3. Options

3.1 T01 Programmable Channel Spacing

The MX800 receiver is available in five different channel spacing options. For applications in systems which require both 12.5kHz and 25kHz channel spacing option T01 allows channels to be programmed for either bandwidth. Switchable IF filters in the receiver and automatic 12.5kHz/25kHz gain compensation in the audio paths make the change in bandwidths transparent to the user.

This option must be specified at order placement. Once the switchable IF bandwidth receiver is fitted, the programmable channel spacing option is selected on the MXTOOLS Configuration screen (Hardware Settings tab) and each channel is programmed as either 12.5kHz/25kHz via the Channel Edit screen. See the MXTOOLS user handbook for details.

3.2 T02 Programmable CTCSS encoder/decoder

Provision is made in the MX800 to fit a CTCSS encoder/decoder. The decoder is non-predictive and any valid CTCSS tone can be decoded. Any standard TX CTCSS tone may be associated with the programmed decode tone through the Channel Edit screen in MXTOOLS. Multiple CTCSS tones are programmable for any channel providing "Community Repeater" functionality. See the MXTOOLS user handbook for details

This option may be fitted at order placement or retro fitted subsequently.

3.3 T03 Programmable DCS/CTCSS encoder/decoder

Provision is made in the MX800 to fit a full duplex DCS encoder/decoder. There are 83 digital codes available. Any standard DCS code or CTCSS tone may be assigned to any of the transmit or receive channels through the Channel screen in MXTOOLS. Multiple CTCSS tones are programmable for any channel providing "Community Repeater" functionality. See the MXTOOLS user handbook for details

The DCS encoding function provides continuous, repetitive digital word modulation to the transmitter. The decode function controls receiver muting to eliminate all calls that are not coded with the assigned DCS code.

This option may be fitted at order placement or retro fitted subsequently. The DCS PCB assembly is fitted in place of IC25 (FX805). Once the DCS option is fitted the "DCS option fitted" check box is ticked in the MXTOOLS Configuration screen and the encode and decode codes are programmed through the Channel Edit screen.

Refer circuit diagram CS001-4

3.4 T04 Balanced and Isolated VF

Standard VF connections to line are 600ohm 4-wire unbalanced. Option T04 may be fitted if transformer balanced and isolated VF inputs and outputs are required. A transformer PCB is fitted internally at the rear of the MX800. This PCB has a RJ45 connector (CN9) which protrudes through the rear panel when this option is fitted and the balanced VF outputs are made available via this connector.

Note that theses connections are essentially in parallel with the standard VF connections on CN1. The VF lines on CN1 are still connected when option T04 is fitted and care should be taken that the TX VF line is not doubly terminated or that two VF sources are not presented to the transmitter.

Pin No	Function
1	600ohm balanced RX VF leg a
2	600ohm balanced RX VF leg b
3	600ohm balanced TX VF leg a
4	600ohm balanced TX VF leg b
5	NC
6	NC
7	NC
8	NC

Table 3-1 CN9 Connections

The RJ45 pins are numbered as shown in Figure 3-1 below.

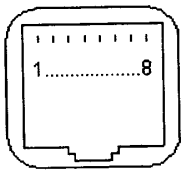

Figure 3-1 CN9 RJ45 Pin-out Detail (View from Rear of MX800)

Refer circuit diagram CS018-1

3.5 T05 Balanced and Isolated VF plus E&M

Option T05 provides the balanced and isolated VF I/O as per option T04 as well as isolated E (PTT) and M (Mute) leads.

Note Jumpers referred to in the table below are those on this option PCB.

The E lead is opto isolated and may be asserted by applying a DC voltage between 5V and 48V with any polarity between CN9 Pins 7&8 (JMP1 in position 2-3, JMP2 removed). Provision is also made to internally source the activation voltage (+12V DC) in which case the E lead is asserted by grounding CN9 Pin8 (JMP1 in position 1-2, JMP2 fitted.)

The M lead is relay isolated and the common and normally open contacts are brought out via CN9. If the internal +12V DC is being used as the activation voltage for the E lead (JMP1 in position 1-2) then the normally closed contact is also available at CN9. The relay contacts are rated at 250mA.

Pin No	Function
1	600ohm balanced RX VF leg a
2	600ohm balanced RX VF leg b
3	600ohm balanced TX VF leg a
4	600ohm balanced TX VF leg b
5	M Lead common
6	M Lead normally open
7	E Lead leg a/M lead normally closed
8	E Lead leg b

Table 3-2 CN9 Connections

The RJ45 pins are numbered as shown below.

