Multitone paging Interface

Fitting Instruction

MAF-02731-01-01
Issue 1
July 2008

Contents

Associated Documentation

MAS-02731-01-xx Multitone Paging Transmitter Service Manual

All available Multitone Paging Interface/Transmitter documentation is TaitWorld Support web site. Consult your nearest Tait Dealer or Customer Service Organisation for more information

Tuning and Configuration

Once the Multitone Paging Interface is fitted, you will need to tune the base station before operating it. To do this you will need to use the Calibration and Program Application software to configure your base station to suit the requirements of your radio system. Refer to the Calibration Application and Program Application documentation for full details on these procedures. The Calibration and Programming Software will be available from the TaitWorld Support web site.

This section describes how to fit a Multitone Paging Interface into a TB7100 base station (DC and no duplexer fitted). It also provides some general information on safety precautions and Multitone Paging Transmitter set-up. We recommend that you read the entire chapter before beginning the fit out.

1.1 Personal Safety

1.1.1 Proximity to RF Transmissions

Do not operate the transmitter when someone is standing within 90 cm (3 ft) of the antenna. Do not operate the transmitter unless you have checked that all RF connectors are secure.

1.1.2 High Temperatures

Take care when handling a TB7100 base station which has been operating recently. Under extreme operating conditions (+60° C [+140° F] ambient air temperature) or high duty cycles the external surfaces of the TB7100 base station can reach temperatures of up to +80° C (+176° F).

1.2 Equipment Safety

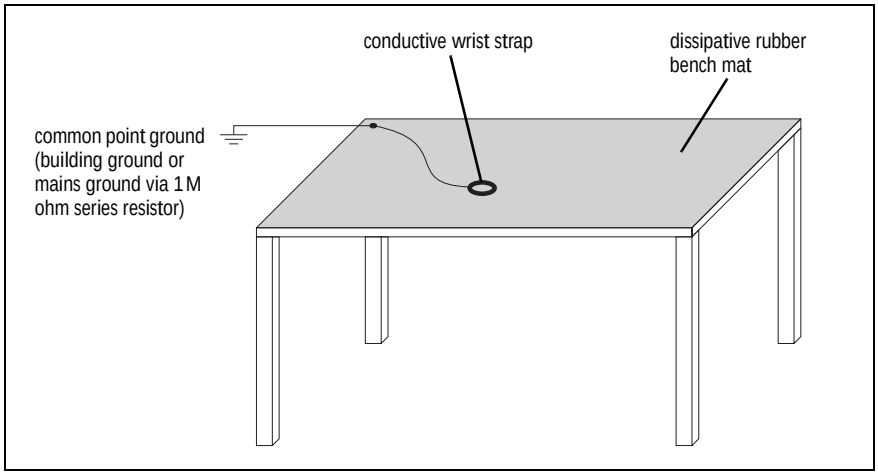
1.2.1 ESD Precautions

Important This equipment contains devices which are susceptible to damage from static charges. You must handle these devices carefully and according to the procedures described in the manufacturers' data books.

We recommend you purchase an antistatic bench kit from a reputable manufacturer and install and test it according to the manufacturer's instructions. Figure 1.1 shows a typical antistatic bench set-up.

You can obtain further information on antistatic precautions and the dangers of electrostatic discharge (ESD) from standards such as ANSI/ESD S20.20-1999 or BS EN 100015-4 1994.

Figure 1.1 Typical antistatic bench set-up



1.3 Tools and Equipment

Torque-drivers

The following torque-drivers are required.

- Philips #2 bit
- PZ1 and PZ2 Pozidriv bit
- Torx T10 bit

Refer to the illustrations in "Disassembly and Reassembly" on page 5 for the corresponding torque values.

Card Remover Tool

To remove the UI board, it is recommended to use the card remover tool (220-02034-**xx**) included in the TBA0ST2 tool kit.

Test Equipment

The following test equipment is required:

- test PC
- calibration and test unit (CTU) (TBA0STU)
- TB7100 CTU adapter (TBB0STU-TBB, included in TBA0STU)
- TMAA20-04 cable (RJ12 socket to RJ45 plug, included in TBB0P00)
- T2000-A19 cable (included in TBB0P00, or TPA-SV-006)
- RF communications test set (audio bandwidth of at least 10 kHz)
- oscilloscope
- multimeter
- function generator
- DC power supply (capable of 13.8 V and 10 A for 25 W base stations, and 20 A for 50 W/40 W base stations)

25W 50W 40W

The standard test setup is illustrated in the service manual MAS-02731-01-xx.

Programming and Calibration Software

Install the TB7100 programming and calibration applications on the test PC. These applications are available from the TaitWorld support web site.

1.4 Parts Required

Before beginning the fitting procedure gather the following parts.

Qty	IPN	IPN Description	Use
1	219-03186-00	CBL assy 16Way IDC to 15Way D-Range 240mm	Paging interface PL100A to transmitter module D-range
1	219-03187-00	CBL assy IDC 16Way to 16Way 190mm	Paging interface PL101A to SI board J101
1	219-03188-00	CBL assy 18Way Ribbon IDC skt to m/m	Paging interface PL2 to UI board
1	219-03189-00	CBL assy 12Way m/m to m/m 130mm	EMC board to paging interface SK101
1	302-00026-00	BRKT mtg PCB TB7100	Bracket for mounting paging interface board
1	303-23055-00	CVR plt A4M955 N conn	Blanking panel for rear panel Rx connector
1	316-85159-00	PLT 9w drng TB7100 pocsag Tx	Mounting plate and label for EMC board
1	365-01891-00	LBL frt pnl TB7100 multitone	Front panel label
1	XA2235-02-PCB	9Way D-Range/MMatch Decoupling	EMC board
1	XA2731-01-PBA	PBA Multi Tone Interface TB7100	Paging interface board
3	349-02061-00	SCRW M3x6 P/H T10 BZ T/T CRL	Screw for bracket
2	352-00010-28	NUT M3 Nyloc hex	For blanking panel
2	354-01043-00	FSTNR scrw Lock 4-40	For mounting EMC board
5	369-00010-14	CBL tie nyl 140x2.6mm	Fixing down cables

1.5 Disassembly and Reassembly

This section describes how to:

- remove and open and close the base station
- remove and fit the modules

General

Important Before disassembling the base station, disconnect the base station from any test equipment or power supply.

