ADI-Spectra MX800 Series Base Connection to A800-SIM

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Updates - Note that any amendments/updates that are new to this document are indicated with a red line symbol in the left boarder of the page. Note: The previous general release was AN0011-01.

1 General

This Application Note details the connection of a ADI-Spectra MX800 Series Base Station to an A800-SIM3a. This includes the general setup of the base station as well as the physical connection to the A800-SIM. Once complete, the MX800 Base Station will provide the signals to the A800-SIM that it requires for most SIM configurations.

This Application Note assumes the technician has a sound working knowledge of the ADI-Spectra MX800 Series of Base Station equipment as well as the Tait A800-SIM. For more information on these products, please refer to the relevant service manual. It will be necessary to refer to a MX800 Series Service Manual to complete the procedure detail in this Application Note.

This Application Note is not suitable for use in conjunction with Application Note AN003 System Splitting. The MX800 base station does not have a readily available RX Disable line without modifications. The RX Disable line is required for System Splitting operation. If System Splitting is required, then it is recommended that Tait T800 equipment be used in the system.

2 Parts

Table 1 Part Required

*Part Number	Description	Supplier	Qty.
A800-SIB	GP I/O Interface Board	Tait	1
400-00020-05	Silicon Tubing 1.5mm SIL Rubber	Tait	400mm
CART350N	Cable Tie Nylon White 100*2.6mm	Prime Electronics	4
CODA15P	DB15 Male Connector Solder Pot	Prime Electronics	3
CODA15COVER LONG	DB15 Grey Plastic Connector Cover with thumb screw locks	Prime Electronics	3
DMC4702	4 Way Multi-Core Cable 7/.20 Screened with Drain Wire	Tyco Aust (SECA)	2m
Misc.	Miscellaneous workshop consumables, e.g. solder, wire, etc.	N/A	N/A

- Suggested part numbers and supplier only. Equivalent items can be use for most parts.

3 Procedure

3.1 MX800 Base Station

Detailed here is the configuration of the MX800 Base Station and A800-SIM.

1. Remove the MX800 Base Station top cover.
2. On the MX800 Base motherboard, set all dip switches and jumper links correctly. Refer to Section 4 Table 3 and Table 4. Note the selection for JMP17 as "3 Only". This means that you should hang the jumper just on pin 3.
3. The MX800 Base Station should be programmed and aligned in accordance with the MX800 Base Station service manual. Refer to this manual for more information.
4. When programming the MX800, ensure that the "RF Mode" is set to "Simplex" (as opposed to "Repeater"). This is for all bases, whether they be TTR's, TTL's, Links, End Site Links. This is because when the MX800 is used with the A800-SIM, the A800-SIM must control whether the MX800 repeats or not. Refer to Figure 1.

