Technical
Support
TECHNICAL NOTE

TECHNICAL NOTE TN-1062

Interfacing the TBA0M0x Tone Remote to the TB7100 Base Station

30 May 2006

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
A custom cable is required to connect the TBA0M0x with the TB7100. This cable is known as the TBBA04-01 (Interconnect Cable for TBA0M0X Tone Remote to TB7100). The pin assignments for the cable are shown in Table 1 on the next page.

TBA0M0x connection		TB7100 connection		Comment
Pin	Function	Pin	Function	
1	Rx in +	1	Rx Line Output +	Balanced 600Ω output from the TB7100. Not used by the TBA0M0x but can be routed to the TBA0M0x Aux Connector.
2	Rx in -	4	Rx Line Output -	
3	Rx audio	24	Rx audio output	
4	Ground			No connection
5	Tx audio	11	Tx audio input	High Z unbalanced input to the TB7100. Direct connection from TBA0M0x Aux connector (Pin 5)
6	Tx out +	5	Tx Line Input +	
7	Tx out -	8	Tx line Input –	
8	RSSI	9	RSSI	
9	Rx gate	14	Rx Gate	
10	Tx key	15	Tx Key	
11	Alarm Input A	12	Tx digital in/out 2	A TB7100 TX event/status (output) can be used to trigger a TBA0M0x alarm.
12	Alarm Input B	22	Rx digital in/out 2	A TB7100 RX event/status (output) can be used to trigger a TBA0M0x alarm.
13	+13.8v	25	13.8v output	
14	Channel select 0	2	Tx/Rx Digital in 1	
15	Channel select 1	3	Tx/Rx Digital in 2	
16	Channel select 2	6	Tx/Rx Digital in 3	
17	Channel select 3	7	Tx/Rx Digital in 4	
18	Channel Select 4	19	Rx digital in/out 1	Requires link W300 on the TB7100 System Interface Board to be fitted in the factory default position (position 1-2)
19	Channel Select 5			No connection
20	Channel Select 6			No connection
21	Auxiliary Output 1			No connection
22	Auxiliary Output 0			No connection
23	CTCSS Defeat			No connection
24	Coax relay driver	23	Digital output/Tx relay	This TB7100 output is presented on the TBA0M0x Aux connector (Pin 2)
25	Ground	13	Ground	

Table 1. Pin assignments of the TBBA04-01.

If an alternative configuration of the cable is required contact Tait Technical Support.

Note: 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.

