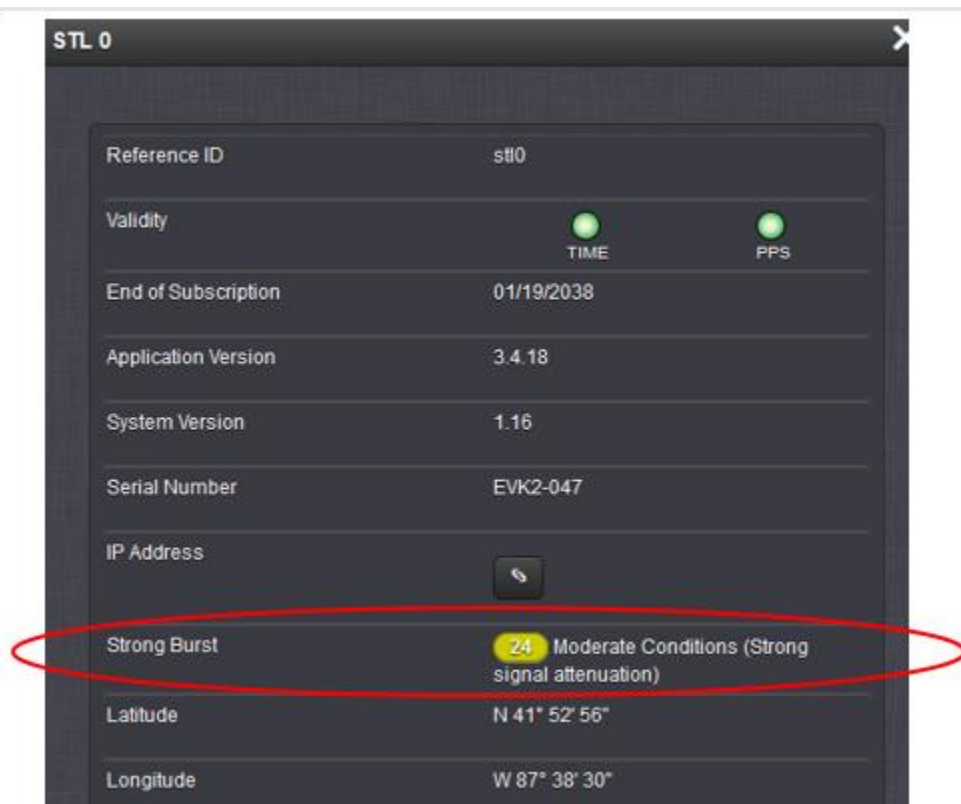
Email from Morgan (28 Nov 17) STL should come enabled from the factory so all you should need to do is find the best location for the STL antenna. The SecureSync-STL will aid in finding the sweet spot for the antenna, by going to **Interfaces\STL 0** where you will have to input the **Latitude, Longitude and Altitude** under the Edit button. Once the location is set then you can randomly place the antenna until you find the location with the strongest, **Strong Burst Signal**.

Here is a link to the online documentation:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/STL.htm

Use the **Interfaces-> STL 0** page of the browser to check for a **Strong Burst Signal** ("Strong Burst" field)

- A Strong Burst Signal, (anything over 15)
- Place the antenna as high as possible which should help with signal strength
- The higher the value the stronger the signs
- Wait at least 25 minutes before trying antenna in a different location.



Burst info via CLI interface

- 5.8.4 and above with 1204-3D: **STR_GetStatus 0 0** <enter>
- 5.8.3 and below with 1204-3D: **AR_StlGetStatus 0 0** <enter>

```
spadmin@10 ~ $ AR_StlGetStatus 0 0

STR (0) Status:
  Strong Burst in last 60s: 191
  Total Burst in last 60s: 291
spadmin@10 ~ $
```

Suggestions to potentially improve the signal

- Move antenna to top of rack.
- Update lat/long for the location of the SecureSync/antennas
- Take the outside of the building and waiting at least 25min to verify operation

From SF case 119335

Email from Morgan (5 Oct 17) I looked at the logs and talked to engineering and you will need to check the antenna placement. You will need to check for a Strong Burst Signal under **Interface\STL 0** the higher the better. A Strong Burst Signal, (anything over 15) will aid in maximizing the antenna location. You should place the antenna as high as possible which should help with signal strength as well.

Other suggestions

Send a picture of where the antenna is placed

Direct communications with STL receiver (via maintenance connector or edge of card)

- Requires Engineering to remote into the receiver to communicate with it

A) STL Splash page

Dashboard - EVK2-047

| | |
|-----------------------------------|----|
| Internet Status | ✓ |
| VPN Status | ✓ |
| Orbit Server Status | ● |
| Base Station Communication Status | ● |
| Base Station Distance | ✗ |
| Burst Count (per minute) | 33 |
| GPS Communication Status | ✗ |
| Browser Communication Status | ✓ |

STL

- Time Of Week = 236414.1
- Latitude = 43.083214
- Longitude = -77.588820
- Altitude = 125.992654

📍 External map

Burst Count:

20ms. Burst Count is continuously updating)

(Bursts are sent out every

0= not receiving burst

Desired: Greater than 20 is recommended

Expected: around 50 to 100 typical

B) STL Logger (logs and file break-down)

STL LOGGER

Logger: /stl_bursts

```
1870480234, 609649, 256134096712, 4448.18, 39.3, 21, 1, 2, 15, 31, 394, 323, 395, 0, 0, 0, 0,
1870480235, 609649, 3471251377108, -30004.37, 43.3, 10, 0, 2, 15, 31, 100, 105, 125, 0, 0, 0, 0,
1870480237, 609649, 52632027682, 4411.34, 48.2, 21, 1, 2, 15, 31, 125, 06, 88, 0, 0, 0, 0,
1870480249, 609650, 604229658821, 4261.61, 41.8, 21, 1, 2, 15, 31, 87, 90, 67, 0, 0, 0, 0,
1870480252, 609650, 876227973968, 4225.15, 51.9, 21, 1, 2, 15, 31, 59, 77, 53, 0, 0, 0, 0,
1870480268, 609651, 597164188932, -30195.14, 41.1, 10, 0, 2, 15, 31, 60, 64, 86, 0, 0, 0, 0,
1870480261, 609651, 686229456077, 4113.30, 48.5, 21, 1, 2, 15, 31, 122, 52, 12, 0, 0, 0, 0,
1870480276, 609653, 030222993047, 3925.73, 48.2, 21, 1, 2, 15, 31, 53, 85, 25, 0, 0, 0, 0,
1870480283, 609653, 667202508318, -30285.12, 42.4, 10, 0, 3, 15, 42, 33, 7, 44, 0, 0, 0, 0,
1870480285, 609653, 846220515552, 3814.17, 50.0, 21, 1, 3, 15, 42, 35, 24, 52, 0, 0, 0, 0,
```

FIRST COLUMN IS TIME TAG (FRAME COUNTER) WHICH GIVES AN INDICATION OF TIME

SECOND, THIRD COLUMN IS DOPPLER INFORMATION

FOURTH COLUMN IS SIGNAL STRENGTH

FIFTH COLUMN IS SATELLITE NUMBER

SIXTH COLUMN IS PLANE NUMBER (NUMBER OF SATELLITES SEEN IN THAT PLANE)

SEQUENCE NUMBER (MESSAGE TYPE RECEIVED)

NEXT 4 NUMBERS ARE ENCRYPTED DATA WHICH IS DECODED INTO NAVIGATION INFORMATION

0 STRINGS ARE USED FOR SUBSCRIPTION INFORMATION

C) STL Parameters page

STL PARAMETERS

THIS IS ALSO SHOWN ON THE SECURESYNC CONFIG PAGE AND WILL MATCH WHAT IS WRITTEN HERE.

Parameters:

Update All

Filter:

display advanced

source: user interface

| | | | | |
|-----|-----------------|------------|-----|-------------|
| D10 | guesspos_lat | 43.082723 | deg | <div></div> |
| D11 | guesspos_lon | -77.585730 | deg | <div></div> |
| D12 | guesspos_alt | 100.0 | m | <div></div> |
| D13 | guesspos_std_ee | 100.0 | m | <div></div> |
| D14 | guesspos_std_nn | 100.0 | m | <div></div> |
| D15 | guesspos_std_uu | 50.0 | m | <div></div> |

D) STL PPS page

STL PPS PAGE

CLOCK COVARIANCE IS ACCURACY OF PPS SIGNAL. THE LARGER THE NUMBER, THE FARTHER IT'S OFF. PPS WILL NOT CONVERGE UNLESS IT'S UNDER A CERTAIN NUMBER.

PPS

| | |
|----------------------|---------------|
| Converged | <div></div> |
| Clock Covariance | 97.941 ns |
| Clock Offset | -0.648 ppb |
| HW PPS Offset | 0.010 us |
| Slew Updated | <div></div> |
| Curve fit processing | <div></div> |
| Bursts per minute | <div>16</div> |

Clock Covariance

- The accuracy of PPS signal. The larger the number, the farther it's off. PPS will not converge unless it's under a certain number

E) STL Subscription page

STL SUBSCRIPTION PAGE

THERE ARE OTHER FEATURES BUT WE ARE ONLY INTERESTED IN THE TIMING FEATURE.

ALSO DISPLAYS START AND END DATE.