Disassemble only as much as necessary to fit the new modules.

Observe the torque settings indicated in the relevant figures.

Important To ensure adequate airflow through the base station, do not cover the fan intake grill on the front panel. Do not operate for more than a few minutes with the fan intake covered.

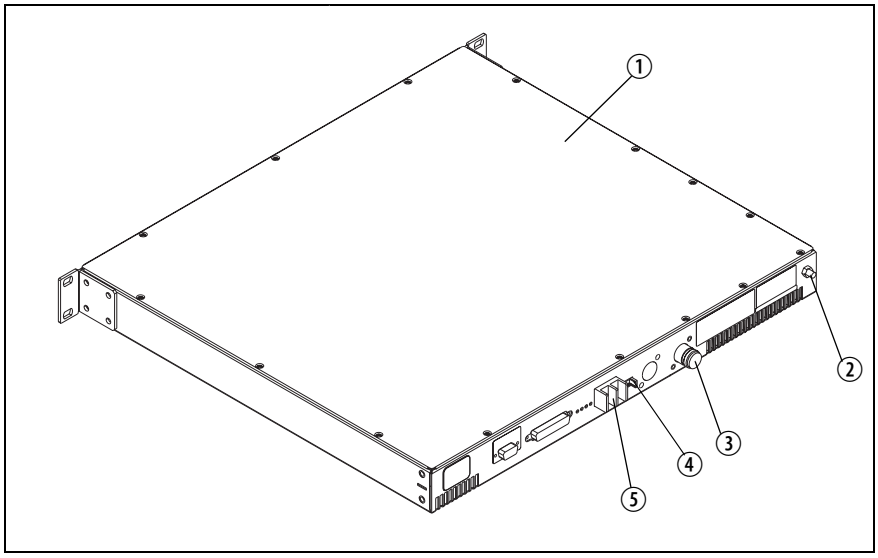
Saving the Base Station Configuration

Before replacing a module in the base station, you should decide whether you need to save its configuration data. If you are unsure whether you have a record of the configuration, use the Programming Application to read the base station and save the configuration files before removing any modules. Once you have replaced the module, you will be able to restore the original configuration by programming the saved configuration back into the base station.

1.5.1 Removing the Multitone Paging Transmitter

Important The modules in the Multitone paging transmitter are **not** hot-pluggable. It is recommended the tray is removed from the rack before any modules are removed.

Figure 1.2 Opening the tray

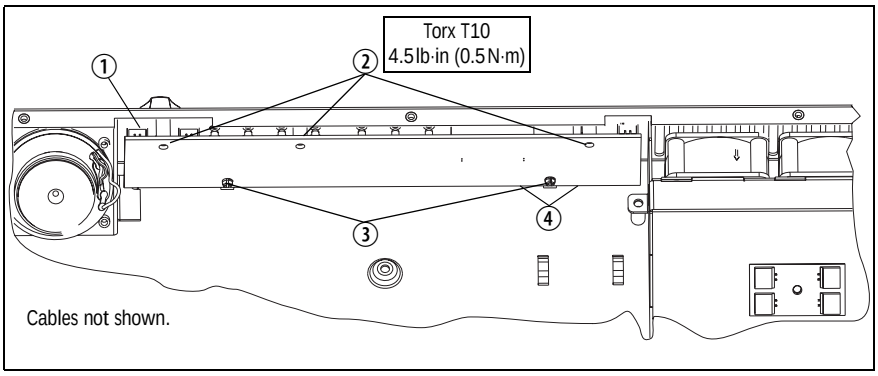


1. Remove the fuse ④ at the rear of the Multitone paging transmitter to disconnect the Multitone paging transmitter from DC power.
2. Use a Philips #2 screwdriver to disconnect the cables from the DC power connector ⑤.
3. Disconnect the antenna connectors ③.
4. Disconnect any other connectors.
5. Disconnect the ground cable from the ground point ②.
6. Use a PZ2 Pozidriv screwdriver to remove the four M6 screws, and remove the Multitone paging transmitter from the rack.
7. Use a Torx T10 screwdriver to remove from the cover the 15 countersunk screws. Remove the tray cover ①.

1.5.2 Removing the UI Board

1. Remove the volume knob by pulling slowly but firmly. The knob is a friction fit and can leave the collet behind on the shaft. If this happens, remove the collet from the shaft and place inside the knob.
2. Disconnect the speaker connector ①.
3. Use a Torx T10 screwdriver to remove the three screws ② together with the spring washers and flat washers.
4. Insert the card remover tool (220-02034-xx) from the tool kit (TBA0ST2), or a small flat-bladed screwdriver into the two small holes at the bottom of the UI board. Lever the board completely off the spring clips ③.
5. Carefully slide the UI board towards the rear of the Multitone paging transmitter until the volume-control shaft clears the front panel. Lift the UI board clear of the chassis.
6. Disconnect cable running from the receiver module to one of the two Micro-MaTch connectors ④.

Figure 1.3 Removing the UI board



7. Keep the UI board disassembled until "Refitting UI board" on page 14.

1.5.3 Removing the Receiver Module

1. Disconnect the cables to the RF ①, DC power ②, system interface ③, and the user interface ④ connectors.
2. Remove the Rx RF cable, connected to ① (219-02978-00 CBL coax 400N type pnl skt BNC) from the rear panel. Place the cable aside.
3. Fit the blanking panel (303-23055-00 CVR plt A4M955 N conn) to the inside of the chassis covering the new Rx hole in the rear panel.

