Technical Support
TECHNICAL NOTE

TECHNICAL NOTE TN-1062

Interfacing the TBA0M0x Tone Remote to the TB7100 Base Station

17 August 2005

Applicability

TBA0M0x tone remote when used with a TB7100 base station.

1. Introduction

The TBA0M0x tone remote can be used with the TB7100 base station. Instructions explaining how to configure each unit are not currently included in the TBA0M0x manual. The manual will be updated but until then, this technical note is an interim solution and contains the information required to correctly interface the two modules for standard operation.

2. Interfacing the TBA0M0x with the TB7100

The configuration of the system is best achieved in stages:
1. Cable connection between TBA0M0x and TB7100.
2. Configuring links on the TB7100 system interface.
3. TB7100 programming.
4. TBA0M0x programming.
5. Audio level setup.

Cable connection between TBA0M0x and TB7100

The TBA0M0x interface connector is directly compatible with the TB8000, but **not** with the TB7100. A custom cable is required between the TBA0M0x and the TB7100. The table on page 2 shows the pin assignments for standard operation.

Most of the TBA0M0x and TB7100 input/outputs are also available on the TBA0M0x Aux connector. For systems with other external equipment requiring connection to the Aux connector, please contact Tait Technical Support.

TBA0M0x to TB7100 pin assignments. Note: The highlighted (grey) rows are connections that are required.				
TBA0M0x Connector		**TB7100 System Connector**		**Comment**
Pin	**Function**	**Pin**	**Function**	
1	Rx in +	1	Rx Line Output +	Optional. Make this connection if you require this output presented on the TBA0M0x Aux connector
2	Rx in -	4	Rx Line Output -	Optional. Make this connection if you require this output presented on the TBA0M0x Aux connector
3	Rx audio	24	Rx audio output	
4	Ground			Not required
5	Tx audio	11	Tx audio input	Optional. Make this connection if you require this input presented on the TBA0M0x Aux connector
6	Tx out +	5	Tx Line Input +	
7	Tx out -	8	Tx line Input –	
8	RSSI	9	RSSI	Optional. Make this connection if voting is required
9	Rx gate	14	Rx Gate	
10	Tx key	15	Tx Key	
11	Alarm Input A	10	Tx digital in/out 1	Optional. Make this connection if a TB7100 event/status (output) is required to trigger a TBA0M0x alarm. See the TB7100 installation and operation manual for details.
12	Alarm Input B	19	Rx digital in/out 1	Optional. Make this connection if a TB7100 event/status (output) is required to trigger a TBA0M0x alarm. See the TB7100 installation and operation manual for details.
13	+13.8v	25	13.8v output	
14	Channel select 0	2	Tx/Rx Digital in 1	Optional. Make this connection if selection of up to 2 channels is required.
15	Channel select 1	3	Tx/Rx Digital in 2	Optional. Make this connection if selection of up to 4 channels is required.
16	Channel select 2	6	Tx/Rx Digital in 3	Optional. Make this connection if selection of up to 8 channels is required.
17	Channel select 3	7	Tx/Rx Digital in 4	Optional. Make this connection if selection of up to 16 channels is required.
18	Channel Select 4	19	Rx digital in/out 1	Optional. Make this connection if selection of up to 32 channels is required.
19	Channel Select 5			Not a standard connection although could be used for one of the TB7100 digital inputs. See the TB7100 installation and operation manual.
20	Channel Select 6			Not a standard connection although could be used for one of the TB7100 digital inputs. See the TB7100 installation and operation manual.
21	Auxiliary Output 1	12	Tx digital in/out 2	Optional. Make this connection if some TB7100 action is required to be triggered by the TBA0M0x/dispatch console. See the TB7100 installation and operation manual.
22	Auxiliary Output 0	22	Rx digital in/out 2	Optional. Make this connection if some TB7100 action is required to be triggered by the TBA0M0x/dispatch console. See the TB7100 installation and operation manual.
23	CTCSS Defeat			Not a standard connection although could be used as a TB7100 digital input. See the TB7100 installation and operation manual.
24	Coax relay driver	23	Digital output/Tx relay	Not required for tone remote operation. Make this connection if you require this TB7100 output presented on the TBA0M0x Aux connector
25	Ground	13	Ground	

