



User Manual

FMTX250

Stereo FM Transmitter with integrated Audio Processor, Stereo Encoder and RDS Encoder



WARNING!

This Transmitter is capable of generating extremely high RF potential. Touching internal parts, or the connected antenna system, will cause serious RF burns. Antenna systems should be installed such that exposure by any person to RF fields cannot exceed safe limits. The permitted limits vary from country to country. Expert advice should be sought about the safe installation of this transmission system.



RISK OF FIRE!

RF (Radio Frequency) energy could cause ignition of combustible surfaces during fault conditions. Installation should be left to qualified personnel. RF can cause burns to skin. Ensure antenna systems and feeder cables are not situated near, or could fall onto, any combustible surface.



WARNING!

Never operate this device without a suitable 50 ohm load connected to the RF OUTPUT socket, or without a suitably installed and matched antenna system connected. Although the output of this transmitter is protected against antenna load faults, MIS-OPERATION MAY RESULT IN DAMAGE NOT COVERED BY ANY WARRANTY.



IMPORTANT!

Correct operation of the cooling fans in this product is vital to reliable continuous operation. Schedule bi-annual maintenance checks. We strongly advise the use of a standby transmitter system for use during maintenance events or fault conditions, to prevent prolonged breaks in transmission.



IMPORTANT!

When cycling the power off, then on, ensure that the transmitter is off for at least 10 seconds before re-applying power, to allow the internal circuits time to fully reset. Failure to do so may result in no RF output (PLL failsafe mode).

Consideration should be given to fitting a suitably rated UPS if power interruptions are likely. Similarly, telemetry reset of power may be advisable for transmitters in remote areas, or having restricted access arrangements.



IMPORTANT!

Always reduce the RF Output power to minimum before changing the transmission frequency. Once the new frequency is active, slowly increase the RF output power control to provide the required power output level.

Introduction

The FMTX250 is a fully integrated 125W Stereo FM broadcast system with audio processing, stereo encoder and RDS encoder in a single, highly compact product.

The audio processor provides intelligent Automatic Gain Control, multi-band compressor/limiters, plus clipping and DSP 15KHz filtering.

The FMTX250 also boasts a high quality Stereo Encoder section, for perfect audio separation and detail.

The integral RDS encoder uses direct digital waveform synthesis for clean, perfect generation of the 57kHz subcarrier. As well as PS (station name) information, extended features - including RadioTEXT, Alternative Frequency and Traffic Announcement content - are also broadcast. Being standalone, a dedicated computer or data feed are not required. Periodic content updates are easily performed via the transmitter's USB port, using a Windows™ Laptop or PC. Free software is available at <https://lucorobroadcast.com/support>

At the heart of the FMTX250 is a high quality PLL modulator, and the RF Power Amplifier uses the latest high-gain Enhancement Mode MOSFET device, achieving new levels of efficiency and reliability.

TTL remote monitoring and switching allows the FMTX250 to be easily integrated into automated back-up applications. An audio silence alarm, plus remote RDS TA control are also provided.

Before operating

These instructions should be read in full before the transmitter is operated.

The safety and operating instructions should be retained for future reference.

All warnings on the transmitter and in the operating instructions should be adhered to.

All operation and user instructions should be followed.

Use of this device into a radiating antenna requires a valid licence from a Spectrum Management Authority in most countries.

Use of this device as part of a transmission system, or combined transmission system not specified by the manufacturer, may require further testing to ensure that it remains compliant with the essential requirements and other relevant provisions of current EU Low Voltage, EMC and Radio Equipment Directives. Approval and clearance from the Spectrum Management Authority may also be required.

Installation must adhere to safety regulations and the requirements of the relevant authorities. We recommend that at least two people are present during installation. Keep a file containing installation instructions and plans, including details of the transmission system (antennas, feeders, filters, etc) and operating instructions for all equipment at the transmission site at all times. Display posters detailing first aid treatment and treatment for electrical shock, along with telephone numbers for contacting the emergency services in the event of personal injury.

Ensure antenna system lightning strike protection is in place.

To reduce the risk of electrical shock, do not remove the cover, or any screws. There are no user serviceable parts inside; refer servicing to qualified personnel.

Do not expose this appliance to rain or moisture. The transmitter should not be used near water. Care should be taken so that objects do not fall - and liquids are not spilled - into the enclosure through openings.

To reduce the risk of fire, always replace fuses with the same type and rating.

The transmitter should be mounted into a well-ventilated standard 19 inch equipment rack, using slide supports. It should be situated so that its location or position does not interfere with its proper ventilation.

The transmitter should be situated away from heat sources.

The transmitter should be connected to a power supply only of the type described in the operating instructions or as marked on the unit. Precautions should be taken so that the grounding or polarisation of this appliance is not defeated.

