

TECHNICAL NOTE TN-1033-AN
Using the Tait TB7100 in TaitNet MPT1327 Trunked Networks

30 May 2006

Applicability

T1810 Channel Module (CM)
 T1711 Channel Management Module (CMM)
 TB7100 Base station fitted with V2.10 firmware or later.

1. Introduction

The TB7100 base station is suitable for use as channel equipment in MPT 1327 trunked networks with Tait infrastructure. This application note aims to explain what you specifically need to do to use the TB7100 base station in a trunking system: order the correct TB7100 equipment, make the necessary hardware connections, and configure the TB7100 base station.

This Technical Note assumes no levels have been previously set up on either the TB7100 System interface board, or the T1810 CM/T1711 CMM control boards.

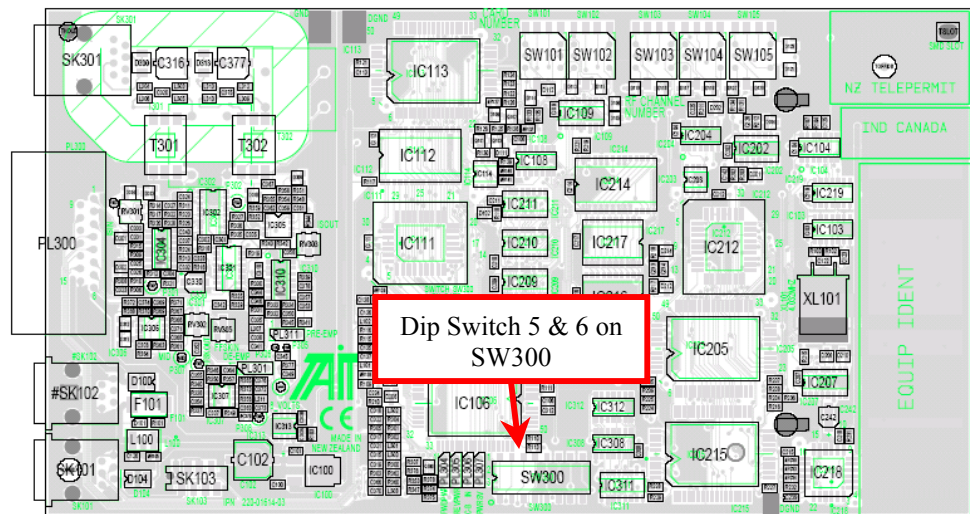
It is assumed the TB7100 Receiver and Transmitter modules have been calibrated.

2. Alarm Limitations

Due to the Mobile hardware platform the TB7100 is based upon, there is currently no provision for alarms of any kind.

This has no implications when using the T1810 CM module as this has no alarm provisioning, however the T1711 CMM requires the alarm reporting to be disabled.

This is achieved by setting dip switch 5 & 6 on SW300 to the 'on' position.



