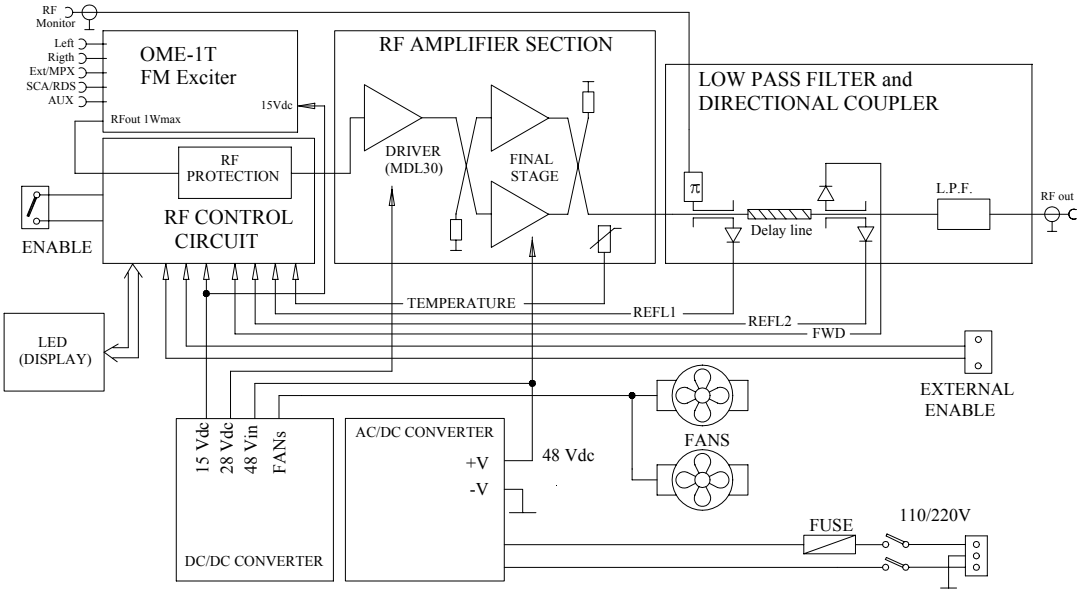
1.0 OVERVIEW

MT250 is a 250 Watt FM Low Power Transmitter. It is very simple and easy to use. It is composed by a mechanical frame (19 inches std., 3 HU high and 500mm depth), an exciter (OME-1T), a RF section, which comprises a RF control board and an amplifier section, a directional coupler and a low pass filter, a display, a power supply with a AC/DC converter and a DC/DC converter.

2.0 BASIC BLOCK DIAGRAM OF MT250



3.0 SUBASSEMBLIES DESCRIPTION

3.1 MT250 AC/DC Power Supply

This power supply is a purchasing product. It has a wide range with an input voltage of 85/265V and an output voltage of 48V. Below, the technical specifications:

Nominal Output Voltage	48V
Max Output Current	13A
Max Output Power	624 Watt
Efficiency	83% typ.
Input Voltage Range	85-265VAC (47-63Hz)
PFHC	Built to meet EN61000-3-2
Power Factor(100/200VAC) (typ)	0.99/0.95

Output Voltage Range	43.2-52.8V
Over Voltage Protection	55.2-64.8

3.2 MT250 DC/DC Power Supply

The MT250 uses a DC/DC converter. It provides a voltage of 28V to the fans and a voltage of 15V to the exciter. In addition, it supplies a voltage of 28V to the driver (MDL30). Below, the technical specifications:

Vdc Input	20 up to 53 Vdc
Output 1	15 Vdc/1.5 A
Output 2	28 Vdc/3 A

3.3 FM Stereo Exciter

The exciter is a OME-1T model. The declared nominal RF output power is 1 Watt; this signal arrives to the RF final stage through the RF protection circuit. All the input connections are arranged on the front panel. (See the annex datasheet).

3.4 MT 250 RF Control Circuit

The RF input circuit has 3 main functions:

1) **RF power control**
2) **RF protection**
3) **Measurement/status indication**

RF Power Control. A pin diode attenuator manages the RF input power coming from the exciter (OME-1T). This attenuator can be manually controlled by RT3 trimmer, in order to adjust the right output power. The AGC control regulates the power, manually set, versus frequency and/or temperature changes.

