TM8100 mobiles
TM8200 mobiles

Accessories Manual

MMA-00012-02
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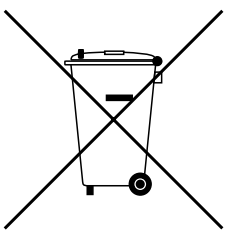

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Contents

Preface

Scope of Manual

This manual contains information on installing, operating and servicing accessory products for TM8100 and TM8200 radios.

Enquiries and Comments

If you have any enquiries regarding this manual, or any comments, suggestions and notifications of errors, please contact Technical Support (refer to "Tait Contact Information" on page 2).

Updates of Manual and Equipment

In the interests of improving the performance, reliability or servicing of the equipment, Tait Electronics Ltd reserves the right to update the equipment or this manual or both without prior notice.

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Associated Documentation

MMA-00002-0X TM8100 Mobiles User's Guide

MMA-00003-0X TM8200 Mobiles User's Guide

MMA-00005-0X TM8100/TM8200 Mobile Radio Service Manual

All available TM8000 product documentation is provided on the TM8000 Product Support CD, product code TMAA20-01. Updates may also be published on the Tait support website.

Publication Record

Issue	Publication Date	Description
1.00	September 2003	first release
2.00	December 2003	added information about the TMAA01-01 line-interface board, TMAA02-06 support kit for concealed and dynamic microphones, TMAA10-02 handset and TMAA10-03 high-power remote speaker
01	December 2004	■ changed product code to MMA-00012-01 ■ added information about the TMAA02-07 concealed microphone, TMAA02-08 keypad microphone, TMAA03-02 security bracket, installing a remote control head, TMAA10-05 hands-free kit and TMAA10-06 high-power remote speaker (for 40W/50W radios
02	June 2005	■ added information about the TMAA01-02 RS-232 board, TMAA02-06 support kit for a concealed microphone, TMAA03-02 security bracket and installing an enhanced remote kit. ■ updated information about the TMAA01-01 line-interface board and installing a remote control head. ■ corrected errors in the TMAA01-05 options extender board (Table 4.4), TMAA02-02 DTMF microphone (Section 5.2).

Alert Notices

Within this manual, four types of alerts are given to the reader: warning, caution, important and note. The following paragraphs illustrate each type of alert and its associated symbol.

Warning!! **This alert is used when there is a potential risk of death or serious injury.**

Caution **This alert is used when there is the risk of minor or moderate injury to people.**

Important This alert is used to warn about the risk of equipment damage or malfunction.

Note This alert is used to highlight information that is required to ensure that procedures are performed correctly.

Abbreviations

Abbreviation	Description
AF	Audio Frequency
ALC	Automatic Level Control
CD	Compact Disk
CMOS	Complementary Metal Oxide Semiconductor
DTMF	Dual Tone Multiple Frequency
DIP	Dual In-Line Package
ESD	Electrostatic Discharge
IC	Integrated Circuit
IPN	Internal Part Number
LED	Light Emitting Diode
NB	Narrow Bandwidth (12.5kHz channel spacing)
PABX	Private Automatic Branch Exchange
PCB	Printed Circuit Board
PGA	Programmable-Gain Amplifier
PSTN	Public Switched Telephone Network
PTT	Press-To-Talk
PSTN	Public Switched Telephone Network
RF	Radio Frequency
SPI	Serial Peripheral Interface
WB	Wide Bandwidth (25kHz channel spacing)

1 Safety and Servicing Information

This chapter contains general information about safety and servicing procedures when working with TM8000 radios. While many TM8000 accessories plug into external radio interfaces, some accessories are fitted inside the radio. Refer to the service manual for detailed disassembly and reassembly information.

1.1 Personal Safety

Explosive Environments

Warning!! **Do not operate equipment near electrical blasting caps or in an explosive atmosphere. Operating the equipment in these environments is a definite safety hazard.**

Proximity to RF Transmissions

Do not operate the transmitter when someone is standing within 0.9m (35 inches) of the antenna. Do not operate the transmitter unless you have checked that all RF connectors are secure.

High Temperatures

The bottom surface of the radio and heatsink fins can become hot during prolonged operation. Do not touch these parts of the radio.

1.2 Equipment Safety

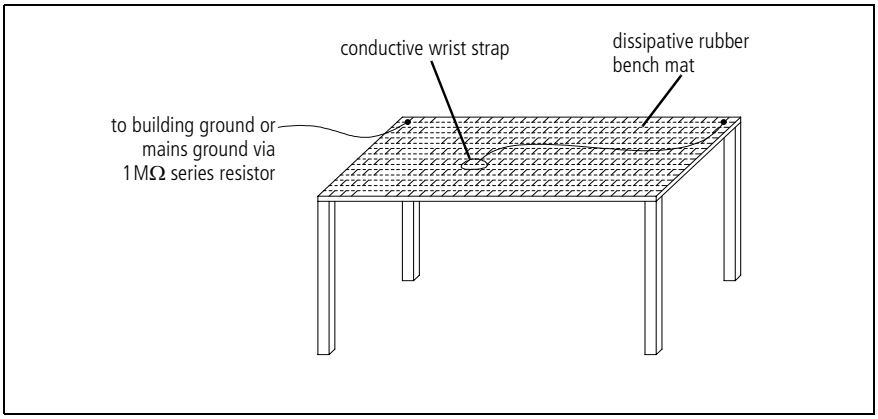
ESD Precautions

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

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 ESD S4.1-1997 (revised) or BS EN 100015-4 1994. The Electrostatic Discharge Association website is http://www.esda.org/.

Figure 1.1 Typical antistatic bench set-up



Antenna Load

This radio has been designed to operate safely under a wide range of antenna loading conditions. However, the radio should always be operated with a suitable load to prevent damage to the transmitter output power stage.

1.3 Identifying Screw Types

Torx Recess Head Screws

Torx recess head screws are the standard type of screw used in TM8000 equipment, although Pozidriv head screws are also used in a few special applications.

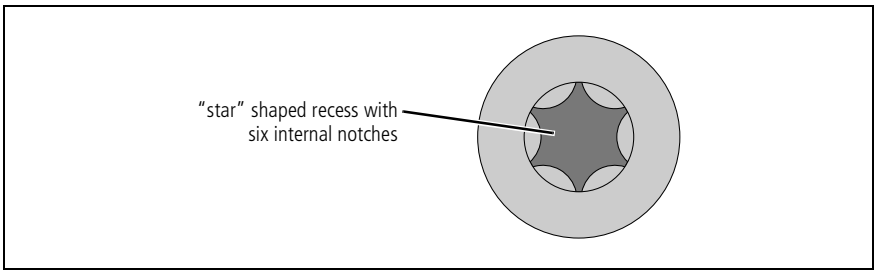
The Torx recess head has the advantage of improved screwdriver tip location, reducing the chances of screw head damage caused by the driver tip rotating within the recess. In addition, using a ball-tip Torx screwdriver allows you to drive a Torx head screw with the driver on a slight angle, which can be useful in situations where access is restricted.

It is important that you use the correct Torx screwdriver tip:

- M2.5 screws - T8
- M3 screws - T10
- M4 screws - T20.

Figure 1.2 below shows a typical Torx recess head screw (the actual hardware may differ slightly from this illustration due to variations in manufacturing techniques).

Figure 1.2 Identifying Torx screws



Allen UNC Screws

Allen 4-40 UNC thread screws are used in some locations in the TM8000 radio and cannot be interchanged with M3 screws.

Pozidriv and Philips Screws

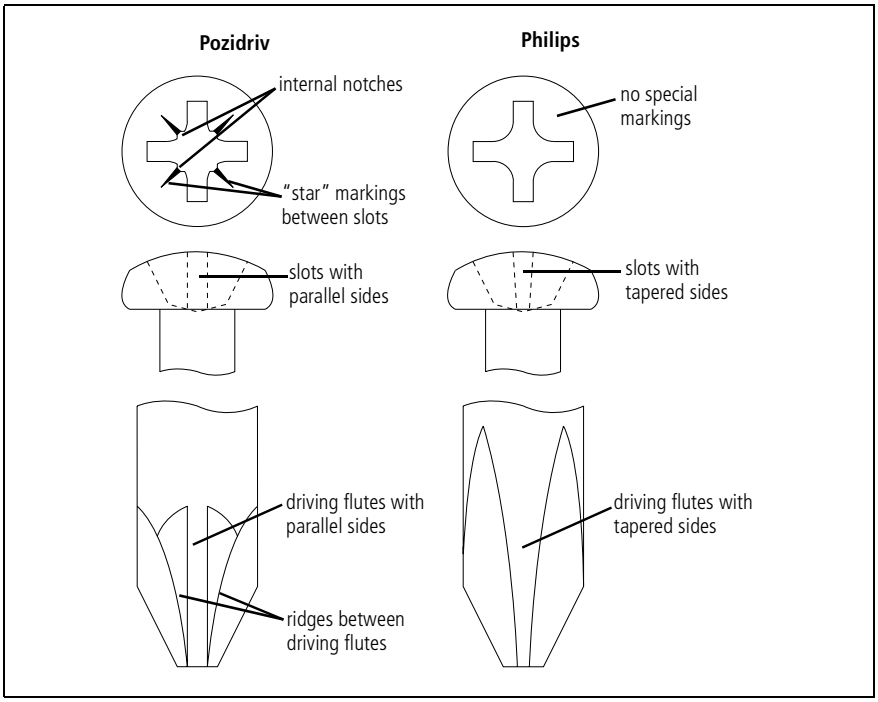
Both Pozidriv and Philips head screws are used on certain TM8000 accessories. It is important that you use the correct type and size screwdriver to avoid damaging screw heads.

It is particularly important that you do not use Philips screwdrivers on Pozidriv screw heads as the tapered driving flutes of the Philips screwdriver do not engage correctly with the parallel-sided slots in the Pozidriv screw head. This can result in considerable damage to the screw head if the screwdriver tip turns inside the recess.

Note If you find you need excessive downwards pressure to keep the screwdriver tip in the Pozidriv screw head, you are probably using the wrong type or size screwdriver.

Figure 1.3 on the following page shows the main differences between typical Pozidriv and Philips screw heads and screwdriver tips (actual hardware may differ slightly from these illustrations due to variations in manufacturing techniques).

Figure 1.3 Identifying Pozidriv and Philips screws and screwdrivers



1.4 Regulatory Information

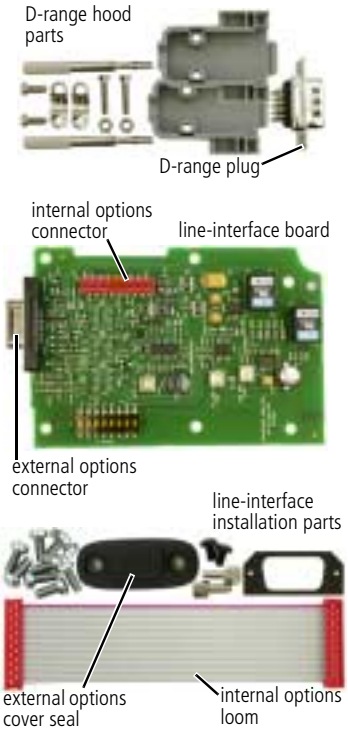
Any modifications you make to this equipment which are not authorised by Tait Electronics Ltd may invalidate your compliance authority's approval to operate the equipment.

1.5 PCB Information

All PCBs are identified by a unique 10 digit IPN (internal part number) which is printed onto the PCB (usually on the top side), as shown in the example below:

The last two digits of this number define the issue status, which starts at 01 and increments through 02,03, 04, etc. as the PCB is updated. If the PCB information contained in a section of this manual does not match the PCB number printed on your board, contact Technical Support (refer to "Tait Contact Information" on page 2).