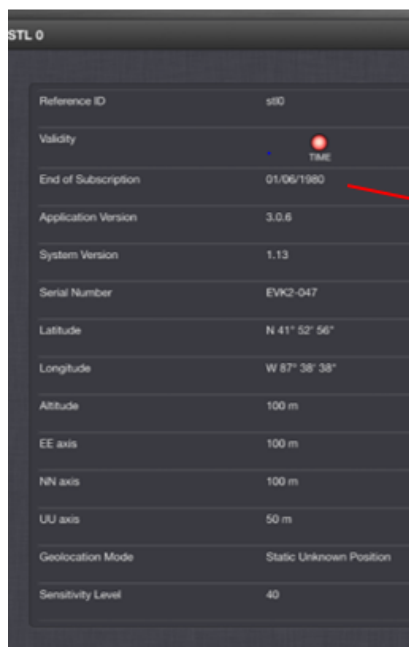
Subscription:

| | |
|------------|------------|
| Start Date | 2017-05-01 |
| End Date | 2017-07-01 |
| Features | [Timing] |

Receiver info: (Serial Number (EVK), System Version, Subscription expiration)

A) via web browser

- displayed in the **Interfaces -> STL 0 "Status"** page of the browser



B) Via CLI interface

“STR_” vs “AR_stl”

Note the beginning of every STL CLI calls are dependent upon software version installed (5.8.3 or below vs 5.8.4 and above) and also dependent on whether 1204-3D or 1204-3E STL card is installed. refer also to: [CLI commands associated with the 1204-3D and 1204-3E cards](#) for details

6. “STR_” (versions 5.8.4 and above for 1204-3D)

```
spadmin@10 ~ $ STR_
STR_GetActFeat      STR_GetRefId       STR_GetValidity
STR_GetConf         STR_GetStatus      STR_GetVersion
STR_GetIpAddr       STR_GetSubk        STR_SetConf
STR_GetNumInst      STR_GetSubscription STR_SetSubk
spadmin@10 ~ $ STR_
```

7. “AR_stl” (versions 5.8.3 and below for 1204-3D)

```
spadmin@10 ~ $ AR_Stl
AR_StlGetActFeat    AR_StlGetStatus    AR_StlGetVersion
AR_StlGetConf       AR_StlGetSubk      AR_StlSetConf
AR_StlGetIpAddr     AR_StlGetSubscription AR_StlSetSubk
```

Web browser

A) Classic interface

Not available in Classic interface browser

B) Newer (black/charcoal) browser (applicable to versions 5.6.c and post 5.7.0)

Note: Screenshots below were taken in version 5.6C (from 10.10.128.25 in Engineering)

Interfaces -> **STL 0** page of the browser

STL SETUP DEEP DIVE



The screenshot shows the 'STL Setup 0' window with the following fields and values:

| Field | Value |
|-------------------|-------------------------|
| Latitude | 43.082723 |
| Longitude | -77.585730 |
| Altitude | 100.000000 |
| EE axis | 100.000000 |
| NN axis | 100.000000 |
| UU axis | 50.000000 |
| Geolocation Mode | Static Unknown Position |
| Sensitivity Level | 40 |

At the bottom, there is a 'Status' button on the left and a 'Save' button on the right.

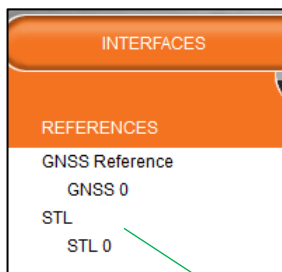
LATITUDE AND LONGITUDE ARE THE PHYSICAL LOCATION OF THE STL UNIT. YOU CAN OBTAIN THIS VIA GOOGLE MAPS

ALTITUDE IS THE ALTITUDE IN METERS. THIS SHOULD NOT HAVE TO BE CHANGED.

EE, NN, UU AXES ARE COORDINATES IN THE ENU (EAST, NORTH, UP) AXIS. THIS VALUES WILL NOT NEED TO BE CHANGED AND SHOULD REMAIN AS 100, 100, 50. HELPS ON INITIALIZATION (LATITUDE/LONGITUDE WITHIN X AMOUNT OF METERS)

GEOLOCATION MODE HAS 4 OPTIONS – STATIC KNOWN POSITION, STATIC UNKNOWN POSITION, PSEUDO-STATIC, AND DYNAMIC. THIS REFERS TO HOW THE STL RECEIVER WILL HANDLE POSITION ESTIMATION AND SHOULD REMAIN AS A STATIC UNKNOWN POSITION.

SENSITIVITY LEVEL REFERS TO THE SENSITIVITY OF THE RECEIVER TO OBTAINING BURSTS. THE LOWER THE NUMBER, THE MORE RESPONSIVE THE RECEIVER IS TO ACKNOWLEDGING BURSTS. THIS NUMBER SHOULD REMAIN AS SHOWN HERE (40). IT IS OPTIMIZED FOR AN INDOOR ANTENNA. A STRONGER VALUE (OUTDOOR ANTENNA) COULD INCREASE THAT VALUE. IT IS NOT RECOMMENDED TO GO BELOW 40.



STL Setup 0

Latitude: 43.083045

Longitude: -77.58876

Altitude: 100

EE axis: 100

NN axis: 100

UU axis: 50

Geolocation Mode: Static Unknown Position

Sensitivity Level: 40

Status

Status

Submit

Note: The position needs to be entered in decimal format- not degrees minutes and seconds.

Factory default values
(Customers should not change)

EE, NN and UU affect
satellite search area

Geolocation Mode selections:

Static known position
Static unknown position
Pseudo Static
Dynamic

Status screen

| Reference ID | u80 |
|---------------------|-------------------------|
| Validity | True |
| End of Subscription | 07012017 |
| Application Version | 3.0.6 |
| System Version | 1.13 |
| Serial Number | EW2-041 |
| Latitude | N 43° 04' 50" |
| Longitude | W 77° 35' 19" |
| Altitude | 100 m |
| EE axis | 100 m |
| NN axis | 100 m |
| UU axis | 50 m |
| Geolocation Mode | Static Unknown Position |
| Sensitivity Level | 45 |

Associated fields

A) Latitude, Longitude and Altitude:

| | |
|-----------|-----------|
| Latitude | 43.083045 |
| Longitude | -77.58876 |
| Altitude | 100 |

(Satellites refers to these fields as “Guesses”) a user setting these values manually (find position using Google Maps for instance) significantly increasing time to first fix.

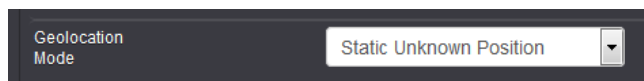
Latitude, Longitude, Altitude: [decimal degrees, meters] Actual geographic position of SecureSync's STL antenna. For help determining your actual position, see [Determining Your Position](#). (this is a link to online S/S user manual)

B) EE Axis, NN Axis, UU Axis: define satellite search area.

| | |
|---------|-----|
| EE axis | 100 |
| NN axis | 100 |
| UU axis | 50 |

Note: These fields should remain at the factory default values (as shown in above).

C) Geolocation Mode:

A dark-themed UI element with the label "Geolocation Mode" on the left and a dropdown menu on the right. The dropdown menu is open, showing the selected option "Static Unknown Position".

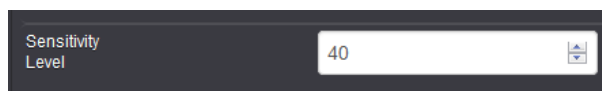
- Define stationary ("Static") or mobile operation.

Geolocation Mode selections:

- Static known position
- Static unknown position
- Pseudo Static
- Dynamic

Static Known Position/Static Unknown Position [default]/Pseudo Static/Dynamic: This parameter refers to how the STL receiver handles position estimation. The default setting is recommended for most applications.


D) Sensitivity Level:

A dark-themed UI element with the label "Sensitivity Level" on the left and a text input field on the right. The input field contains the number "40".

- How sensitive is the receiver (we recommend it remain the default value of "40" or greater)

Sensitivity Level: [default = 40] This value determines the sensitivity of the STL receiver towards the STL signal bursts transmitted by the satellites. The lower the number, the more responsive the receiver will be to acknowledge the bursts. The default value is optimized for an indoor antenna. A higher value can be tried out for outdoor antennas. A value lower than (40) is not recommended.

STL SETUP DEEP DIVE

A screenshot of the "STL Setup 0" dialog box. It contains several input fields: Latitude (43.062723), Longitude (-77.565730), Altitude (100.000000), EE axis (100.000000), NN axis (100.000000), UU axis (50.000000), Geolocation Mode (Static Unknown Position), and Sensitivity Level (40). There are "Status" and "Submit" buttons at the bottom.

LATITUDE AND LONGITUDE ARE THE PHYSICAL LOCATION OF THE STL UNIT. YOU CAN OBTAIN THIS VIA GOOGLE MAPS

ALTITUDE IS THE ALTITUDE IN METERS. THIS SHOULD NOT HAVE TO BE CHANGED.

EE, NN, UU AXES ARE COORDINATES IN THE ENU (EAST, NORTH, UP) AXIS. THIS VALUES WILL NOT NEED TO BE CHANGED AND SHOULD REMAIN AS 100, 100, 50. HELPS ON INITIALIZATION (LATITUDE/LONGITUDE WITHIN X AMOUNT OF METERS)

GEOLOCATION MODE HAS 4 OPTIONS – STATIC KNOWN POSITION, STATIC UNKNOWN POSITION, PSEUDO-STATIC, AND DYNAMIC. THIS REFERS TO HOW THE STL RECEIVER WILL HANDLE POSITION ESTIMATION AND SHOULD REMAIN AS A STATIC UNKNOWN POSITION.

SENSITIVITY LEVEL REFERS TO THE SENSITIVITY OF THE RECEIVER TO OBTAINING BURSTS. THE LOWER THE NUMBER, THE MORE RESPONSIVE THE RECEIVER IS TO ACKNOWLEDGING BURSTS. THIS NUMBER SHOULD REMAIN AS SHOWN HERE (40). IT IS OPTIMIZED FOR AN INDOOR ANTENNA. A STRONGER VALUE (OUTDOOR ANTENNA) COULD INCREASE THAT VALUE. IT IS NOT RECOMMENDED TO GO BELOW 40.