4. Secure the panel in place using two M3 Nyloc nuts (352-00010-28 NUT M3 Nyloc hex), torque to 50cm.N (4.5in-lbs).

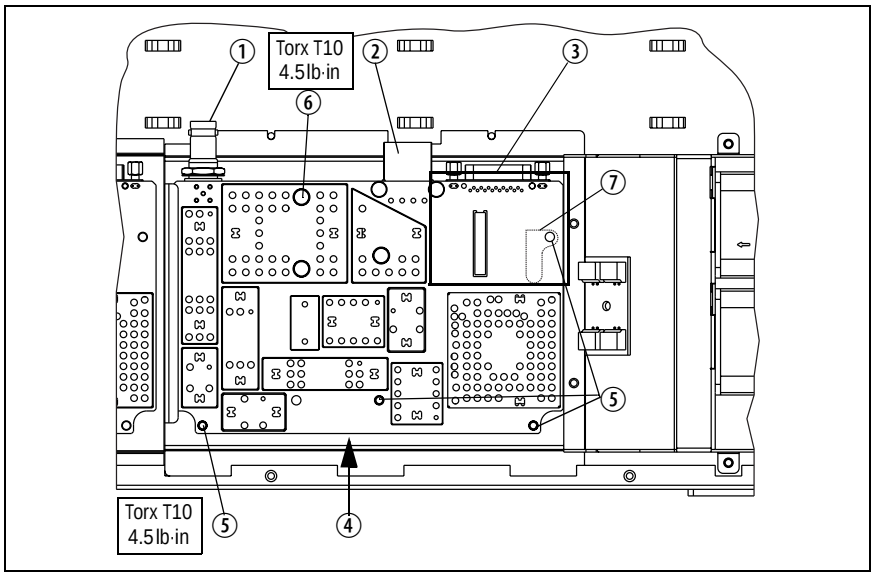
5. Use a Torx T10 screwdriver to remove the five screws ⑤ and ⑥ together with the spring washers and flat washers, put to one side.

6. Lift the receiver module clear of the chassis, put to one side.

7. Remove the metal heatsink ⑥ for the audio PA, put to one side.

8. Put all the removed items into a plastic bag and retain as spares.

Figure 1.4 Removing the receiver module



Note Although the boards of the transmitter and receiver modules look alike, the transmitter board cannot be used in the receiver module and the receiver board cannot be used in the transmitter module. There is no heat transfer plate on the receiver module. Similar boards from the Tait mobile radio range cannot be used as replacements either.

1.5.4 Modifying the SI Board

Removal

1. Disconnect the system interface cables ④ to the transmitter and the receiver, the fan control cable ⑤, the temperature sensor cable ⑥, and move them to one side.

2. Remove the DC power cables ⑦ and ⑧ and put the cable connected to ⑦ to one side. Move the cable connected to ⑧ to one side. Note the connection position for ⑧.

3. Remove the cable ties securing the cables that were connected to DC power ②, system interface ③, and the user interface ④ connectors.

4. Remove the cables originally connected to the receiver module, and User interface and put them to one side.

5. Retain the receiver DC power cable and place in the bag used above.

6. Use a Torx T10 screwdriver to remove the two screws ⑩.
Use a PZ1 Pozidriv screwdriver to remove the screw ⑨ on the heatsink of U406.

7. Carefully lift the front of the SI board off the spring clips ⑪.

8. Carefully slide the SI board towards the front of the base station until the connectors ①, ② and ③ clear the rear panel. Lift the SI board clear of the chassis.

Modify

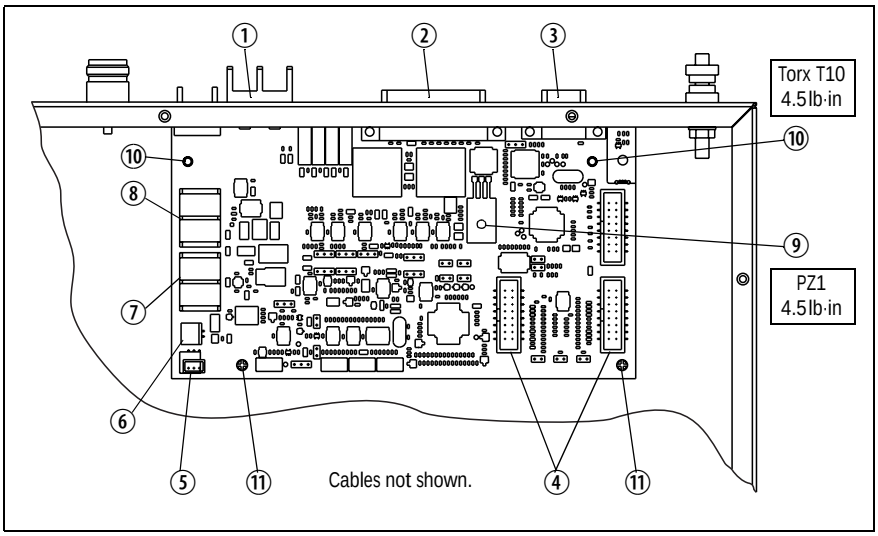
1. Remove Item J104 ③ (240-00010-45,SKT 9wy drng 90° PCB mtg) and put aside.

2. For XBBS104 SI Board, PCB=220-02077-06 and later, place the links in the following positions.

3. Park Links: W300, W301, W302, W401, W402

4. Insert Links: J400 (1-2), J401 (1-2), J507 (1-2), J500 (2-3), J503 (1-2), J502 (2-3), J501 (1-2), J206 (1-2), J207 (2-3), J221 (1-2).