The unit should be cleaned only as recommended by the manufacturer.

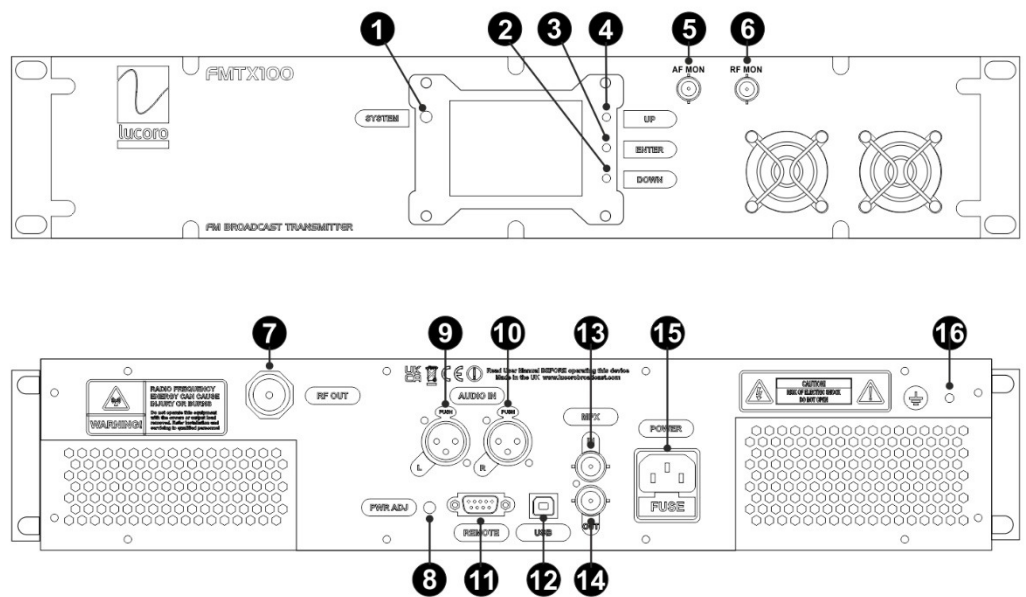
The transmitter should be serviced by qualified service personnel if it does not appear to operate normally, exhibits a marked change in performance, has been subjected to shock, damage, moisture, or if foreign objects have ingressed.

The user should not attempt to service the transmitter beyond that which is described in the Operating Instructions. All other servicing should be referred to qualified service personnel.

This appliance may become warm under normal operating conditions.

Recycle according to WEEE regulations.

Controls and Connectors



1. **SYSTEM** Status LED. Green indicates correct operation, red indicates a system error requiring urgent further investigation.

2. **DOWN** Push-button. Press this control to navigate the LCD menu.

3. **ENTER** Push-button. Press this control to navigate the LCD menu.

4. **UP** Push-button. Press this control to navigate the LCD menu.

5. **AF MON** BNC connector for monitoring of the input to the modulator (baseband MPX spectrum).
6. **RF MON** BNC connector for monitoring of the RF output. Output level will be the RF output level attenuated by approximately 40dB. Not to be used for measurement of harmonics.
7. **RF OUT 'N'** Socket. Connect a matched, pre-tested antenna system with a return loss of >14dB to this socket. Ensure all parts of the feeder and antenna system are rated for 300W or above.
8. **RF ADJ** Use a suitable trimmer tool to adjust the RF output power level, (RF FWD on the display). Never set to above the 250W maximum rated output power.
9. **AUDIO IN (LEFT)** XLR Socket. Connect a +8dB 600ohm balanced audio feed to this socket.
10. **AUDIO IN (RIGHT)** XLR Socket. Connect a +8dB 600ohm balanced audio feed to this socket.
11. **REMOTE** 9-pin D-sub Female. Remote control and monitor inputs and outputs are available on this connector:
 - Pin 1. Reflected Power Alarm. TTL logic low during normal operation. Floats high to indicate a high level of reflected power (critical antenna mis-match) has been detected.
 - Pin 2. Forward Power alarm. TTL logic low during normal operation. Floats high to indicate RF output has failed.
 - Pin 3. Audio failure alarm. TTL logic low during normal operation. Floats high to indicate more than one minute (approx) of no signal detected on the XLR audio inputs.
 - Pin 4. Temperature alarm. TTL logic low during normal operation. Floats high to indicate over-temperature condition has occurred.
 - Pin 5. RDS TA Control. Supplying between 5 and 12V this pin to (with reference to chassis ground potential) will activate the RDS TA (Traffic Announcement). Primarily used in automated changeover systems. (Option at time of ordering)

Pin 9. RF Mute Control. Supplying between 5 and 12V this pin to (with reference to chassis ground potential) will mute the RF output. Primarily used in automated changeover systems.

Pin 6, 7, 8 GND connection, at chassis earth potential.