2 TMAA01-01 Line-Interface Board



The TMAA01-01 line-interface board provides both audio and digital interfaces for a variety of systems. The interfaces available are:

- an isolated 600Ω audio interface which is capable of both simplex operation on a two-wire system, or duplex operation on a four-wire system
- a keying interface which allows for two-wire keying or single line bi-directional keying
- a variable delay timer
- a logic sense control.

The line-interface board fits inside the radio in the options cavity and is connected to the main PCB by the internal options loom. The high-density 15-way D-range connector mounted on the line-interface board fits through the external options connector hole provided in the radio chassis.

Important This kit does not meet the IP54 protection standard. Care must be taken when a radio with a TMAA01-01 line-interface board kit installed is being operated in an environment where there is water, dust or other environmental hazards.

2.1 Operation

One of the control head function keys may be programmed to toggle the line-interface board on and off. When the function key LED is glowing, the line-interface board is on and when the LED is off, the line-interface board is off.

Refer to "Programming Information" on page 22 for information on the radio programming procedure.

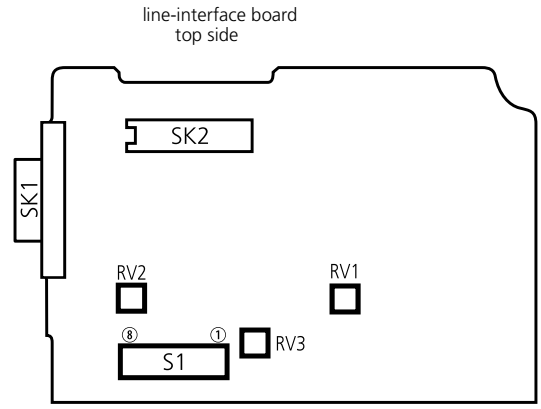
2.2 Configuring the Line-Interface Board

Important This equipment contains devices which are susceptible to damage from static discharges. Refer to "ESD Precautions" on page 11 for more information.

2.2.1 Adjustment Points on the Line-Interface Board

The following table describes the line-interface adjustment points. Adjustments are made by setting the DIP switches on S1 to either "on" or "off" and by three variable resistors (RV1, RV2 and RV3).

Table 2.1 Line-interface board adjustment points

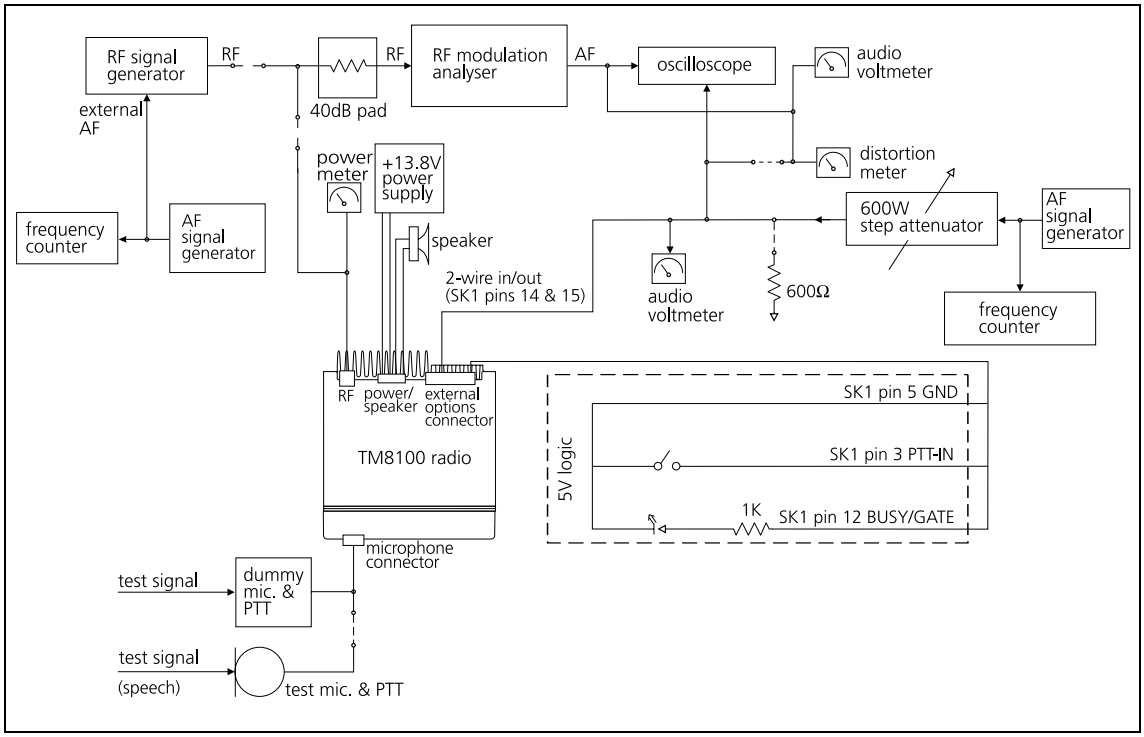


Function	Selection 1	Selection 2
two-wire audio interface	DIP1 on	DIP2 off
four-wire audio interface	DIP1 off	DIP2 on
busy/gate = busy	DIP3 on	DIP4 off
busy/gate = rx-gate	DIP3 off	DIP4 on
busy/gate logic (active high)	DIP5 on	DIP6 off
busy/gate logic (active low)	DIP5 off	DIP6 on
bi-directional keying line	DIP7 on	
two-wire keying	DIP 7 off	
enable gate/keying delay	DIP8 on	
gate/keying delay	adjust RV1	
audio line out level	adjust RV2	
audio line in level	adjust RV3	
time delay range	W1 open	

2.2.2 Test Equipment Setup

The following diagram shows the setup of the test equipment used when adjusting RV1, RV2 and RV3.

Figure 2.1 Line-interface test equipment setup



2.2.3 Configuration Procedure

The line-interface board configuration must be completed before the board is installed in the radio, as the top side of the line-interface board is not accessible once the board is screwed to the radio lid. To configure the line-interface board, carry out the following steps.

1. Program the radio in which the line-interface board is being installed with default line-interface test settings. The default test settings are explained in the following tables.

Note A general description of IOP_GPIO lines used with the line-interface board is given in Table 2.6 on page 22.

Table 2.2 Line-interface default test settings in the Programmable I/O form, Digital tab

Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored
IOP_GPIO1	Input	None	External PTT 1	Low	60	None	None
IOP_GPIO2	Output	0	No Action	Low	None	None	None
IOP_GPIO3	Output	BUSY	Busy Status	High	None	None	None
IOP_GPIO4	Output	FKEY	F1 Key Status[a]	Low	None	Latching	None

a. One of the four control head function keys may be selected to control the line-interface AUX line, which turns the line-interface board on and off. For the associated LED to reflect the status of the line-interface board, the Function Key Action field on the Key Settings form must be set to Action Digital Output Line.

Table 2.3 Line-interface settings in the Programmable I/O form, 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
EPTT1	T5	A-Bypass In	On PTT	None	C-Bypass 0	On PTT

Table 2.4 Line-interface settings in the PTT form, External PTT (1) tab

Field		Setting
Advanced PTT	PTT Transmission Type	Voice
	Audio Source	Audio Tap In

2. Set the DIP switches on the line-interface board (S1) to the following default test settings:
   - DIP1 on (two-wire audio interface)
   - DIP2 off
   - DIP3 off
   - DIP4 on (busy/gate = rx-gate)
   - DIP5 on (busy/gate logic active high)
   - DIP6 off
   - DIP7 off (two-wire keying)
   - DIP8 off (time delay disabled).

3. Disassemble the radio in order to gain access to the options cavity. For detailed disassembly instructions, refer to the disassembly procedure in the service manual.

Note When installing the internal options loom, take care that it is folded in the way shown in Figure 2.2.

Connect the internal options loom between SK2 on the line-interface board and SK102 on the radio's main PCB.

4. Set up the test equipment shown in Figure 2.1, and follow the adjustment procedure for RV1, RV2 and RV3 described in the following section.

2.2.4 Adjusting RV1, RV2 and RV3

Setting the Keying Time Delay (RV1)

The keying time delay circuit is used to prevent the burst of noise occurring before a mobile is able to mute the audio when the carrier signal disappears. The keying time delay is used in conjuction with the keying signal (SK1 pin 1).

Set DIP8 on, and adjust RV1 for the required time delay. Rotate RV1 clockwise to increase the delay, and counterclockwise to reduce the delay.

Note If the W1 link is fitted, the maximum time delay available is reduced from 5 seconds to approximately 2.5 seconds.

Setting the Line Output Level (RV2)

Monitor the line output (SK1 pins 14 and 15) and apply an on-channel signal from the RF signal generator at an output level of -47 dBm, modulated to 60% of system deviation, at 1 kHz AF.

Adjust the RV2 for a line output level of -10 dBm.

Setting the Line Input Level (RV3)

Apply a line input signal of -10 dBm and key the transmitter.

- For a two-wire configuration, apply the line input signal to pins 14 and 15 on SK1.
- For a four-wire configuration, apply the line input signal to pins 4 and 10 on SK1.

Adjust RV3 until 60% of system deviation at 1 kHz is achieved.

2.3 Installing the Line-Interface Board

Note The line-interface board link options must be set before the board is installed in the radio, as the top side of the line-interface board is not accessible once the board is screwed to the radio lid.

2.3.1 Parts Required

The following table describes the parts required to install a line-interface board in a radio. The parts marked with an asterisk (★) are not shown in Figure 2.2 and are used to connect to the radio's external options connector.

Table 2.5 Line-interface installation parts required

Quantity	Internal Part Number	Description	Figure 2.2 Reference
1	362-01111-XX[a]	foam seal	③
1	362-01108-XX[a]	cover seal	⑪
2	347-00011-00	4-40x3/16 screws	⑫
2	354-01043-00	screw-lock fasteners	⑦
6	349-02062-00	M3x8 screws	⑨
★1	240-00010-80	D-range plug	—
★1	240-06010-29	D-range hood	—

a. Contact Technical Support for the exact IPN.

2.3.2 Installation Procedure

1. Disassemble the radio in order to gain access to the options cavity.

   For detailed disassembly instructions, refer to the disassembly procedure in the service manual.

The circled numbers in the following instructions refer to items in the diagram on the previous page.

2. Remove the top cover and lid ① from the radio to access the options cavity.

3. Remove the external options connector bung ②, if it is fitted.

4. On the inside of the radio lid place the foam seal ③ over the external options connector cavity ④.

5. With the top side of the line-interface board ⑤ facing the radio lid, guide the external options connector ⑥ (the D-range connector on the line-interface board) into the external options connector cavity.

6. Screw the external options connector to the radio lid using the two screw-lock fasteners ⑦.

   Tighten the fasteners to a torque of 0.9N·m (8lbf·in).

Important The external options connector screw-lock fasteners must be tightened correctly before screwing the line-interface board onto the mounting posts ⑧.