T1711 Channel Management Module

3. System Interface Links

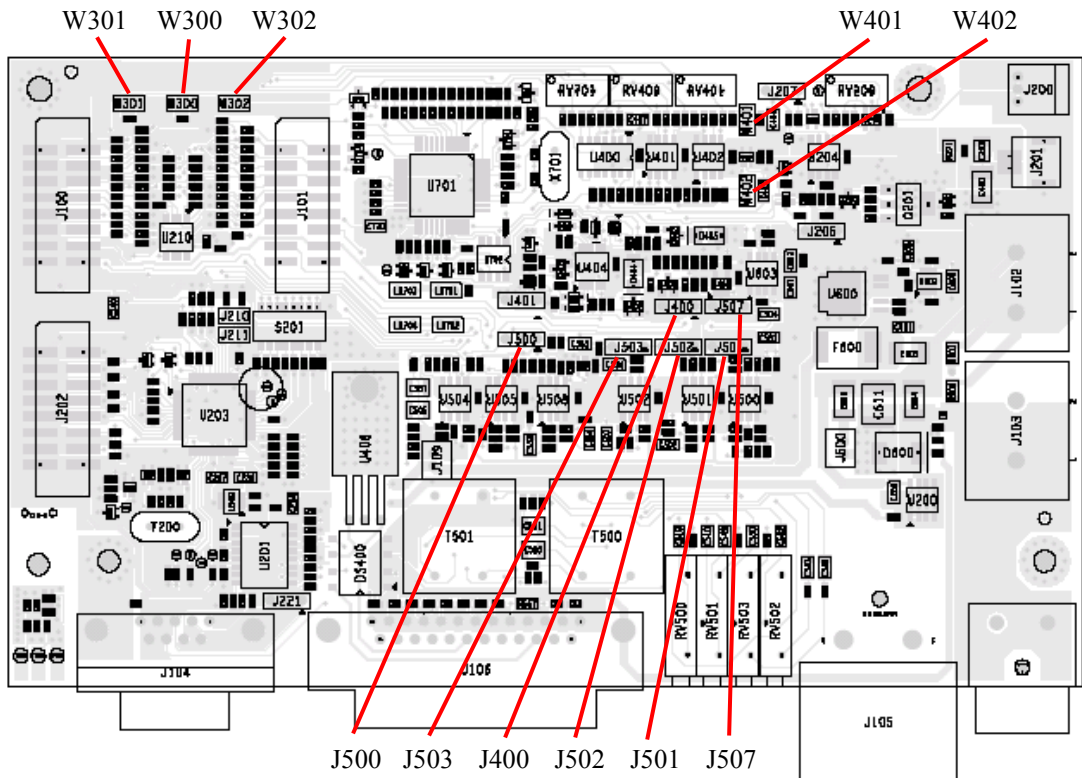
Link Settings

To route the various audio lines and control signals correctly between the TB7100 and a CM/CMM, set the links on the TB7100 system interface board as follows :

Link	Pins	Name	Link Position	Function
J400	3	Tx Key Source	1-2	External PTT signal to transmitter
J500	3	Line out frequency response	2-3	De-Emphasis
J501	3	Line in frequency response	1-2	Flat Response
J502	3	Tx audio source	1-2	External audio line in to transmitter
J503	3	Rx Audio Destination	2-3	Received audio sent to balanced & unbalanced outputs
J507	3	Line in Destination	1-2	TX_MIC_AUD Tx audio from a microphone
J206	3	Fan Control Options	1-2 or 2-3	Fan Controlled by J207 Fan Always On
J207	3	Fan Control Options	1-2 or 2-3	Fan Tx Key Controlled Fan Temperature Controlled

Link Table for TB7100 System Interface PCB
(Note- Functionality of the fan is optional)

Link Positions



TB7100 Systems Interface PCB

Remove Links – W302, W301, W300, W401, W402

4. TB7100 Preparation for Operation

Programming

Receiver Module

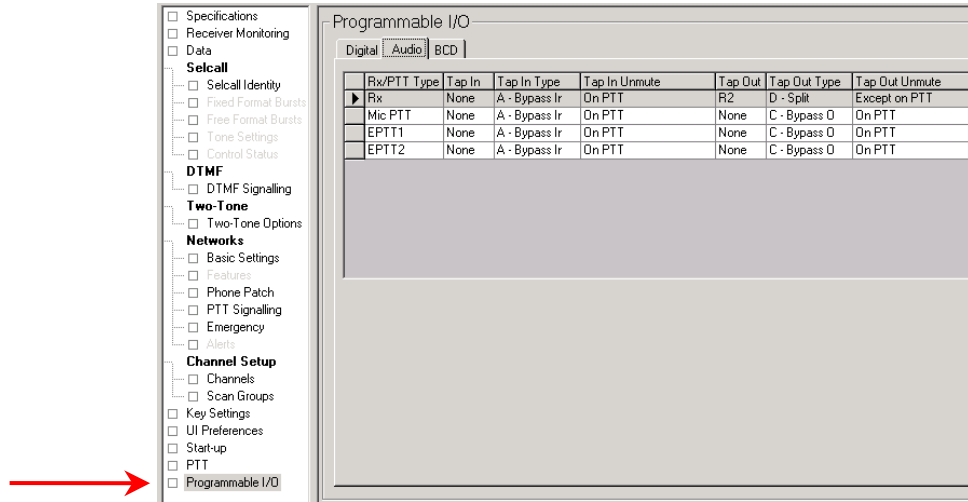
The 'File>Reset to Defaults' setting can be used to set the Receiver Module to a known state. (*Customer frequencies can then be added*)

It is then necessary to configure the audio Tap out point to suit the requirements of the trunking system equipment.

Important Note – TB7100 Programming application version 1.10.00 or later must be used in conjunction with firmware version 2.10 or later.

Procedure

1. Set the Receiver Programmable I/O > Audio tab to the following configuration. These tap points are different to standard, and are a requirement to reduce delay for trunking signalling.