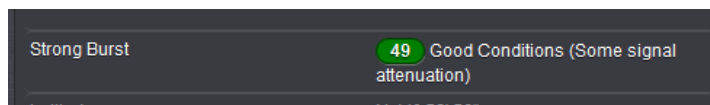
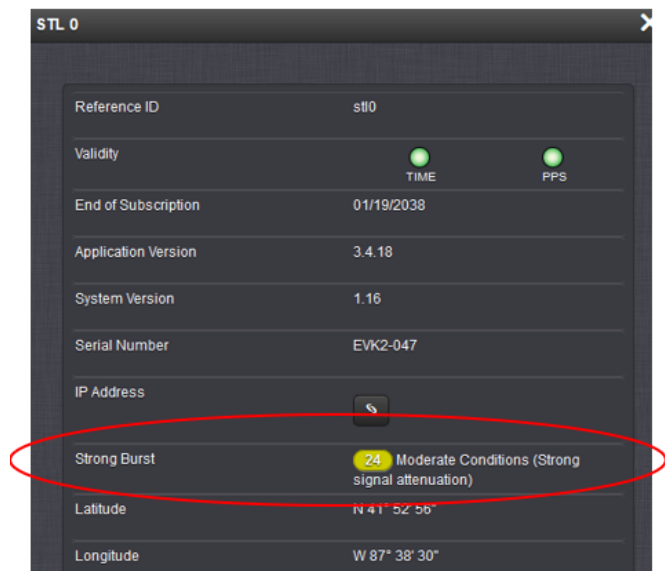
Normal Operation of STL receiver

Monitoring Signal Strengths of the STL signal

- available Via the browser or CLI interface

A) Use the **Interfaces-> STL 0** page of the browser ("Strong Burst" field) to check for a Strong Burst Signal

- A Strong Burst Signal, (anything over 15)
- Place the antenna as high as possible which should help with signal strength
- The higher the value the stronger the signs



B) Obtain Burst info via CLI interface

- 5.8.4 and above with 1204-3D: **STR_GetStatus 0 0** <enter>
- 5.8.3 and below with 1204-3D: **AR_StlGetStatus 0 0** <enter>

```
spadmin@10 ~ $ AR_StlGetStatus 0 0
STR (0) Status:
  Strong Burst in last 60s: 191
  Total Burst in last 60s: 291
spadmin@10 ~ $
```

From SF case 119335

Email from Morgan (5 Oct 17) I looked at the logs and talked to engineering and you will need to check the antenna placement. You will need to check for a Strong Burst Signal under **Interface\STL 0** the higher the better. A Strong Burst Signal, (anything over 15) will aid in maximizing the antenna location. You should place the antenna as high as possible which should help with signal strength as well.

Q Please let me know how can i check the signal strength to make sure we are getting good signal.

A Reply from Morgan (13 Oct 2017) The only way to check the signal strength is under Interfaces\STL 0\Strong Burst. This number will constantly change but it is the best indicator of the signal.

1PPS Phase Error/ Accuracy of 1PPS input to SecureSync Phase

- Refer to Salesforce Cases such as 210915 and 212832
- Will vary (can be adversely affected by periods of weak or no Bursts being received)
- Usually better than about 1 microsecond
- Typically, about 200ns phase errors on average

Monitoring phase error of the STL receiver/preventing quick spikes from adversely affecting phase error

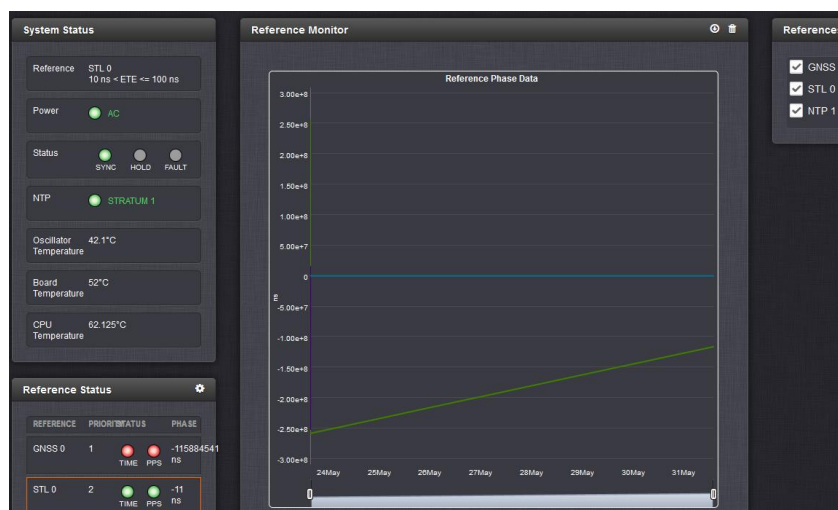
Refer to online SecureSync User Guide:

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPRTN/StatMon_InputRefs.htm

5. View the Tools-> Reference Monitor page of the SecureSync's browser

(http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/TIME/RefMon.htm)

- Can Optionally export this graph data via sqlite dbase in log bundle, then view/extract data using dB browser program



6. Monitor 1PPS phase error via SNMP:

- Can perform SNMP Gets for the 1PPS phase error value

Q (from Salesforce Case 212832) We have the optional STL antenna installed on this unit, but we are experiencing signal strength issues. In order to properly monitor and keep a history of the STL signal strength, we would like to expose this data via SNMP or some other method. Please advise how we can access this information.

A Reply from Dave L (Oct 2019) this time there are no SNMP OIDs for the STL signal tracking. We have no way to download a status or signal strength record of the STL performance. There are some data entries in the Timing log that can be viewed in the home/spectracom/log/timing.log if that is helpful.

Optionally enable the System's Smart Reference Monitoring (if not already enabled) to prevent spikes from affecting Phase errors.

- Refer to online user guide at:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/TIME/RefMon.htm

Holdover mode of the STL receiver itself (receiver holdover)

- In at least software v5.6C, the STL receiver itself has a **ten (10) minute holdover** duration (if STL is the only available/valid input reference, SecureSync won't go into Holdover mode until 10 minutes after STL receiver stops tracking satellites).

Marginal STL reception/still remaining in sync

- As long as the SecureSync/NetClock sees (1) good burst every 30 minutes, it will stay locked.

Email from Morgan (12 Dec 17) I could see in the logs that you were seeing burst, the number of burst will vary throughout the day, but as long as we see (1) good burst every 30 minutes, it will stay locked.

Troubleshooting 1204-3D cards

- Refer to the online user guide documentation:
http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/STL.htm
- Refer also to “**Known Issues**” further below

Associated CLI commands

- **Verify the subscription is valid by checking expiration date**
 - **Versions 5.8.4 and above with 1204-3D: STR_GetSubscription 0 0** <enter>
spadmin@Spectracom ~ \$ **STR_GetSubscription 0 0**
End of Subscription: 01/06/1980
 - **Versions 5.8.3 and below with 1204-3D: AR_StlGetSubscription 0 0** <enter>

```
AR_StlGetSubk      AR_StlGetSubscription
spadmin@10 ~ $ AR_StlGetSubscription 0 0

Begin of Subscription: 07/01/2017
End of Subscription: 08/01/2018
Subscription OK
spadmin@10 ~ $
```

GPS antenna alarm asserted

- This alarm is only associated with the GPS receiver (not the STL receiver)
- If a GPS antenna is not also connected (in addition to STL antenna), mask the GPS antenna alarm in the **Management -> Notifications** page of the browser

Spectracom logs:

- In version 5.7B, STL log entries for STL are now available in the SecureSync (refer to **Timing** and **Journal** logs)
- In at least v5.6C special release, no STL-related logs are captured in SecureSync logs. Need to obtain receiver logs from the receiver, directly via the rear panel Maintenance port (via remote access, if allowed)

- **Timing log contains burst information. Example log entries below**

Note: Ryan indicated these entries directly below show marginal reception

Oct 4 07:32:27 Spectracom Spectracom: [system] 2017 277 07:32:36 000 STL Status: **Total Burst:1 Strong Burst:0**
 Oct 4 07:32:32 Spectracom Spectracom: [system] 2017 277 07:32:41 000 STL Status: **Total Burst:2 Strong Burst:0**
 Oct 4 07:33:17 Spectracom Spectracom: [system] 2017 277 07:33:26 000 STL Status: **Total Burst:3 Strong Burst:0**
 Oct 4 07:33:27 Spectracom Spectracom: [system] 2017 277 07:33:36 000 STL Status: **Total Burst:2 Strong Burst:0**
 Oct 4 07:33:32 Spectracom Spectracom: [system] 2017 277 07:33:41 000 STL Status: **Total Burst:1 Strong Burst:0**

Other observed Timing log entries associated with STL

Dec 1 12:02:16 Spectracom Spectracom: [system] 2017 335 12:02:16 000 AR stl0 has lost communication.
 Dec 1 12:02:24 Spectracom Spectracom: [system] 2017 335 12:02:24 000 AR stl0 has established communication.
 Dec 1 12:02:26 Spectracom Spectracom: [system] 2017 335 12:02:26 000 AR stl0 has lost communication.
 Dec 1 12:02:34 Spectracom Spectracom: [system] 2017 335 12:02:34 000 AR stl0 has established communication.
 Dec 1 12:02:36 Spectracom Spectracom: [system] 2017 335 12:02:36 000 AR stl0 has lost communication.
 Dec 1 12:02:44 Spectracom Spectracom: [system] 2017 335 12:02:44 000 AR stl0 has established communication.
 Dec 1 12:02:46 Spectracom Spectracom: [system] 2017 335 12:02:46 000 AR stl0 has lost communication.
 Dec 1 12:02:54 Spectracom Spectracom: [system] 2017 335 12:02:54 000 AR stl0 has established communication.
 Dec 1 12:02:56 Spectracom Spectracom: [system] 2017 335 12:02:56 000 AR stl0 has lost communication.
 Dec 1 12:03:04 Spectracom Spectracom: [system] 2017 335 12:03:04 000 AR stl0 has established communication.