7. Screw the line-interface board to the mounting posts on the radio lid using six M3x8 self-tapping screws ⑨.

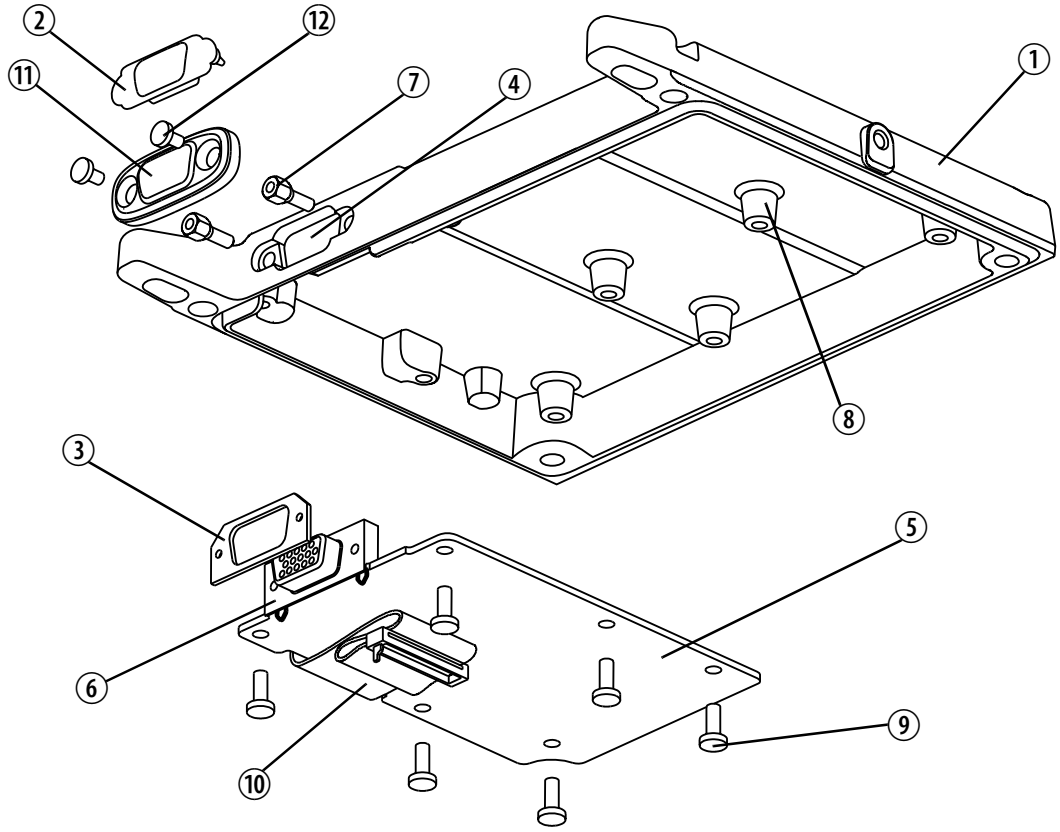
   Tighten the M3x8 screws to a torque of 1.9N·m (17lbf·in)

Important For the line-interface board to be installed correctly in the radio's options cavity, the internal options connector loom ⑩ must be looped in the way shown in Figure 2.2.

8. Plug the unattached end of internal options connector loom ⑩ into the internal options connector on the radio main PCB.

9. Refit the radio lid and top cover to the radio and screw the external options cover seal ⑪ over the external options connector, using the two 4-40x3/16 screws ⑫.

Figure 2.2 Installing the line-interface board



① radio lid
② external options connector bung
③ foam seal
④ external options connector cavity
⑤ line-interface board
⑥ external options connector
⑦ screw-lock fasteners
⑧ mounting posts
⑨ M3x8 self-tapping screws
⑩ internal options loom
⑪ external options cover seal
⑫ 4-40x3/16 screws

2.4 Programming Information

The lines from the radio's internal options connector that are used by the line-interface board are IOP_GPIO1 to IOP_GPIO4. The behaviour of these lines is configured in the Programmable I/O and PTT forms of the programming application. Refer to the online help of the programming application for more information.

The Table 2.6 explains the required input and output line-interface connections.

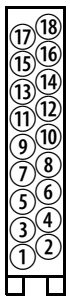
Table 2.6 Line-interface input and output connections

Radio Signal	Function	Comments
GPIO1	PTT FROM OPT	This signal causes the radio to transmit. This normally requires External PTT1 to be set up in the Digital tab of the Programmable I/O form and the External PTT (1) tab of the PTT form.
GPIO2	Busy/Gate	This active high signal allows connection to the Busy/Gate output signal. If this is not used, the Action field is set to No Action and the Active field is set to Low.
GPIO3	Busy/Gate (Keying Line)	This active high signal allows connection to the Busy/ Gate output signal. This signal also allows the single line keying functionality.
GPIO4	AUX	This allows the line-interface board to be disabled. One of the four control head function keys is selected to control this AUX line. For the associated LED to reflect the status of the line-interface board, the Function Key Action field on the Key Settings form must be set to Action Digital Output Line.

2.5 Interface Specification

The following tables summarize the signals used for the line-interface board on the internal options connector (SK2 on the line-interface board) and the external options connector (SK1 on the line-interface board).

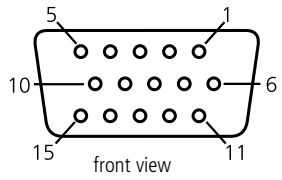
Table 2.7 Internal options connector (SK2)—pins and signals



top view

Pin	Radio Signal	Line-Interface Signal	Description
1	13V8_SW	13V8 FROM RADIO	switched 13V8 supply from the radio
2	AUD_TAP_OUT	AUDIO TAP OUT	Programmable tap point out of the receive or transmit audio chain.
3	AGND	AGND	analogue ground
4	AUX_MIC_AUD	—	not connected
5	RX_BEEP_IN	—	not connected
6	AUD_TAP_IN	AUD_TAP_IN	Programmable tap point into the receive or transmit audio chain.
7	RX_AUD	—	not connected
8	RSSI	—	not connected
9	IOP_GPIO1	PTT FROM OPT	IOP_GPIO1 from the radio 3V3 logic level, 5V tolerant
10	IOP_GPIO2	SECONDARY BUSY	IOP_GPIO2 from the radio 3V3 logic level, 5V tolerant
11	IOP_GPIO3	BUSY	IOP_GPIO3 from the radio 3V3 logic level, 5V tolerant
12	IOP_GPIO4	AUX	IOP_GPIO4 from the radio 3V3 logic level, 5V tolerant
13	IOP_GPIO5	GPIO5	IOP_GPIO5 from the radio 3V3 logic level, 5V tolerant
14	IOP_GPIO6	—	not connected
15	IOP_GPIO7	—	not connected
16	DGND	AGND	analogue ground
17	IOP_RXD	RXD	asynchronous serial port - receive data
18	IOP_TXD	TXD	asynchronous serial port - transmit data

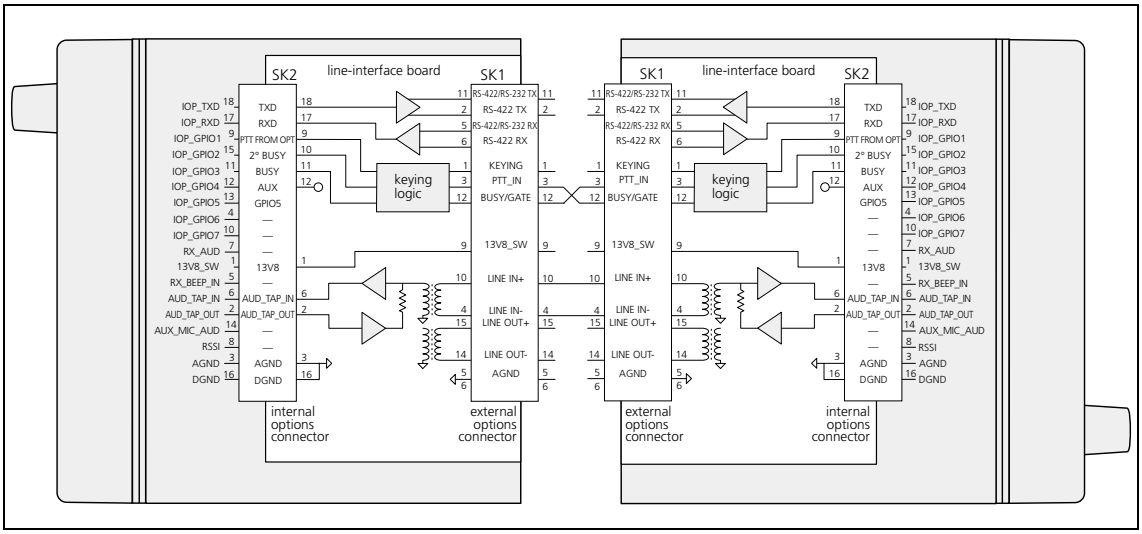
Table 2.8 External options connector (SK1—pins and signals

	Pin	Signal	Description
	1	KEYING	signal line keying
	2	RS-422/RS-232	serial data TX-/RS-232 TXD
	11	RS-422	serial data TX+
	3	PTT-IN	bi-directional keying input
	4	4W_LINE_IN -	4-wire line in negative
	10	4W_LINE_IN +	4-wire line in positive
	5	RS-422/RS-232	serial data RX+/RS-232 RXD
	6	RS-422	serial data RX-
	7	GND	ground
	8	—	not connected
	9	13V8 FROM RADIO	switched 13.8V supply from the radio
	12	BUSY/GATE	busy or receiver gate output. 5V CMOS logic level.
	13	—	not connected
	14	4W_LINE_OUT -	4-wire line out negative or 2-wire line in/out negative
	15	4W_LINE_OUT +	4-wire line out positive or 2-wire line in/out positive

2.6 Line-Interface Board Application

The following diagram shows the control of two radios operated together, crossband or repeater linked.

Figure 2.3 Two radios connected as a repeater/crossband link



2.7 Line-Interface Board Specifications

Input Voltage	10.8V to 16VDC
Operating Temperature Range	-10°C to +60°C ambient
DC Input Current	<40mA total (+13.8V supply)
Line Input Sensitivity (60% deviation)	-20dBm to +6dBm (600Ω)
Line Output Level (60% deviation)	-20dBm to +6dBm (600Ω)
Line Impedance	600Ω
Return Loss (300Hz to 3kHz)	>20dB relative to 600Ω
Line Output Filter Response (stopband)	
2 pole	-12dB/octave, f >4kHz
6 pole	-36dB/octave, f >4kHz

2.7.1 Radio With Line-Interface Board: Receiver + Line Output

Receiver Frequency Response*	
Receiver Processed Bandwidth	300Hz to 3kHz (standard) 400Hz to 3kHz (CTCSS)
Response	+1, -3dB relative to -6dB/octave
Receiver Unprocessed	+1, -3dB (300Hz to 3kHz)
*relative to 1kHz, 60% deviation	
Test Signal	-46dBm RF*, 0dBm line output, audio tap T4 *60% deviation at 1kHz
Signal-to-Noise Ratio	
Narrow Bandwidth	>40dB
Wide Bandwidth	>43dB
Mute Ratio	>60dB
Distortion*	
Narrow Bandwidth	<4%
Wide Bandwidth	<4%
*30kHz bandwidth distortion meter	

2.7.2 Radio With Line-Interface Board: Receiver + Line Input

Transmitter Frequency Response*	
Bandwidth	300Hz to 3kHz
Response	+1, -3dB relative to -6dB/octave
*relative to 1kHz, 20% deviation, below limiting	
Test Signal	0dBm line input*, audio tap T1 *60% deviation at 1kHz
Signal-to-Noise Ratio*	
Narrow Bandwidth	>40dB
Wide Bandwidth	>43dB
*demodulated, filtered 300Hz to 3kHz and de-emphasised 750µs rms	
Mute Ratio	>60dB
Distortion*	<3%
*demodulated, filtered 15kHz low pass	

2.8 Circuit Description

2.8.1 Audio Interface

When the line-interface board is used for repeater applications, the audio passed between the two radios must be of such a level that the message is able to be repeated intelligibly. The audio interface is therefore capable of handling a wide range of input and output levels (-20 to +6 dBm). The audio interface is also capable of using either a two- or four-wire isolated interface formats, which are selectable using S1.

The input to the line driver IC (U5) is the AUDIO TAP OUT line from the radio. This line is a software-programmabable tap point which can be chosen from various audio signals available within the radio and is coupled through a capacitor into the audio line out level control (RV2). This variable resister is AC coupled into the line driver (U5) which is used in a bridged-output format, with gain set to provide the necessary 21 dB gain.

The resistors on the output of the line driver provides the necessary 600Ω terminating impedance, but also cause a 50% loss of signal. This is compensated for by the higher-than-necessary gain of the line driver. Line out protection is provided by two zener diodes, and the transformer (T1) provides isolation.