The above 'Open Collector' outputs are capable of operation up to 50V and sinking a current of 75mA maximum. The normally high, (ie. 'pull low' upon alarm condition) provides inherent 'power failure' or 'cable connection failure' signalling.

12. **USB Socket.** When updates to the RDS content are required, connect a Windows™ PC (running the manufacturer's free software application) to this port. Use a high-quality USB cable, of 1 metre or less in length.

13. **MPX IN.** If using an external processor and RDS encoder, or a baseband MPX Studio-Transmitter Link, connect to this BNC. Adjust the output level of the external equipment to provide the correct modulation level (requires test equipment).

14. **MPX OUT.** To broadcast audio connected to the transmitter, with the internal audio processing and RDS data applied, connect the supplied patch lead between this 'MPX OUT' socket and the 'MPX IN' BNC socket.

15. **POWER.** Connect a power lead with an IEC C13 connector (and a 3 amp fuse in the plug or at the distribution panel) to this socket. Two T2 amp (time delay) fuses are fitted within this connector's Fuse carrier.

16. **EARTH.** Grounding connection point (M4 stud and bolt).

Installation

Connect a suitable rated test load to the RF OUPUT socket before connecting the unit to mains power. **IMPORTANT! FAILURE TO DO SO MAY RESULT IN DAMAGE NOT COVERED BY WARRANTY.**

Power-up the unit and reduce the output power (using the rear panel RF OUTPUT POWER ADJUST control) to the lowest level.

Using the front panel display and buttons, set the desired transmission frequency.

Power down the unit, wait a few seconds and, whilst pressing ENTER for 5 seconds, power up the unit. After a short while, the currently set frequency will appear on the display. Use the UP and DOWN buttons to select the desired frequency. Press ENTER to store. The new frequency will flash rapidly to indicate that it is now stored. The unit will begin its boot process and, after a few seconds the display will return to normal mode, and the transmitter will begin broadcasting.

The factory will have set the deviation, RDS and pilot injection levels. They should need no further adjustment. However, if absolutely necessary, these can be changed as follows (NOT recommended):

To adjust the deviation level, use a suitable trimmer tool carefully adjust the front panel "DEV ADJ". This is a single turn control. The level can be varied by approximately $\pm 10\%$. Pilot and RDS subcarrier levels will also change.

To adjust the RDS injection level, locate the circuit board "MPX/RDS" on the inside rear panel. Adjust trimmer "VR1 (RDS)" to set the desired RDS injection level. This is a multiturn control.

ELECTRIC SHOCK AND RF BURN HAZARD! DISCONNECT THE POWER BEFORE REMOVING ANY COVERS.

Take GREAT CARE not to adjust any other circuit trimmer controls. Even the slightest adjustment WILL degrade performance and may cause non-compliance to broadcast regulations.

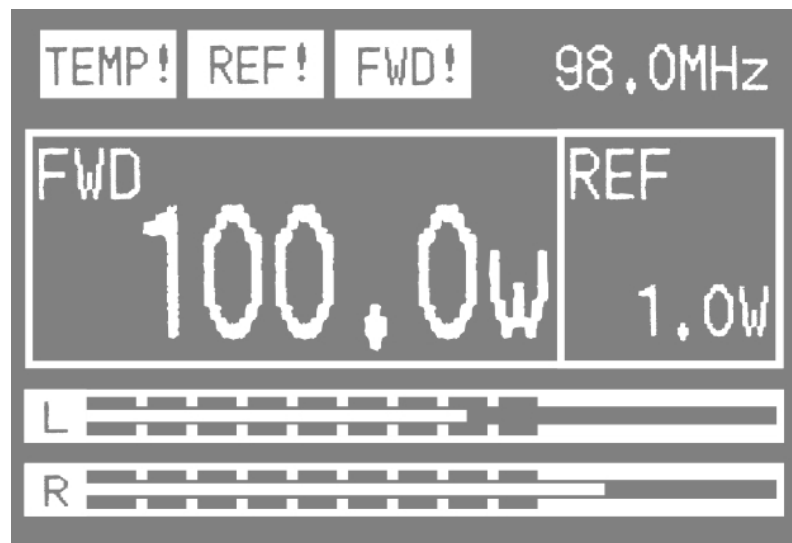
Connect Left and Right Audio to the rear panel XLR connectors, and adjust the source level so that maximum audio peaks register just below the peak section of the front panel audio level bar graph display. Use ordinary programme material, rather than test tones. Ensure the MPX OUT to MPX IN loop-through patch lead (BNC to BNC) is connected.

Once all settings are correct, power down the unit. Disconnect the test load and connect to the antenna. Power up the unit and increase the RF Power (using the rear panel RF ADJ control) to the desired level, not exceeding 100W.