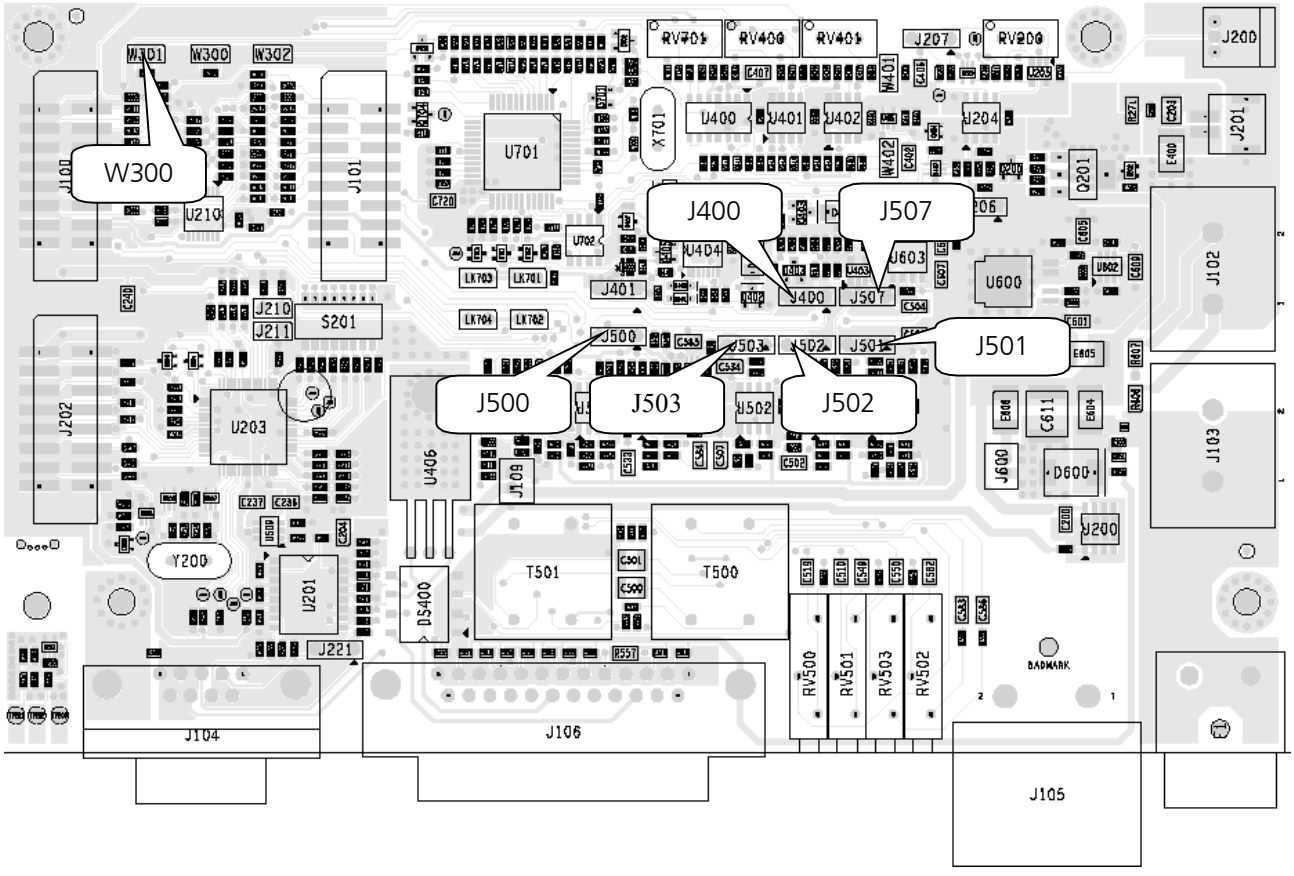
Configuring links on the TB7100 system interface board.

The TB7100 system interface board, found inside the TB7100, has link settings which allow the configuration of audio paths, control signals, digital I/O, data, and fan behaviour.

For TBA0M0x tone remote operation with the TB7100 no change is required to the default factory positions of these links.

