SpectraTime iPrecision Timing Solutions™

Rubidium Master Oscillator (RMO) Mounting Recommendations for Optimal Heat Sink

Contents

Introduction

The unit should be mounted in preference to a PCB equipped with metal connection holes of 1.2 to 1.5 mm in diameter. Mounting screws (2 x M3, stainless steel 5mm maxi into the RMO box) should be tightened with a torque between 50 Ncm and 100 Ncm.

The heat transfer characteristics of the mounting surface must be adequate to limit the rise of the unit's base plate to <+60°C (+70°C for high temp option). Since the minimum total power consumption for proper Rb operation is around 200mA / 24V, the allowed environmental temperature (Ta_{max}) for this mounting is:

Ta_{max} = 60°C -Vs x Is x Rk

Vs = Supply voltage
Is = Supplied current
Rk = Heat sink thermal resistance

CAUTION

User must ensure that the maximum operating temperature is not exceeded (+55°C as measured at the unit's base plate, and +60°C for option E)

This maximum temperature can be reached when operating the unit into forced air flow at 55°C (60°C for option E) or by mounting the unit into user equipment with thermal interface corresponding to a thermal resistance of 1 to 2 °C/W between the RMO unit and the ambient.

The RMO is a well shielded unit, using several magnetic shield layers as well as special RF shields for the RF section. Nevertheless, some considerations must be given to the operating location of the unit, regardless of its application. To minimize frequency offsets and/or non-harmonic distortion, the unit should not be installed near equipment generating strong magnetic fields such as generators, transformers, etc.

Mechanical Interface

The general information for the mechanical interface of the RMO unit is given in the package drawing below

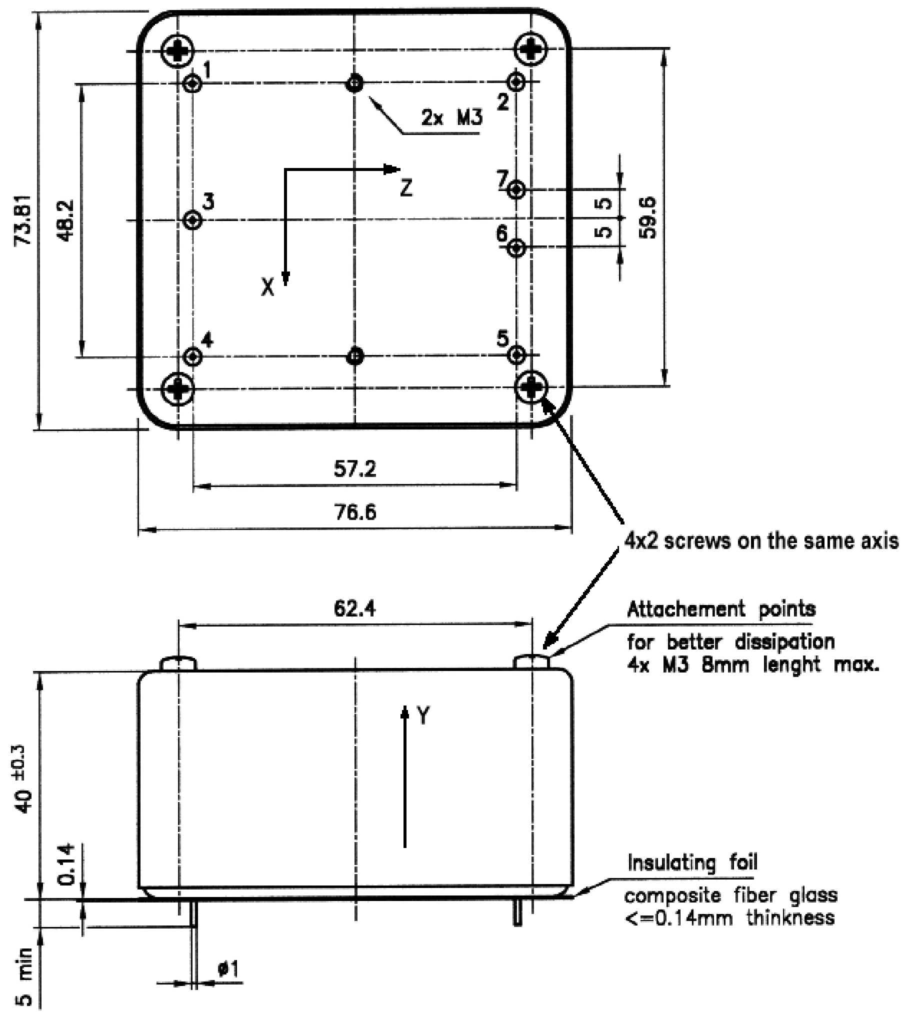

Fig. 1.