Figure 1.5 Modifying the SI board



Fitting

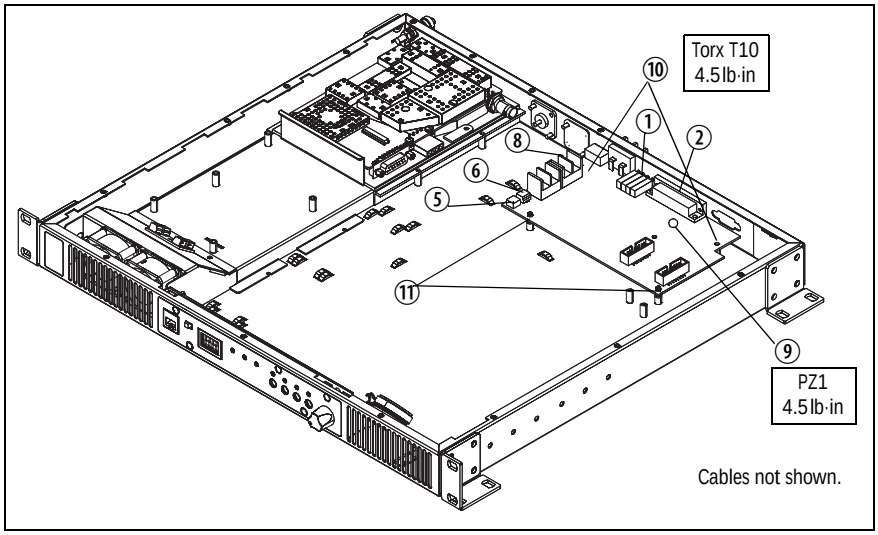
1. Slide the SI board into the tray chassis by fitting the connectors ① and ② into the rear panel.

2. Press down firmly on the front of the SI board to engage the two spring clips ⑪.

Important Make sure that the thermal pad is fitted under and the plastic insulating washer is fitted on U406.

3. Use a torque-driver to fasten the two screws ⑩ (Torx T10) and the screw ⑨ (PZ1) on the heatsink of U406 to 4.5lb·in (0.5 N·m).

Figure 1.6 Fitting the SI board



4. Refit the transmitter power cable to the SI board terminals ⑧, the fan control cable ⑤, and the temperature sensor cable ⑤.

5. Put all removed items into a plastic bag and retain for spares.

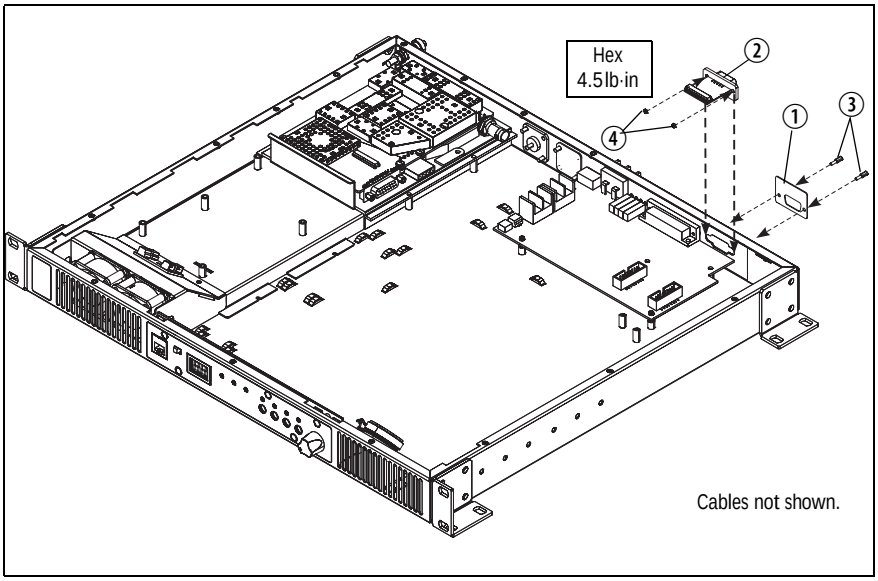
1.5.5 Fitting the EMC Board

1. Locate these items:
   ① 316-85159-00, 9-way D-range plate.
   ② XA2235-02-PCB, EMC board.
   ③ 2 x 354-01043-00, screw lock 4-40 fastener.
   ④ 2 x 352-00010-28, M3 Nyloc hex nut.

2. Fit the XA2235-02-PCB ② as shown below with the Micro-MaTch connector facing up.

3. Ensure the FSK ENCODER plate ① is sitting level and the text is on the outside. Torque Fasteners ③ and Nyloc nuts ④ to 50cm.N (4.5in-lbs).