The audio interface is capable of using a two- or four-wire interface, so a tap is taken from one side of the balanced line out and is feed directly into the line input level control (RV3). When using a four-wire interface, the signal comes in through a second isolation transformer, T2. T2 is terminated with 600Ω and also acts as a voltage divider. This means that the signal level at RV3 will be identical to the level at RV3 when using a two-wire interface.

To achieve the required output level the non-inverting AC amplifier (U7) has a gain of 10, which provides the necessary 13 dB of gain. The output of the amplifier is AC coupled into the AUDIO_TAP_IN line (pin 6 of SK2).

2.8.2 Logic Interface

The line-interface board is able to provide simple interface solutions with other radios. Logic is used to control keying of both radios as well as providing time delays to prevent squelch or cycling problems. The logic uses gates rather than discrete components.

The choice of which input controls BUSY/GATE can be selected using switches 3 and 4 of S1, while the sense of BUSY/GATE (pin 12 of SK1) can be selected using switches 5 and 6. Switch 7 accommodates either a two-line keying system or a single bi-directional keying line.

The comparators (in U1) operate off a single sided regulated 5V supply.

U1 pins 2,4 and 5 provide receiver gate delay. Once the busy signal is not active, C4 charges through R12 and causes U4 to go low. Once charging exceeds the voltage at U1 pin5. This also locks out the keying state until this delay has occurred (U6 pin 5).

2.8.3 Data Communication

The Line Interface circuitry is designed to provide RS-232 and RS-422 data communication. RS-232 is provided by U9, but if RS-422 is required, U9 is removed and replaced by U2 and U10. Also resistors R15,16,43 and 47 need to be fitted.

2.8.4 Power Supply

The power supply for the line-interface board comes from the radio via the internal options connector and is a 13.8V switched supply. Digital logic components are used in the line-interface board so there is a 5V regulator provided.

Initially the 13.8V from the radio is filtered and used for the audio line driver (U5) with reference to analogue ground. This 13.8V is also used to supply the 5V regulator, which is filtered separately for either 5V digital or analogue devices. A simple voltage divider is used to provide a 2.5V half-rail for the digital and a 2.2V rail for the analogue sections.

2.9 PCB Information

2.9.1 TMAA01-01 Parts List (PCB IPN 220-65202-03)

Ref.	IPN	Description
C1	014-08100-03	Cap Tant SMD 10u 35v 20% D
C2	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C3	014-07470-01	Cap Tant SMD 4u7 25v 10% B
C4	014-18100-05	Cap Tant SMD 10u 10v 10% A
C5	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C7	014-07470-01	Cap Tant SMD 4u7 25v 10% B
C8	018-14100-00	Cap 0603 1n 50v X7r ±10%
C9	018-14100-00	Cap 0603 1n 50v X7r ±10%
C10	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C12	015-26220-08	Cap 0805 220n 10% X7r 16v
C13	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C14	018-14100-00	Cap 0603 1n 50v X7r ±10%
C15	018-14100-00	Cap 0603 1n 50v X7r ±10%
C16	014-06220-00	Cap Tant SMD 2.2Mf 50v
C17	015-26220-08	Cap 0805 220n 10% X7r 16v
C18	016-08470-01	Cap Elec SMD 47uf 6*4 16v
C19	018-15100-00	Cap 0603 10n 50v X7r ±10%
C20	018-15100-00	Cap 0603 10n 50v X7r ±10%
C21	014-07470-01	Cap Tant SMD 4u7 25v 10% B
C22	018-15100-00	Cap 0603 10n 50v X7r ±10%
C25	015-26220-08	Cap 0805 220n 10% X7r 16v
C26	018-13150-00	Cap 0603 150p 50v NPO ±5%
C27	015-26220-08	Cap 0805 220n 10% X7r 16v
C28	015-26220-08	Cap 0805 220n 10% X7r 16v
C29	018-15100-00	Cap 0603 10n 50v X7r ±10%
C30	018-15100-00	Cap 0603 10n 50v X7r ±10%
C31	018-15100-00	Cap 0603 10n 50v X7r ±10%
C32	018-15100-00	Cap 0603 10n 50v X7r ±10%
C35	015-26220-08	Cap 0805 220n 10% X7r 16v
C37	018-15100-00	Cap 0603 10n 50v X7r ±10%
C38	018-15100-00	Cap 0603 10n 50v X7r ±10%
C39	018-15100-00	Cap 0603 10n 50v X7r ±10%
C40	018-15100-00	Cap 0603 10n 50v X7r ±10%
C41	018-15100-00	Cap 0603 10n 50v X7r ±10%
D1	001-10084-47	Diode SMD BZX84C4V7 Zen SOT23
D2	001-10099-01	Diode BAV99w Dual Ss
D4	001-10070-01	Diode BAV70W Dual Ss SOT323
D5	001-10084-51	Diode SMD BZX84C5V1 Zen SOT23
D6	001-10084-51	Diode SMD BZX84C5V1 Zen SOT23
D7	001-10084-51	Diode SMD BZX84C5V1 Zen SOT23
D8	001-10099-01	Diode BAV99w Dual Ss
D9	001-10084-51	Diode SMD BZX84C5V1 Zen SOT23
D10	001-10099-01	Diode BAV99w Dual Ss
D11	001-10099-01	Diode BAV99w Dual Ss
D12	001-10284-51	Diode SMD BZX284B5V1 Zensod110
E1	057-10120-03	Ind 0805 120e@100m .2 Emi Supr
E2	057-10120-03	Ind 0805 120e@100m .2 Emi Supr
E3	057-10120-03	Ind 0805 120e@100m .2 Emi Supr
E4	057-10120-03	Ind 0805 120e@100m .2 Emi Supr
FL1	057-10120-03	Ind 0805 120e@100m .2 Emi Supr
FL2	057-10120-03	Ind 0805 120e@100m .2 Emi Supr
FL3	057-10120-03	Ind 0805 120e@100m .2 Emi Supr
FL4	057-10120-03	Ind 0805 120e@100m .2 Emi Supr
FL5	057-11220-02	Ind 0603 Blm11a221 Emi Supr
FL6	057-11220-02	Ind 0603 Blm11a221 Emi Supr
FL7	057-11220-02	Ind 0603 Blm11a221 Emi Supr
FL8	057-11220-02	Ind 0603 Blm11a221 Emi Supr
FL9	012-14100-00	Cap Cer SMD 1N Array EMI Supr
Q1	000-10084-71	Xstr BC847BW NPN SOT323
Q2	000-10084-71	Xstr BC847BW NPN SOT323
Q3	000-10084-71	Xstr BC847BW NPN SOT323
R1	036-02100-03	RES Pwr 1218 10R 5% 1W
RV1	042-05100-06	Res Pre TH 10k 6mm Top
R2	038-15100-10	RES 0603 10k 1% 1/10W
RV2	042-05100-06	Res Pre TH 10k 6mm Top
R3	038-14100-10	RES 0603 1k0 1% 1/10W
RV3	042-05100-06	Res Pre TH 10k 6mm Top
R4	038-15100-10	RES 0603 10k 1% 1/10W
R5	038-16470-00	RES 0603 470k 5% 1/10W
R8	038-17100-10	RES 0603 1M 1% 1/10W
R9	036-02100-03	RES Pwr 1218 10R 5% 1W

Ref.	IPN	Description
R10	038-13100-10	RES 0603 100R 1% 1/10W
R11	038-14330-10	RES 0603 3k3 1% 1/10W
R12	038-14560-00	RES 0603 5k6 5% 1/10W
R13	038-16330-10	RES 0603 330k 1% 1/10W
R14	038-16330-10	RES 0603 330k 1% 1/10W
R15A	038-13680-00	RES 0603 680R 5% 1/10W
R16A	038-13120-00	RES 0603 120R 5% 1/10W
R17	038-13680-00	RES 0603 680R 5% 1/10W
R18	038-15100-10	RES 0603 10k 1% 1/10W
R19	036-13270-00	RES 0805 270R 5% 1/8W
R20	038-15100-10	RES 0603 10k 1% 1/10W
R21	038-14330-10	RES 0603 3k3 1% 1/10W
R22	038-10000-00	RES 0603 0R
R23	038-15100-10	RES 0603 10k 1% 1/10W
R24	038-14330-10	RES 0603 3k3 1% 1/10W
R25	038-15100-10	RES 0603 10k 1% 1/10W
R26	038-15470-10	RES 0603 47k 1% 1/10W
R27	038-15820-10	RES 0603 82k 1% 1/10W
R28	038-15470-10	RES 0603 47k 1% 1/10W
R29	038-16120-10	RES 0603 120k 1% 1/10W
R30	038-15470-10	RES 0603 47k 1% 1/10W
R31	038-15470-10	RES 0603 47k 1% 1/10W
R32	038-16120-10	RES 0603 120k 1% 1/10W
R34	038-12560-00	RES 0603 56R 5% 1/10W
R35	038-14100-10	RES 0603 1k0 1% 1/10W
R36	038-15470-10	RES 0603 47k 1% 1/10W
R37	038-15100-10	RES 0603 10k 1% 1/10W
R38	038-15120-10	RES 0603 12k 1% 1/10W
R39	038-16180-00	RES 0603 180k 5% 1/10W
R40	038-13180-10	RES 0603 180R 1% 1/10W
R41	038-13180-10	RES 0603 180R 1% 1/10W
R43A	038-13680-00	RES 0603 680R 5% 1/10W
R44	038-13680-00	RES 0603 680R 5% 1/10W
R45	038-13330-00	RES 0603 330R 5% 1/10W
R47A	038-13120-00	RES 0603 120R 5% 1/10W
R48	038-16120-10	RES 0603 120k 1% 1/10W
R49	038-16150-10	RES 0603 150k 1% 1/10W
R50	038-15120-10	RES 0603 12k 1% 1/10W
R51	038-16120-10	RES 0603 120k 1% 1/10W
R52	038-15470-10	RES 0603 47k 1% 1/10W
R53	038-10000-00	RES 0603 0R
R54	038-10000-00	RES 0603 0R
R55	038-10000-00	RES 0603 0R
R56	038-12560-00	RES 0603 56R 5% 1/10W
S1	230-10010-44	Sw SMD Spst 16dil X8
SK1	240-00011-67	Skt 15w Drng Ra Slim Dsub 7912
SK2	240-10000-11	Conn SMD 18w Skt M/Match
T1	054-00010-18	Xfmr Line SMD 600 Ohm P2781
T2	054-00010-18	Xfmr Line SMD 600 Ohm P2781
U1	002-10339-00	IC SMD LM339 4x CMplt S014
U3	002-10740-40	IC 74AHCT04 SOIC14 Hex Inv
U4	002-10740-80	IC 74AHCT08 SOIC14 4x2IP AND
U5	002-10854-10	IC TDA8541T 1w Audio Amp
U6	002-10740-80	IC 74AHCT08 SOIC14 4x2IP AND
U7	002-10003-58	IC SMD LM358 Dual 0-Amp
U8	002-10078-05	IC SMD 78l05 5v Reg
U9	002-10002-02	IC SMD ADM202E RS232/Esd S016
	220-65202-03	PCB 600 OHM line Interface TMA
	402-00012-0X	MANL f/instr TMAA01-01
600-00009-00 Pkg Kit Opt 15w parts:		
	240-00032-00	Plg 15w Drng Hi-D UL-CSA P/Mtg
	240-06010-29	Conn 9w Hood/Cvr Lets
600-00010-00 Pkg Kit Opt Int parts:		
	219-00329-00	Loom TMA Int Opt
	354-01043-00	Fsnr Scrw Lok 1pr 4-40
	362-01108-01	Seal Drng Cvr 9way TMA
	362-01111-00	Seal Drng 9way TMA
	347-00011-00	Scrw 4-40*3/16 Unc P/P Blk
	349-02062-00	Scrw M3*8 T/T P/T ContiR