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 AUDIO_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
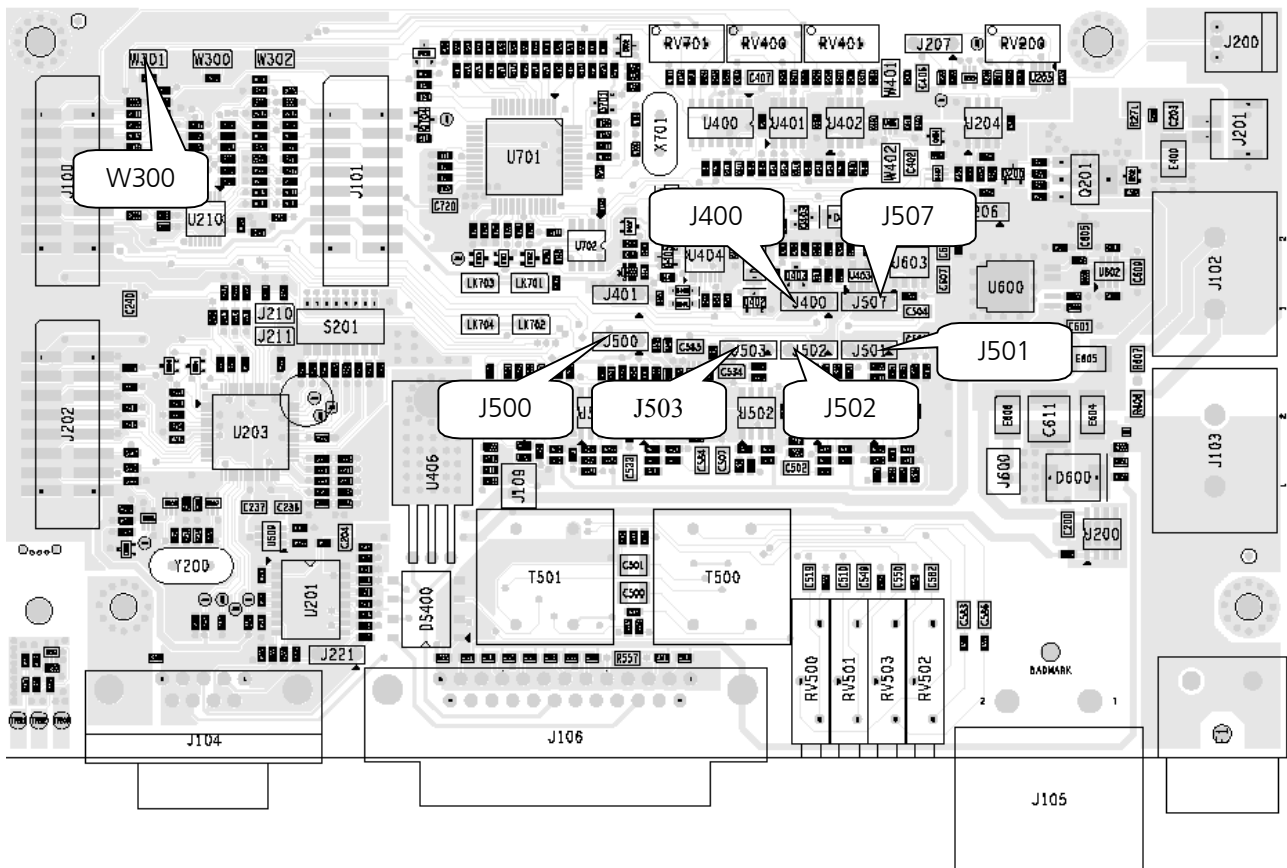
3.   TB7100 Programming

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.
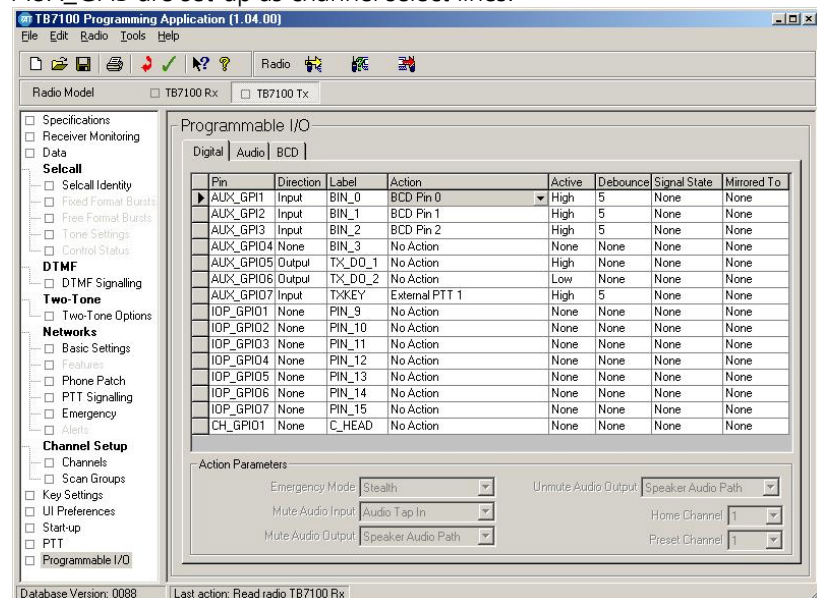
7. Click on the tab at the top of the table labelled "BCD"
8. Use the drop down menu for BCD/BIN Operation and select "BIN"
9. Use the drop-down menu for BCD Channel Selection and select "Channel ID"
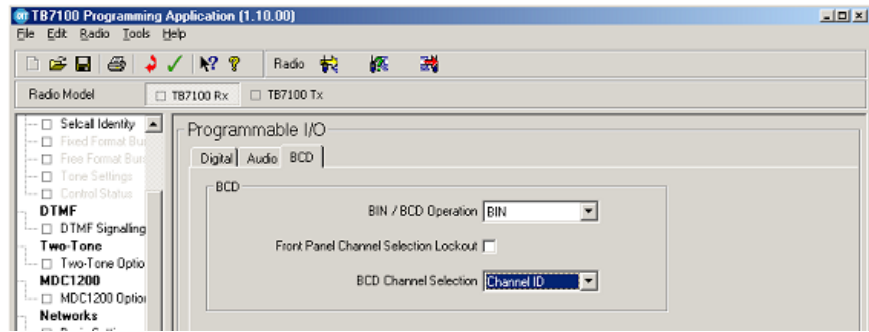
Note: For Programming Application V1.08 (or earlier) the BCD Channel Selection option is not available. If this is the case see Section 6 - Channel Selection.