The table below shows the relevant links and their required positions

TB7100 System Interface links			
Link	**Position**	**Function**	**Factory default**
J400	1-2	External PTT signal to transmitter	Yes
J500	2-3	De-emphasis (Line out from Rx)	Yes
J501	2-3	Pre-emphasis (Line In to Tx)	Yes
J502	1-2	External audio line in to Tx	Yes
J503	2-3	Rx Audio sent to balanced and unbalanced external outputs	Yes
J507	2-3	Tx audio directed to tap point ADIO_TAP_IN	Yes
W300	1-2	Optional. When fitted, Tx digital in/out 1 is connected to Rx digital in/out 1, allowing both modules to respond to the same digital input. Could be used to provide channel select line 4 for the TBA0M0x.	Yes



3. TB7100 Programming

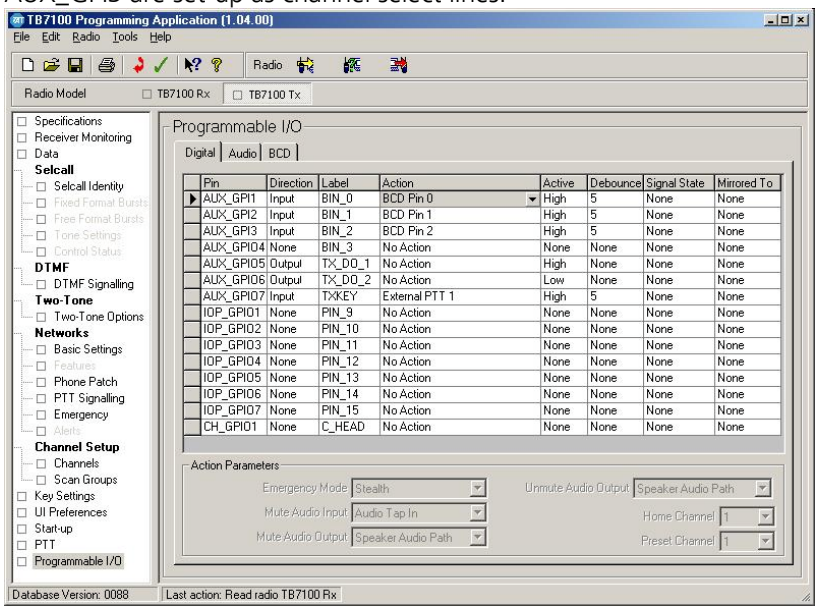
The following describes how to program the TB7100 for operation with the tone remote in particular the channel select functionality. The default settings for the Rx Gate and Tx Key control lines will work with the TBA0M0x. Note - each TB7100 module (Tx and Rx) will need to be programmed.

From within the TB7100 programming application navigate to the Programmable I/O form. The form consists of a table showing all the digital I/O lines. There are three tabs along the top of the table. The signal lines available for channel selection are the first five pins listed in the table, namely; AUX_GPI1 to AUX_GPI3, AUX_GPIO4 and AUX_GPIO5. Depending on the particular system configuration some or all of these signal lines may be used for channel select however the lines must be used sequentially and must start with AUX_GPI1. Additionally, when AUX_GPIO5 is used (if 32 channel select is required), the Link W300 must be fitted on the system interface board. See the previous section (2.2).

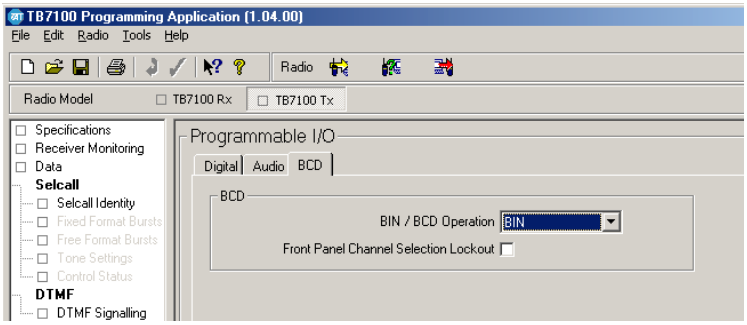
Steps for setting up channel selection

1. Determine the number of signal lines required. Note that the TBA0M0x uses binary format for channel select.
2. Set the signal direction of each line to INPUT
3. Label the signal lines as desired
4. Click on the ACTION field and use the drop-down menu to select "BCD Pin". Use "BCD Pin 0" for signal line AUX_GPI1 and "BCD Pin 1" for AUX_GPI2 and so on.
5. Set the logic of each line to "High"
6. Set the Debounce on each line to 5ms

The following screen shot shows an example in which AUX_GPI1 to AUX_GPI3 are set-up as channel select lines.