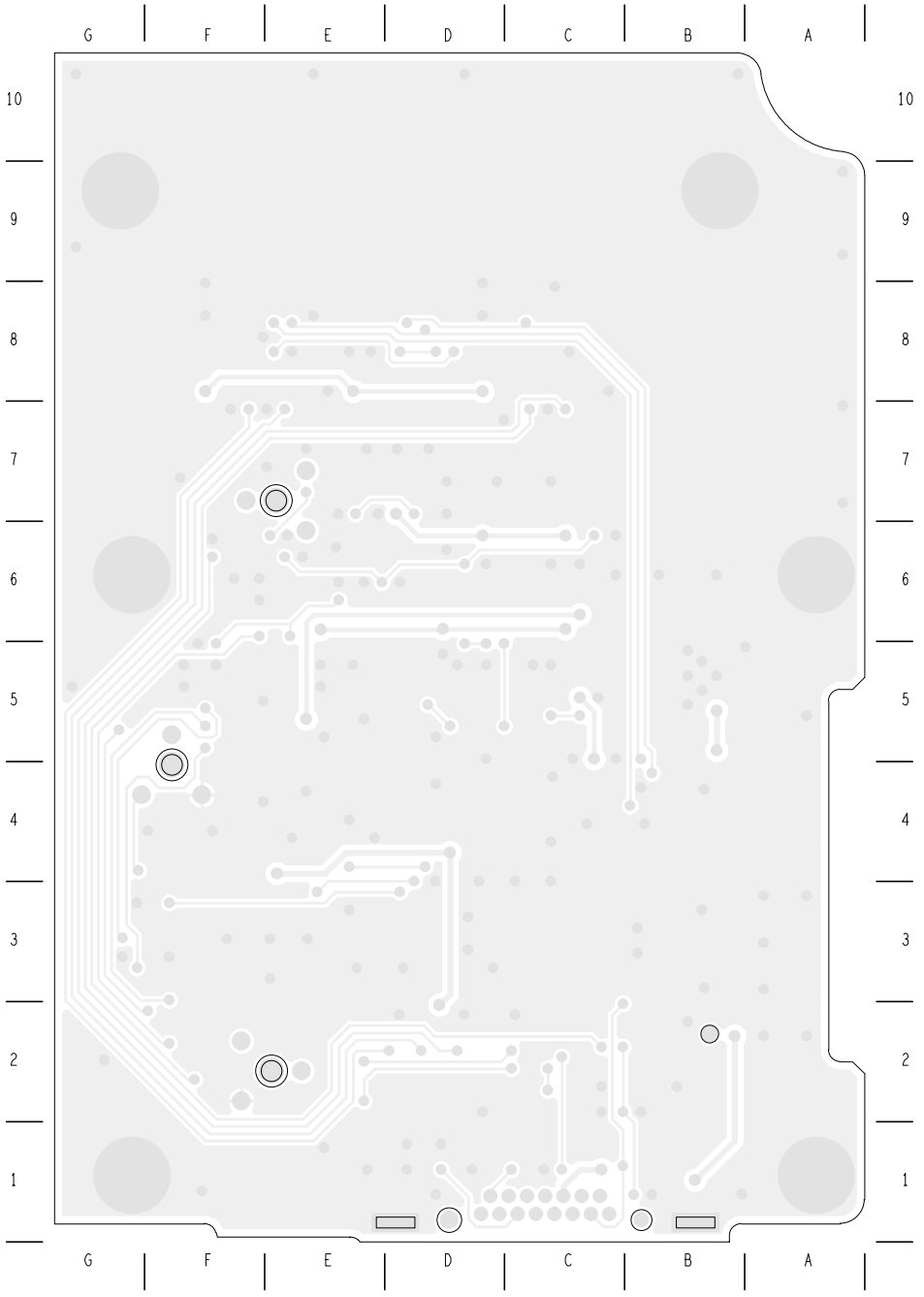
2.9.2 TMAA01-01 Grid Reference List (PCB IPN 220-65202-03)

Ref.	PCB	Circuit
C1	B2	2:A2
C2	B1	2:A2
C3	C5	2:A4
C4	F6	1:D5
C5	D8	2:G3
C7	B6	2:A4
C8	D2	2:F6
C9	D2	2:G6
C10	B6	2:B4
C12	E2	1:K3
C13	F8	2:C3
C14	D2	2:B6
C15	C2	2:C6
C16	C7	1:B10
C17	E3	1:K4
C18	E3	1:J7
C19	E6	1:A9
C20	C6	1:A9
C21	F3	1:K8
C22	D6	1:A10
C24	C1	2:G8
C25	E5	1:H2
C26	F5	1:H3
C27	G4	1:G3
C28	F4	1:H4
C29	E5	1:A12
C30	D6	1:A11
C31	C1	1:J13
C32	C1	1:H13
C33	B1	2:G8
C35	D5	1:J9
C37	E8	2:E3
C38	D8	2:E3
C39	E8	2:E3
C40	E8	2:E4
C41	D8	2:E4
D1	E1	1:C11
D2	D2	1:F12
		1:G12
D4	D6	1:C10
		1:B10
D5	B3	1:J12
D6	C2	1:K12
D7	C3	1:J12
D8	G5	1:H4
D9	B2	1:H12
D10	D2	1:E12
D11	C2	1:D12
D12	B5	2:A3
E1	C2	2:C6
E2	D2	2:C6
E3	C1	2:C7
E4	D1	2:C7
FL1	D2	2:G6
FL2	D2	2:F6
FL3	D1	2:G7
FL4	D1	2:F7
FL5	E3	1:K11
FL6	D3	1:J11
FL7	C3	1:J11
FL8	C3	1:H11
FL9	C1	1:D13
		1:G13
		1:E13
MT1	B9	2:A5
MT2	G9	2:A6
MT3	A6	2:A6
MT4	G6	2:A7
MT5	A1	2:A7
MT6	G1	2:A8
Q1	G5	1:E9
Q2	E2	1:G10
Q3	C6	1:D4
R1	B1	2:B2
R2	D6	1:E7
R3	D2	1:E12
R4	F8	2:G3
R5	E6	1:E6
R8	E6	1:D5
R9	C6	2:B3
R10	B6	2:A4
R11	C4	1:D2
R12	E6	1:E5
R13	E6	1:E5
R14	C7	1:E4
R15A	A7	2:E8
R15	F8	2:G5
R16A	A7	2:E8
R16	E8	2:F5
R17	E8	2:F5
R18	F7	1:E6
R19	F7	1:D5
R20	D6	1:D4
R21	C4	1:D2
R22	D1	2:B8
R23	D7	1:B8
R24	C3	1:G2
R25	F5	1:E9
R26	E2	1:G9
R27	D7	1:B9
R28	E7	1:B9
R29	E7	1:B10
R30	E3	1:F9
R31	D2	1:G11
R32	D7	1:B10
R34	F5	1:D9
R35	C2	1:D12
R36	E2	1:E11
R37	D6	1:B11
R38	E3	1:K4
R39	E4	1:K7
R40	E4	1:K8
R41	D4	1:J8
R43A	A7	2:E9
R43	C8	2:C4
R44	C8	2:B4
R45	C4	1:H10
R46	E8	2:F2
R47A	A7	2:E9
R47	C8	2:C4
R48	F5	1:H3
R49	E5	1:H3
R50	F4	1:G3
R51	F5	1:H3
R52	D2	1:D12
R53	C3	1:H11
R54	D3	1:J11
R55	F8	2:F3
R56	E3	1:F10
R57	F9	2:F2
RV1	E7	1:E5
RV2	F2	1:K3
RV3	F4	1:H5
S1	G3	1:D5
		1:D11
		1:F4
		1:G4
		1:G9
		1:J9
		1:H9
		1:F9
SK1	D1	2:B8
		2:F9
		2:C8
		2:G9
SK1	D1	1:K13
		1:J13
		1:H13
		1:B13
		1:G13
		1:D13
		1:E13
SK2	B3	2:F1
		2:C1
		2:B1
		2:G1
SK2	B3	1:C1
		1:H1
		1:D1
		1:G1
		1:F1
		1:K1
T1	D4	1:J11
T2	C4	1:H11
TP1	B4	1:D2
TP2	B3	1:F2
TP3	B4	1:D2
TP4	B3	1:G2
TP5	D2	1:E13
TP6	C2	1:G12
TP7	C2	1:D13
U1	E7	1:C5
		1:E6
		1:B9
		1:A11
		1:C4
U2	E8	2:F3
U3	F5	1:G6
		1:G7
		1:F2
		1:B6
		1:C10
		1:A9
U4	E5	1:B6
		1:A10
		1:E8
		1:F3
U5	E3	1:J7
U6	D5	1:A8
		1:C10
		1:B11
		1:B7
		1:D3
U7	E4	1:H3
		1:J3
		1;A12
U8	B5	2:A3
U9	D8	2:E3
U10	C8	2:C3
W1	C7	1:E4