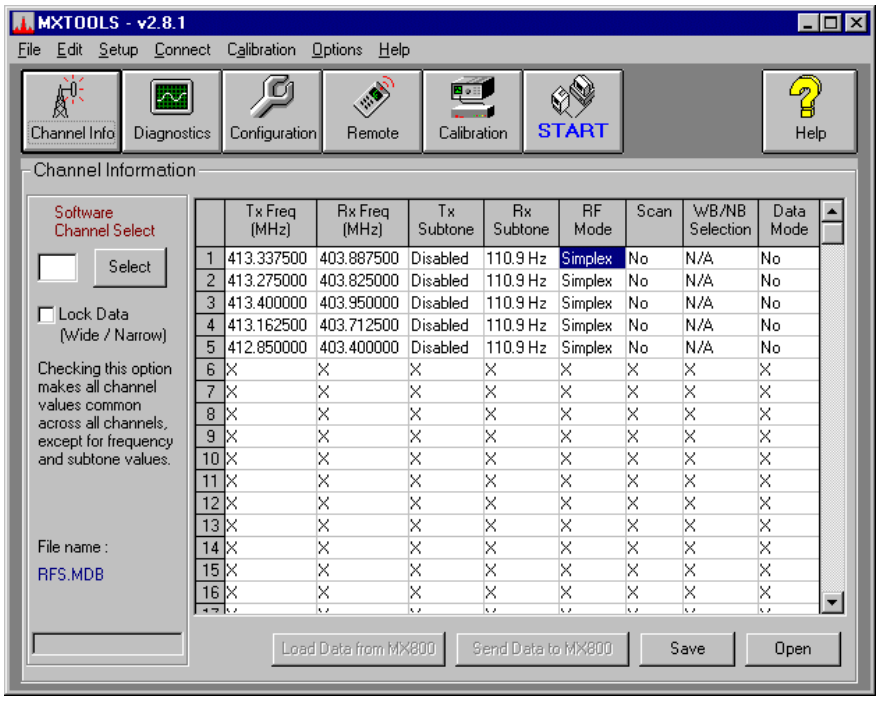

Figure 1

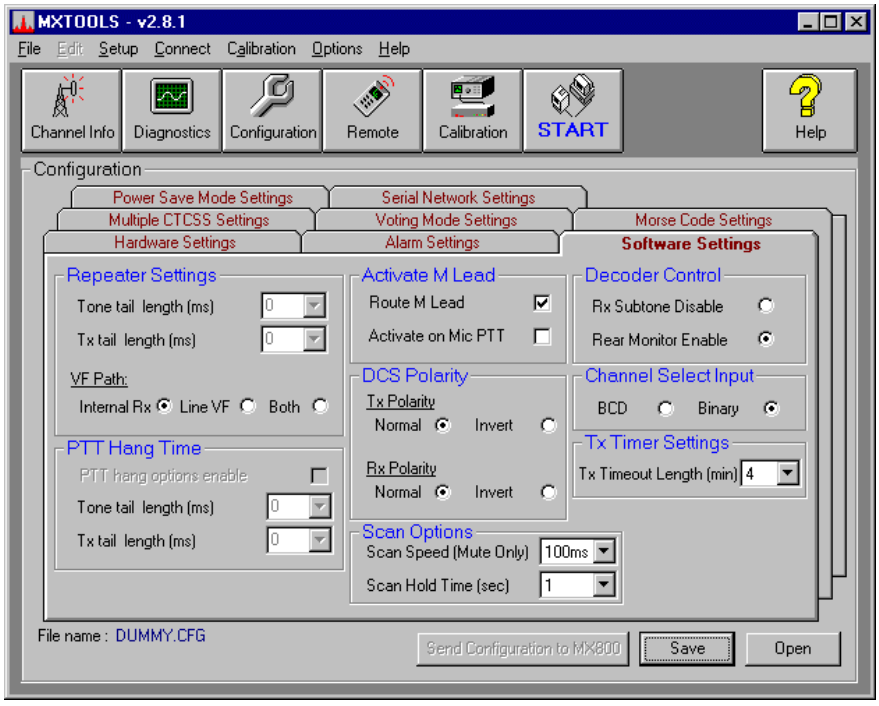

Figure 2

5. When setting the MX800 programming Configuration parameters, ensure that the TX Tail and Tone Tail are set to 0, and that Active M Lead is set to "Route M Lead". Refer to Figure 2.

6. On the MX800 motherboard, fit the A800-SIB board. The A800-SIB board should be mounted with the supplied double sided tape, and fixed to the MX800 Motherboard. Refer to Figure 3.
7. On the MX800 motherboard, remove the resistors R98 10K and R149 10E. Refer to Figure 3.
8. Refer to Table 2a. Note that Table 2 is only shown here as a reference as to the previous connection method (described in AN0011-01). Refer to Figure 3 for the location of each of the connection points. Where possible place silicon tubing over solder joints. Place cable ties around the wires the keep them tidy. The unused wires on the A800-SIB wiring loom can be removed from the board connector. Keep the removed wires in case they are required at a later date.