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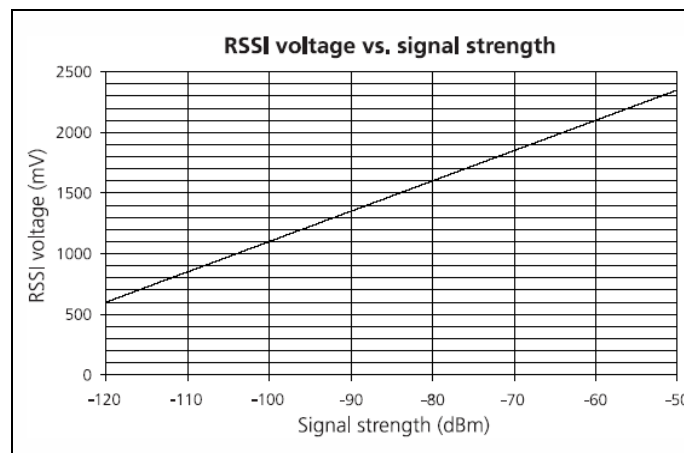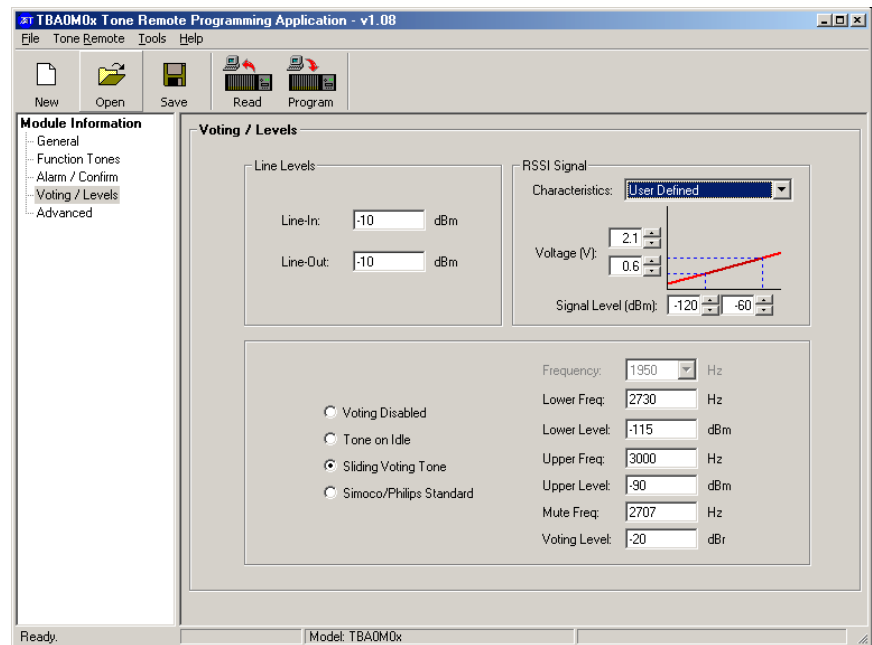
RF Signal Strength	RSSI Voltage
-120dBm	0.6V
-100dBm	1.1V
-60dBm	2.1V
Slope = 25mV/dB	