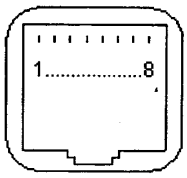

Figure 3-2 CN9 RJ45 Pin-out Detail (View from Rear of MX800)

Refer circuit diagram CS018-1

3.4 T04 Balanced and Isolated VF

Standard VF connections to line are 600ohm 4-wire unbalanced. Option T04 may be fitted if transformer balanced and isolated VF inputs and outputs are required. A transformer PCB is fitted internally at the rear of the MX800. This PCB has a RJ45 connector (CN9) which protrudes through the rear panel when this option is fitted and the balanced VF outputs are made available via this connector.

Note that theses connections are essentially in parallel with the standard VF connections on CN1. The VF lines on CN1 are still connected when option T04 is fitted and care should be taken that the TX VF line is not doubly terminated or that two VF sources are not presented to the transmitter.

Pin No	Function
1	600ohm balanced RX VF leg a
2	600ohm balanced RX VF leg b
3	600ohm balanced TX VF leg a
4	600ohm balanced TX VF leg b
5	NC
6	NC
7	NC
8	NC

Table 3-1 CN9 Connections

The RJ45 pins are numbered as shown in Figure 3-1 below.

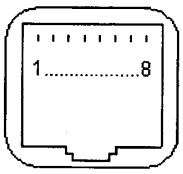

Figure 3-1 CN9 RJ45 Pin-out Detail (View from Rear of MX800)

Refer circuit diagram CS018-1

3.5 T05 Balanced and Isolated VF plus E&M

Option T05 provides the balanced and isolated VF I/O as per option T04 as well as isolated E (PTT) and M (Mute) leads.

Note Jumpers referred to in the table below are those on this option PCB.

The E lead is opto isolated and may be asserted by applying a DC voltage between 5V and 48V with any polarity between CN9 Pins 7&8 (JMP1 in position 2-3, JMP2 removed). Provision is also made to internally source the activation voltage (+12V DC) in which case the E lead is asserted by grounding CN9 Pin8 (JMP1 in position 1-2, JMP2 fitted.)

The M lead is relay isolated and the common and normally open contacts are brought out via CN9. If the internal +12V DC is being used as the activation voltage for the E lead (JMP1 in position 1-2) then the normally closed contact is also available at CN9. The relay contacts are rated at 250mA.

Pin No	Function
1	600ohm balanced RX VF leg a
2	600ohm balanced RX VF leg b
3	600ohm balanced TX VF leg a
4	600ohm balanced TX VF leg b
5	M Lead common
6	M Lead normally open
7	E Lead leg a/M lead normally closed
8	E Lead leg b

Table 3-2 CN9 Connections

The RJ45 pins are numbered as shown below.

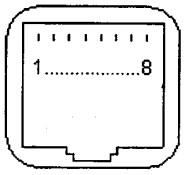

Figure 3-2 CN9 RJ45 Pin-out Detail (View from Rear of MX800)

Refer circuit diagram CS018-1

3.6 T06 Simplex Changeover Relay

For simplex applications an internally mounted coaxial changeover relay can be provided. This mounts on the rear panel and the common port protrudes through the chassis providing the simplex antenna connection. The relay normally closed port is internally connected to the MX800 receiver and the normally open port is connected to the transmitter via the standard RX connector hole in the chassis (the RX connector is removed) using a special cable assembly. The relay also has control connections to the micro controller PCB.

Once the relay option is fitted the channels are programmed as simplex channels through the Channels Edit screen of MXTOOLS. Switches SW2/1 & SW2/2 on the micro controller are switched ON to delay the transmitter PTT (to allow the relay to changeover) and set the simplex operating mode respectively.

3.7 T07 Turn Around Mixer

This option is not currently available.

3.8 T08 VF Delay

This option provides a 40mS delay to the received audio. When the option is fitted delayed audio is fed to the line and talkthrough paths but discriminator audio (output on CN1 Pin4) is undelayed.

This option is intended for two main applications. Firstly when the delay is fitted the mute "crash" characteristically heard when a mobile releases its PTT but the repeater tail continues, it is eliminated. Secondly systems (including trunking systems) which have mixed voice and data on a channel can delay the VF signal to line and air so that in the event that a data stream is detected (by the data controller) the VF to line and air can be disconnected for the duration of the data burst thus avoiding radio system user annoyance. Internal switches in the MX800 may be used to disconnect the audio under the control of the RX TALK line (CN1 Pin7) the sense of which may be inverted using JMP12 on the micro controller.