Moreover, the input attenuator includes a soft start, activated at the switching on or after any RF protection intervention.

When the MT250 works at a very high temperature and/or high reflected output power, a derating circuit provides to decrease the output power in order to maintain the equipment on duty, even at low power.

RF Protection. A fast comparator switches when the output detected reflected power exceeds a pre-set threshold. The regulation of this threshold is made by RT2 trimmer, adjusted in factory at a value of 40 Watt reflected power. When the protection is switched on, the protection circuitry cuts the RF signal applied to the final stage amplifier very quickly, in about 1 micro second.

Measurement/status indication. The two main measurements, FWD and REF power, are displayed by two BAR LEDS. The MT300 status is indicated with 3 leds: RF nominal, RF fault, RF derating. The RF fault is on when the output power is lower than 3 dB related to the nominal output power. If the power decreases in derating conditions, the fault is off in all cases. The enable SW1 switch is on the front panel. It is possible to operate on the enable using the contacts on the rear panel, too. The enable of the amplifier is realized when the SW1 is on and the rear panel enable is closed.

WARNING: with enable off, there is no RF out but all the internal circuits are supplied (stand by condition). So, switch off the mains before operating inside.

3.5 MT250 RF Amplifier

The RF amplifier section provides to amplify the RF signal coming from the RF control circuit.

It is composed by:

- MDL30 (Driver)
- 90 deg. 2 way hybrid splitter
- a pair of final stage amplifiers mounting SD2931-10 devices
- 90 deg. 2 way hybrid combiner

The **MDL30** provides the first step of amplification of minimum 17dB gain in order to correctly drive the final stages. It is composed by a stage operating in class AB. Below, the technical specifications:

VCC	28V
Idq	200 mA typ.
Frequency range	FM (87.5-108 MHz)
Power Gain	> 17 dB typ.
Output Power	> 25 W

The **2way splitter** is made by a 90 deg. Hybrid structure and provides to split in quadrature the input signal. Below, the technical specifications:

Frequency	87.5 – 108 MHz
Input power	50W Max
Return Loss (S11)	<-17 dB
Return Loss (S22 ed S33)	<-15 dB
Isolation (S32)	>15 dB
Insertion Loss (S21=S31)	<0.6 dB

The **final stage** is an amplifier for FM signal operating in band II (87.5 – 108 MHz), with nominal output power of 250 Watt CW.

Normally it works up to 280 Watt, in order to win the Insertion loss of the circuitry that follows the amplifiers, as the Directional couplers and Low Pass Filter.
It is a balanced amplifier, including a pair of single end sections, each one using a high power MOSFET with the input / output matching network printed on the pcb. The RF MOSFET's bias are integrated on this printed circuit board. The polarization is in class B, with a 10 mA quiescent current per section. The two sections are split and combined by 90 deg. hybrid.

VCC nominal	48V
IDC (@ Full Power)	10 A typ.
Idq	20 mA typ.
Frequency range	FM (87.5-108 MHz)
Power Gain	Typ. 16 dB
Output Power	280 W min

The **2 way Combiner** is a 2 way in quadrature structure, and it provides to sum each two final stage sections to have 250 W power at the common port. One unbalancing 50 Ohm resistor warranties the isolation between the input ports, in order to maintain the Transmitter on duty, in case one of the final stages will be on fault (- 6dB derating).
Below, the technical specifications:

Frequency	87.5 – 108 MHz
Power handling	400 W Max
Return Loss (S11)	<18 dB
Return Loss (S22 ed S33)	<18 dB
Isolation (S32)	>18 dB
Insertion Loss (S21=S31)	< 0.4 dB

3.6 Low Pass Filter and Directional Coupler Unit

The filter has a particular elliptic configuration; this configuration has been specifically chosen to guarantee the values of the harmonic components levels.

In-band Insertion Loss	<0.5 dB
Insertion Loss @ 175MHz	>55 dB
In-band Return Loss	<-20 dB

The directional coupler is a block composed by 2 directional couplers and a quarter wave delay line. Both ports of each directional coupler are used. Two of them detect the reflected power, one detects the FWD power and one is used as RF monitor. The function of the delay line is to have two reflected power signals detected at 90° of electrical angle. In this way, it is possible to

have a quite constant reflected power level vs the phase angle of that signal. The RF monitor is connected to the front panel (RF monitor port) to have 0 dBm nominal signal.