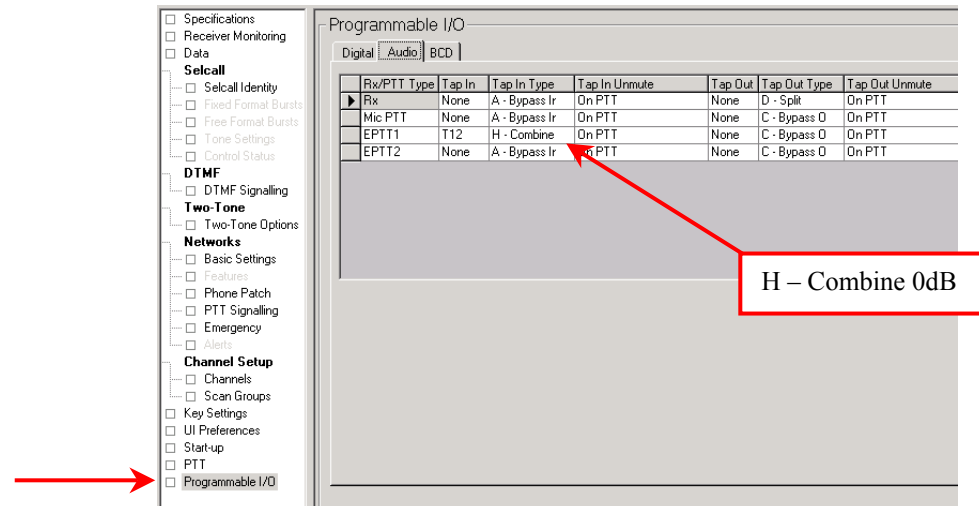
Transmitter Module

The 'File>Reset to Defaults' setting can be used to set the Transmitter Module to a known state. (*Customer frequencies can then be added*)

It is then necessary to configure the various inputs using the programming application to suit the requirements of the trunking system equipment.

Procedure

1. Set the Transmitter's Programmable I/O > Audio tab to the following configuration. These tap in points are different to standard, and are a requirement to reduce delay for trunking signalling.



2. Configure the PTT operations as shown in each of the screenshots below

1.

2.

3.

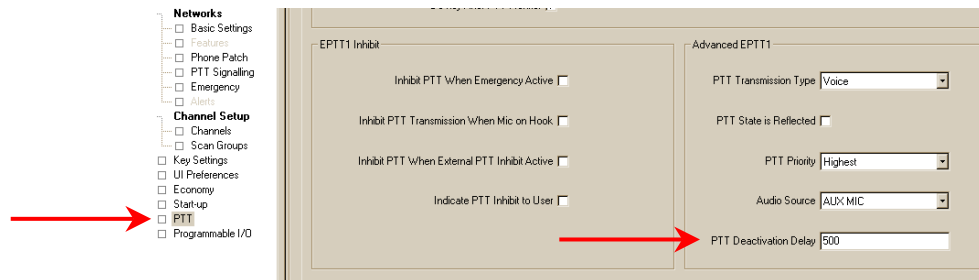
Tail Timer

The TB7100 base station is capable of offering a tail time of up to 5 seconds. *(Note – Must be used with Firmware version 2.10 and later, and TB7100 programming application version 1.10 and later)*

The purpose of this tail timer in a trunking system is to allow radios in a call to return to the control channel before the traffic channel is cleared and the carrier dropped at the call closure.

The recommended value for this tail timer is 0.5 seconds (500ms). This time period is set in the PTT sub menu in the TB7100 programming application in the 'PTT Deactivation Timer' parameter field.

This should be set to **500ms** on the **External PTT (1)** configuration tab found in the PTT sub menu of the TB7100 programming application. *(As seen on previous page and below)*



System Interface Run-up

To ensure uniformity between Base Stations in a system, it is recommended the system interface is run-up as below. The cable required to connect a T1711 Channel Management Module and a T1810 Channel Module has the following part number TBBA04-02. *(details of this cables construction are found on page 10 of this document)*

Test Equipment

The following test equipment is used to set up the TB7100 trunking operation:

- TBA0ST1 calibration test unit (CTU)
- TB7100 CTU adaptor board (XBA0ST1-TBB)
- CTU cable (219-02888-00)
- PC, programming cables and the programming application
- Multimeter
- RF Test Set
- DC power supply

Note – On the CTU, ensure all switches are in the off position. Also set all the digital I/O switches to the '1' position.