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.
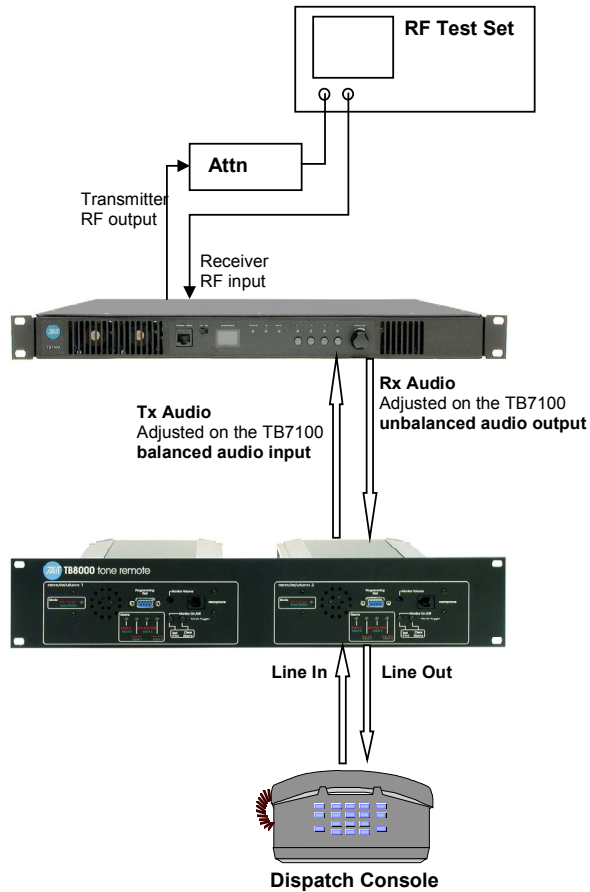
 Tx Audio Adjustment
Setup the equipment as shown in the diagram above.

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

Note: This section is only applicable if you are unable to use TB7100 programming application V1.10 or later.

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.
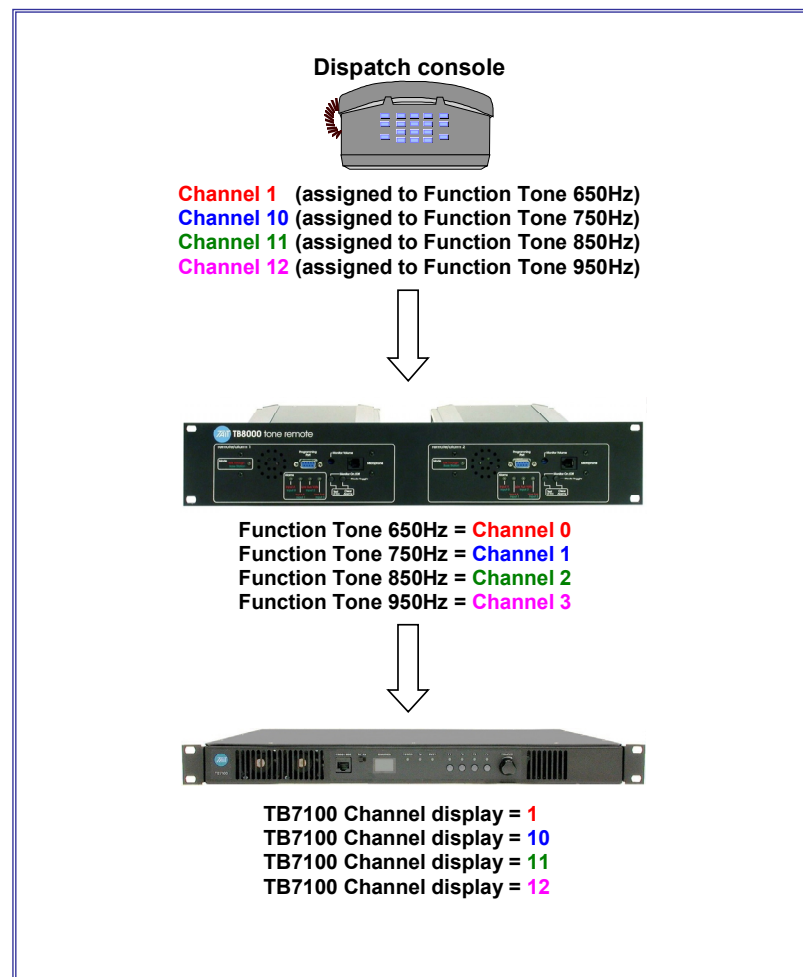
7.   Issuing Authority

**Name and Position
of Issuing Officer**

Jeff Northcott
Senior Technical Support Engineer

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Document History

Original Release	16 August 2005	JN
General Updates	30 May 2006	JN