Technical Support

TECHNICAL NOTE

Technical Note TN-887b-AN

TM8100
Cross-Band Operation

28 June 2004

(Updated 28 June 2005)

Applicability

This technical note explains how to configure two TM8100 radios for Audio Linking operation either as Back-to-Back or Cross-Band Repeater.

1. Introduction

What is Cross-Band repeating

Back-to-Back or Cross-band repeating provides a relatively inexpensive means for extending the range of a system and to the terminals used.

A repeater allows stations to communicate that ordinarily would not be able to do so because of the frequencies used and the distance or terrain between them. This is also the case with back-to-back or cross-band repeating.

A cross-band repeater is similar in function to a standard repeater, but for the different frequencies used. Voice signals that one TM8100 receives on its input frequency are automatically retransmitted on the other TM8100's output frequency.

This can provide simplex-to-simplex linking or repeater-to-simplex. It cannot easily provide repeater-to-repeater linking, as it does not have the repeater tail lockout feature required.

What is Back-to-Back?

Back-to-back literally means having two radio units audio lines connected together. Radio A's receiver keys radio B's transmitter and vice versa. A normal back-to back repeater usually uses frequencies within the same band. A Cross-Band back-to-back repeater uses frequencies in different bands (e.g. UHF to VHF)

Things to consider

If you are unfamiliar with how repeater setups are installed and how they operate, the points below will help guide you in the right direction.

- Antenna separation: How far to separate the antennas
- Notch Filtering: Is it required?
- Tail Time / Delay: Critical for repeater linking

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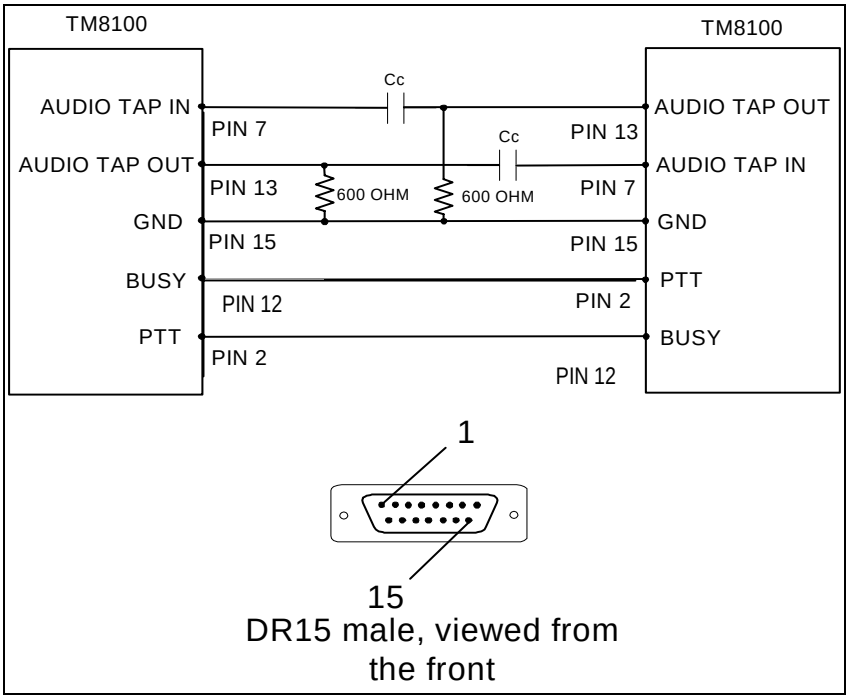
2. Interfacing

Configuring the Cross-Band Interconnect Cable

Configure the Cross-Band interconnect cable as indicated in the diagram below.



For voice linking applications the value of Cc should be at least 100ηF.
For data linking applications the recommended value for Cc is 4.7μF.
In either case the capacitor needs to be non-polarised.

The simplest way to create a 600-Ohm resistor is by using two 1K2Ω resistors in parallel.

The resistor(s) and capacitor can then be mounted inside each DB-15 cover.

TMAA04-04

Manufactured by TEL this cable provides the connections defined in this Technical Note along with the R/C network for voice applications. The SMD capacitor can be changed for a 4.7μF for data interfacing.
This cable also has provisions for a MAX232 IC and 78L05 regulator for other RS-232 applications instead.