Figure 1.7 Fitting the EMC board

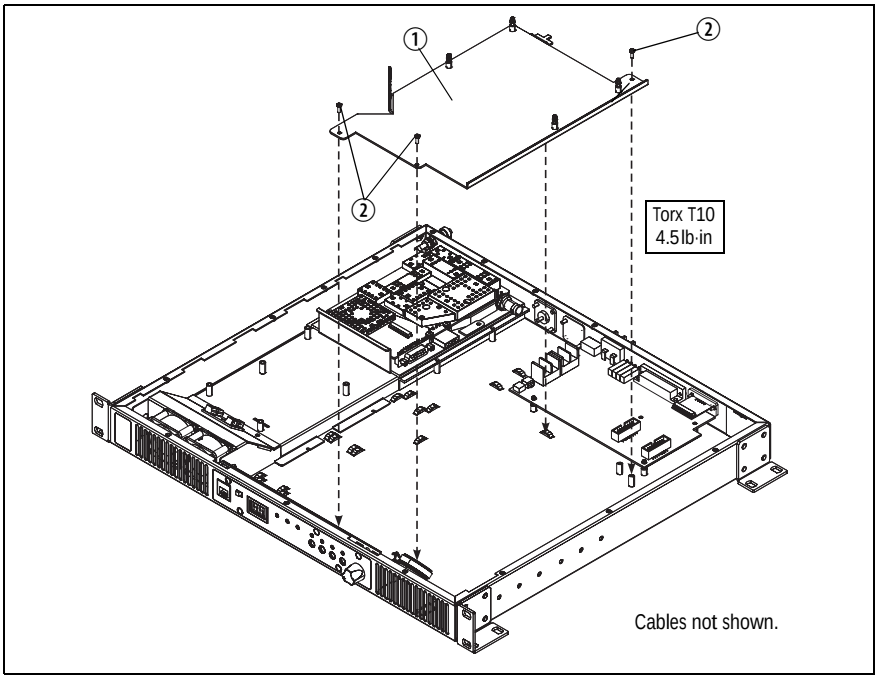


1.5.6 Fitting the Bracket

1. Locate these items:
   ① 302-00026-00 Multitone paging interface bracket.
   ② 3 x 349-02061-00 M3x6 panhead T10 screws.

2. Fit the bracket ① as shown below. One corner clips under a hook in the chassis. The three screws ② are fitted and torqued to 50cm.N (4.5in-lbs).

Figure 1.8 Fitting the bracket



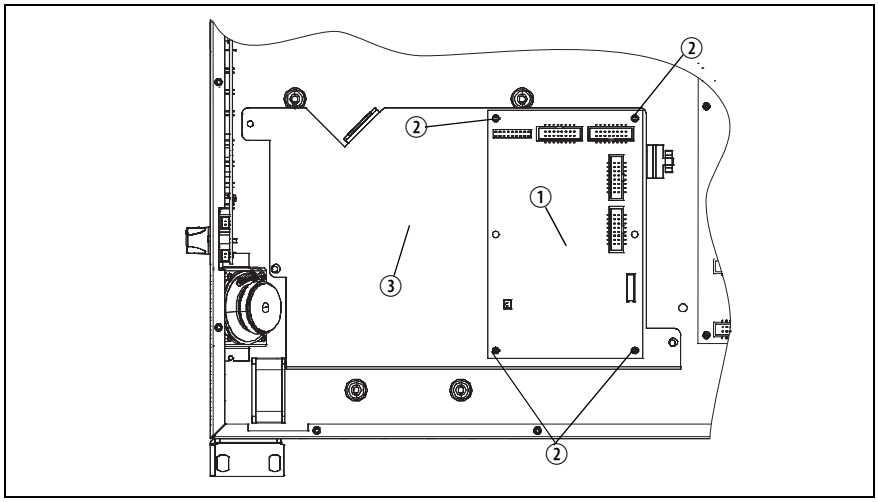
1.5.7 Fitting the Paging Interface Board

1. Locate the following items:
   ① XA2731-01-PBA Multitone paging interface.

2. Place the board ① in position on the bracket ③ as shown below, ensure the connectors are in the position shown below.

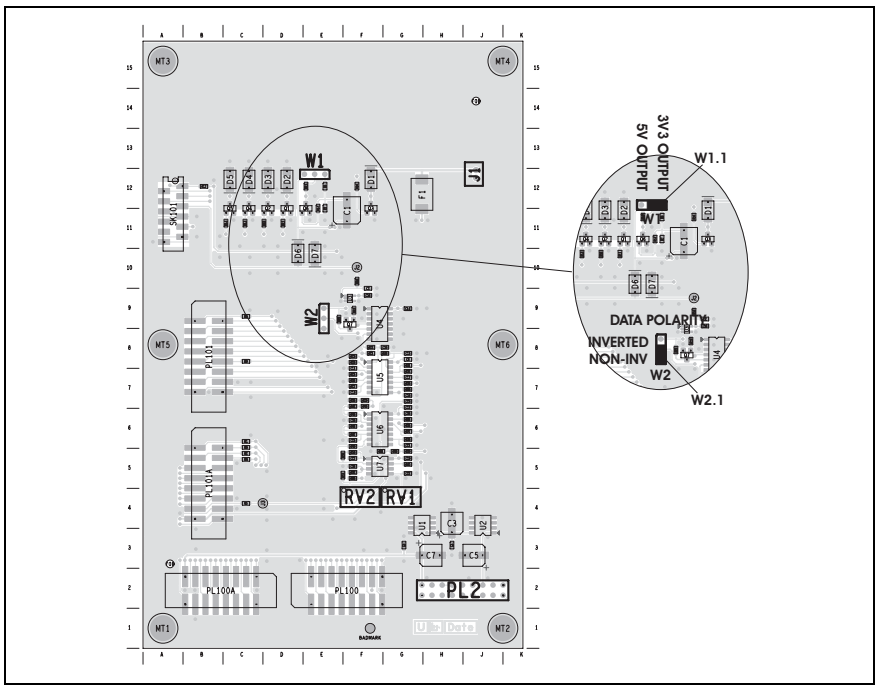
3. Press down firmly on the front and rear of the paging interface board ① to engage the four spring clips ②.

Figure 1.9 Fitting the Paging Interface board



4. Ensure the shorting links W1.1 and W2.1 are fitted to the Multitone paging interface board ① as shown below.

Figure 1.10 Setting the Paging Interface board links



1.5.8 Connecting the Cables

1. Locate the following items:
   ④ 219-03186-00 Cable 16Way IDC to 15Way D-Range 240mm.
   ⑤ 219-03187-00 Cable IDC 16Way to 16Way 190mm.
   ① 219-03188-00 Cable 18Way Ribbon IDC skt to m/m.
   ⑦ 219-03189-00 Cable 12Way m/m to m/m 130mm.