   The A800-SIB (V1.02) board conditions various signals and generates Live Tone (received CTCSS audio) for use with the A800-SIM. Furthermore the A800-SIB (V1.03+) adds CTCSS decoding. Refer to the A800-SIM Service Manual (AM8-SIM.pdf) for more information.

   Table 2 – A800-SIB (V1.02) Connections – Original V1.02 Configuration

Pin	Colour	MX800 Motherboard	Function
1	Red/Blue	IC27/1 (via beside)	+12 Volts
2	Yellow	IC27/2 (via beside)	Ground
4	Brown	IC27/2 (via beside)	INPUT1- Sets phase of DECIN
5	Blue	JMP17/1 (LOW)	GATEIN – Gate Signal In ***Note 1***
6	Yellow/Black	R98 (via beside)	DECIN – Decode Signal In
8	White	JMP17/2 (middle pin)	GATEOUT - Gate Signal Out
9	Pink	TR7/C (via beside)	DECOUT - Decode Signal Out
12	Red	C97+	Received CTCSS ‘Live Tone’
13	Green	RX DISC TP	Discriminator Audio In

   Table 2a – A800-SIB (V1.03+) Connections – NEW Configuration

Pin	Colour	MX800 Motherboard	Function
1	Red/Blue	IC27/1 (via beside)	+12 Volts
2	Yellow	IC27/2 (via beside)	Ground
5	Blue	JMP17/1 (LOW)	GATEIN – Gate Signal In ***Note 1***
8	White	JMP17/2 (middle pin)	GATEOUT - Gate Signal Out
9	Pink	TR7/C (via beside)	DECOUT - Decode Signal Out
12	Red	C97+	Received CTCSS ‘Live Tone’
13	Green	RX DISC TP	Discriminator Audio In

   Note 1 *: Fit a diode inline with the Blue wire between pin 5 of the A800-SIB and JMP17 pin 1, with cathode facing JMP17 pin 1. This stops the gate LED flickering.*
9. Fit a 0.1µF capacitor between JMP8 pins 1-2 on the MX-800 motherboard, if the cap is polarized then the +ve leg to pin 2 (move the link on pins 1-2 to pin 3 to get it out of the way). This stops the Tx frequency drifting 3-4khz of frequency due to loading down the TX DC-FM Input (CN1 pin 13)

10. **Upgrading from Original V1.02 Configuration to V1.03+ A800-SIB** - When upgrading an existing A800-SIB (V1.02) in the MX-800 to an A800-SIB (V1.03+), the A800-SIB can be used as the CTCSS decoder instead of the internal CTCSS. The only extra modifications required are to desolder the wire on the MX-800 that go to Pin 4(Brown) of the A800-SIB and also the wire that goes from Pin 6(Yellow/Black) of the A800-SIB. This enables the A800-SIB (V1.03+) to provide a Decode Out signal so that the decoding is now carried out by the A800-SIB instead of the onboard CTCSS decoder

    A800-SIB (V1.03+) in Links - The use of the A800-SIB (V1.03+) in the above way (see Table 2a) is recommended for use on Links. This is because link receivers have the opportunity of receiving the same CTCSS tone sequentially. As an example a link receiver may receive 'live' CTCSS from a mobile and then encoded tone from the link, both come in quick succession from the previous site in the linking system. The CTCSS De-encoder in the MX-800 has a habit of occasionally 'dropping' its Decode Out gate line during the transition from one CTCSS tone to another source of CTCSS. This could be due to the circuitry of the MX-800 CTCSS decoder decoding the transition of CTCSS tones as a valid phase shift for an RTB decode to occur and therefore mute very quickly. The A800-SIB (V1.03+) on the other hand will allow a phase shift without dropping its Decode Out line, therefore eliminating any initial 'audio chop' that may other wise occur in the mobile while voting.

    A800-SIB (V1.03+) in Repeaters - The A800-SIB (V1.03+) should also be used on Talk Through Repeaters (TTR) in the above way (see Table 2a).