This option may be fitted at order placement or retro fitted subsequently. The Option PCB assembly is fitted above the Micro controller on four hex pillars. A 16-way ribbon connection is made from the Option PCB to SKK on the micro controller card. The links on the Option card are set as below. Once the delay option is fitted the "Delayed Audio Option" check box is ticked in the MXTOOLS Configuration screen (Hardware settings tab).

Note that this options PCB is also used for T09, CTCSS Suppression Upgrade Filter and T10, the Low Standby Current Mode and all three are independent and may be used separately or together. If the option PCB is ordered for one particular option it may or may not be populated for the other options.

JMP	Function/Description	Option Active	Option Disabled
JMP 1	Low standby current mode switched exciter power	Out	In
JMP 2	Low standby current mode switched receiver power	Out	In
JMP 3	300Hz Elliptic filter	1-2	2-3
JMP 4	RX audio delay	2-3	1-2

Table 3-3 Option PCB Link Settings

Refer circuit diagram CS022-1A

3.9 T09 CTCSS Suppression Upgrade Filter

This option provides upgraded CTCSS tone suppression on the RX VF. When this option is fitted the standard 300Hz filter is removed from circuit by changing the position of JMP5 on the micro controller to position 1-2.

This option may be fitted at order placement or retro fitted subsequently. The Option PCB assembly is fitted above the Micro controller on four hex pillars. A 16-way ribbon connection is made from the Option PCB to SKK on the micro controller card. The links on the Option card are set as below. This option is purely a hardware change and no configuration is required using MXTOOLS.

Note that this options PCB is also used for T08, VF Delay and T10, the Low Standby Current Mode and all three are independent and may be used separately or together. If the option PCB is ordered for one particular option it may or may not be populated for the other options.

JMP	Function/Description	Option Active	Option Disabled
JMP 1	Low standby current mode switched exciter power	Out	In
JMP 2	Low standby current mode switched receiver power	Out	In
JMP 3	300Hz Elliptic filter	1-2	2-3
JMP 4	RX audio delay	2-3	1-2

Table 3-4 Option PCB Link Settings

3.10 T10 Low Standby Current Mode

For solar powered sites and other power critical applications the MX800 is capable of a Low Standby Current Mode. This option can be implemented in three stages. Stage one implementation replaces the micro controller linear voltage regulators with switching regulators. Response times are unaffected. Stage two involves removing power from the exciter when the radio is in standby mode. In this case RX responses times are unaffected. In stage three the RX power is cycled on and off at a user selectable duty cycle. Essentially the choice of mode of operation involves a compromise between response time and average current consumption. Current consumption of 250mA is achievable with a typical response time in the order of 1sec.

Condition	Description	Approx Average Current Drain mA
Standard	Standard MX800 (TX VCO on continuously)	525
Standard	Standard MX800 (TX VCO switched)	490
Stage 1a	Standard MX800 (TX VCO on continuously) option board fitted	475
Stage 1b	Standard MX800 (TX switched) option board fitted	440
Stage 2	TX exciter inc TX VCO powered down	370
Stage 3 RX 100% duty	TX exciter inc TX VCO powered down RX module power duty cycled	370
Stage 3 RX 50% duty	TX exciter inc TX VCO powered down RX module power duty cycled	255*
Stage 3 RX 25% duty	TX exciter inc TX VCO powered down RX module power duty cycled	198*

*Average current calculation is based on RX off current drain of 140mA and RX on current drain of 370mA.

Table 3-5 Current Consumption Details

This option may be fitted at order placement or retro fitted subsequently. The Option PCB assembly is fitted above the Micro controller on four hex pillars. A 16-way ribbon connection is made from the Option PCB to SKK on the micro controller card. The links on the Option card are set as below. Once the power save option is fitted the "Power Save Option Board Installed" and "Power Save Exciter Module" check boxes are ticked in the MXTOOLS Configuration screen (Hardware settings tab). In addition three timers need to be set. "Idle Time to Power Save" is entered in seconds and defines how long the radio will wait following the most recent activity before reverting to standby mode. "RX Module On Time" and "RX Module OFF Time" define the duty cycle of the receiver module.