TB7100 Receiver Audio Output Level Adjustments

Unbalanced Line

1. Connect the unbalanced output on the CTU to the audio input port on the test set and set up the test set to measure the audio level.
2. Set the RF signal generator to the correct RF frequency, modulated with a 1kHz audio tone at 60% of full system deviation.
3. Set the RF output level to -70dBm.
4. Verify that the receiver gate opens and the busy LED turns on.
5. Adjust RV502 (UNBAL OUT) on the rear panel to set the unbalanced output to a level of 1Vp-p.

Balanced Line

1. Connect the balanced line output from the CTU to the audio input port on the test set and set up the test set to measure the audio level.
2. Turn the CTU 600-ohm switch on.
3. Set the RF signal generator to the correct RF frequency modulated with a 1kHz audio tone at 60% of full system deviation.
4. Set the RF output level to -70dBm.
5. Verify that the receiver gate opens and the busy LED turns on.
6. Adjust RV503 (BAL OUT) on the rear panel to set the balanced output to a level of -10dBm.

TB7100 Transmitter Audio Input Level Adjustments

Balanced Line

1. Set up the test set to measure the transmitter modulation level.
2. Connect the CTU line input to the audio output port on the test set.
3. Set up the test set audio output to 1kHz at a line level of -10dBm.
4. Activate the Tx Key switch and verify that the transmission is at the programmed power and frequency.
5. Adjust RV500 (BAL IN) on the rear panel to 60% of full system deviation.

Unbalanced Line

1. Set up the test set to measure the transmitter modulation level.
2. Connect the CTU unbalanced input to the audio output port on the test set.
3. Set up the test set audio output to 1kHz at a line level of 1Vp-p.
4. Activate the Tx Key switch and verify that the transmission is at the programmed power level and frequency.
5. Adjust RV501 (UNBAL IN) on the rear panel to 60% of full system deviation.

5. T1711 Channel Management Module Level Set-Up

Connect the TB7100 to a T1711 Channel Management Module and apply power.

The following instructions assume the TB7100 RX and TX modules are calibrated (*typically ex factory*), and the System Interface has been adjusted as per step 4.

The local talk-through audio should be checked as follows:

1. Connect a signal generator to the base station receiver, set to the frequency of operation.
2. Attach the output of the TB7100 Transmitter to a modulation meter or similar measuring device.
3. Modulate a 1kHz test tone onto the carrier of the signal generator at a deviation equal to 60% of the maximum permissible deviation (1.5kHz for Narrowband channel, and 3.0kHz for a Wideband channel).
4. Set the signal level to represent a fully quieting strong signal (e.g. -80dBm).
5. Set SW101 and SW102 on the T1711 CMM to '**90**' (*Local audio level check mode*). Power-cycle the card.
6. With the Signal path configured as shown for a T1711 CMM the deviation measured should be ~ 60% of system max. To make this level exactly 60%, adjust RV500 (BAL IN) on the rear panel of the TB7100.

The Rx FFSK input signal should be adjusted as follows:

1. Set PL311 (pre-emp) on the T1711 to **1 – 2**, Rx FFSK signal is flat
2. Connect a signal generator to the base station receiver, set to the frequency of operation.
3. Set the signal level to represent a fully quieting strong signal (e.g. -80dBm).
4. Modulate the carrier with a 1500Hz tone at a deviation equal to 60% of the maximum permissible deviation (1.5kHz for Narrowband channel, and 3.0kHz for a Wideband channel).
5. Set SW101 and SW102 on the T1711 CMM to '**90**' (*Local audio level check mode*). Power-cycle the card.
6. Now adjust the 'FFSKIN' pot to obtain a 234mVrms (0.66V peak-to-peak) signal at P305 using a multimeter or Oscilloscope.

The Tx FFSK output signal should be adjusted as follows:

1. Set PL301 (De-emp) on the T1711 to **1 – 2**, Tx FFSK signal is flat
2. Attach the output of the PA to modulation meter or similar measuring device.
3. With the T1711 card running as a control channel transmitting FFSK, (*SW101 and SW102 set to '96'*), adjust the 'FFSKOUT' pot until 60% of max system deviation is achieved on the modulation meter.

The intersite receive audio (input from DAS) should be adjusted as follows:

1. Connect a 2 wire audio cable from an audio tone generator or similar to pins 4 and 5 of the CMM intersite audio RJ45 socket.
2. Attach the output of the TB7100 Transmitter to a modulation meter or similar measuring device.
3. Apply a 1kHz test tone at '-10dBm' to the line from the test tone generator.
4. Set SW101 and SW102 on the T1711 CMM to '**91**' (*Intersite audio level check mode*). Power-cycle the card.
5. Adjust the intersite in pot (ISIN) until 60% of maximum system deviation is achieved.