- **Example Journal log entries**

- Nov 27 20:35:20 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 40.584330 Longitude: -74.243270 Altitude: 100.000000 EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 0.708330 -1.295790 100.000000 100.000000 100.000000 50.000000 1 40
- Nov 28 07:42:47 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 40.584330 Longitude: -74.243270 Altitude: 100.000000 EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 704.328737 12940.473736 100.000000 100.000000 100.000000 50.000000 1 40
- Nov 28 07:48:20 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 40355.064000 Longitude: 741434.530000 Altitude: 100.000000 EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 704.328737 12940.473736 -100.000000 100.000000 100.000000 50.000000 1 40
- Nov 28 07:51:41 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 40355.064000 Longitude: 741434.530000 Altitude: -100.000000 EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 7042.492544 12940.473213 75.000000 100.000000 100.000000 50.000000 1 40
- Nov 28 08:01:59 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 403505.100000 Longitude: 741434.500000 Altitude: 75.000000 EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 7042.492544 12940.473213 29.000000 100.000000 100.000000 50.000000 1 40
- Nov 28 08:02:21 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 403505.100000 Longitude: 741434.500000 Altitude: 29.000000 EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 7042.492544 12940.473213 9.000000 100.000000 100.000000 50.000000 1 40
- Nov 28 08:08:07 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 403505.100000 Longitude: 741434.500000 Altitude: 9.000000 EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 0.708335 -1.295788 9.000000 100.000000 100.000000 50.000000 1 40
- Nov 28 09:29:22 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 40.584617 Longitude: -74.243176 Altitude: 9.000000 EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 0.708335 -1.295788 124.000000 100.000000 100.000000 50.000000 1 40
- Nov 28 09:30:27 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 40.584617 Longitude: -74.243176 Altitude: 124.000000

EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 0.708335 -1.295788 9.000000 100.000000 100.000000 50.000000 1 40

- Nov 28 19:28:18 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 40.584617 Longitude: -74.243176 Altitude: 9.000000 EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 704.275260 12940.412126 9.000000 100.000000 100.000000 50.000000 1 40
- Nov 28 19:29:06 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 40352.000000 Longitude: 741431.000000 Altitude: 9.000000 EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 704.275260 12940.412126 9.000000 100.000000 100.000000 50.000000 1 40
- Nov 29 08:13:16 Spectracom Spectracom: [webui] Changed STL Configuration for ASCII Reference 0 in slot 3 from STR (0) Configuration: Serial Number: EVK2-066 Latitude: 40352.000000 Longitude: 741431.000000 Altitude: 9.000000 EE axis: 100.000000 NN axis: 100.000000 UU axis: 50.000000 Geolocation mode: 1 Sensitivity level: 40 to STR (0) Conf: EVK2-066 0.708337 -1.295786 9.000000 100.000000 100.000000 50.000000 1 40

Questions/Info to find out from customer:

- 1) Is “**STL 0**” listed/enabled in the **Management -> Reference Priority** page of the browser?
- 2) Can the “Maintenance” Ethernet jack on the rear panel be connected to Internet for our Engineers to communicate with the receiver?
- 3) Can you take a screenshot of the detailed status page for the STL reference? Navigation instructions to get to the STL detailed status page can be found at the bottom of the option card 3D manual page.

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/STL.htm?Highlight=stl

- 4) If it is possible, can you also send us a photo of where the STL antenna is placed?
- 5) Can you also send me a screenshot from the STL status page in the SecureSync UI?

(true example below- notice the “**End of Subscription date**” has expired



Possible issues

A) No reception/not a valid reference

1. Antenna location
 2. Subscription has since expired (date in the “**End of Subscription**” field in the **STL status page** has since elapsed)
- Subscription unexpectedly reporting its expired – email from Sadie (26 Jul 17) We were able to mimic similar results in our lab by disconnecting the SD card on the EBK. We believe that something came disconnected during shipping. I will be sending you a Priority return shipping label in the morning. Kindly return the system and we'll correct the hardware and re-ship. My apologies for the inconvenience. This system is our PoC beta form factor. We're wrapping up development of the STL option card module that will have the EBK reside on the option card itself.

Email from Ron- Can you take a screenshot of the detailed status page for the STL reference? Navigation instructions to get to the STL detailed status page can be found at the bottom of the option card 3D manual page.

http://manuals.spectracom.com/SS/Content/NC_and_SS/Com/Topics/OPTCARDS/OC_List/STL.htm?Highlight=stl

If it is possible can you also send us a photo of where the STL antenna is placed?

Known issues with STL/ 1204-3E and 1204-3D cards

Option Cards for Model 2400 SecureSyncs only

(2400 SecureSyncs) GB Ethernet Option Cards (1204-49, 1204-4A, 1204-4E, 1204-51)

Available Ethernet cards for 2400 series SecureSyncs (not available for Model 1200 SecureSyncs)

| Option Card Model | Description |
|-------------------|---|
| 1204-49 | Dual (2) GB Ethernet Option Card (for 2400 SecureSyncs) |
| 1204-4A | QUAD (4) 1GBE OPTION BOARD (for 2400 SecureSyncs) |
| 1204-4E | OOB (5) 1GBE OPTION BOARD (for 2400 SecureSyncs) |
| 1204-51 | SINGLE (1) 1GBE OPTION BOARD (for 2400 SecureSyncs) |

Note about the 1204-06 GB Ethernet Option Card

The Model 1204-06 GB eth Option Card (for the 1200 SecureSync) is not supported for use in Model 2400 SecureSyncs. Refer to the list of Option Cards above.

Links

ECO-2191 for the 1GB Option Board (in Arena): https://app.bom.com/changes/detail-affected?change_id=2397189114

Schematic for 1G Option Board (1204-14A1-0200) in Arena: https://app.bom.com/items/detail-spec?item_id=1259643568&version_id=11258617528&

PCB drawing for Quad GBE Option Board (1204-14A9-0200) in Arena: https://app.bom.com/items/detail-spec?item_id=1275075450&version_id=11471406078&

Associated with all GB Ethernet cards for 2400 SecureSync

**Per Ron Dries (9 Aug 2022) Network Expansion cards for 2400s are not management-capable (Currently NTP only - PTP interfaces in the future). For instance, they can't access the browser, can't send SNMP traps, etc

..Effects on GB Interfaces when PTP has been enabled on that interface

Refer to Salesforce Case 272881

Per Ryan Johnson (8 Sept 2021) This unit came into service and I took a look at it. And... there doesn't seem to be anything wrong with it. I was able to log into the unit fine with both spadmin/spfactory. But I have a hunch what happened. If they had been attempting to log into the device via the **IP address of one of the 1204-49 (PTP) ports** they would see the problem they did. When trying to connect to the 49/4A cards via ssh it will let the user attempt to connect, but the credentials are completely different from the standard console interface and so spadmin/spfactory/etc will not work.

I did make a ticket (**O4-118**) to disable the ssh service on these cards since 1) it's confusing and 2) a (minor) security risk. Below are the contents of the update log which show that they did attempt to apply a SS1200 5.9.1 bundle but it was rejected as expected.

Per Ryan Johnson (23 Sept 2021) Just to clarify the intent of disabling SSH on the cards, that interface was never intended to provide access into the base system. The SSH service that's operating on the cards was only put in for developer use and it was an error to leave it enabled for the released software. So this won't be a user-level control. The 49/4A cards are conceptually the same as say the 32 card: a completely isolated network interface that only serves to provide NTP/PTP timing

The network service access to the device is only through ETH0/ETH1

Detailed Tech info on Dual/Quad GB eth Option Cards

[9/8/2022 8:35 AM] Tristan Pensel

Hello Keith, we have this material under Confluence for the 4in1 card:

<https://spectracom.atlassian.net/wiki/spaces/DMND/pages/255787009/4in1+Option+Card>

especially this page : <https://spectracom.atlassian.net/wiki/spaces/DMND/pages/1417478160/Working+with+the+OC+4-in-1+in+software>

1. [Option cards](#)

A) 4in1 Option Card

Created by [Florent Follet \(Unlicensed\)](#)

Last updated: [Jul 05, 2018](#) by [Herve Echelard](#)

This option card will be populated in 4 different ways to be used in 4 different cases :

4 SFP 1 x Gigabit interfaces for ~~PTP~~ and NTP with Hardware timestamping on every port

2 SFP 1 x Gigabit interfaces for ~~PTP~~ and NTP with Hardware timestamping on every port

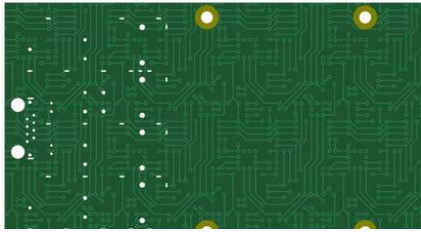
1 SFP 1 x Gigabit interface for ~~PTP~~ and NTP with Hardware timestamping

1 RJ45 1 x Gigabit interface for OOB (out of band interface)



Mechanical Concept

The Board is the same for the 4 configurations. Holes in the board are limited by putting SFP cage in the center of the board and sharing holes:



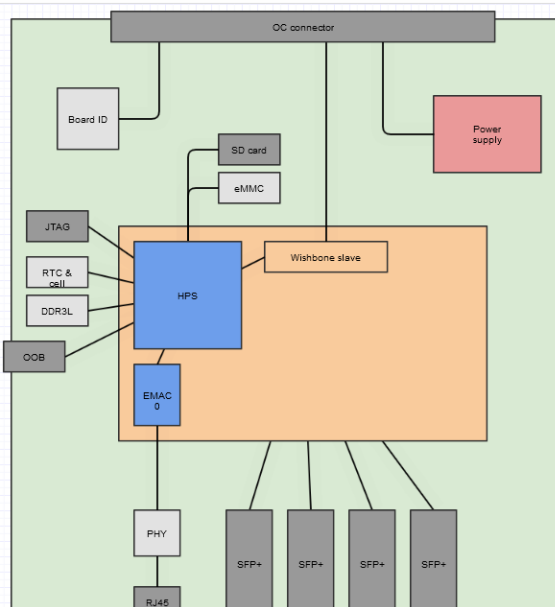
The Front plate is composed of 4 plates with configuration of 4SFP, 2SFP, 1 SFP and 1 RJ45. We use the Low profile SFP with light-pipe cage. The low profile version is mandatory to avoid issue during manufacturing of plate. RJ45

We use the Low profile SFP with light-pipe cage. The low profile version is mandatory to avoid issue during manufacturing of plate.

| Type | Front Plate | |
|---------|-------------|--|
| 1X4 SFP | | |
| 1X2 SFP | | |
| 1X1 SFP | | |
| RJ45 | | |

Complete block diagram

4in1_complete_diagram

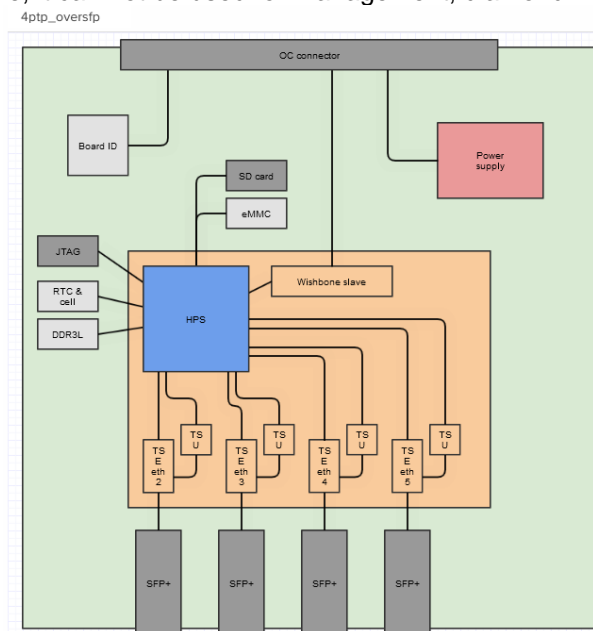


Note: SFP+ cages will be used as they are better quality designed than SFP cages and they are compatible with SFP modules.