Note that this options PCB is also used for T08, VF Delay and T09, CTCSS Suppression Upgrade Filter and all three are independent and may be used separately or together. If the option PCB is ordered for one particular option it may or may not be populated for the other options. If the option is being retrofitted the two main 5 Volt 78M05 regulators on the Microcontroller board must be removed and subsequently replaced if de-installing.

JMP	Function/Description	Option Active	Option Disabled
JMP 1	Low standby current mode switched exciter power	Out	In
JMP 2	Low standby current mode switched receiver power	Out	In
JMP 3	300Hz Elliptic filter	1-2	2-3
JMP 4	RX audio delay	2-3	1-2

Table 3-6 Option PCB Link Settings

Refer circuit diagram CS022-1

3.11 T11 Combined Options

This option combines the functions and features of T08, T09 and T10

3.12 T12 External Reference Oscillator Input

The MX800 receiver and transmitter modules have separate reference oscillators. In normal operation to achieve a low frequency transmitter modulator frequency response to DC the MX800 normally uses a two-point modulation method. The TX reference oscillator and the VCO are both modulated. Option T12 provides for the TX reference frequency to be externally injected. An SMB connector is fitted to the exciter and an internal cable is provided from there to a chassis mount N Type connector into which the external reference frequency is injected. As two-point modulation is not possible with this configuration transmitter frequency response is only specified to 67Hz for this option.

3.13 T13 Local Speaker and Mic

For applications needing a user interface at the base station the MX800 is available with the Local Control option. When fully implemented the Front Panel is as illustrated below. It has the same LED indicators as the standard front panel as well as the following features

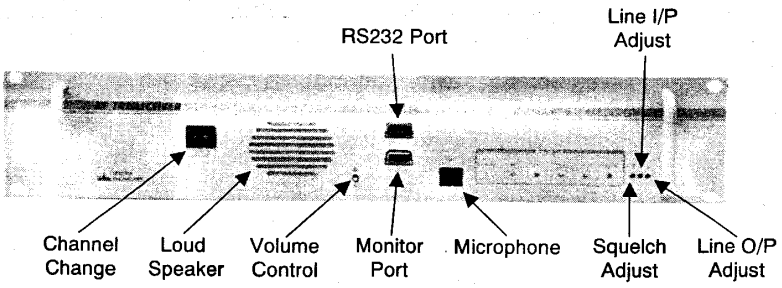

Figure 3-3 Front Panel (Fully Implemented)

- **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 micro controller. 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. This socket is wired compatibly with the Motorola GM300 microphone.

- **Channel Change Control**
  Twin push wheel switches can be optionally fitted to the front panel to allow selection of the operating channel. When fitted this switch is wired to the channel select pins on CN3, the rear channel select port, and replaces the channel select function normally accessible on that connector. 99 channels are selectable. Refer to section 2.2.2.3 for more details on alternative channel select methods.

- **RS232 and Monitor Ports**
  Provision is made to optionally fit these two connectors on the front panel instead of on the rear panel. The pinout and functions of these two ports remain unchanged when this is done.

- **Mute / Squelch Adjustment**
  Provision is made to optionally locate the squelch control potentiometer

behind the front panel. A screwdriver hole is provided in the front panel to access this adjustment.

- **Line I/O Level Adjustment**
  Provision is made to optionally locate the line in and line out level potentiometers behind the front panel. A screwdriver hole is provided alongside the squelch adjustment hole in the front panel to access this adjustment.

Note Note that it is possible to select some features of the Local Control Option and omit others. For example operating channel select from the front panel may not be required (or permitted) and the Local Control Option may be ordered without this feature. Consult Spectra Engineering for details.

Refer circuit diagram CS001-6 sheet 6 of 6

3.14 T14 Local Channel Change

See T13.

3.15 T15 RF and Line FFSK Modems

This option provides for FX429A FFSK modems. Two modems may be fitted one facing toward the Line port and the other to "Air". Consult Spectra regarding application software and hardware for this option.

3.16 T16 1PPM Frequency Stability 12.5 kHz, N to X Bands

This option provides for 1PPM frequency stability for narrowband MX800s in the N to X bands. This frequency stability is specified from –30° C to +60° C.

3.17 T17 1PPM Frequency Stability 25 kHz, R to X Bands

This option provides for 1PPM frequency stability for wideband MX800s in the R to X bands. This frequency stability is specified from –30° C to +60° C.

3.18 T18 Extended Temperature Range

The MX800 is optionally available in an extended operating temperature range version covering –30° C to –10° C. Frequency stability is specified at 2.5PPM for this option.