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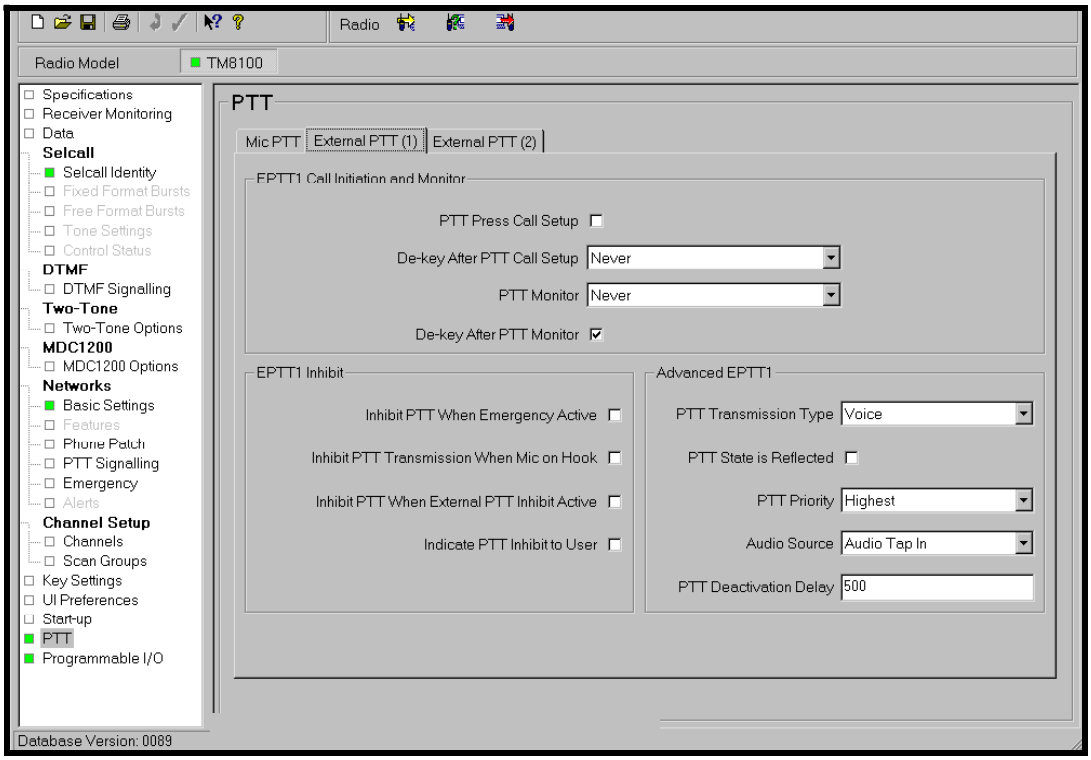
3. Radio Programming

Programming Instructions

After defining the separate radio's Transmit and Receive channel parameters, the following settings need to be programmed to enable cross-band operation:

In the PC Application menu:
PTT > External PTT(1) > Advanced EPTT1

- PTT Transmission Type should be Voice.
- PTT Priority should be Highest.
  Note: PTT or EPTT(2) priority may need changing.
- Audio Source should be Audio Tap In.



Repeater Transmit Tail

(Prog App v2.90 and Firmware v2.09 onwards)

If desired the Transmitter can have a 'tail' by defining the PTT Deactivation Delay time up to 1000ms (see above). This duration is the same as 'holding PTT in' so any signalling (such as CTCSS) is still present.
The CTCSS can be configured using the Networks > Basic Settings > Subaudible Signalling tab.

- Leave the Reverse Tone Burst Duration at about 130ms to ensure the mobile receiving radios mute promptly.
- If desired, set a ***further*** transmitter tail by setting the Lead-Out Delay field for any duration up to 1000ms
  NOTE: This duration does **not** encode any subaudible signalling.