2.9.3 Line-Interface Board Layout (top side)

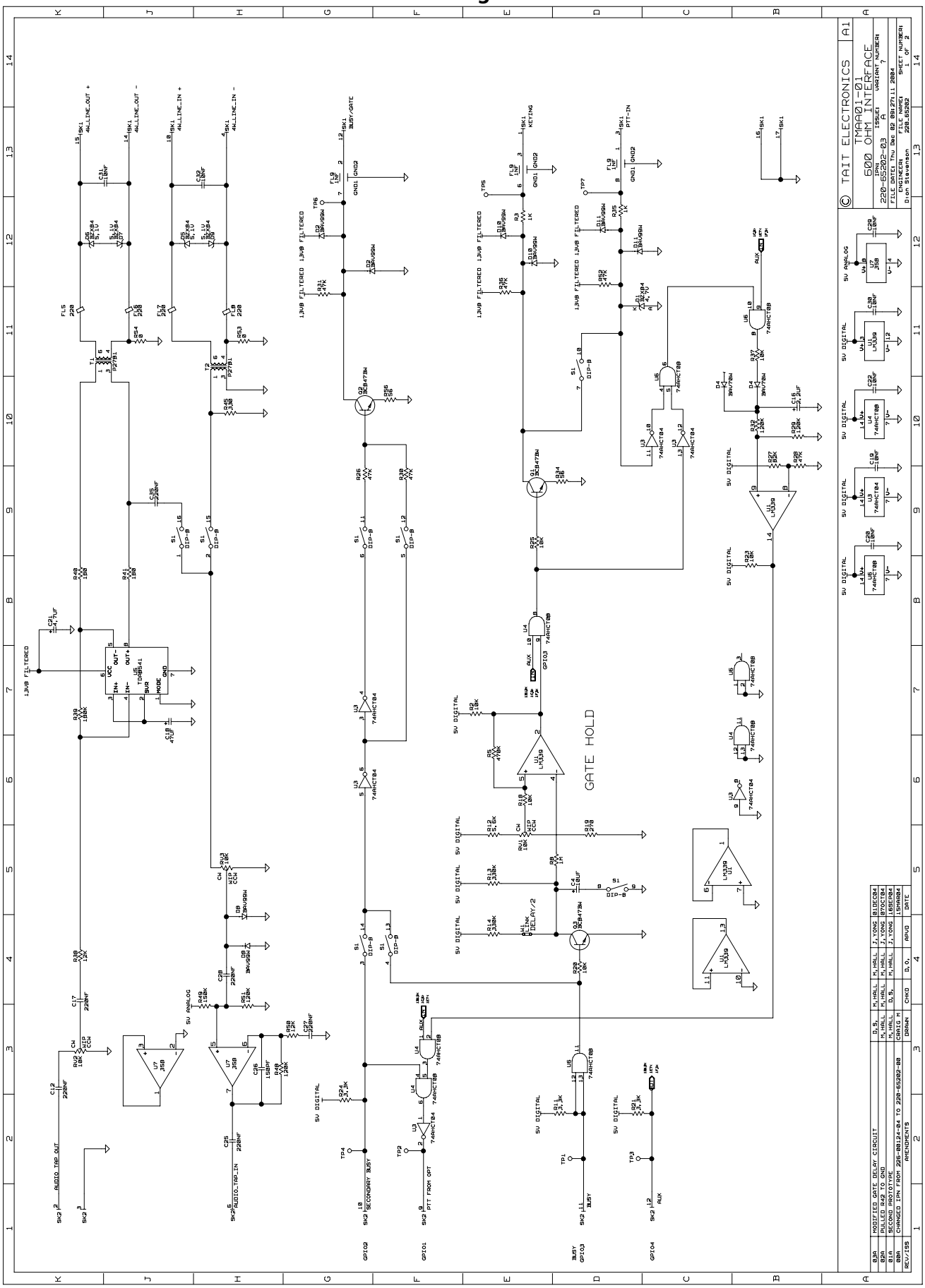
IPN 220-65202-03

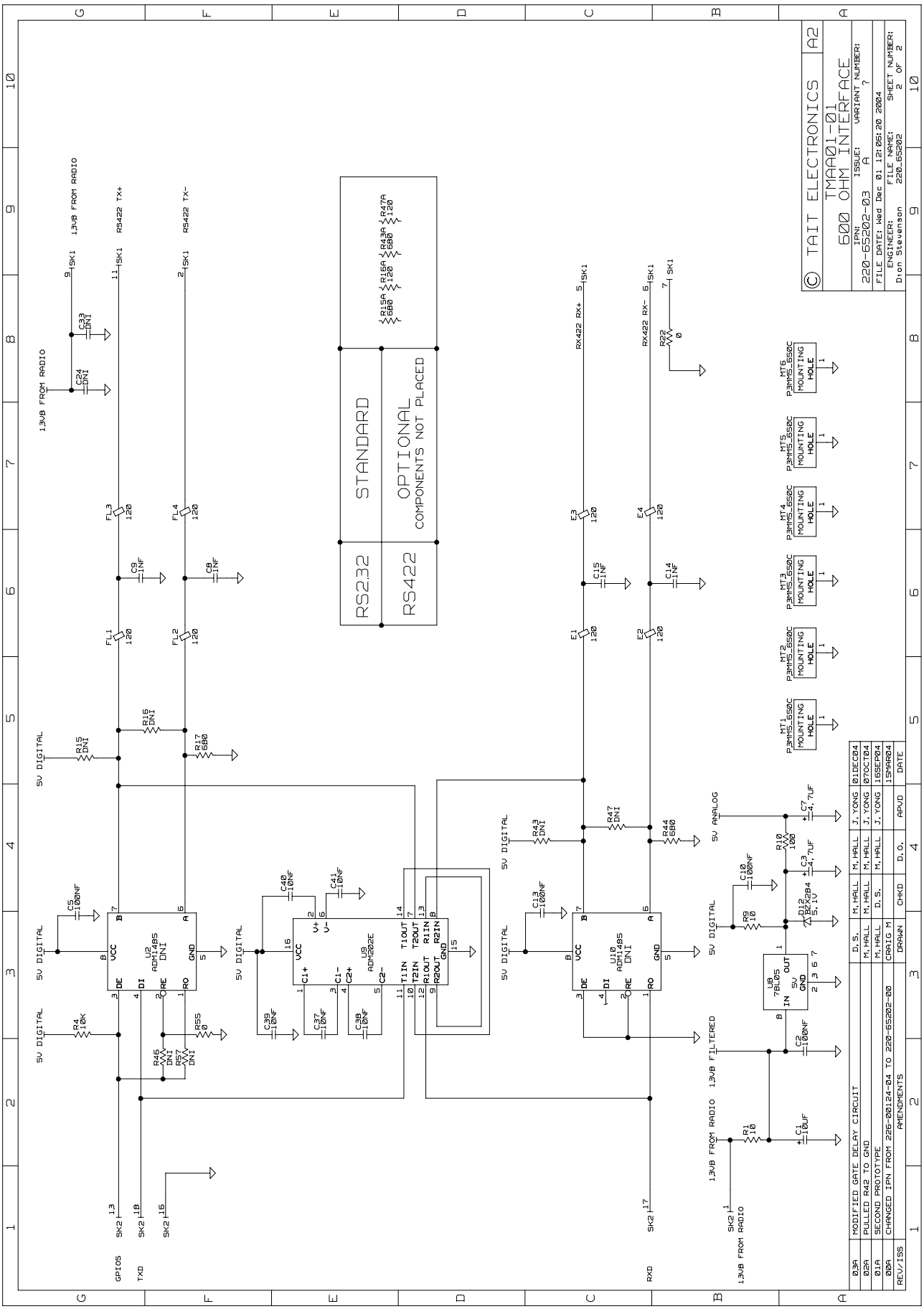
2.9.4 Line-Interface Board Layout (bottom side)



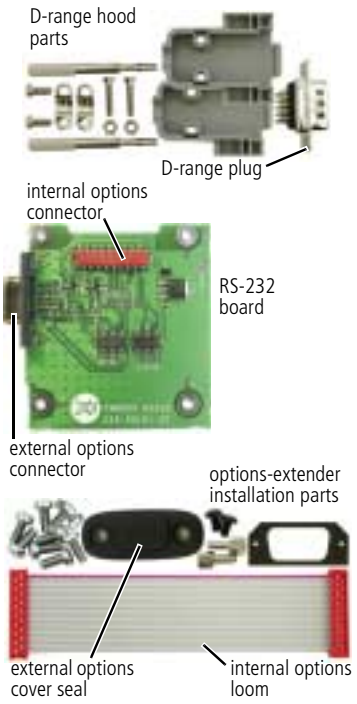
IPN 220-65202-03

2.9.5 Line-Interface Board Circuit Diagram





3 TMAA01-02 RS-232 Board



The TMAA01-02 RS-232 board fits inside the radio in the options cavity and is connected to the main PCB by the internal options connector and loom.

The RS-232 signals are then made available on the 9-way D-range connector mounted on the RS-232 board. This connector fits through the external options connector hole provided in the radio chassis.

Important The radio does not meet the IP54 protection standard once an RS-232 board has been installed unless the external options cover seal is installed.

Important To comply with EN 301 489-5, all cables connected to the external options connector must be less than three metres (10 feet) in length.

3.1 Operation

The TMAA01-02 RS-232 board provides a suitable interface to external devices requiring full RS-232 level compatibility. As well as supporting transmit and receive data lines, the board also supports RTS and CTS hardware flow control lines.

3.1.1 Hardware Flow Control

Although the serial transmit and receive lines are dedicated connections on the internal options connector, the RTS and CTS lines have to be assigned. For hardware flow control, these lines are set up in the programming application. RTS should be assigned to IOP_GPIO3 and CTS should be assigned to IOP_GPIO1.

Refer to the online help of the programming application for more information.

3.2 Installing the RS-232 Board

3.2.1 Parts Required

The following table describes the parts required to install an RS-232 board in a radio. The parts marked with an asterisk (★) are not shown in Figure 3.1 and are used to connect to the radio's external options connector.

Table 3.1 RS-232 installation parts required

Quantity	Internal Part Number	Description	Figure 3.1 Reference
1	362-01111-XX[a]	foam seal	③
1	362-01108-XX[a]	cover seal	⑪
2	347-00011-00	4-40x3/16 screws	⑫
2	354-01043-00	screw-lock fasteners	⑦
4	349-02062-00	M3x8 screws	⑨
★1	240-00034-00	D-range plug	—
★1	240-06010-29	D-range hood	—

a. Contact Technical Support for the exact IPN.

3.2.2 Installation Procedure

1. Disassemble the radio in order to gain access to the options cavity.

   For detailed disassembly instructions, refer to the disassembly procedure in the service manual.

Refer to the diagram on the following page and the instructions below.

2. Remove the top cover and lid ① from the radio to access the options cavity.
3. Remove the external options connector bung ②, if it is fitted.
4. On the inside of the radio lid place the foam seal ③ over the external options connector cavity ④.
5. Plug one end of the internal options connector loom into the internal options connector on the RS-232 board.
6. With the top side of the RS-232 board ⑤ facing the radio lid, guide the external options connector ⑥ (the D-range connector on the RS-232 board) into the external options connector cavity.

Important The external options connector screw-lock fasteners must be tightened correctly before screwing the RS-232 board onto the mounting posts ⑧.

7. Screw the external options connector to the radio lid using the two screw-lock fasteners ⑦.

   Tighten the fasteners to a torque of 0.9N·m (8lbf·in).

8. Screw the RS-232 board to the mounting posts on the radio lid using four M3x8 self-tapping screws ⑨.

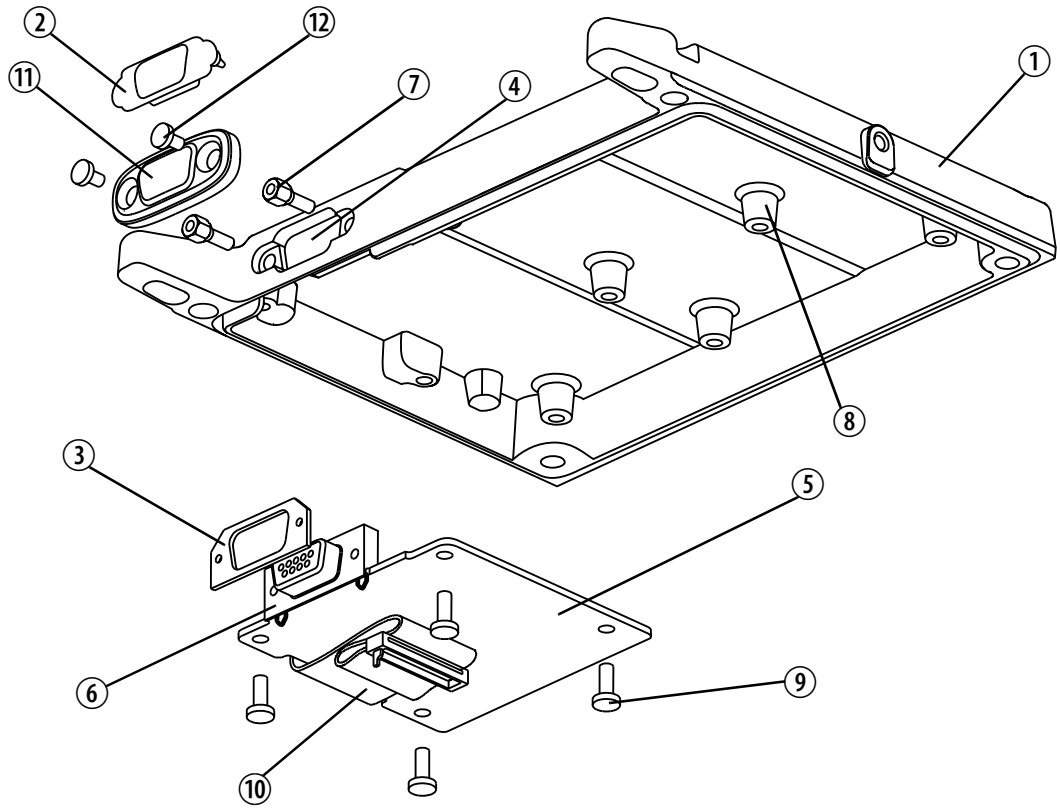
   Tighten the M3x8 screws to a torque of 1.9N·m (17lbf·in)

Important For the RS232 board to be installed correctly in the radio's options cavity, the internal options connector loom ⑩ must be looped in the way shown in Figure 3.1.

9. Plug the unattached end of internal options connector loom ⑩ into the internal options connector on the radio main PCB.