3.2 A800-SIB Firmware Versions

Note: The firmware version of the A800-SIB is printed on a label on IC2 of the A800-SIB

Following is the firmware history:

Date	Version	Description
7/3/00	V1.00	Initial pre-release version
14/3/00	V1.01	Updated pre-release version
21/3/00	V1.02	Initial release version.
19/10/00	V1.03	Incorporates CTCSS decode functions. Note : the programmed CTCSS decode frequency is on a label on the A800-SIB
28/11/00	V1.04	Enhanced decode handling of switching transition between 2 like CTCSS tones from different sources.

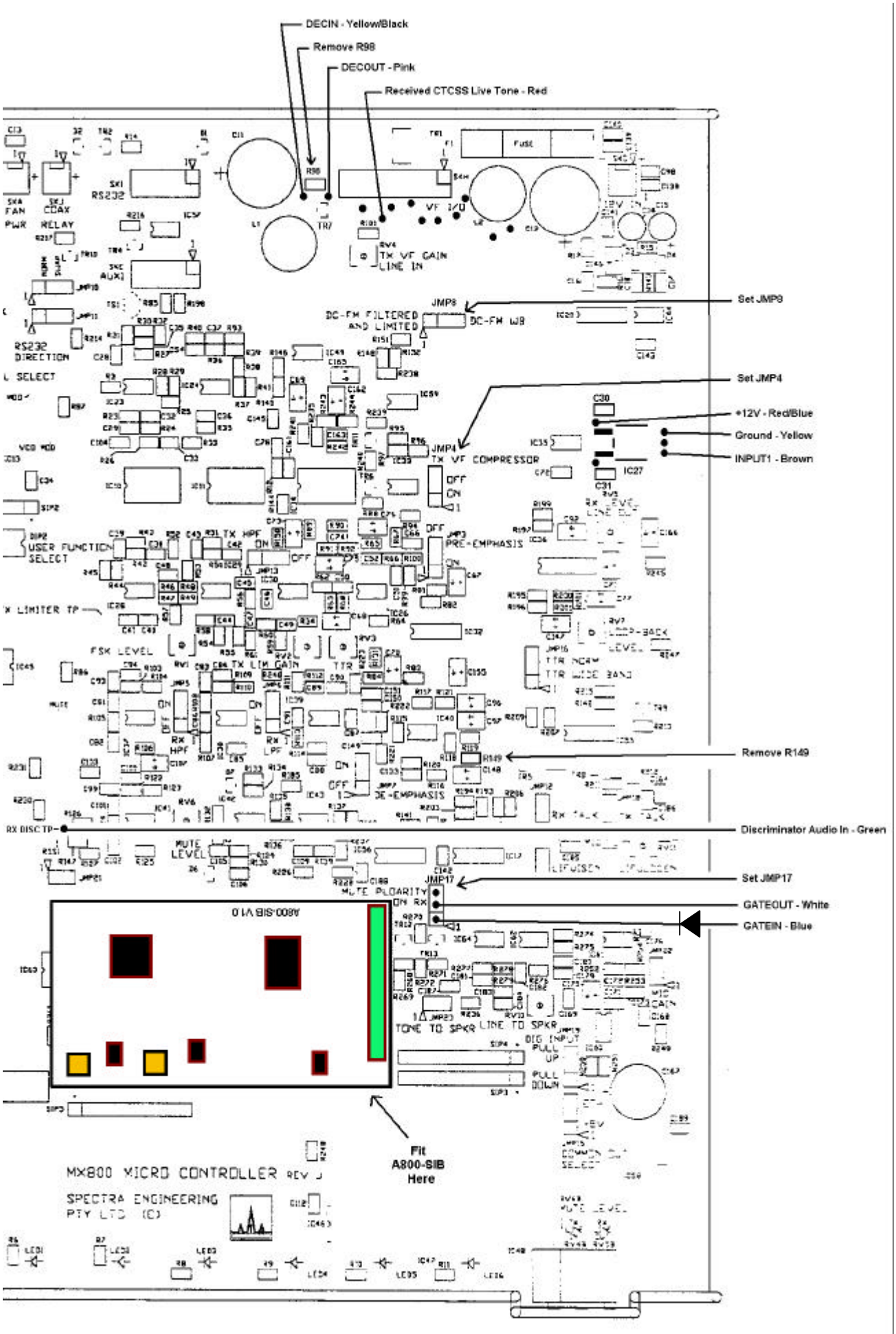
DECIN - Yellow/Black
Remove R98
DECOUT - Pink
Received CTCSS Live Tone - Red
Set JMP9
Set JMP4
+12V - Red/Blue
Ground - Yellow
INPUT1 - Brown
Remove R149
Discriminator Audio In - Green
Set JMP17
GATEOUT - White
GATEIN - Blue
Fit A800-SIB Here
MX800 MICRO CONTROLLER REV J
SPECTRA ENGINEERING PTY LTD (C)