The SD Card will be used only at manufacturing to load the firmware of the Option Card the first time. It will not be used by customers.

4 x SFP 1GbE PTP/NTP variant

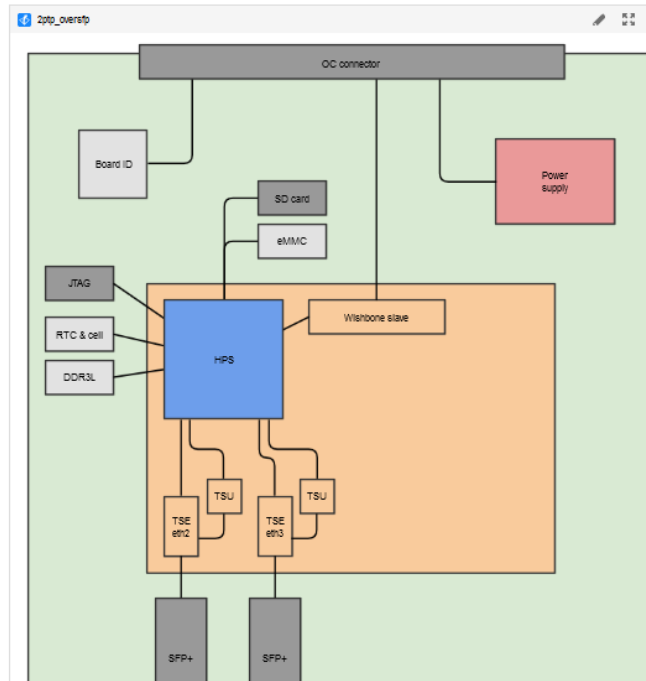
This board is intended to replace the current Option Card 6 of the SecureSync which provides 3 x GbE ports. It provides 4 x GbE ports through SFP modules with PTP or NTP support and hardware timestamping. Therefore, it can not be used for management, diamond WebUI is not accessible on these ethernet ports.



Note: SFP+ cages will be used as they are better quality designed than SFP cages and they are compatible with SFP modules.

2 x SFP 1GbE PTP/NTP Variant

Provides 2 gigabit PTP or NTP interfaces on SFP+ with hardware timestamping.
It can't be used for management, diamond WebUI is not accessible on these ethernet ports.
This board is exactly the same than the 4 SFP variant, but has 2 SFP populated only

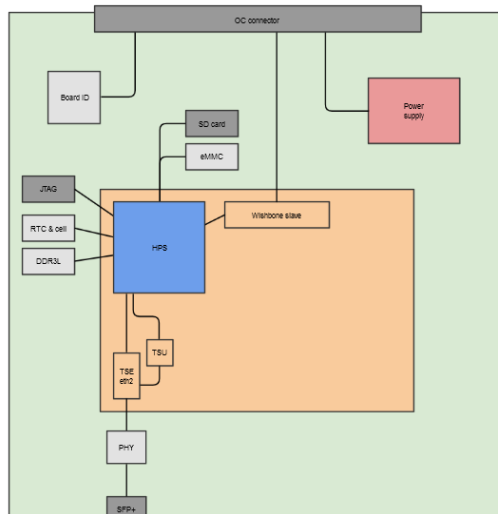


Note: SFP+ cages will be used as they are better quality designed than SFP cages and they are compatible with SFP modules.

1 x SFP 1GbE PTP/NTP variant

This Option Card provides one GbE port through a SFP module with PTP or NTP hardware timestamping. It is intended to replace the Option Card 12, 32, and 3B.

It can't be used for management, diamond WebUI is not accessible on these ethernet ports.



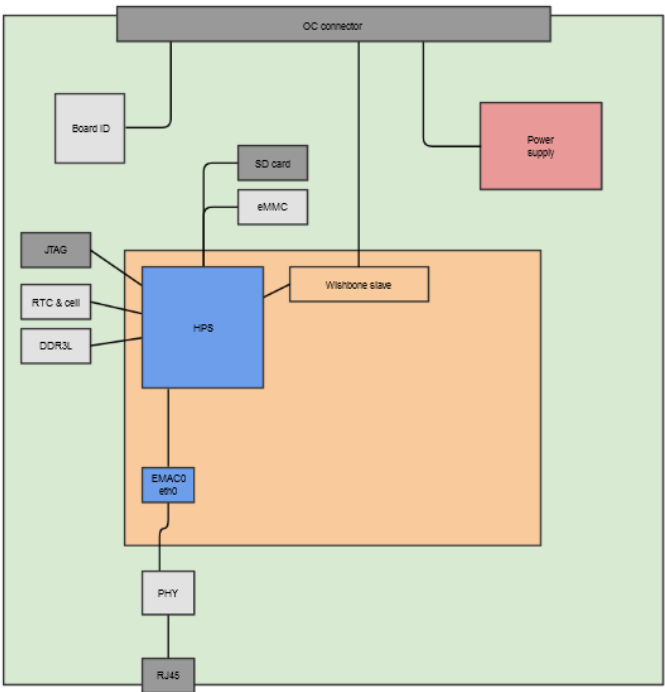
Note: SFP+ cages will be used as they are better quality designed than SFP cages and they are compatible with SFP modules.

B) OOB Variant

Provides an Out Of Band (OOB) management interface on RJ45 connector.

OOB Variant

Provides an Out Of Band (OOB) management interface on RJ45 connector.



[Herve Echelard](#): please add explanation about the HW interface of the OOB Option Card with the CPU board.

Requirements

| Req Num | Category | Description | Type | Source | Comment | Verification | OC | Release |
|---------|-----------------------|---|--------------|------------|---|--------------|----|---------|
| 16 | 4 in 1 Option Card | The option card shall provide four (4) alternative external RJ45 connections and one internal RJ45 connection | (1) Shall | confluence | External : 4 SFP 2 SFP 1 SFP 1 RJ45 No Internal Connection | | X | X |
| 17 | 4 in 1 Option Card | The option card shall provide GbE ports capable of time stamping PTP or NTP packets | (1) Shall | confluence | | | X | X |

| | | | | | | | |
|----|-----------------|---|--------------|------------|--|----------------------|---|
| 18 | OOB Option Card | The option card shall monitor status of the unit, including: Voltage on power rails consumption fan speed temperature | (1) Shall | confluence | Data are sent by the CPU board. The OOB board act as a slave | (3) Demonstration | X |
| 19 | OOB Option Card | The option card shall be able to configure the unit to: power on/off reboot CPU board reset individual chips (if applicable) | (1) Shall | confluence | See OOB link | (3) Demonstration | X |
| 20 | OOB Option Card | The option card shall be separated from the existing logic in the unit. | (1) Shall | | | (3) Demonstration | X |
| 21 | OOB Option Card | The option card shall be used remotely through a dedicated copper connection | (1) Shall | | Would it be fiber? | (3) Demonstration | X |

Power consumption

From the power estimates that have been done for sketchboard and matchbox in the past, we have the following figures regarding the main components :

| Component | power consumption |
|------------------|-------------------|
| SoC | 8.89W |
| DDR3 | 3.51W |
| eMMC | 0.231W |
| μSD | 0.198W |
| SFP | 2W |
| Gigabit ethernet | 1W |

We also know by measurement that a full matchbox with both gigabit ethernets enabled consumes 8-9W only. That means that the initial estimates were overvalued a bit. But this is the way power estimations shall be made, as it is much better than the opposite...

Then we can make the following estimates for the 4in1 card :

| 4SFP | 2SFP | 1SFP | OOB |
|------|------|------|-----|
| 21W | 17W | 15W | 14W |

[Laurent Borgagni Florent Follet \(Unlicensed\)](#) Regarding number of option cards it depends on the power that each card draws. LAF-202 chassis main board hardware specification contains all the power estimates and requirements. SecureSync option card power is section 4.4.6 of LAF-202.

Each option card is budgeted to consume 2W at 12V, 1.5W at 3.3V, and 1W at 1.2V, 4.5W total for each option card. 6 option cards is 27W total option card power budget for all installed option cards in a SecureSync. The 4.5W could be drawn entirely from 12V if desired.

System power design is section 4.6. power design is in section 4.6 of the LAF-202. Please read for SecureSync power budgets. The power budget accounts for derating of the AC power supply output power at temperatures above 50C.

Document

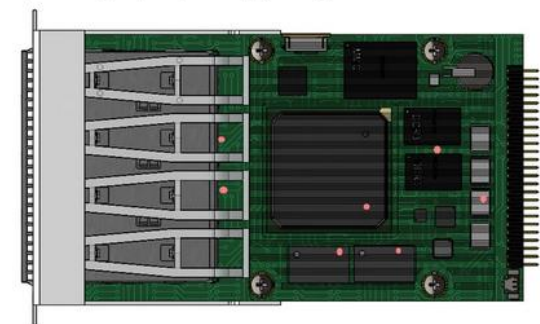
Cooling

The Option Card will be cooled down using forced air. The air will be forced by the fan embedded in the host product. In case of Diamond, the Option Card will feature some temperature sensors that will allow their main CPU board to know the details of the OC temperature and adjust the fans speed accordingly. The Option Card will also likely require a custom designed heat spreader.



Temperature sensors are available on the board to monitor.

SFP, Ethernet Phy, FPGA, DDR3, Power Supply Module (2) and Oscillators Area:



Temperature sensors are available on the board to monitor.

SFP, Ethernet Phy, FPGA, DDR3, Power Supply Module (2) and Oscillators Area:

Interfaces

The 4in1 option card shall work in a current SecureSync and the Diamond. This is valid for the first 3 variants only i.e. 4, 2 or 1 PTP/NTP ports. The OOB variant will be usable only on Diamond as only Diamond will support the OOB interface from the host product point of view.

