

1. General Description

The MX800 series employs state of the art design and construction methods to deliver a range of high performance, ultra reliable radio transceivers. They are ideally suited for use in VHF or UHF two way voice radio systems, however the MX800 can perform in a range of applications where the added advantage of linear frequency and phase response from DC to 3.4kHz can be utilized. The MX800 uses a two-point modulation method synthesizer for extended low end VF transmit frequency response. The Receiver, Exciter and Power Amplifier are contained in their own specialized Aluminium module and can be easily removed from the main chassis.

The flexibility of the MX800 series allows it to be configured for a wide range of applications.

Standard MX800 applications include:

- ◆ Conventional 2-Way voice base station
- ◆ Full duplex or simplex base station
- ◆ Radio modem base station
- ◆ High speed data transceiver
- ◆ Trunking base station for MPT1327, LTR, SmartTrunk and others
- ◆ Analog Cellular base station
- ◆ POCSAG paging transmitter to 2400 BPS
- ◆ POCSAG repeater
- ◆ DC-coupled Direct FSK modulation system
- ◆ Voice repeater
- ◆ Wide band data repeater
- ◆ DC-coupled repeater
- ◆ Point to point link
- ◆ Fast 25mS multi hopped repeater
- ◆ Cross band link or repeater

The MX800 incorporates special technical features, of which the key ones are listed below:

- ◆ Extremely low conducted emissions
- ◆ Extremely low transmitter spurious
- ◆ Fast transmitter on time
- ◆ Transmitter frequency response down to DC
- ◆ Low group delay distortion
- ◆ Very Wide RF switching bandwidth
- ◆ No re-tune receiver
- ◆ Fully software programmable
- ◆ Built in diagnostics
- ◆ Trunking control and VF routing interface
- ◆ Built in community multi-tone style repeater
- ◆ High stability reference input for Simulcast systems

In addition, the MX800 can be fitted with many options, not being limited to the following:

- ◆ Programmable channel spacing
- ◆ Programmable CTCSS / DCS encoder and decoder
- ◆ Isolated VF and E&M lead interfaces
- ◆ Simplex antenna changeover relay
- ◆ VF audio delay for noiseless mute/squelch/repeater function
- ◆ Low receiver standby current consumption
- ◆ External reference oscillator input
- ◆ Local speaker and microphone
- ◆ Push wheel channel selector
- ◆ High stability options
- ◆ Low transmit power models
- ◆ Low Cost mini controller board
- ◆ Special high performance Receiver options
- ◆ Other custom features on special request

For further information, please contact Spectra Engineering.

1.1 Physical Description

The MX800 is a compact lightweight standard 19" rack mounting transceiver. It is designed to mount horizontally in a 19" rack frame and occupies 2RU (89mm). The depth of the unit is 330mm and the weight is less than 9kg.

The unit consists of four main sub assemblies an Exciter Module, a Receiver Module, a Power Amplifier Module and a Micro Controller board. These modules are housed in a fully welded steel case.

The MX800 features a high degree of RFI and EMI screening throughout the design and construction. The receiver and exciter (low power transmitter) modules are contained in solid aluminium enclosures, and for additional screening each interface pin in the modules is individually filtered. The PA module is contained in a special compact efficient extrusion for minimum harmonic radiation. This design results in low conducted and radiated emissions and minimal susceptibility to RFI and EMI.

User interface is via the front and rear panels. The rear panel provides access to all connectors and the standard front panel provides 6 LED indicators of the radio status. The local control option front panel has additional speaker, microphone and (optionally) channel select functions. Other variations can accommodate serial and monitor ports as well as VF line level adjustment on the front panel.

1.1.1 Front Panel

1.1.1.1 Standard Front Panel

The MX800 standard front panel is illustrated below. Custom versions of the front panel can be supplied to OEM customers.

Table 1-1 below explains the functions of the front panel LED's. Each LED indicates the status of the MX800 in real time.