Figure 3

3.3 A800-SIM

In the A800-SIM, ensure the following.

1. Configure the A800-SIM as standard by following the AM8-SIM.pdf Service Manual, and any other associated application notes that may be required for the system.
2. Ensure that the PTT Output modification is completed, as detailed in the A800-SIM Service Manual (AM8-SIM.pdf) version 02-02-00 or later, the Section 6.8 'Improved PTT Output Performance'. This modification is to ensure the A800-SIM reliably keys the MX800 Base Station.

Note that this change has been implemented as standard in the A800-SIM Serial Number 3866231 onwards.

3. When configuring the A800-SIM, do not fit any of the ENC_TONE_CTCSS or RX_AF_TONE links for any of the ports that MX800 Bases are to be connected. The setting of these links is not required. These are links LK51 to LK58 for ENC_TONE_CTCSS and LK61 to LK68 for RX_AF_TONE. Refer to AM8-SIM.pdf Service Manual for more information.

3.3 Cabling

Make up the MX800 to A800-SIM cable as detailed in Section 5 Cabling.

3.4 Setup

To setup the MX800 Base station with the A800-SIM, complete the following steps.

1. Connect the MX800 Base Station to the A800-SIM.
2. Follow the setup detailed in the A800-SIM Service Manual (AM8-SIM.pdf) Section 5 'Installation, Set up and Adjustment'. The adjustment of the MX800 Base Station should be done in the same manor as for a T800 Base Station even for the CTCSS Tone level adjustment.

4 MX800 Links and Dip Switches

In the MX800 Base station, set the following jumper links and switches.

Table 3 – MX800 microcontroller

Link	Setting	Description
JMP4	2-3	Disables the COMPRESSOR for the TX audio.
JMP8	3 Only	TX DC-FM. Enable a direct connection to the TX modulator. Correct configuration for external TX CTCSS encode input. Note : A 0.1µF cap will be fitted between pins 1-2.
JMP17	3 Only	Mute Output polarity. With the setup detailed here, the output polarity is fixed by the A800-SIB

Note: All other MX800 jumper links should be set to default. There are too many jumpers to individually list here. Refer to the MX800 service manual for a complete list.

Table 4 – MX800 Motherboard Dip Switch Settings – Dip Switch SW2 (6 Way Dip Switch)

Switch	Setting	Description
1	OFF	PTT Delay – Off disables the 50mS delay of PTT
2	Depends →	Simplex Enable – ON for End Site Link, OFF for all other bases
3	Depends →	TX Timer. Sets programmable TX time out timer on. For more information, refer to the MX800 service manual. The TX Timer should be set as required
4	Depends →	Repeater Enable – Enables repeater function. OFF for End Site Link, ON for all other bases
5	ON	TX VCO on continuously – Switches TX VCO on continuously. Set to ON normally. Under rare circumstances it may be desirable to switch this function off. An example of this could be where a TTR is located in a town & the background radiation from the TTR will be received by the local mobile radios.
6	OFF	Scan

5 Cabling

Make up a 1m Y Cable as per Table 5, Table 6, and Figure 4. Note that if a 1m cable is not enough to run between the MX800 Base and the A800-SIM, then the cable should be made longer. The parts required for this cable can be found in Section 2 Parts. The solder connections to all connectors should be insulated with 10mm of 1.5mm silicon tubing. The drain (braid) wire from each cable should be insulted at the connector end with a suitable length of 1.5mm silicon tubing.