7. Click on the tab at the top of the table labelled "BCD"
8. Use the drop down menu for BCD/BIN Operation and select "BIN"


TB7100 Programming Application (1.04.00)
File Edit Radio Tools Help
Radio
Radio Model
TB7100 Rx
TB7100 Tx
Specifications
Receiver Monitoring
Data
Selcall
Selcall Identity
Fixed Format Bursts
Free Format Bursts
Tone Settings
Control Status
DTMF
DTMF Signalling
Programmable I/O
Digital
Audio
BCD
BCD
BIN / BCD Operation
BIN
Front Panel Channel Selection Lockout

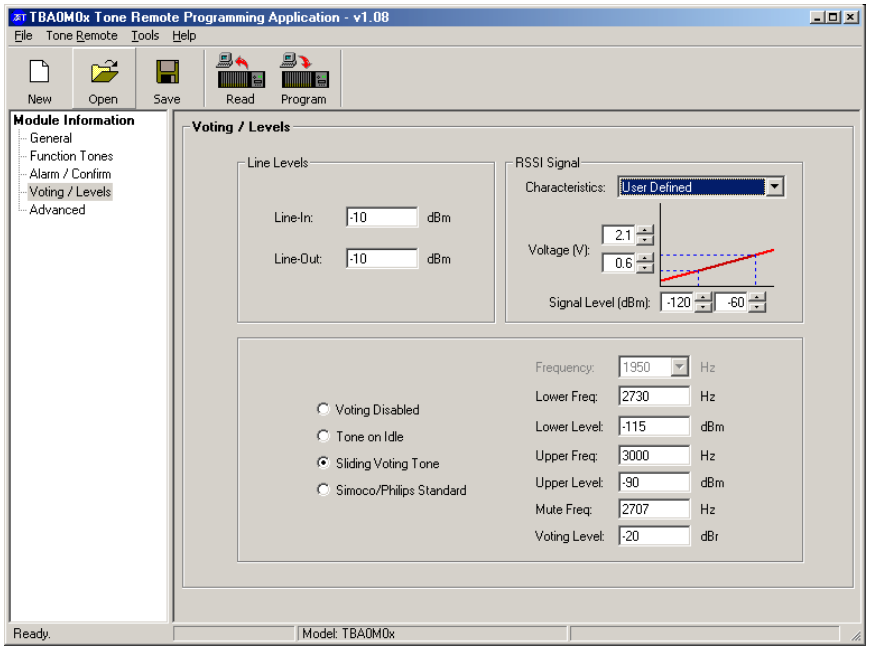
4. TBA0M0x Programming

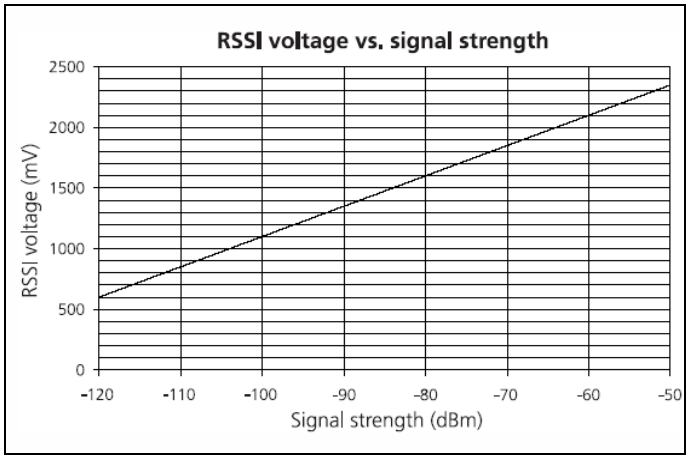
This section describes how to program the tone remote settings specifically required for operation with the TB7100.

The two settings that must to be properly set are the channel select output characteristic and the RSSI signal characteristic (required for voting).

1. The channel select output option is found on the first form of the TBA0M0x programming application (General Settings). Ensure that the "Use Momentary Channel Select" option is **not** checked.

2. The RSSI signal characteristic only needs to be adjusted if sliding tone voting is used (or the Simoco/Philips standard). The characteristic is found on the Voting/Levels form of the programming application. Use the drop down menu from the "Characteristic" field and select "User Defined". The curve can now be adjusted using the Voltage and Signal Level adjustments, so that the tone remote RSSI curve matches the TB7100 curve.