2. Ensure the cable ⑥ from the transmitter to the user interface is still fitted.

3. Ensure the power cable ⑧ from the transmitter to the SI board is still fitted.

4. Ensure the RF cable ② from the transmitter to the rear panel is still fitted.

5. Ensure the fan power cable ③ from the SI board to the fan module is still fitted.

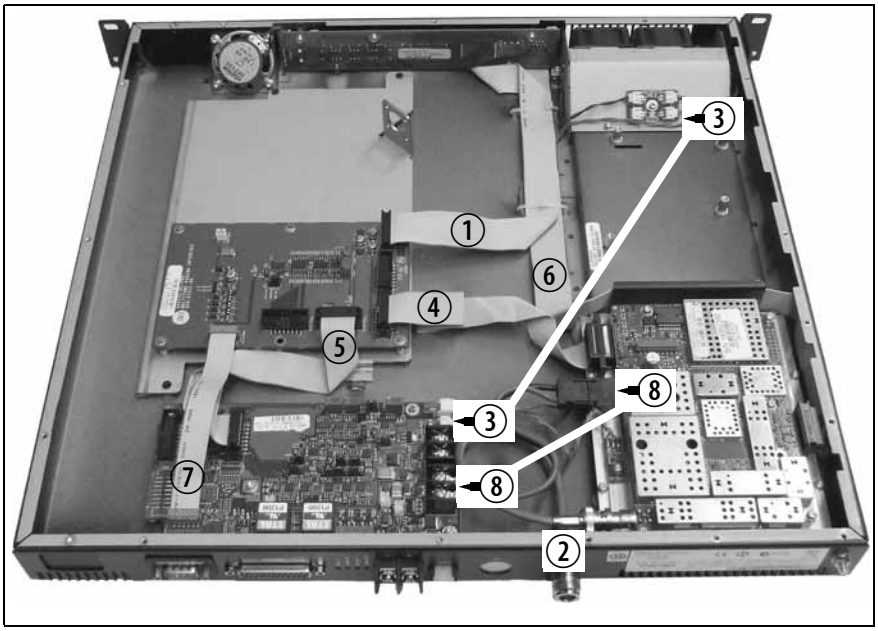
6. Fit the cable ① to the user interface Micro-MaTch connector where the user interface to SI board cable was removed from. Fit the other end to the Multitone paging interface board PL2 as shown below.

7. Fit the cable ⑦ from the EMC board to the paging interface board SK101 as shown below.

8. Fit the cable ⑤ from the SI board J101 to the paging interface board PL101A as shown below.

9. Fit the cable ④ from the paging interface board PL100A to the transmitter module's D-range as shown below.

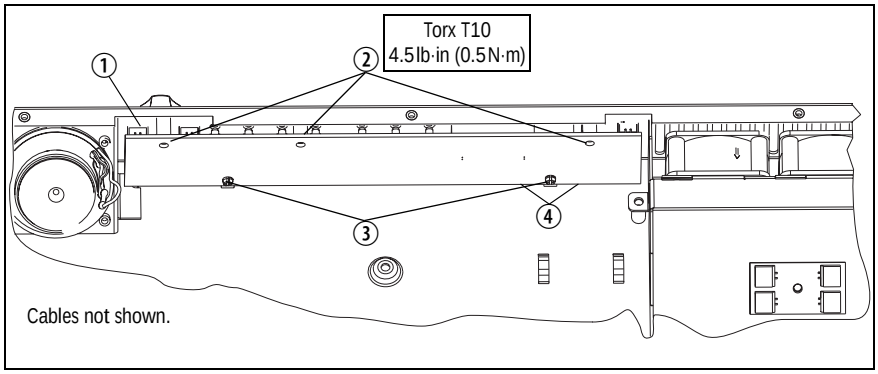
Figure 1.11 Fitting the cables



Refitting UI board

1. Plug the two Micro-MaTch connectors ④ into the UI board. The Micro-MaTch connector for the transmitter is closest to the edge of the UI board.
2. Align the volume-control shaft with the hole in the front panel, also align the programming/microphone connector and function buttons as the board is slid into place.
3. Gently slide the UI board into position so that the spring clips ③ are engaged. Press firmly around the spring clips to ensure they are engaged fully.
4. Use a Torx T10 screwdriver to fasten the three screws ② to 4.5lb·in (0.5N·m).
5. Plug the speaker connector ① into the UI board.
6. On the front panel peel off the two decals and fit the new Multitone label (365-01891-00).
7. Fit the volume knob onto the shaft and press firmly until fully seated.

Figure 1.12 Removing the UI board



8. Using the cable ties (369-00010-14) fix down the cables.

1.6 Programming

1. Run the TB7100 programming application (PGM) version 1.14.00 or later. Select radio model as TB7100 Tx.

1.7 Set-up Tx Channel Configuration

1. Program the radio using the front panel RJ45 (PROG/MIC) programming port and the TX/RX switched to Tx.
2. In the PGM Specifications form select the band that is being built.
3. In the Channels form set up the channels as required.

Note Note: frequency will change according to the radio band, e.g. H5, 6,7 will be 460.1MHz and B1 will be 160.1MHz. (25kHz bandwidth, country squelch for all)

1.8 Set-up Programmable Audio I/O

1. On the Programmable I/O form in the Audio tab set as per the following table.

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	None	D-Split	On PTT
Mic PTT	None	A-Bypass In	On PTT	None	C-Bypass Out	On PTT
EPTT1	T12	A-Bypass In	On PTT	None	C-Bypass Out	On PTT
EPTT2	None	A-Bypass In	On PTT	None	C-Bypass Out	On PTT