LED	FUNCTION
POWER	Indicates the power supply voltage is within software selectable limits.
RX	A signal is being received by the receiver or the receivers squelch is open.
TX	The transmitter is transmitting RF power.
CTCSS	A valid Continuous Tone Coded Squelch Signal has been detected.
AUX	An Aux function is selected or the PLL is unlocked.
ALARM	A prearranged alarm condition exists.

Table 1-1 LED Functions

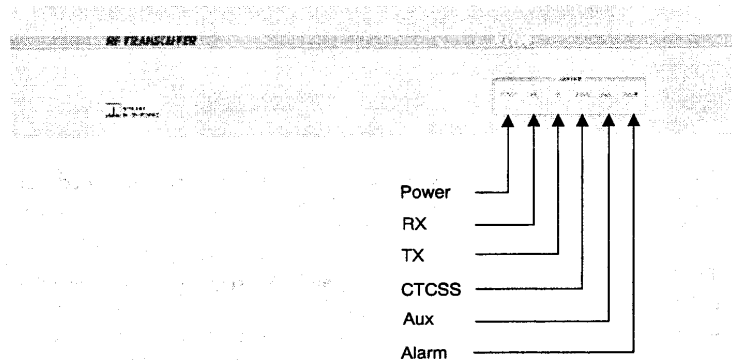


Figure 1-1 Standard Front Panel

1.1.1.2 Local Control Front Panel

The Local Control Front Panel is illustrated in Figure 1-2 below.

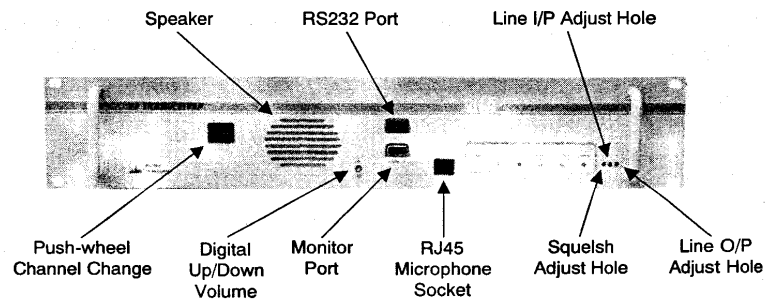


Figure 1-2 Local Control Front Panel

It has the same LED indicators as the standard front panel as well as the following features

◆ Loudspeaker and Volume Control

A 1 Watt loudspeaker is provided to monitor 'on air' received audio as well as transmit audio from line. Volume control is provided by means of a 3 position toggle switch adjacent to the loudspeaker. This switch is biased in the centre position. To raise or lower the volume the switch is momentarily moved up or down respectively. For each switch closure the volume is incremented or decremented a fixed amount.

The speaker has a link selectable connection to a tone output from the

microcontroller. This may be used in conjunction with the appropriate software configuration to generate an alert tone to the user.

◆ **Microphone Socket**

An RJ45 socket is provided for connection of a microphone.

◆ **Channel Change Control**

Twin push-wheel switches can be optionally fitted to the front panel to allow selection of the operating channel. This switch replaces the channel select function normally accessible on CN3 on the rear panel. 99 channels are selectable. Refer to section 2.2.2.3 for channel select method.

◆ **RS232 and Monitor Ports**

Provision is made to optionally fit these two connectors on the front panel instead of on the rear panel. The pin-out and functions of these two ports remain unchanged when this is done.

◆ **Mute / Squelch Adjustment**

Provision is made to optionally locate the mute / squelch control potentiometer behind the front panel. A screwdriver hole is provided in the front panel to access this adjustment.

◆ **Line Level Adjustments**

Provision is made to optionally locate the line I/O level control potentiometers behind the front panel. A screwdriver hole is provided in the front panel to access each of these adjustments.

1.1.2 Rear Panel

Figure 1-3 below and Table 1-2 details the functions of each connector.