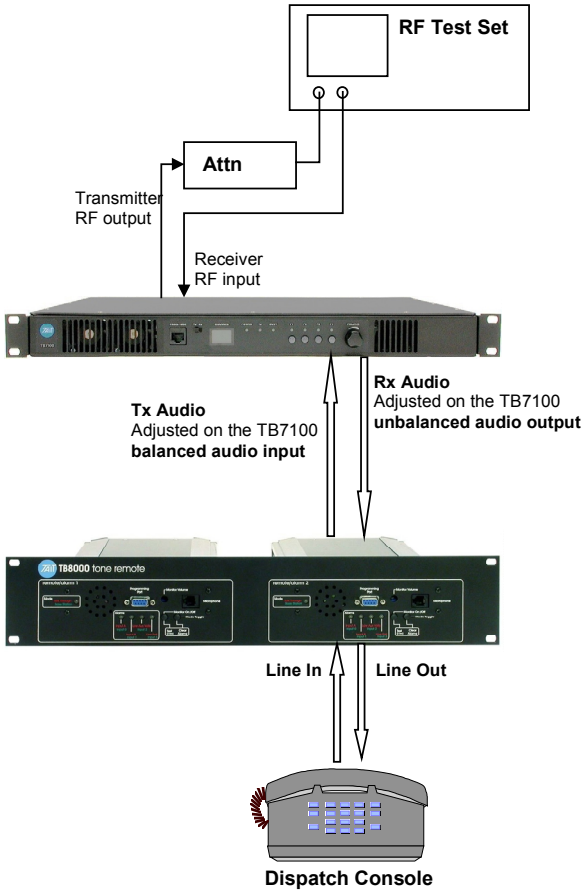


RF Signal Strength	RSSI Voltage
-120dBm	0.6V
-100dBm	1.1V
-60dBm	2.1V
Slope = 25mV/dB	

5. Audio Level Setup

This section describes only how to set the audio levels between the TBA0M0x tone remote and the TB7100. Information about setting the TBA0M0x line levels (to and from the dispatch console) is available in the TBA0M0x service manual.

Both the Tx audio and the Rx audio levels are adjusted on the back of the TB7100. Note – the TB7100 levels must be set before the TBA0M0x line levels are adjusted.



Tx Audio Adjustment

Setup the equipment as shown in the diagram above.

1. Use the test set to monitor the TB7100 transmitter deviation. Set the de-emphasis filter **ON**.

2. Set the TBA0M0x into test tone mode by pressing the Monitor and Mode toggle buttons on the front, simultaneously. For more

information see the TBA0M0x service manual section 4.2.3 - Test Modes. Note that the test mode will time-out after 1 minute. Reactivate if necessary.

3. While monitoring the transmitter deviation adjust the Tx Audio level using BAL IN (RV500) on the TB7100 rear panel, for 60% of maximum system deviation. Max system deviation will depend on the channel spacing used - see the table below.

Channel Spacing	Equivalent Max Tx Deviation (Hz)	60% of Max Tx Deviation (Hz)
12.5kHz Narrow Band	2500	1500
20kHz Mid Band	4000	2400
25kHz Wide Band	5000	3000

Setup the equipment as shown in the previous page.

Rx Audio Adjustment

Method 1

1. Use the test set in duplex mode to generate an on-channel signal to open the mute the TB7100 receiver. Modulate the RF carrier with 1020Hz tone at 60% full system deviation (adding CTCSS tone if necessary).

2. Set the TBA0M0x into talk-through mode by pressing the mode toggle button on the front. This will key the TB7100 transmitter.

3. While monitoring the transmitter deviation on the test set (with the de-emphasis filter OFF) adjust the Rx Audio level using UNBAL OUT (RV502) on the TB7100 rear panel, for 60% of maximum system deviation. Maximum system deviation will depend on the channel spacing used. See the table above.

Method 2

1. Use the test set in duplex mode to generate an on-channel signal to open the mute the TB7100 receiver. Modulate the RF carrier with 1020Hz tone at 60% full system deviation (adding CTCSS tone if necessary).