10. Refit the radio lid and top cover to the radio and screw the external options cover seal ⑪ over the external options connector, using the two 4-40x3/16 screws ⑫.

Figure 3.1 RS-232 board installation



① radio lid
② external options connector bung
③ foam seal
④ external options connector cavity
⑤ RS-232 board
⑥ external options connector
⑦ screw-lock fasteners
⑧ mounting posts
⑨ M3x8 self-tapping screws
⑩ internal options loom
⑪ external options cover seal
⑫ 4-40x3/16 screws

3.3 Interface Specification

The following tables summarize the signals used for the RS-232 board on the internal options connector (SK1 on the RS-232 board) and the external options connector (SK2 on the RS-232 board).

Note The TM8000 3DK Hardware Developer's Kit Application Manual (product code MMAA30-01-00-807) contains a detailed electrical specification for the signals available on the radio's internal options connector. This manual is part of the 3DK Resource CD, which can be purchased using product code TMAA30-01.

Table 3.2 Internal options connector—pins and signals

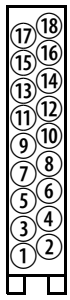
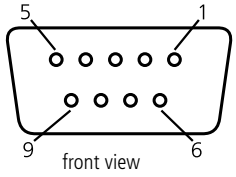
	Pin	Connector Signal	Description
 top view	1	13V8_SW	switched 13V8 supply from the radio
	2	AUD_TAP_OUT	Programmable tap point out of the receive or transmit audio chain. DC-coupled
	3	AGND	analogue ground
	4	AUX_MIC_AUD	Auxiliary microphone input, with electret microphone biasing provided. Dynamic microphones are not supported.
	5	RX_BEEP_IN	receive sidetone input, AC-coupled
	6	AUD_TAP_IN	Programmable tap point into the receive or transmit audio chain. DC-coupled
	7	RX_AUD	not connected
	8	RSSI	analogue RSSI output
	9-15	IOP_GPIO1 to IOP_GPIO7	programmable function and direction
	16	DGND	digital ground
	17	IOP_RXD	an RS-232 compliant asynchronous serial port - receive data
	18	IOP_TXD	an RS-232 compliant asynchronous serial port - transmit data

Table 3.3 External options connector—pins and signals

	Pin	Signal	Direction
	2	serial transmit data	output from the radio
	3	serial receive data	input to the radio
	5	data ground	—
	7	RTS using IOP_GPIO3	input to the radio
	8	CTS using IOP_GPIO1	output from the radio

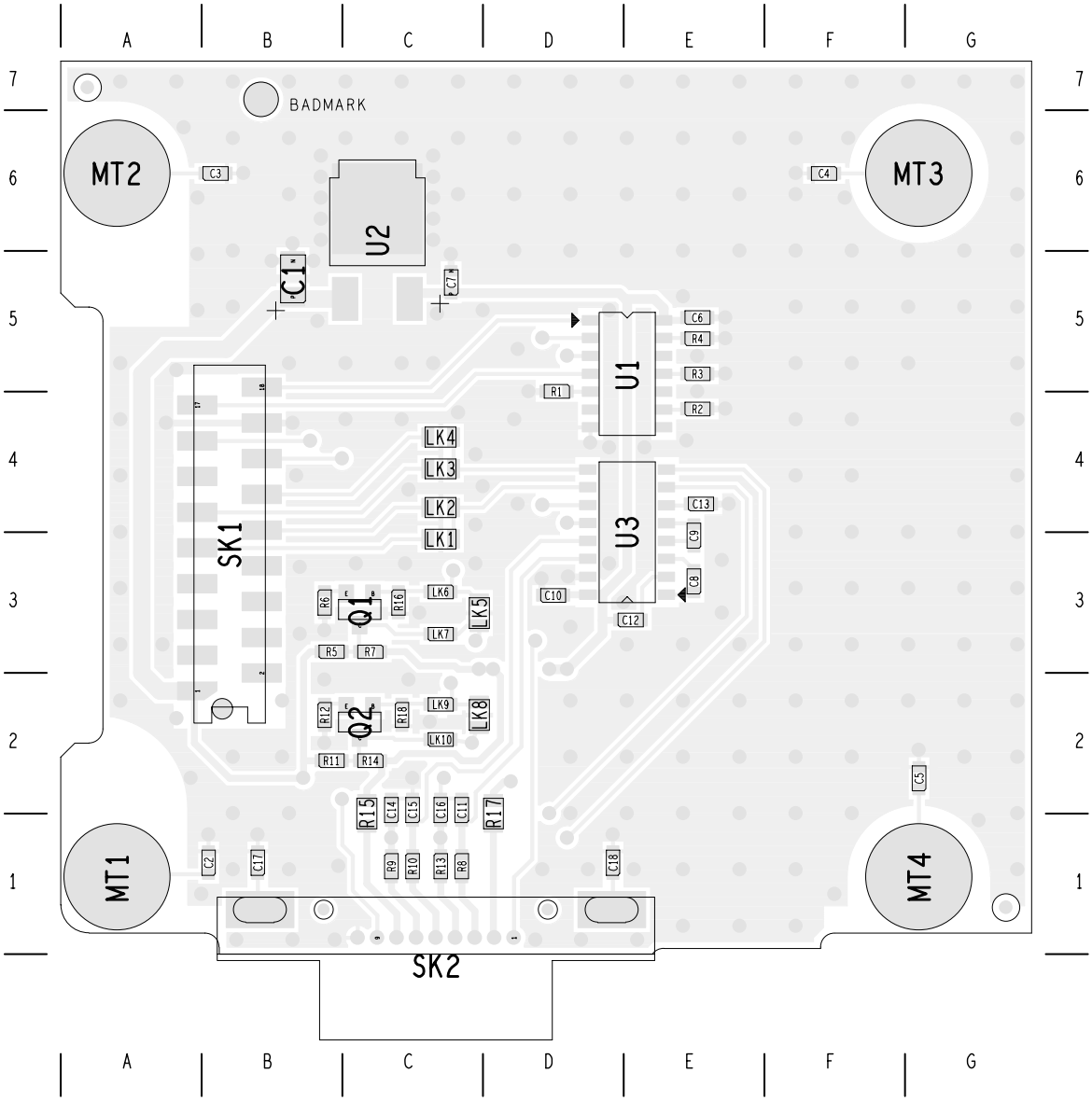
3.4 PCB Information

3.4.1 TMAA01-02 Parts List (PCB IPN 220-01740-01)

Ref.	IPN	Description
C1	014-07100-02	Cap Tant SMD 1u0 16v 20% A
C2	018-14100-00	Cap 0603 1n 50v X7r ±10%
C3	018-14100-00	Cap 0603 1n 50v X7r ±10%
C4	018-14100-00	Cap 0603 1n 50v X7r ±10%
C5	018-14100-00	Cap 0603 1n 50v X7r ±10%
C6	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C7	014-07470-10	Cap Tant SMD 4u7 10V 20% 0603
C8	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C9	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C10	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C11	018-14100-00	Cap 0603 1n 50v X7r ±10%
C12	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C13	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C14	018-14100-00	Cap 0603 1n 50v X7r ±10%
C15	018-14100-00	Cap 0603 1n 50v X7r ±10%
C16	018-14100-00	Cap 0603 1n 50v X7r ±10%
C17	018-14100-00	Cap 0603 1n 50v X7r ±10%
C18	018-14100-00	Cap 0603 1n 50v X7r ±10%
LK1	036-14100-10	RES 0805 1k 1% 1/8W
LK3	036-14100-10	RES 0805 1k 1% 1/8W
R1	038-15100-10	RES 0603 10k 1% 1/10W
R2	038-15100-10	RES 0603 10k 1% 1/10W
R3	038-15100-10	RES 0603 10k 1% 1/10W
R4	038-15100-10	RES 0603 10k 1% 1/10W
R8	038-13100-10	RES 0603 100R 1% 1/10W
R9	038-13100-10	RES 0603 100R 1% 1/10W
R10	038-13100-10	RES 0603 100R 1% 1/10W
R13	038-13100-10	RES 0603 100R 1% 1/10W
SK1	240-10000-11	Conn SMD 18w Skt M/Match
SK2	240-06009-20	Conn DIP D-Sub 9W Female TM8K
U1	002-10740-40	IC 74AHCT04 SOIC14 Hex Inv
U2	002-10078-00	IC SMD MC78M05CDT5v Reg0.5a
U3	002-10022-22	IC SMD ST202E RS232/ESD SO16

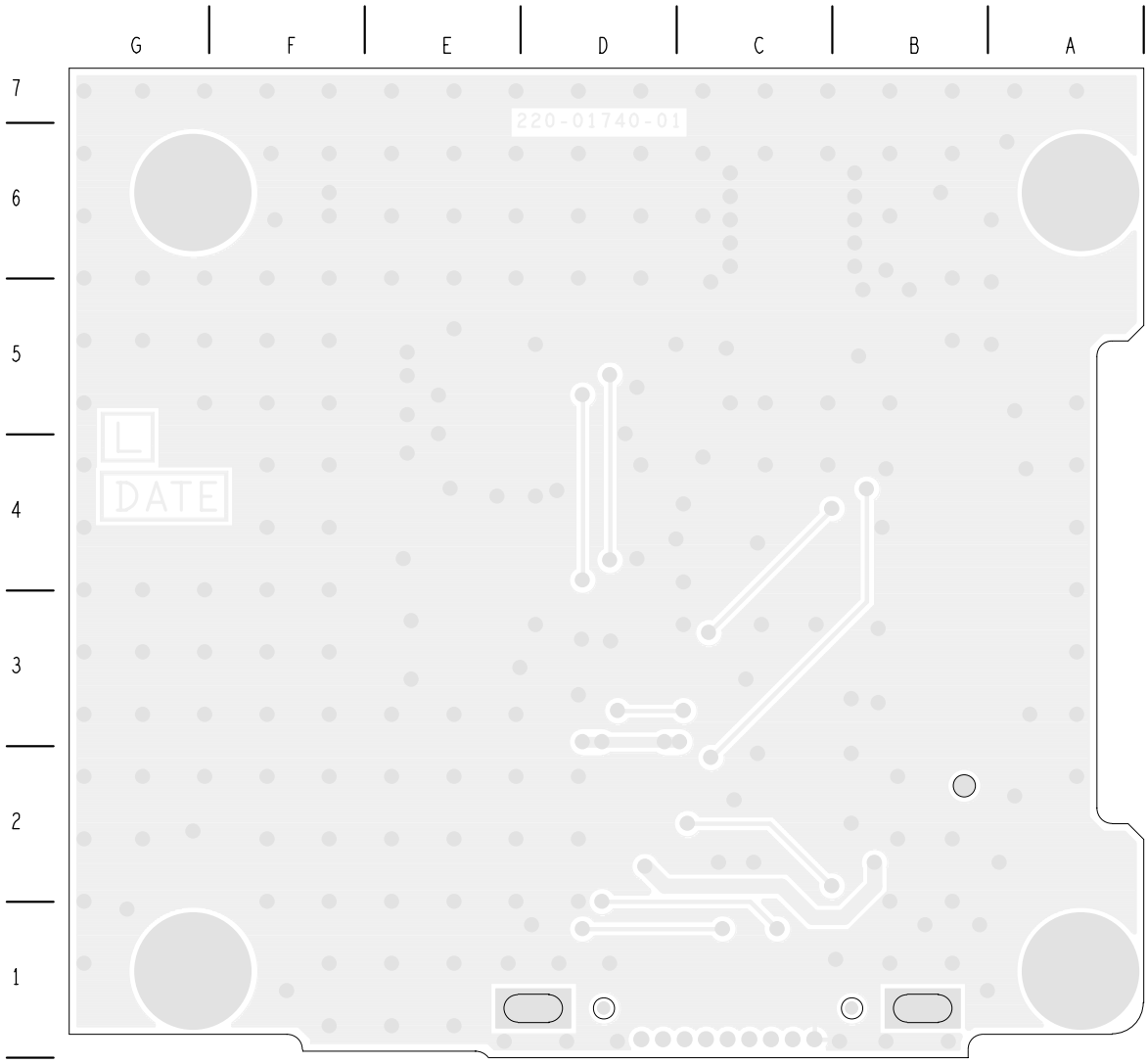
Ref.	IPN	Description
	220-01740-01	PCB TMA RS232 Options
	402-00019-0X	F/Inst TMAA01-02 RS232 Brd
600-00010-00 Pkg Kit Opt Int parts:		
	219-00329-00	Loom TMA Int Opt
	354-01043-00	Fsnr Scrw Lok 1pr 4-40
	362-01108-01	Seal Drng Cvr 9way TMA
	362-01111-00	Seal Drng 9way TMA
	347-00011-00	Scrw 4-40*3/16 Unc P/P Blk
	349-02062-00	Scrw M3*8 T/T P/T ContiR
600-00012-00 Pkg Kit Opt 9w parts:		
	240-00034-00	Plg 9w Drng UL-CSA Pnl Mtg
	240-06010-29	Conn 9w Hood/Cvr Lets

