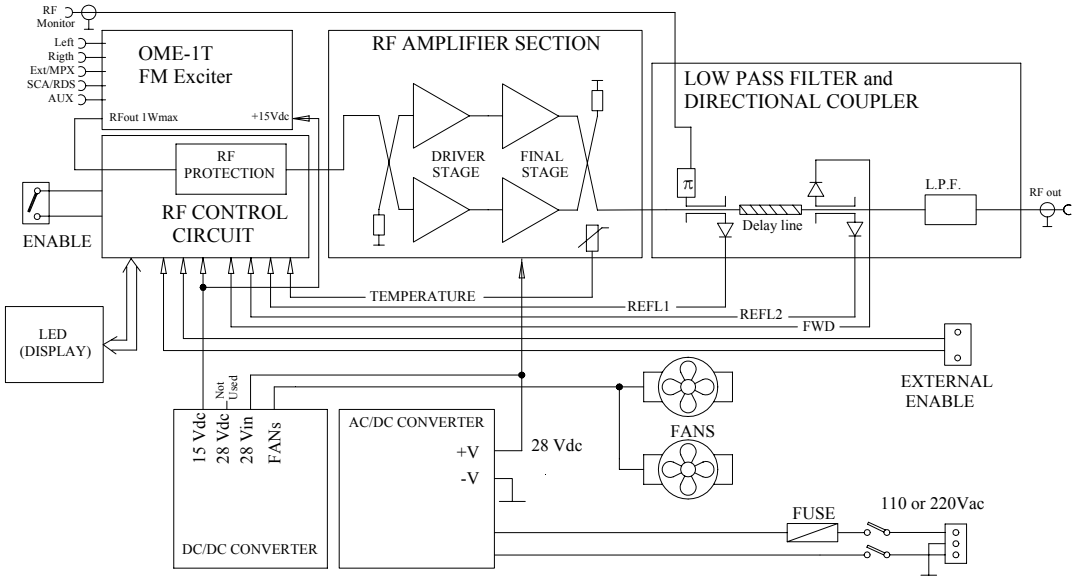
MT100 STEREO LOW POWER FM TRANSMITTER
100 WATT

1.0 OVERVIEW

MT100 is a 100 Watt FM Low Power Transmitter. It is very simple and easy to use. It is composed of a mechanical frame (19 inches std., 3 RU 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 MT100 BASIC BLOCK DIAGRAM



3.0 SUBASSEMBLIES DESCRIPTION

3.1 MT100 AC/DC Power Supply

The AC/DC power supply is a vendor-supplied product. The input voltage is manually selectable for 220V or 110V, while the regulation range of the output voltage is 28V. The input voltage selector switch is located on the front of the

power supply inside the MT100 chassis. The VADJ control is used to stabilize the output power. Below, are the power supply technical specifications:

Input	110 Vac or 220 +/- 15% (manually switched)
Output	28 to 30 Vdc
I max	10 A operating; 15 A short circuit
Efficiency	85% typ.
Isolation	4 KV (In/out or In/GND)
Weight (Typ.)	1500 g
Size (WxHxD)	120x80x200

3.2 MT100 DC/DC Power Supply

The MT100 uses a DC/DC converter. It provides a voltage of 15V to the exciter and power to the fan circuits. 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 RFCast model OME-1T. 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. Please refer to the annex datasheet at the back of this manual for more detailed specifications and for operational settings.

3.4 MT100 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 controls the RF input power coming from the exciter (OME-1T). RT3 trimmer may manually control this attenuator located on the internal control panel, in order to adjust for the output power requirement. 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. To access RT3 the operator engineer will need to remove the transmitter top cover.

When the MT100 works at a very high temperature and/or high reflected output power, a derating circuit is provided to decrease the output power in order to allow the equipment on function at a reduced 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 for a value of 20 Watts. When the protection is switched on, the protection circuitry removes the RF signal applied to the final stage amplifier very quickly, in about 1 microsecond.

Measurement/status indication. The two main measurements, FWD and REF power, are displayed by two BAR LEDs. The MT100 status is indicated with 3 LED's: 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" switch (SW1) is located on the front panel. It is possible to operate the enable switch by using the contacts on the rear chassis panel of MT100. The enable mode of the amplifier is realized when switch SW1 is on and the rear panel contacts (jumper) are closed.
WARNING: with enable off, there is no RF out but all the internal circuits are powered (stand by condition). Remember to switch off the main on / off switch on the transmitter rear panel and remove the power cord before opening the top cover or operating any inside circuits. Operating with the transmitter cover removed also affects the proper cooling of the RF amplifier.

3.5 MT100 RF Amplifier

The RF amplifier section provides to amplify the RF signal coming from the RF control circuit.
It is composed by:

- 2 way 90 deg. hybrid splitter
- driver stage
- final stage
- 2 way 90 deg. hybrid combiner

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 **driver stage** provides the first step of amplification of minimum 14dB gain in order to correctly drive the final stages. It is composed by a pair of SINGLE END stages operating in class AB. Below are the technical specifications:

VCC	28V
Idq	50 mA per section
Frequency range	FM (87.5-108 MHz)
Gain	> 16 dB typ.
Output Power	> 5 W

The **final stage** is an amplifier stage for FM signal operating in band II (87.5 – 108 MHz), with nominal output power of 100 Watts CW.

Normally, the amplifier operates up to 150 Watts in order to overcome the Insertion loss of the circuitry that follows the amplifiers, being the 2 Way Combiner, Directional couplers, and Low Pass Filter.

It is a balanced amplifier, including a pair of "push – pull" sections, each one using a medium power MOSFET with input / output matching network, and balancing to unbalancing transformer (balun). The RF MOSFET's bias are integrated on this printed circuit board. The polarization is in class B, with a 25 mA quiescent current per section.

VCC	28V
IDC (@ Full Power)	7 A typ.
Idq (total per 2 sections)	50 mA typ.
Frequency range	FM (87.5-108 MHz)
Power Gain	> 17 dB typ.
Output Power	> 100 W

The **2 way Combiner** is a 2 way in quadrature structure, and it provided to sum each two final stage sections to have 100 Watts power at the common port. One unbalancing 50 Ohm resistor guarantees the isolation between the input ports, in order to keep the Transmitter on, in case one of the final stages would be faulty (- 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 +10 dB nominal signal.