1.9 Set-up Programmable Digital I/O

1. On the Programmable I/O form in the Digital tab set as per the following table.

Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored To
AUX_GPI1	Input	RT_DI_1	BCD Pin 0	Low	10	None	None
AUX_GPI2	Input	RT_DI_2	BCD Pin 1	Low	10	None	None
AUX_GPI3	Input	RT_DI_3	External PTT 2	Low	10	None	None
AUX_GPIO4	Output	HI_VSWR	F2 Key Status	High	None	Momentary	None
AUX_GPIO5	Output	OOL	F3 Key Status	High	None	Momentary	None
AUX_GPIO6	Output	HI_TEMP	F4 Key Status	High	None	Momentary	None
AUX_GPIO7	Input	TXKEY	External PTT 1	Low	2	None	None
IOP_GPIO1	None	PIN_9	No Action	High	None	None	None
IOP_GPIO2	None	PIN_10	No Action	High	None	None	None
IOP_GPIO3	None	PIN_11	No Action	High	None	None	None
IOP_GPIO4	None	PIN_12	No Action	High	None	None	None
IOP_GPIO5	None	PIN_13	No Action	High	None	None	None
IOP_GPIO6	None	PIN_14	No Action	High	None	None	None
IOP_GPIO7	None	PIN_15	No Action	High	None	None	None
CH_GPIO1	None	C_HEAD	No Action	High	None	None	None

1.10 Program Key Settings

1. On the Key Settings form set the keys as per the following table

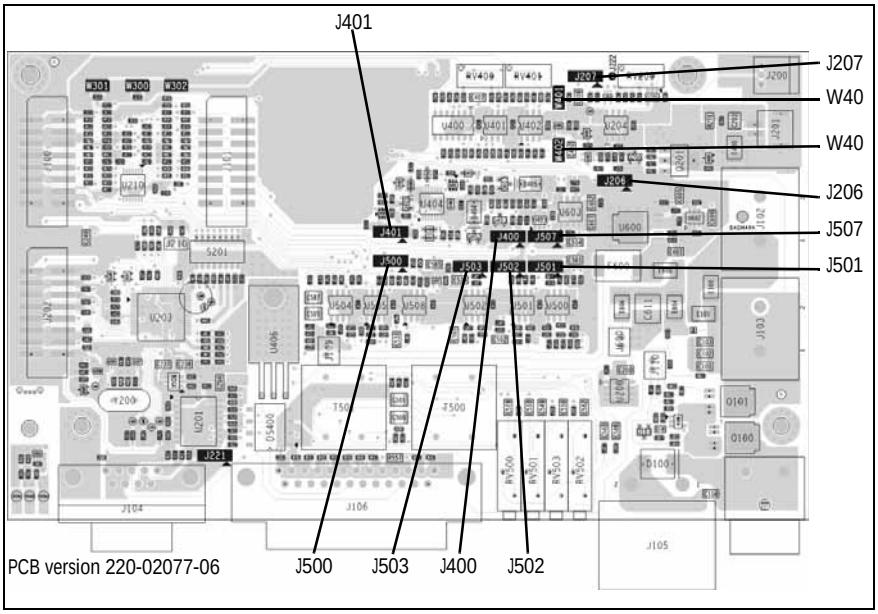
Key	Action
Key 1	Backlighting Toggle
Key 2	Action Digital Output Line
Key 3	Action Digital Output Line
Key 4	Action Digital Output Line

1.11 Transmit Tests

Note Ensure W401 and W402 jumpers on the SI board are parked before continuing.

Note A function generator will be required to generate the square waves the Multitone paging interface expects to receive.

Figure 1.13 Link positions on the SI board



1. On a communications test set Monitor RF on the transmit channel.

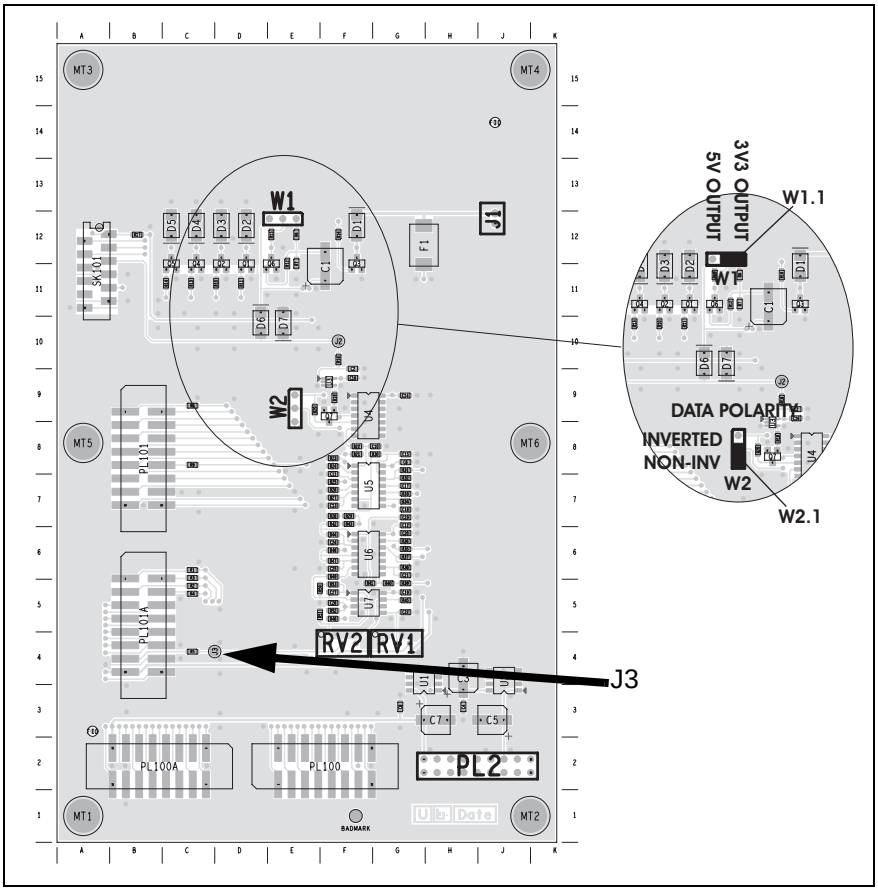
2. Connect the Multitone paging transmitter system connector directly to the CTU using the standard cable.