The three DB15 male ends of the cable should be appropriately labelled as either “RX Port”, “TX Port”, or “MX800”.

Table 5 RX Port Cable

MX800 CN1 DB15M			A800-SIM RX Port DB15M		
Description	**Pin**	**Wire Colour**	**Pin**	**Label**	**Description**
RECEIVER AUDIO 5S	3	Green	7	RXAF_TONE	Received CTCSS Audio (Live Tone) into SIM
O/C ALARM O/P#1	6	Yellow	12	RXDEC	CTCSS Decode + Gate into SIM
ANALOG EARTH	10	Braid	15	GND	Ground
RX MUTE	14	Red	11	RXGATE	Carrier Gate into SIM
RX AUDIO O/P	15	Blue	1	RXAF	RX Audio into SIM

Table 6 TX Port Cable

MX800 CN1 DB15M			A800-SIM TX Port DB15M		
Description	**Pin**	**Wire Colour**	**Pin**	**Label**	**Description**
TX AUDIO I/P	9	Blue	1	TXAF	TX Audio from SIM
ANALOG EARTH	10	Braid	15	GND	Ground
TX PTT IN	12	Red	13	TXKEY	PTT Signal from SIM
TX DC-FM INPUT	13	Green	8	ENC_TONE	CTCSS tone from SIM

A800-SIM to MX800 Base Connection

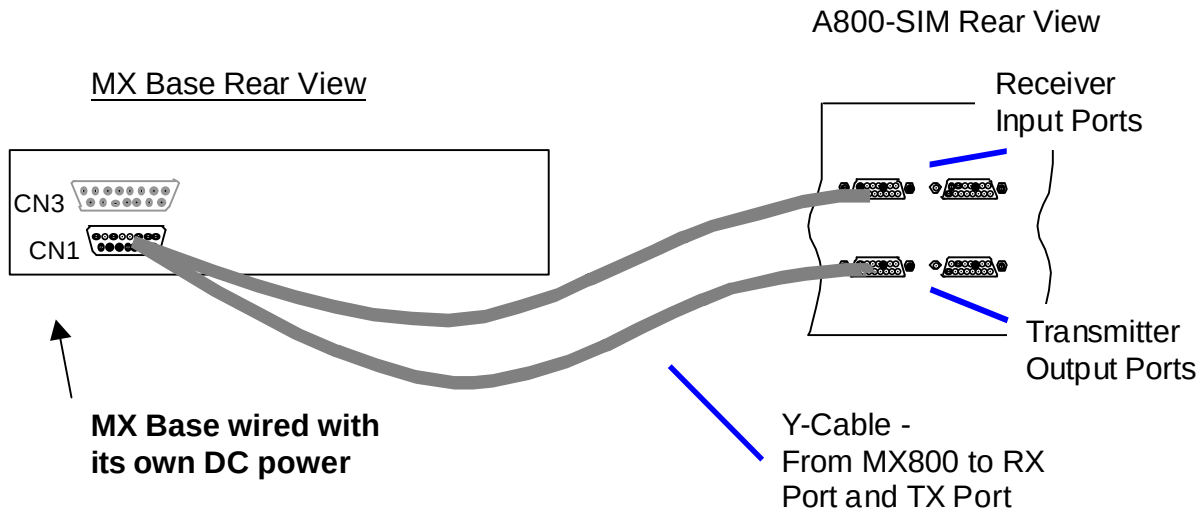

Figure 4