Therefore, the 4in1 OC supports the usual SecureSync option card interface.

[See the description of the option card interface here](#)

The Option Card ID will be read from the host product using the usual mechanism : the ID is present on the SPI Bus and used by the discovery mechanism of Kramden.

Interface with the host

The communication with the host product (i.e. SecureSync or Diamond) will use the parallel bus of the Option Card bus.

Frequency of the option bus is 50MHz, with 16 bits Address/data shared and signaling, the bandwidth is around 100 MBit/s (12.5MB/s).

the SPI bus is reserved for

- ID
- Reset of the board.
- Programming the SD card.

Firmware

Firmware size requirements

The firmware will require at least the following Non volatile and volatile memory:

- Non Volatile: the firmware will require 1 Gbyte of RAM DDR3.
- Volatile: the firmware will require 4 Gbytes of Flash memory.

Firmware first installation

There are two ways of installing the firmware the first time: with SD Card or by directly plugging the Option Card in a host product.

See the page [Programming and booting sequence](#)

Firmware upgrade

The firmware upgrade will be performed by the host product. It will be absolutely fail safe because in case of failure during an upgrade, the Option Card will automatically reboot on a read only partition which will provide enough functions to retry another upgrade.

The Option Card will be populated with a TPM processor to reinforce Cyber Security and especially check if a new firmware to be installed is an approved one.

The firmware upgrade will take approximately 1 minutes.

To allow maximal bandwidth, the wishbone bus will be used to transfer data from the CPU board to the memory storage of the option card.

Estimated image of the software is around 80MB. The transfer of data will take 7s but the process to upgrade on SD card will be longer, around 20 seconds.

This time is given is there is no other option card in the system. it will be increased to 1 minute.

PTP Master/Slave operation

~~Every GbE port will be able to run either as a PTP master or slave upon user configuration.~~

~~When a port is configured as a Master only, it will then use the host product time and frequency as reference.~~

~~When a port is configured as a Slave only, it will then transfer the time and frequency acquired from the PTP interface to a local oscillator. This local oscillator will be a small VCXO installed on the Option Card. On the 4 and 2 GbE ports variants, in order to limit the number of VCXO on the Option Card, only one of the PTP ports will be capable of being a slave at a time. This architecture allows to not directly steer the host main oscillator from a slave PTP port. The main benefit is that the host product will be able to select the time and frequency reference to be used in an easier way. So the FPGA/Software design will allow to steer the VCXO from the PTP port that users will have selected in the Web UI as to be the single PTP slave port of the Option Card.~~

Network interface

Network adapters

The SFP based ports will support the following physical layers depending on the SFP module used:

- 10 BaseT
- 100 BaseTX
- 1000 BaseT
- 100 BaseFX
- 1000 BaseFX

[Herve Echelard](#): please confirm or not the list of physical interfaces we shall support.

Network protocols

The GbE Ethernet ports dedicated to PTP and NTP shall support the following network protocols:

- Ethernet, UDP, TCP,
- ARP, IGMP, ICMP

They will also have to be able to support the following link aggregation mechanisms:

- Round-robin : transmit network packets in sequential order from the first available network interface (NIC) slave through the last. This mode provides load balancing and fault tolerance.
- Active-backup: only one NIC slave in the bond is active. A different slave becomes active if, and only if, the active slave fails. The single logical bonded interface's MAC address is externally visible on only one NIC (port) to avoid distortion in the network switch. This mode provides fault tolerance.
- XOR: transmit network packets based on a hash of the packet's source and destination. The default algorithm only considers MAC addresses (layer2). Newer versions allow selection of additional policies based on IP addresses (layer2+3) and TCP/UDP port numbers (layer3+4). This selects the same NIC slave for each destination MAC address, IP address, or IP address and port combination, respectively. This mode provides load balancing and fault tolerance.
- Broadcast: transmit network packets on all slave network interfaces. This mode provides fault tolerance.
- IEEE 802.3ad Dynamic link aggregation: creates aggregation groups that share the same speed and duplex settings. Utilizes all slave network interfaces in the active aggregator group according to the 802.3ad specification. This mode is similar to the XOR mode above and supports the same balancing policies. The link is set up dynamically between two LACP-supporting peers.
- Adaptive transmit load balancing: Linux bonding driver mode that does not require any special network-switch support. The outgoing network packet traffic is distributed according to the current load (computed relative to the speed) on each network interface slave. Incoming traffic is received by one currently designated slave network interface. If this receiving slave fails, another slave takes over the MAC address of the failed receiving slave.
- Adaptive load balancing: includes balance-tlb plus receive load balancing (rlb) for IPV4 traffic, and does not require any special network switch support. The receive load balancing is achieved by ARP negotiation. The bonding driver intercepts the ARP Replies sent by the local system on their way out and overwrites the source hardware address with the unique hardware address of one of the NIC slaves in the single logical bonded interface such that different network-peers use different MAC addresses for their network packet traffic.

12 page comments

[Laurent Borgagni](#)

Feb 09, 2018

Based on the CPU board experience: are we going to put an SDcard on this OC or just the eMMC ? If we put a SDCard what would be its purpose ?

- [Reply](#)
-

[Herve Echelard](#)

Feb 09, 2018

SD card can be used by Developpment team.

It can be used for production tool as VersaSync : placed for the first boot, and removed after.

- [Reply](#)
-

[Laurent Borgagni](#)

Feb 12, 2018

Ok. I have added a note in the text to mention this point

- [Reply](#)
-

[Laurent Borgagni](#)

Feb 09, 2018

@Herve Echelard: can you add a description of the OOB interface: signals, connectors to be used, what it will support ?

- [Reply](#)
-

[Laurent Borgagni](#)

Feb 09, 2018

@Herve Echelard: for each of the OC variant can you provide a power consumption budget and explain how this power will be provided through the OC bus or not ?

- [Reply](#)

[Laurent Borgagni](#)

Feb 09, 2018

@Herve Echelard: can you please explain how this OC will be cooled down ?

- [Reply](#)
-

[Herve Echelard](#)

Feb 09, 2018

We have multiple ways :

- Passive with standard heatsink glued on the Cyclone V and others Power devices.
- Passive with our own heatsink milled using the two screws of the board to fix it.
- Active with a fan on our own heatsink.
- heatsink on SFP cage if there is no LED lightpipe on the top.
- [Reply](#)
-

[David Sohn](#)

Feb 12, 2018

@Herve Echelard: Can we have a single SFP variant for NTP/PTP, rather than an RJ45? This is looking ahead as a potential replacement for the 1204-32. Also, other than potentially using the SFP+ cages/connectors, all of these connection are really SFP, not SFP+, for Gb Ethernet.

- [Reply](#)
-

[Laurent Borgagni](#)

Feb 12, 2018

OK. I modified the text to reflect the 1 SFP variant instead of RJ45 and the cage are SFP+ but the modules will be SFP. I have also added a note to explain this

- [Reply](#)
-

[Ryan Johnson](#)

Feb 15, 2018

Could this potentially replace both the 32 & 3B cards?

- [Reply](#)
-

[Denis Reilly \(Unlicensed\)](#)

Feb 15, 2018

Yes, although the 32 card does a lot of the packet processing in hardware, and I think this architecture would actually be slower unless we port that special hardware over. It's not clear to me whether we have the rights to do that from Korusys, given my understanding of the contract.

The 3B card is a much simpler port, at least FPGA wise, and I think the Masterpiece stack would work much better on the HPS SoC than on the current NIOS.

- [Reply](#)
-

[Sylvain Dessapt](#)

Feb 16, 2018

Great ! I expect we will expand the choice of PTP profiles (not only limited to default and telecom). This could be interesting to work together on a "nice list to have".

- [Reply](#)
-

Spreadsheet



Add label

Related pages

[Option Card Bus](#)

Option Card Bus

[Diamond](#)

Often read together

[FPGA Implementation](#)

FPGA Implementation

[Diamond](#)

Organized together

[Working with the OC 4-in-1 in software](#)

Working with the OC 4-in-1 in software

[Diamond](#)

Often read together

Working with the OC 4-in-1 in software

From: <https://spectracom.atlassian.net/wiki/spaces/DMND/pages/1417478160/Working+with+the+OC+4-in-1+in+software>

Created by [Michael Pratt](#)

Last updated: [Jan 19, 2022](#) by [William Comly](#)

Understanding the OC IP address

Processes on the host Diamond unit communicate with the OC using network protocols via a point-to-point (ppp) link.

The IPv6 address of the card on the ppp interface has the format:

```
fe80::XXXX:XXXX:XXXX:SSHH
```

where:

```
XX...: hex digits identical to the MAC address of eth0
SS:    number of the slot the 4-in-1 card is plugged into
HH:    0x01 for the 4-in-1 card and 0xfe for the host unit
```

The easiest way to manually generate the address is:

1. List network interfaces with `ifconfig`
2. Find the 'ppp' interface corresponding to the card. It will be labeled with a number "pppN" corresponding to the slot in which the card is installed
 1. For example, a card installed in slot 2 will communicate over the interface `ppp2`
3. Copy the ppp interface's address and replace the last section:
<ppp address>:N01
4. Append the interface name:
<OC address>%pppN

For example, suppose a 4-in-1 card installed is in slot 2 and the following result is given from `ifconfig`:

```
$ ifconfig
...
ppp2      Link encap:Point-to-Point Protocol
          inet6 addr: fe80::c:ec0e:143:2fe/10 Scope:Link
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1500  Metric:1
          RX packets:199 errors:0 dropped:0 overruns:0 frame:0
          TX packets:184 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:3
          RX bytes:33155 (32.3 KiB)  TX bytes:34113 (33.3 KiB)
```

Then, the address of the card would be:

```
fe80::c:ec0e:143:201%ppp2
```

To construct a URL that includes a specific port, it is necessary to wrap the address in square brackets. To continue from the above example, the REST API on the card would be reached at the following URL:

```
http://[fe80::c:ec0e:143:201%ppp2]:8080
```

Permissions

Communication with the 4-in-1 OCs is restricted to certain users.