3. Connect a multimeter between earth and J3 on the Multitone paging interface board. Adjust RV1 on the Multitone paging interface for 1.5VDC.

4. Connect the function generator to to pin 3 of the FSK ENCODER 9-way D-range. Inject 5V p-p square wave at 256Hz on pin 3 and key

the transmitter using the TX key on the CTU. Adjust RV2 on the Multitone paging interface for 4.5kHz (WB) deviation.

Figure 1.14 Paging Interface Board Test points



1.12 Set Fan Voltage

1. On the SI board connect a multimeter between earth and J222. Adjust RV200 for 1.4V DC (see “Link positions on the SI board” on page 16).

1.13 User Interface Check

1. Check both Chassis fans are in operation.
2. Check LED operation: Power, TX.
3. Check F1- Toggles back light.
4. Check that F2-F4 LED's on the front panel turn on when the corresponding function button is pressed.
5. Check CTU digital input and LCD. Use switches 1 and 2 only.

6. Check the RJ45 communications using the TB7100 programming application to interrogate the Tx.

1.14 Final System Check

1. Set the default options on the Programmable I/O form in the Digital tab set as per the following table.

Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored To
AUX_GPI1	Input	RT_DI_1	BCD Pin 0	Low	10	None	None
AUX_GPI2	Input	RT_DI_2	BCD Pin 1	Low	10	None	None
AUX_GPI3	Input	RT_DI_3	BCD Pin 2	Low	10	None	None
AUX_GPIO4	Output	HI_VSWR	Alarm Status	Low	None	None	None
AUX_GPIO5	Output	OOL	Alarm Status	Low	None	None	None
AUX_GPIO6	Output	HI_TEMP	Alarm Status	Low	None	None	None
AUX_GPIO7	Input	TXKEY	External PTT 1	Low	2	None	None
IOP_GPIO1	None	PIN_9	No Action	High	None	None	None
IOP_GPIO2	None	PIN_10	No Action	High	None	None	None
IOP_GPIO3	None	PIN_11	No Action	High	None	None	None
IOP_GPIO4	None	PIN_12	No Action	High	None	None	None
IOP_GPIO5	None	PIN_13	No Action	High	None	None	None
IOP_GPIO6	None	PIN_14	No Action	High	None	None	None
IOP_GPIO7	None	PIN_15	No Action	High	None	None	None
CH_GPIO1	None	C_HEAD	No Action	High	None	None	None

2. Enable the following Digital Action Parameters: Alarm on Out Of Lock, Alarm on High Temperature, Alarm on Very High Temperature and Alarm on High Reverse Power.

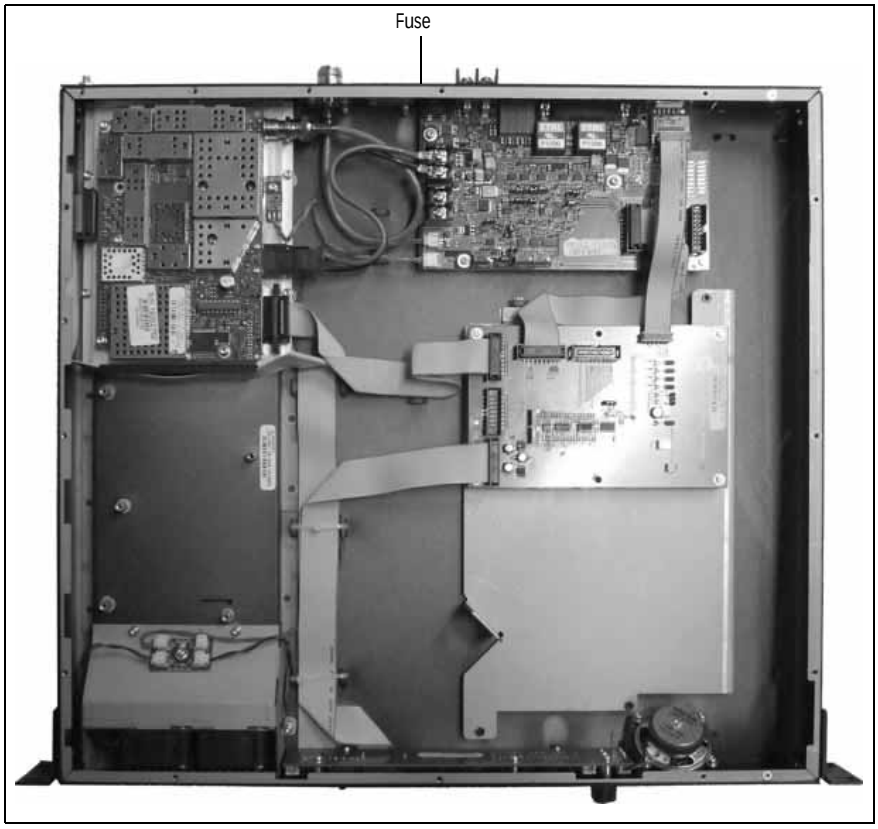
3. Set all Key Settings to none.

4. On the SI board place W300 (Tx / Rx GPIO 5) Link (“Link positions on the SI board” on page 16.

1.15 Final Reassembly

1. Ensure all internal cables are connected correctly as shown below.
2. Place the tray cover onto the chassis.
3. Use a Torx T10 torque-driver to fasten the tray cover with the 15 countersunk screws to 4.5 lb·in (0.5 N·m).
4. Fit the fuse ① at the rear of the Multitone paging transmitter.

Figure 1.15 Final reassembly



Tait Contact Information

Tait Radio Communications
Corporate Head Office

Tait Electronics Limited
P.O. Box 1645
Christchurch
New Zealand

For the address and telephone number of regional offices, refer to the TaitWorld website:

Website: www.taitworld.com

Technical Support

For assistance with specific technical issues, contact Technical Support:

E-mail: support@taitworld.com
Website: www.taitworld.com/technical