Conn Type	Function	Description
3 PIN	DC Power input	13.8 Volt DC power input. Also +28 Volt input on spare pin if required.
N TYPE	Simplex relay out or N type RX input	Location for internal simplex relay. The antenna for RX / TX connects to this point. Alternatively an N-Type connector can be used for the input to the receiver for full duplex operation.
BNC	RX input	Standard BNC connector for the input to the receiver for full duplex operation.
N TYPE	TX output	The RF power output from the transmitter for full duplex operation.
RJ45	Spare	Knockout provision for RJ45 connector.
DB25-F	Parallel I/O	Provides one 8 bit input port. One parallel 8 bit BCD or Binary channel select input and one 8-bit output port.
DB15-F	Line I/O	Provides the necessary analog receiver and transmitter interface for system interfacing.
DB9-M	RS-232 serial port	9600 Baud serial port for frequency programming, channel selection and alarm and status monitoring.
DB9-F	Monitor port	Provision for special monitoring of certain internal signals.

Table 1-2 Rear Panel Connections

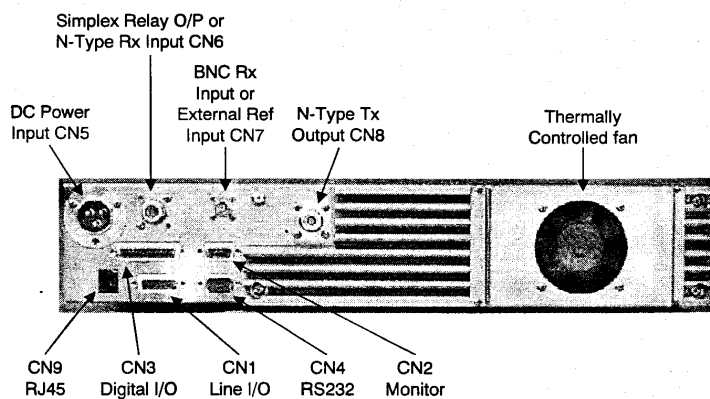


Figure 1-3 MX800 Rear Panel

1.2.2 Receiver Module

The receiver module accepts the low level RF input signal and amplifies, filters and conditions the signal prior to detecting the wanted audio component. The Receiver module features the same advanced synthesizer and wide bandwidth as the exciter. Only the front-end bandpass filter and VCO need to be changed in order to support different frequency bands, resulting in significant flexibility and end-user cost savings. The purpose built front end bandpass filter has a wide no-adjust bandwidth equal to the band allocation (refer to section 7.4 for details of the band allocations).

The receiver has high sensitivity while maintaining excellent intermodulation immunity and adjacent channel rejection. A dual first IF filter provides excellent rejection to common known spurious responses. High blocking of over 100dB typical ensures that strong interfering signals do not desensitise the receiver when receiving weak signals.

1.2.3 Power Amplifier Module

The PA receives the low level modulated RF signal from the Exciter and amplifies and filters it to final output power level. Forward and reflected power indications are fed to the Micro Controller card.

The PA is very compact and efficient for high reliability and low cost. The heatsink has minimal temperature rise even under continuous operation, ensuring the best MTBF obtainable for a practical design. A low loss 13 element elliptical low pass filter ensures that harmonics remain below -90 dBc.

1.2.4 Micro Controller Board

The Micro Controller Board is physically located behind the rear panel connectors and all signal connections (apart from the RF connections) external to the transceiver are made via the controller card. User settable jumpers and DIP switches are located on the card as are level adjustment potentiometers.

The Micro Controller controls the operation of the RF modules and acts as the interface between the user connections, indicators and the RF modules. It processes transmit and received audio to and from the Exciter and Receiver modules as well as providing the digital I/O functions of the transceiver.

The circuit board has an onboard EEROM in which is stored all of the user channel related data such as frequencies, CTCSS tones etc. A serial port at the rear (or optionally the front) of the MX800 provides access to the Controller card and in conjunction with the Spectra Engineering "MXTOOLS" programming utility allows the user to create and change this channel related information. Use of the "MXTOOLS" utility is covered in a separate manual.

Special functions capable of being carried out by this card include non-predictive full duplex CTCSS encoding/decoding, DCS encoding/decoding as

well as FFSK and 4-level FSK modems. Digipots under the control of the processor ensure that user set up levels for TX deviation and power levels are correctly set for each channel.