2. Measure Pin 24 of the TB7100 system interface connector with an oscilloscope (or a high impedance multimeter).

3. Using UNBAL OUT (RV502) on the TB7100 rear panel adjust the Rx audio level until 230mV$_{RMS}$ (650mVpp) is measured.

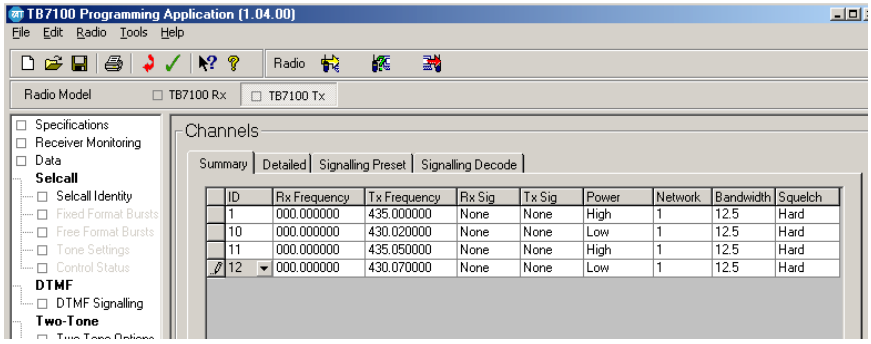
CAUTION: The Rx audio level must not exceed 230mV$_{RMS}$ (650mVpp) as specified in this procedure. This will ensure that the actual TBA0M0x line output level corresponds to the programmed value and thus ensures levels do not exceed the specifications of the leased line.

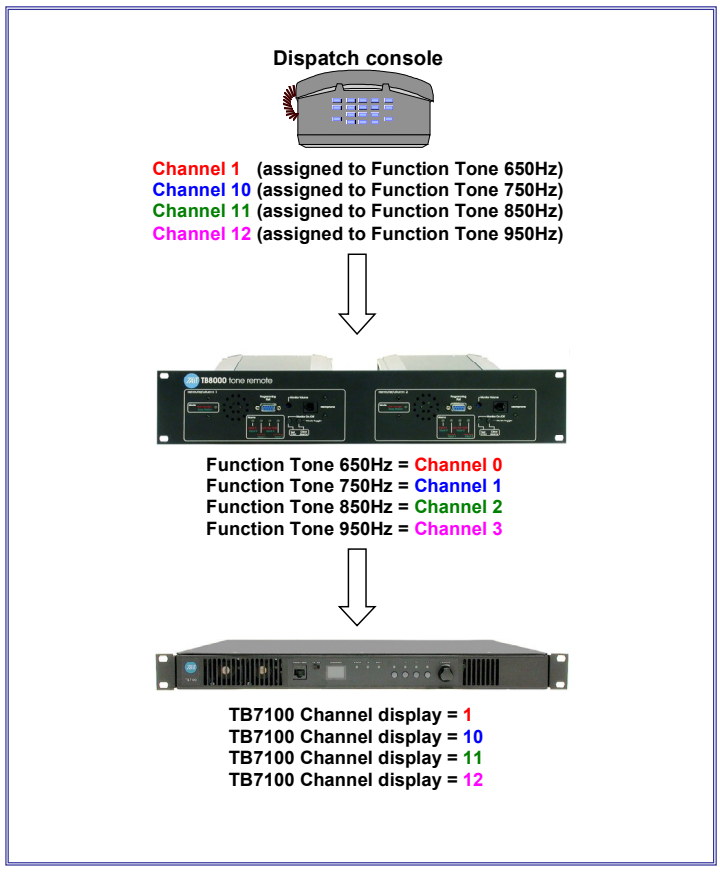
6. Channel Selection

Channel selection using external signal lines (BCD or binary) selects a channel number corresponding to the record number in the channel table - **NOT** the channel ID. That is, if channel 4 is selected using the tone remote the actual channel selected will be the 4th record in the channel table. The front panel channel number displayed will be the channel ID.

If it is required that the channel displayed reflects the binary channel number selected by the tone remote then ensure that the TB7100 channel ID's are sequential and start at channel 0 (whether or not channel 0 is actually used).

Alternatively the channels programmed into the tone remote can be set so that the dispatch console channel select matches the TB7100 channel display. For example, based on the channel table shown below, the dispatch console and the TB7100 can be programmed with the same channel numbers but because the binary channel select is based on the channel record in the table, the tone remote is programmed for record numbers 0-3. See below.





7. Issuing Authority

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Distribution Level	Associate		
Document History	Original Release	16 August 2005	JN