- Communication with the OC REST API is restricted to the user “spui”
- Communication related to OC configuration management is restricted to the user “oc-cm”

Talking to the OC REST API from the host CLI typically looks like this:

```
sudo sudo -u spui curl -i -X GET http://[address]:8080/api/...
```

Testing the OC upgrade

When the host Diamond unit is upgraded all installed 4-in-1 OCs will also be upgraded. The following procedure can be used to test the OC upgrade process more directly (and more quickly).

1. Copy the OC image to the host Diamond unit
It will be named something like “oc-4-in-1.squashfs”
2. Copy the OC 4-in-1 upgrade script to host Diamond unit
The script is named “oc4in1-upgrade.py” and can be found in option-cards-firmware package or in out/output-diamond/images
3. On the unit, run the upgrade script w/ the bundle

```
3. sudo sudo -u spui ./oc4in1-upgrade.py <path to bundle>
```

This will detect and upgrade all 4-in-1 cards installed. Diagnostic information will be printed to the console.

OC root login

Root login to the OC is disabled by default. It can be enabled from the host unit with the following command:

```
sudo sudo -u spui curl -i -X PUT http://[address]:8080/api/administration/sshd/permit_root_login/enable
```

After login is enabled, one can ssh into the card. This can be done even from the host unit. For example:

```
sudo sudo -u spui ssh root@address
```

The username and password are both “root”.

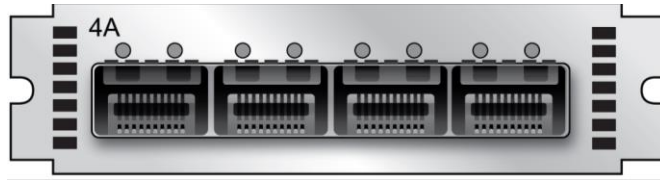
OC Rest API

Information on the rest API can be found [here](#):

README: <https://bitbucket.org/spectracom/python-oc4in1-rest-app/src/master/docs/README.md>

All endpoints: <https://bitbucket.org/spectracom/python-oc4in1-rest-app/src/master/docs/>

1204-4A: QUAD (4) 1GBE Option Cards / 1204-49: Dual (2) GB Ethernet Option Cards (2400 SecureSyncs)



1204-4A (Quad “4in1 GBE”)



1204-49 (Dual “2in1 GBE”)

Links

- Refer to the online 2400 SecureSync user guide (excerpted below) at:
http://manuals.spectracom.com/2400/Content/NC_and_SS/2400/OCs/NTP_Network_4A_4E_49_51.htm

Specs for 1204-4A and 1204-49

1204-4A Specifications

- Inputs/Outputs: (4) Gigabit Ethernet
- Connectors: SFP Ports (4x)
- Management: Enabled or Disabled (NTP server only)
- Maximum Number of Cards: 1
- Ordering Information: 1204-4A: Quad Gigabit Ethernet

1204-49 Specifications

- Inputs/Outputs: (2) Gigabit Ethernet
- Connectors: SFP Ports (2x)
- Management: Enabled or Disabled (NTP server only)
- Maximum Number of Cards: 1
- Ordering Information: 1204-49: Dual Gigabit Ethernet

Software support for 1204-4A: Added in version 1.1.0A (Feb 2020)

Refer to ECO-1919 (in Arena): https://app.bom.com/changes/detail-summary?change_id=2395337393

in Salesforce:

Links/Shortcuts

FOO assembly (1204-0490-F000) for (in Arena): https://app.bom.com/items/detail-spec?item_id=1259854963&version_id=11240816508&

Schematic (1204-14A1-0200) in Arena: https://app.bom.com/items/detail-spec?item_id=1259643568&version_id=11239085448&

Lists of various configuration part numbers/Process Details

Refer to ECO-19119 (in Arena) https://app.bom.com/changes/detail-affected?change_id=2395337393

1204-49 (Dual “2in1 GBE”): Dual (2) 1GBE ethernet Option card

In Arena: https://app.bom.com/items/detail-spec?item_id=1259854674&version_id=11240824178&orb_msg_single_search_p=1

1204-4A (“4in1 GBE”): Quad (4) 1GBE ethernet Option card

In Arena: https://app.bom.com/items/detail-spec?item_id=1256084824&version_id=11147713468&orb_msg_single_search_p=1

Known issues and software changes/versions associated with 1204-4A/1204-49 Option Cards

1. Limitation on which slots the 1204-4A/1204-49 Option Cards can be installed in

In at least update versions 1.6.0 and below, these two cards can only be installed in **Slot 1 or Slot 2**

Important Note: These Option Cards are only compatible with **Slots 1 and 2** of the 2400 SecureSyncs. This is not a potential issue with Model 2402 SecureSyncs (which only has Slots 1 and 2), But this can potentially be an issue with Model 2406 SecureSyncs (having 6 slots).

On 6/14/2023, Jon Brand mentioned that OPA automated tested has since started verifying these cards are only installed in Slots 1 or 2, and has also become more thorough at verifying operation of these cards. Earlier shipped 2400 SecureSyncs have had these cards installed in at least slot 6, if not also 4 or 5 as well.

Symptoms of these cards being installed in a slot other than 1 or 2 include the Option Card being installed. But the Card's version is reported as “N/A”.

1204-49 Firmware versions

For older Option Card software versions, refer to: (SPxx) [I:\New Released\Firmware Software\1204-xxxx-xxxx](#) To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)

The screenshot shows the Arena software interface with a search bar at the top. The search bar contains the text "Search: Items" followed by a dropdown menu set to "Items", then "for All Items", then "where Item Number", then "is 1200-SU01*", and finally a "Go" button. The interface also shows various navigation tabs like Dashboard, Items, Requests, Changes, Suppliers, Supplier Items, Files, Projects, and Quality.

FPGA (Firmware) for the 1204-49 card rt_oc49_hw01_fpga.bin

| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|-----------------|---|--|--------------------|
| | | 1.00 (Still the latest rev as of at least v5.8.5) | Added support for this Option card (first release) | |

FPGA (Firmware) for the 1204-4A card rt_oc50_hw01_fpga.bin

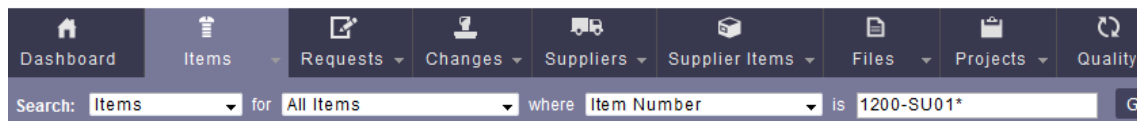
| ECN | Archive version | FPGA version reported | Change | approximate cut-in |
|-----|----------------------|---|---|--------------------|
| | | 1.00? | Added support for this Option card (first release)? | |
| | Version 5.8.5 | 1.01? (the latest rev as of at least 5.8.5) | Note: Version 1.01? was cut-in | |

1204-4A Firmware versions

For older Option Card software versions, refer to: (SPxx) <I:\New Released\Firmware Software\1204-xxxx-xxxx>

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



SFP info for 1204-49 and 1204-4A Option Cards

Email from Gary Boeff (29 Sept 2022) the only SFP that we have tested with the 4a OC is the BEL-05 SFP. Tom R. may have additional information on the compatibility of SFPs and OCs. What SFP was the customer attempting to use with the 49/4a OC?

SFPs found to be incompatible in testing: Arista SFP-1G-T

List of qualified SFPs: Refer to online 2400 SecureSync user guide

https://orolia.com/manuals/2400/Content/NC_and_SS/2400/OCs/NTP%20Network%204A%204E%2049%2051.htm

Hardware

Cards in this category have SFP interface(s) that accept any number of brands chosen by the user.

Orolia has successfully tested the following SFP models with the Gb Networking cards:

- Bel SFP-1GBT-05 (available from Orolia as SFP-COPPER)
- Avago AFB-5710LZ (available from Orolia as SFP-FIBER-MM)
- Finisar FTLF1318P38TL (available from Orolia as SFP-FIBER-SM)

The following SFP models are NOT approved for use with cards of this type (found to be incompatible in testing):

- Arista SFP-1G-T

1204-4A and 1204-49 supports both SFP-Fiber or SFP-Copper

Refer to online 2400 SecureSync user guide

https://orolia.com/manuals/2400/Content/NC_and_SS/2400/OCs/NTP%20Network%204A%204E%2049%2051.htm

Refer to Case 283878 (April 2022)

Q Can SFP-COPPER use for with 1204-4A

A Refer them to 2400 online user guide: (excerpted below)

https://orolia.com/manuals/2400/Content/NC_and_SS/2400/OCs/NTP%20Network%20A%20E%2049%2051.htm

Hardware

Cards in this category have SFP interface(s) that accept any number of brands chosen by the user.

Orolia has successfully tested the following SFP models with the Gb Networking cards:

- Bel SFP-1GBT-05 (available from Orolia as SFP-COPPER)
- Avago AFBR-5710LZ (available from Orolia as SFP-FIBER-MM)
- Finisar FTLF1318P3BTL (available from Orolia as SFP-FIBER-SM)

The following SFP models are NOT approved for use with cards of this type (found to be incompatible in testing):

- Arista SFP-1G-T

Known issues and software changes/versions associated with 1204-4A and 1204-49

1. Limitation on which slots the 1204-4A/1204-49 Option Cards can be installed in

In at least updated versions 1.6.0 and below, these two cards can only be installed in Slot 1 or slot 2

2. 2400 SecureSync update version 1.4.1 (Apr 2022)

Per v1.4.1 Release Notes Option cards 1204-49 and 1204-4A have been upgraded to **version 1.1.2**

o Fixed configuration loss after upgrade.

Per v1.4.1 Release Notes Repaired Web UI issue not correctly displaying the 1204-4A and 1204-49 cards

Log files / log entries associated with the 1204-49/1204-4A cards

- As of at least versions 1.6.0 and below (at least April 2023) it appears there are no logs/ entries (sch as Journal and NTP) associated with these cards
- Refer to JIRA **DMND-1971** (Created 26 Apr 2023)

Web browser interface (Network and NTP configuration) for 1204-49 and 1204-4A

A) Network Interface Setup of expansion cards

Note: Network settings for the GB expansion cards are only available when starting from the “**Configure 1GBE**” button in the *Management* -> *Network Setup* page of the browser. The Network Settings won't be displayed/available if clicking on the **Configure 1GBE**” button in the *Management* -> *NTP Setup* page.