The same functionality can be attained using the DCS fields

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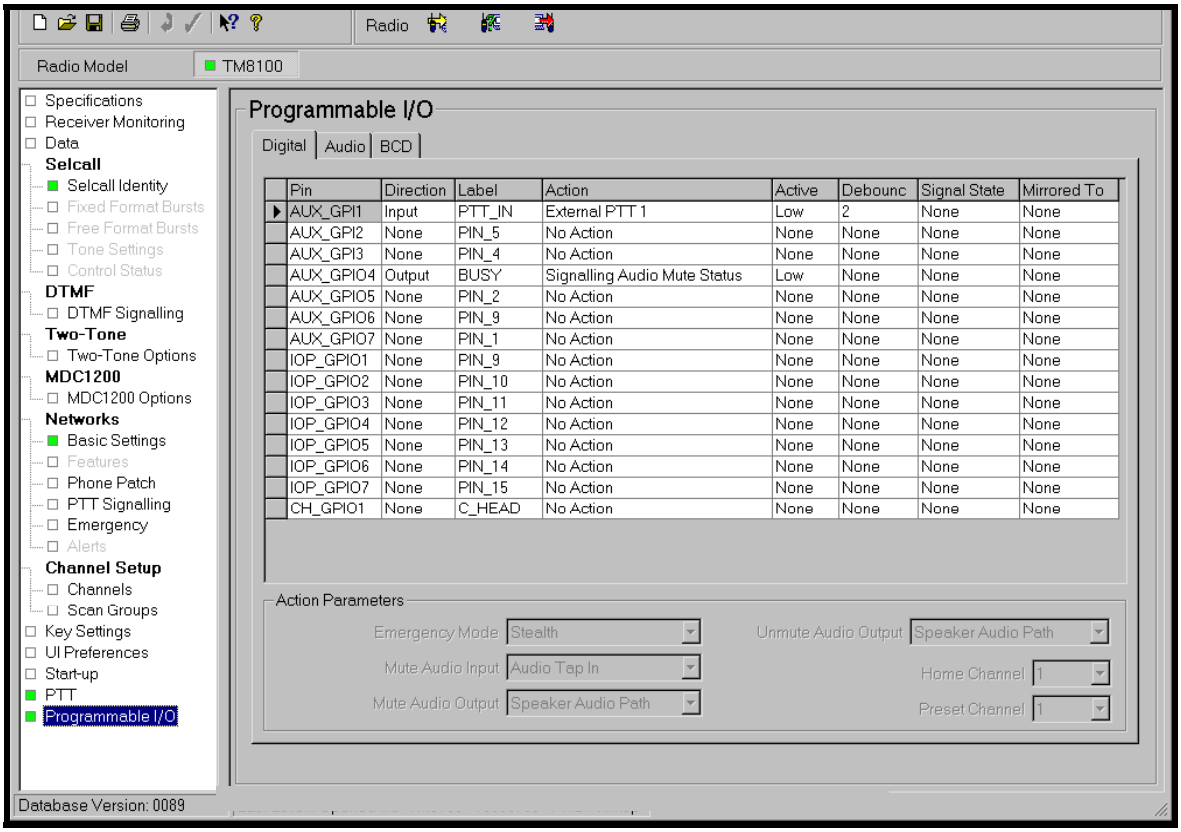
Programmable I/O
Digital Tab

Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored To
AUX_GPI1	**Input**	**PTT_IN**	**External PTT1**	**Low**	**2**	None	None
AUX_GPIO5	**Output**	**BUSY**	**Signalling Audio Mute Status**	**Low**	None	None	None



Repeater Transmit Tail

If the transmitter requires a 'tail' and uses CTCSS this can be configured using the Networks > Basic Settings > Subaudible Signalling tab.

- Leave the Reverse Tone Burst Duration at about 130ms to ensure the mobile receiving radios mute promptly.
- Set a transmitter tail by setting the Lead-Out Delay field for any duration up to 1000ms.
  NOTE: This duration does not encode any subaudible signalling.

The same functionality can be attained using the DCS fields.