Using a Radiator/Fan to Improve Thermal Dissipation

To ensure an optimal heat sink power dissipation of the unit, the user can mount a radiator on the top of the unit's cover by using 4 screws as fastening points. Do not forget to put thermally conductive paste between the radiator and the cover.

The 3 pictures below give you an illustration on how a radiator can be mounted on the RMO. Note that this type of mounting is not convenient for integrated systems that should resist to vibration. Under vibration environments, the radiator should be maintained by additional fastenings located directly to the base plate of the system.

Fig. 2. First suggested mounting: the radiator is screwed to the RMO cover through 4 M3 screws. This solution is not suitable in a hermetic case, for the radiator is mounted horizontally.

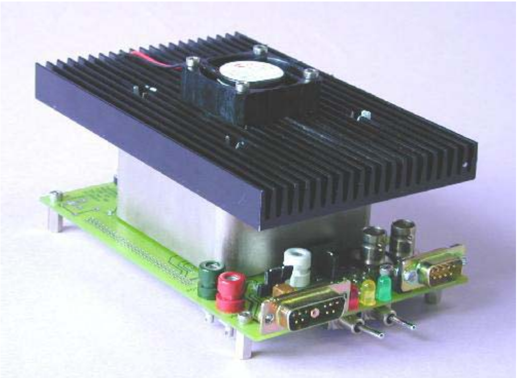

Fig. 3. Second suggested mounting: if the radiator is mounted horizontally, a fan can be placed on top of the radiator to force an air flow and improve the heat sink transfer. We suggest using a 24Vdc fan connected in parallel to the RMO supply with a fuse.

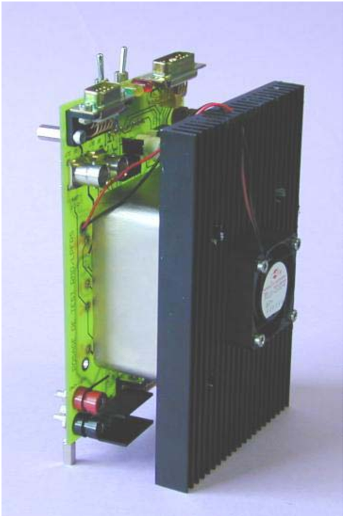

Fig. 4. Third suggested mounting: if the radiator is mounted vertically, with or without fan. The heat sink transfer is maximized by natural convection. The radiator has a typical thermal resistance of 1.5°C / W.

The design of the heat sink or the radiator can be computed from the following information (assuming a RMO option E):

- The RMO consumes at least 4W.
- When the RMO case is maintained at 60°C with air flow, it consumes 4W.
- When the RMO case is maintained at 25°C with air flow, it consumes 8W.

Figure 5 shows the thermal characteristics of the RMO with its power consumption versus case temperature. The forbidden zone is the maximum allowed case temperature, which can vary according to the RMO option (here 60°C max).

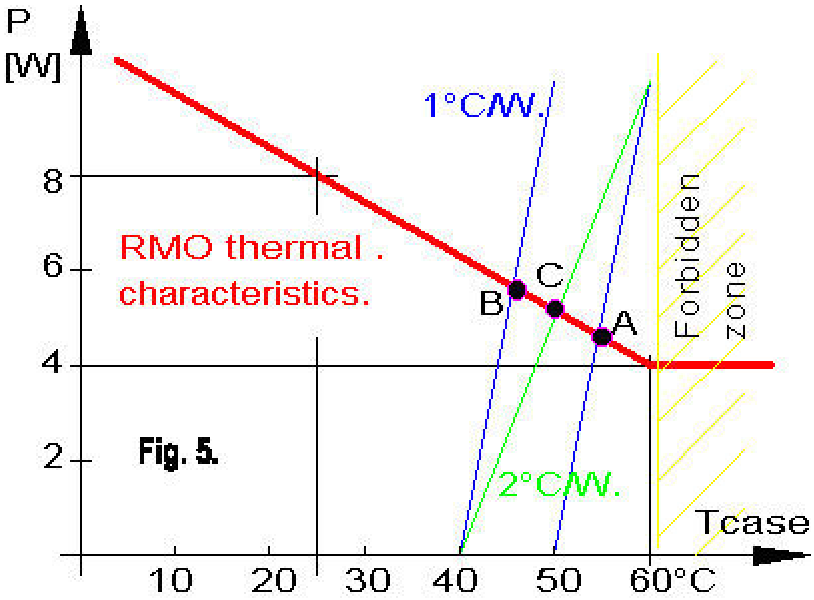

Fig. 5.