Management -> *Network Setup* page

UTC: 2022-08-04 15:05:45

HOME INTERFACES MANAGEMENT TOOLS HELP

Actions

- General Settings
- Web Interface Settings
- Access Control
- Login Banner
- SSH
- System Time Message
- VLAN
- HTTPS
- Configure Dual 1GBE (Slot 1)**

Network Services

System Time Message ☐

Ports

| PORT | ACTION | STATUS |
|------|---|---------------------------------|
| eth0 | <input type="button" value="e"/> <input type="button" value="s"/> | CONNECTED (1000, FULL DUPLEX) |
| eth1 | <input type="button" value="e"/> <input type="button" value="s"/> | CABLE UNPLUGGED |

Dual 1GBE (Slot 1) Network Status

| PORT | ACTION | STATUS |
|------|---|--------------------------|
| eth0 | <input type="button" value="e"/> <input type="button" value="s"/> | UNPLUGGED, Not available |
| eth1 | <input type="button" value="e"/> <input type="button" value="s"/> | UNPLUGGED, Not available |

Dual 1GBE (Slot 1) Interface Status: eth0

General Status IPv4 Status IPv6 Status

Interface Enabled ☐ Disabled

Interface Status UNPLUGGED

Connection Status Not available

Hardware Address 00:0C:EC:10:01:8E

Auto-connect ☒ Enabled

MTU 0

Back Edit

Dual 1GBE (Slot 1) Edit Interface Settings: eth0

General Status IPv4 Status IPv6 Status

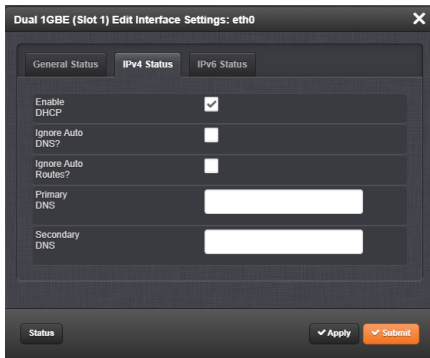
Enable Interface ☐

Auto-connect ☒

MTU (0=auto) 0

Status Apply Submit

See additional info further below about “Enable Interface” and “Auto-Connect”



Info about “General Status” (“Enable interface” and “Auto-connect”)

Whether a network cable is connected to an installed SFP (and the other end of the cable connected to another network device) DOES determine whether the Enable button can remain selected. Please have the customer connect a cable to the SFP, and their observation should disappear.

Having an SFP installed in a network interface, but no cable connecting the SFP to a network device, will not allow the interface to be “enabled”. An SFP needs to be installed, and a network cable needs to be connecting the SFP to another network device (such as a switch), in order for the port to be able to be enabled/remain enabled.

If the “**Auto-connect**” button (under the “Enable” Button) remains selected (enabled by default) the Enable button will be selected automatically, once a cable connects the SFP to another device, and the web page is refreshed. Then, if the Enable button is unchecked by a user, while the cable remains selected, the port switches from “**active**” state to “**inactive**” state.

Report of *Management* -> *Network Setup* page not displaying eth0/eth

- Refer to Case 274942
- Was due to being logged in as a USER account (instead of an admin account). User account doesn't have rights to view or change network settings.

Reply from Dave Lorah (9 Nov 2021) The reason you are seeing only the one Icon instead of three on the Network Setup screen is because you are logged in with an account that has only User privileges, which is read only. The configuration Icons are not visible if logged in with a User Account.

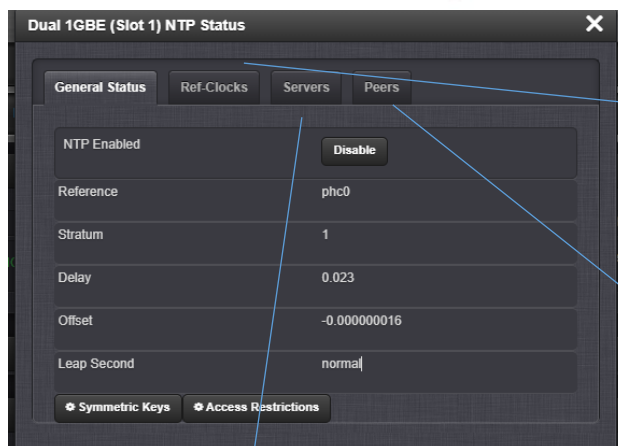
You can either login to the spadmin account or change your User Account privileges to Admin instead of User.

The front panel doesn't have a login and is always capable of setting the Network parameters.

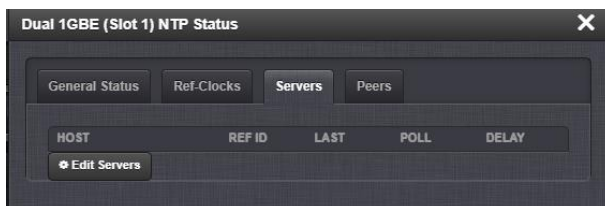
B) NTP Setup of network expansion cards

- (NTP on Expansion cards is separate from the base NTP)
[Management](#) -> [NTP Setup](#) page

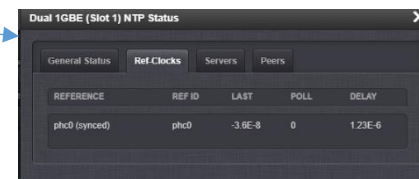
Note: NTP settings for the GB expansion cards are only available when starting from the “**Configure 1GBE**” button in the [Management](#) -> [NTP Setup](#) page. The NTP Settings won't be displayed if clicking on the “**Configure 1GBE**” button in the [Management](#) -> [Network Setup](#) page.



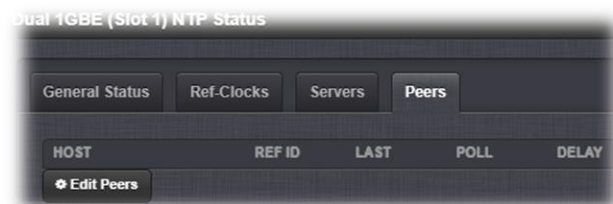
Servers tab



Ref-Clocks tab



Peers tab



1204-4E: OOB (5) 1GBE OPTION BOARD (for 2400 SecureSyncs)

Refer to the online 2400 SecureSync user guide at:

Software support for 1204-4E:

1204-51: SINGLE (1) 1GBE OPTION BOARD (for 2400 SecureSyncs)

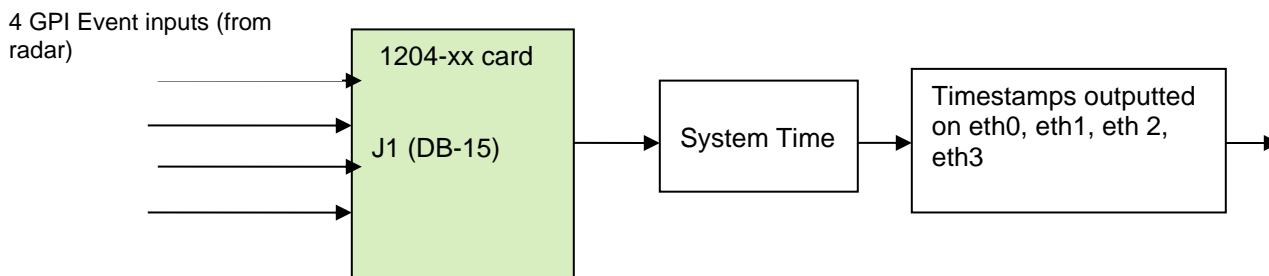
Refer to the online 2400 SecureSync user guide at:

Software support for 1204-51:

Draft for new Option Cards

- ➔ **Link to schematic:** (1204-12E1-0200) in Arena: https://app.bom.com/items/detail-spec?item_id=1202846050&version_id=10212763328
- ➔ **Link to BOM (1204-02E0-F000):** In Arena: https://app.bom.com/items/detail-whereused?item_id=1202846050&version_id=10212763328
- ➔ **For software assembly versions, refer to:** (1204-SHxx, SP1xx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

Block diagram



Schematic: (refer to 1204-xxxx-F000) <I:\New Released\PCB Documentation>

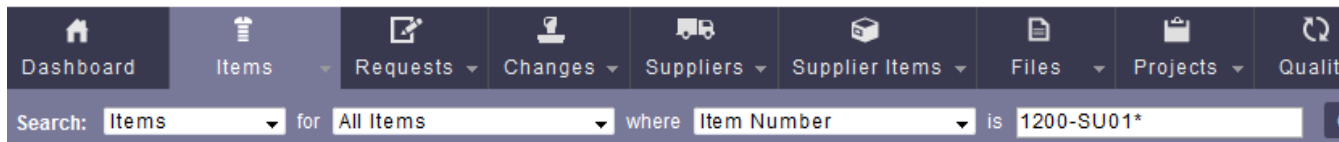
For software assembly versions, refer to: (1204-SHxx, SP1xx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

Firmware

For older Option Card software versions, refer to: (SPxx) I:\New Released\Firmware_Software\1204-xxxx-xxxx

To find firmware versions of cards for a specific release, extract the software update bundle and then look at the umf.txt file for the rt file associated with the particular option card.

Note: To find all software update bundles in Arena, search “Items” for “Item number” and search for “1200-SU01*” (as shown below)



FPGA (firmware) for the Model 1204-XX card: rt_ocXX_hw01_fpga.bin

| ECN | Archive version | FPGA FPGA version reported | Change | approximate cut-in |
|-----|-----------------|----------------------------|--------|--------------------|
| | | | | |
| | | | | |
| | | | | |

Hardware

For Option Card hardware versions, refer to: (SPxx) [I:\New Released\Firmware_Software\1204-xxxx-xxxx](#)

| ECN | Archive version | New Version | Change | approximate cut-in |
|-----|-----------------|-------------|--------|--------------------|
| | | | | |
| | | | | |
| | | | | |

Setup/Inputs

Setup/Outputs

Status/Inputs

Status/Outputs

Troubleshooting 1204-2E cards

- Refer to “known issues” below

Known issues