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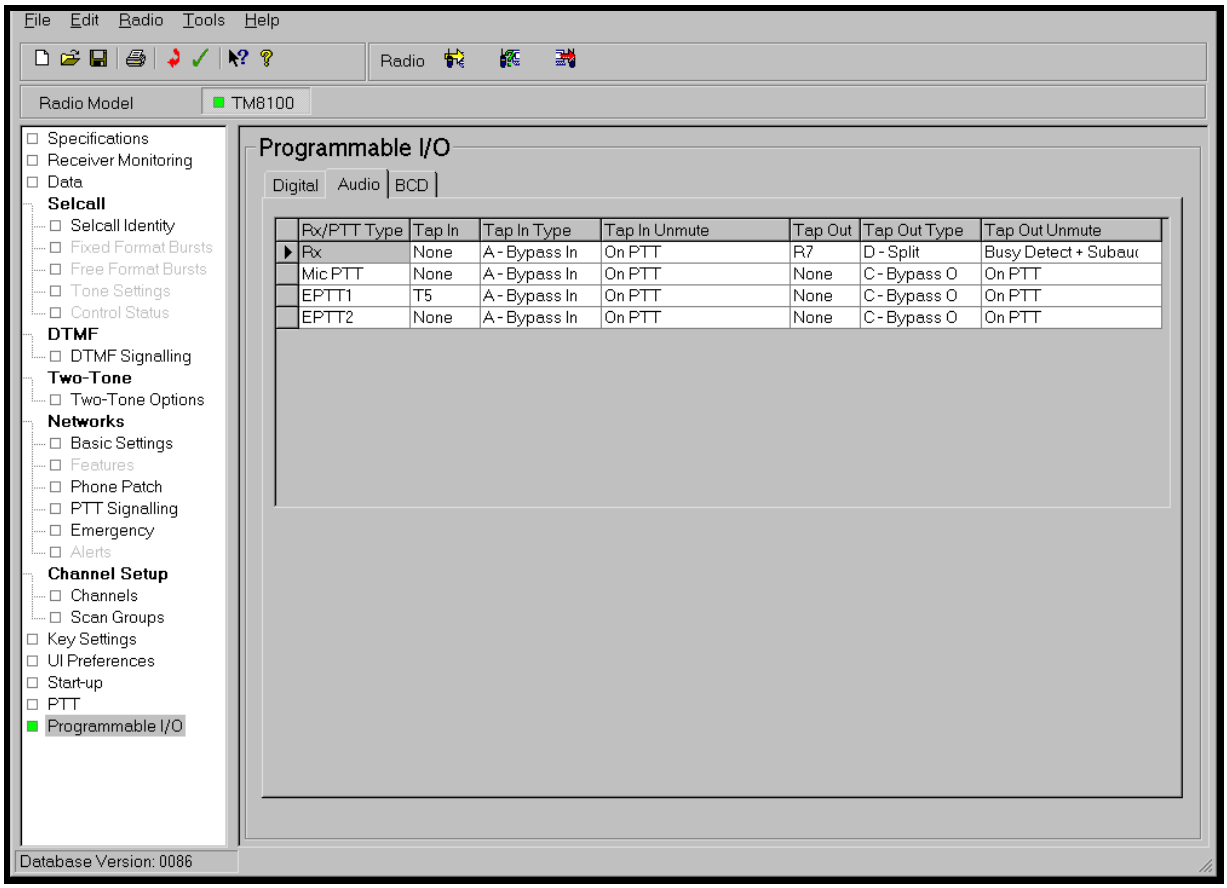
Programmable I/O
Audio Tab

Rx/PTT Type	Tap In	Tap In Type	Tap In Unmute	Tap Out	Tap Out Type	Tap Out Unmute
Rx	None	A-Bypass In	On PTT	**R7**	**D-Split**	**Busy Detect + Subaud**
EPTT1	**T5**	A-Bypass In	On PTT	None	C-Bypass Out	On PTT



Operational Testing

- Inject into the receiving radio an on-channel RF signal of –70 dBm with a 1 KHz tone and the deviation set to either 3 KHz for a Wideband channel or 1.5 KHz for a Narrowband channel.
- The transmitting radio's deviation should be:
  ±3KHz (± 200Hz) on a 25KHz Wideband channel or
  ±1.5KHz (± 200Hz) on a 12.5KHz Narrowband channel.

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Compliance Issues	If the link is a fixed site, RF compliance may need to be obtained and / or monies to be paid to regulatory bodies.
CSO Instruction	Please pass this information onto the field support technicians, technical support engineers and appropriate dealers.

4. Issuing Authority

Name and Position of Issuing Officer	Barry Crates Technical Support Team Leader - Terminals
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Document History

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Modified to TEL TN format for publishing to global audience.	28 June 2004	BLC
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