The intersite transmit audio (output to DAS) should be adjusted as follows:

1. Connect a signal generator to the base station receiver, set to the frequency of operation.
2. Modulate a 1kHz test tone of 60% maximum system deviation onto the carrier of the signal generator.
3. Set the signal level to represent a fully quieting strong signal (e.g. -80dBm).
4. Connect pins 3 and 6 of the CMM intersite audio RJ45 socket to an audio level-measuring device. If this meter does not have a 600-ohm input impedance, a 600ohm load will have to be placed across the balanced audio lines. (2 x 1k2 resistors in parallel can be used across the line). The equipment may have to then be configured to perform accurate measurements with this load applied. (For example, an Agilent/HP Service Monitor needs to be told there is a 600ohm load applied to the audio input for accurate measurements to occur)
5. Set SW101 and SW102 on the T1711 CMM to '**91**' (*Intersite audio level check mode*). Power-cycle the card.
6. Adjust the intersite out pot (ISOUT) on the T1711 to obtain an output level of '-10dBm' from the line.

6. T1810 Channel Module Level Set-Up

Connect the TB7100 to a T1810 Channel Module and apply power. The following instructions assume the TB7100 RX and TX modules are calibrated (*typically ex factory*), and the System Interface has been adjusted as per step 4.

The talk-through audio should be checked as follows:

1. Connect a signal generator to the base station receiver, set to the frequency of operation.
2. Attach the output of the PA to modulation meter or similar measuring device.
3. Modulate a 1kHz test tone onto the carrier of the signal generator at a deviation equal to 60% of the maximum permissible deviation (1.5kHz for 12.5kHz channel spacing and 3.0kHz for 25kHz channel spacing systems).
4. Set SW200 to '8' and SW201 to '3' on the T1810 CM, press SW202 to reset.
5. Set the signal level to represent a fully quieting strong signal (e.g. -80dBm).
6. With the Signal path configured as shown for a T1810 CM the deviation measured should be ~ 60% of system max. To make this level exactly 60%, adjust RV500 (BAL IN) on the rear panel of the TB7100.

The Rx FFSK input signal should be adjusted as follows:

1. Set SW200 to '8' and SW201 to '1' on the T1810 CM, press SW202 to reset.
2. Set PL200 **2 – 3**, Rx FFSK signal is flat
3. Connect a signal generator to the base station receiver, set to the frequency of operation.
4. Set the signal level to represent a fully quieting strong signal (e.g. -80dBm).
5. Modulate the carrier with a 1500Hz tone at a deviation equal to 60% of the maximum permissible deviation (1.5kHz for 12.5kHz channel spacing and 3.0kHz for 25kHz channel spacing systems).
6. Now adjust RV201 to obtain a 234mVrms (0.66 V peak-to-peak) signal at test point P201.

The Tx FFSK output signal should be adjusted as follows:

1. Set SW200 to '8' and SW201 to '2' on the T1810 CM, press SW202 to reset.
2. Set PL202 to **1 – 2**, Tx FFSK signal is flat
3. Attach the output of the PA to modulation meter or similar measuring device.
4. With the T1810 CM card running as a control channel transmitting FFSK, adjust RV200 until 60% of max system deviation is achieved on the modulation meter.

System Interface to CM/CMM Cable Information (TBBA04-02)

The cable to connect a CM or CMM to a TB7100 for trunking operation is an orderable part -TBBA04-02.

If you wish to construct your own cable, or modify an existing cable, the details of the TBBA04-02 cable are as follows –

Skt 15w Drng

<u>Pin</u>	<u>Wire Colour</u>
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Grey
9	White
10	Pink
11	Light Blue
12	N/C
13	N/C
14	N/C
15	Black

Plg 25w Drng

<u>Pin</u>	<u>Operation</u>
1	Rx Audio Out +
4	Rx Audio Out -
24	FFSK Out
14	Rx Gate
15	Tx Key
11	FFSK In
5	Tx Audio In +
8	Tx Audio In -
25	+13.8V (1.5A)
N/C	
N/C	
13	Gnd

7. Issuing Authority

Name and Position of Issuing Officer

Paul Hinton
Technical Support Engineer

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Distribution Level

Associate

Document History

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