Three scenarios are presented to give an example of heat sink/radiator computation. Figure 5 shows a simple graphic method can be used to find the optimal power dissipation (P) and RMO's case temperature (Tcase) values. These 2 values can also be computed by solving the following equations:

(1) Rth = (Tcase - Text) / P
(2) P = 4 + 4 * (60 - Text) / 35

Where

Text:	Is the known ambient temperature in the box
Rth	Is the known radiator thermal resistance
Tcase:	Is the unknown RMO's case temperature
P:	Is the unknown RMO's power dissipation

Scenario A
Assumptions:
1) The RMO is mounted inside a box in which the temperature rises up to 50°C with a 1°C/W radiator.
In this scenario, the RMO temperature will approximately rise to 54.5°C.

Scenario B
Assumptions:
1) The RMO is mounted inside a box in which the temperature rises up to 40°C with a 1°C/W radiator.
In this scenario, the RMO temperature will approximately rise to 45.5°C.

Scenario C
Assumptions:
1) The RMO is mounted into a box in which the temperature rises up to 40°C with a 2°C/W radiator.
In this scenario, the RMO temperature will approximately rise to 50°C.

Mounting a RMO inside a 19" Rack

Figure 6 shows how to mount a RMO inside a 19" rack for optimal heat sink.

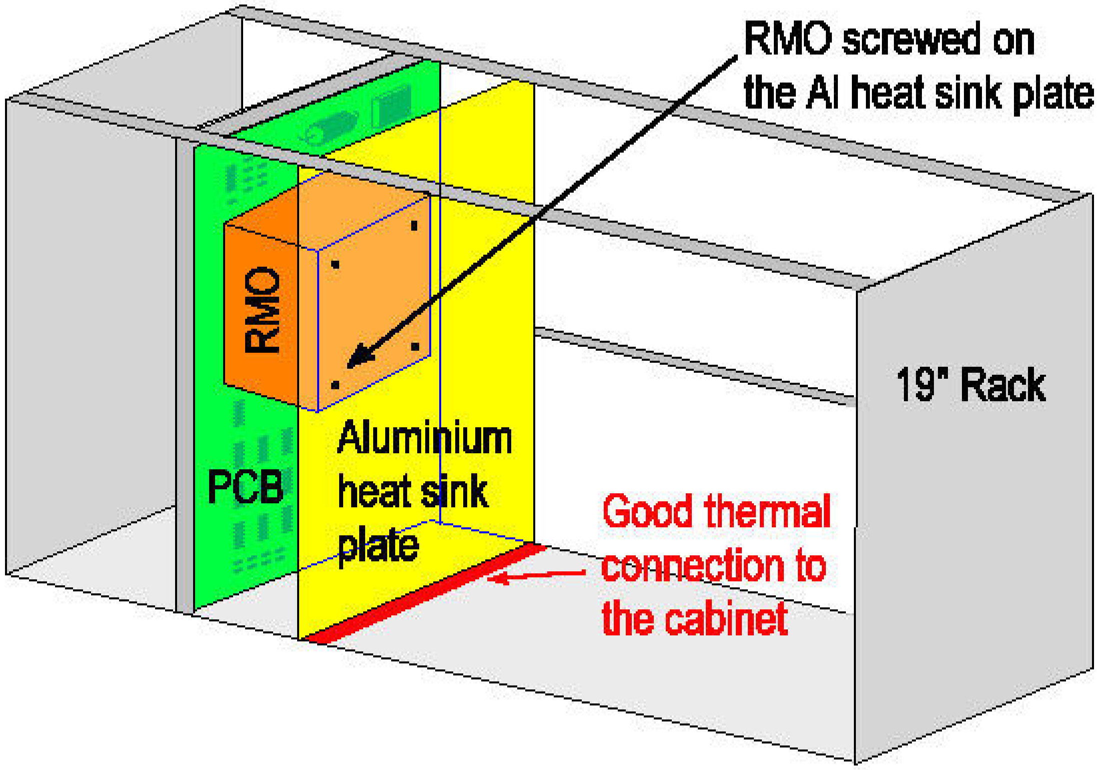

Fig. 6. RMO Rack Mounting