Operation

The FMTX250 is designed for continuous reliable transmission, however the fans must be periodically checked for correct operation and free airflow.

The front panel display shows the transmission frequency, forward power level (**FWD**), reflected power level (**REF**) and audio input levels (ahead of any audio processing).



Audio levels will be optimised by the Audio Processor, however regular checks of audio levels entering the transmitter are advised.

Correct operation is confirmed by a front panel green STATUS LED. Should this turn red, the transmission system may shut down its RF output and will, in any case, require URGENT attention.

The LCD display shows all main parameters so no further menus are provided or required (except frequency setting detailed above). During normal operation, therefore, the menu buttons do not have any function.

The following are LCD display fault indicators and their meaning:

TEMP! The system is running too hot and has shut down the RF output as a safety precaution. Check the fans for correct operation. Also check the antenna system, including all cabling (and/or filters and/or combiners where fitted) for correct operation. The FWD! indicator (see below) will also show and the standby transmission system (where used) will have activated (TTL control).

REF! The system has detected a fault in the antenna system and has shut down the RF output as a safety precaution. Check the antenna system, including all cabling (and/or filters and/or combiners where fitted) for correct operation. The FWD! indicator (see below) will also show and the standby transmission system (where used) will have activated (TTL control).

FWD! The system has detected there is no forward power. This may be due to one or both of the above symptoms, due to a PLL failure, or due to excessive power setting. The standby transmission system (where used) will have activated (TTL control).

The RDS content can be periodically updated using a Windows™ computer and USB programming device (purchased separately) connected to the RDS Programming Port connector on the rear panel. Follow the instructions provided with the RDS Programming Device and software.

Ensure air vents and internal air tunnels are kept free from dust during operation.

The cooling fans should be replaced after 40,000 hours of cumulative operation. This life rating is for guidance only and is subject to ideal environmental operating conditions. Immediately replace any fan that fails or becomes slow or noisy, immediately. Replacement fan assemblies with wiring loom and mating connector are available from the manufacturer. It is recommended that replacement work must be carried out by the manufacturer or an approved agent.

EC Declaration of Conformity to R&TTE Directive 1999/5/EC

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hereby take sole responsibility to confirm that the product:

FMTX100, FMTX250
(and versions thereof with M and RBRX suffix)

which this declaration refers to, conforms to all applicable requirements of EU Directive 2014/53/EU and is CE marked accordingly:

Low Voltage Directive 2014/35/EU:

IEC 60950-1:2005/A2:2013
Safety Requirements for equipment < 600V

EMC Directive 2014/30/EU:

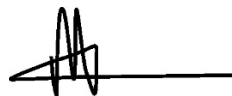
ETSI EN301 489-53 v1.1.0 (ETSI EN301 489-1 v2.1.1
ERM/EMC for Radio Equipment
Specific Conditions for FM Transmitters (Part 11)

Radio Equipment Directive 2014/53/EU:

ETSI EN302018-2 v2.1.1
Transmitting Equipment for FM Radio Broadcasting service

The following operation conditions and installation arrangements have to be presumed:

- (i) According to Operating Instruction Manual
- (ii) Connected lead lengths of 2 metres or less



M. O'Rorke, Director
September 2020

Technical Specifications

RF:

Frequency range	87.5 to 108.00MHz
Frequency stability	Better than $\pm 200\text{Hz}$
Output power	30 - 250W
Harmonic & spurious output	-75dBc typical
AM Noise	$<0.5\%$ @ $\pm 40\text{kHz}$ deviation
THD	$<0.15\%$ @ $\pm 75\text{kHz}$ deviation
RF output connector	'N' type (F)

Monitoring:

RF	BNC (F) -40dB 50 ohms
MPX	BNC (F) 1V P-P 10K ohms

Audio Interface:

Audio Input Level	+8dBu for $\pm 75\text{kHz}$ deviation
Audio Input Impedance	600 Ohms
Audio input connectors	XLR (F)

RDS:

Groups	0A & 2A (others on request)
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Power Supply:

Input AC	100V to 250V (50/60 Hz)
Consumption (maximum RF output)	550W (230V 50Hz)

Mechanical:

Size (mm)	2U 88 (H) x 482 (W) x 290 (D)
Weight	5kg
Temperature	0°C to +42°C
Humidity	95% (relative non-condensing)

We reserve the right to alter specifications without notice. E&OE.



WEEE - Waste Electrical and Electronic Equipment

The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way.

The crossed-out wheeled bin symbol invites you to use those systems.

If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.

IMPORTANT!

NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE WITH RESPECT TO THIS PRODUCT. Do not misconstrue any information as our recommendation to use any product, process, or equipment in conflict with any regulatory authority or patent.

Ensure compliance with all applicable safety requirements when installing or using this equipment, and operate in accordance with local laws governing the use of radio transmission equipment.

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