3.4.2 RS-232 Board Layout (top side)



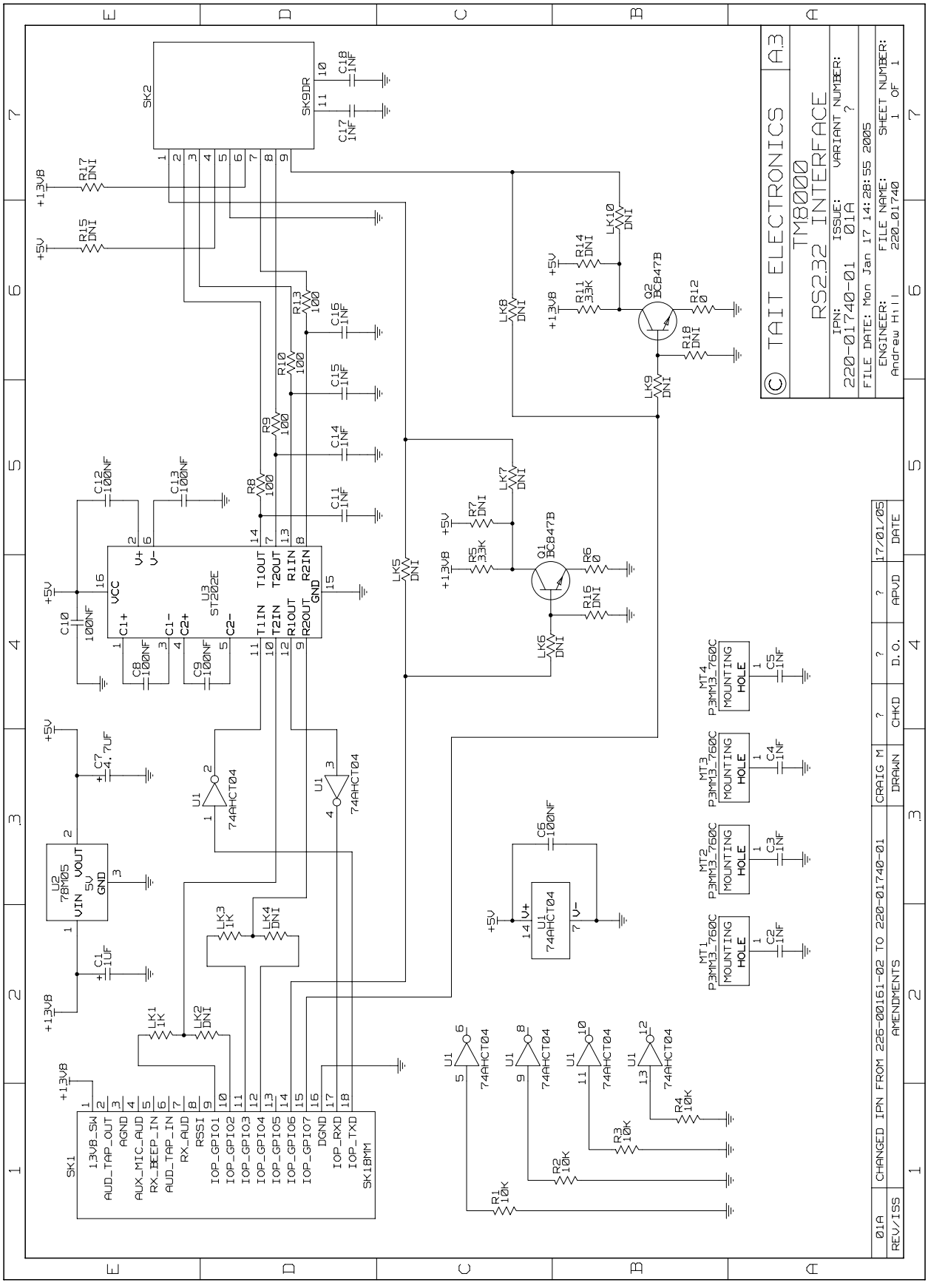
IPN 220-01740-01

3.4.3 RS-232 Board Layout (bottom side)

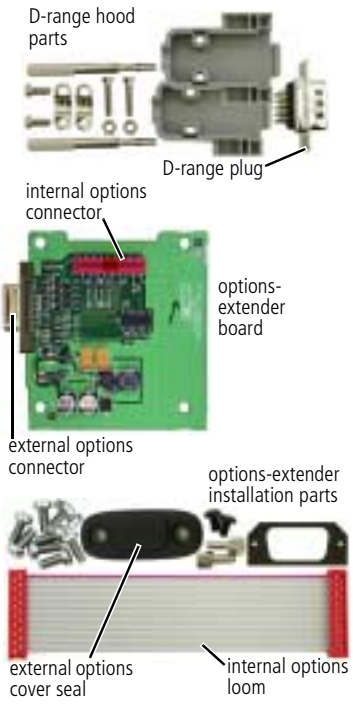


IPN 220-01740-01

3.4.4 RS-232 Board Circuit Diagram



4 TMAA01-05 Options-Extender Board



The TMAA01-05 options-extender board provides external access to most of the signal lines provided by the radio's internal options connector.

The options-extender board fits inside the radio in the options cavity and is connected to the main PCB by the internal options connector and loom.

The internal options connector signals are then made available on the high-density 15-way D-range connector mounted on the options-extender board. This connector fits through the external options connector hole provided in the radio chassis.

Important The radio does not meet the IP54 protection standard once an options-extender board has been installed unless the external options cover seal is installed.

Important To comply with EN 301 489-5, all cables connected to the external options connector must be less than three metres (10 feet) in length.

4.1 Changing the Options-Extender Links

The options-extender board configuration must be completed before the board is installed in the radio, as the top side of the options-extender board is not accessible once the board is screwed to the radio lid.

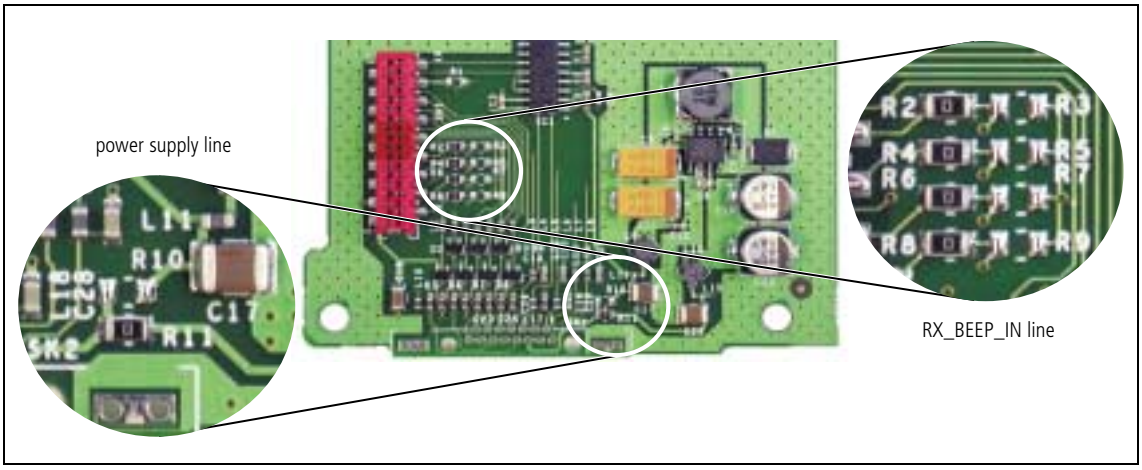
Important This equipment contains devices which are susceptible to damage from static discharges. Refer to "ESD Precautions" on page 11 for more information.

The options-extender board has various link options which allow the user to re-configure the outputs available on the external options connector. The outputs that can be made available by changing linking resistors are:

- the 5V supply line, and
- the RX_BEEP_IN line.

In both cases, these lines replace other lines that are available when the linking resistors are in the factory-set configuration. Note that there is no external connection available for the RX_AUD line.

Figure 4.1 Options-extender board linking resistor locations



4.1.1 Power Supply Line

The power supply output available on pin 2 of the external options connector is factory-set to 13.8V. The output on this pin can be changed to 5V if R11 (a 0Ω surface mount resistor) is moved to position R10. Figure 4.1 at the top of the page shows the component locations.

Important The maximum current for the 5V supply line is 400mA.

4.1.2 RX_BEEP_IN Line

If the RX_BEEP_IN line is required on the external options connector, it must replace one of the following lines:

- IOP_RSSI
- AUD_TAP_IN
- AUX_MIC_AUD
- AUD_TAP_OUT.

The following table explains the resistor link changes required and Figure 4.1 at the top of the page shows the component locations.

Table 4.1 RX_BEEP_IN resistor changes

RX_BEEP_IN Line Replaces	Remove Resistor	Add Resistor
IOP_RSSI	R2	R3
AUD_TAP_IN	R4	R5
AUX_MIC_AUD	R6	R7
AUD_TAP_OUT	R8	R9

4.2 Installing the Options-Extender Board

4.2.1 Parts Required

The following table describes the parts required to install an options-extender board in a radio. The parts marked with an asterisk (★) are not shown in Figure 4.2 and are used to connect to the radio's external options connector.

Table 4.2 Options-extender installation parts required

Quantity	Internal Part Number	Description	Figure 4.2 Reference
1	362-01111-XX[a]	foam seal	③
1	362-01108-XX[a]	cover seal	⑪
2	347-00011-00	4-40x3/16 screws	⑫
2	354-01043-00	screw-lock fasteners	⑦
4	349-02062-00	M3x8 screws	⑨
★1	240-00010-80	D-range plug	—
★1	240-06010-29	D-range hood	—

a. Contact Technical Support for the exact IPN.

4.2.2 Installation Procedure

1. Disassemble the radio in order to gain access to the options cavity.

   For detailed disassembly instructions, refer to the disassembly procedure in the service manual.

Refer to the diagram on the following page and the instructions below.

2. Remove the top cover and lid ① from the radio to access the options cavity.

3. Remove the external options connector bung ②, if it is fitted.

4. On the inside of the radio lid place the foam seal ③ over the external options connector cavity ④.

5. With the top side of the options-extender board ⑤ facing the radio lid, guide the external options connector ⑥ (the D-range connector on the options-extender board) into the external options connector cavity.

6. Screw the external options connector to the radio lid using the two screw-lock fasteners ⑦.

   Tighten the fasteners to a torque of 0.9 N·m (8 lbf·in).

Important The external options connector screw-lock fasteners must be tightened correctly before screwing the options-extender board onto the mounting posts ⑧.

7. Screw the options-extender board to the mounting posts on the radio lid using four M3x8 self-tapping screws ⑨.

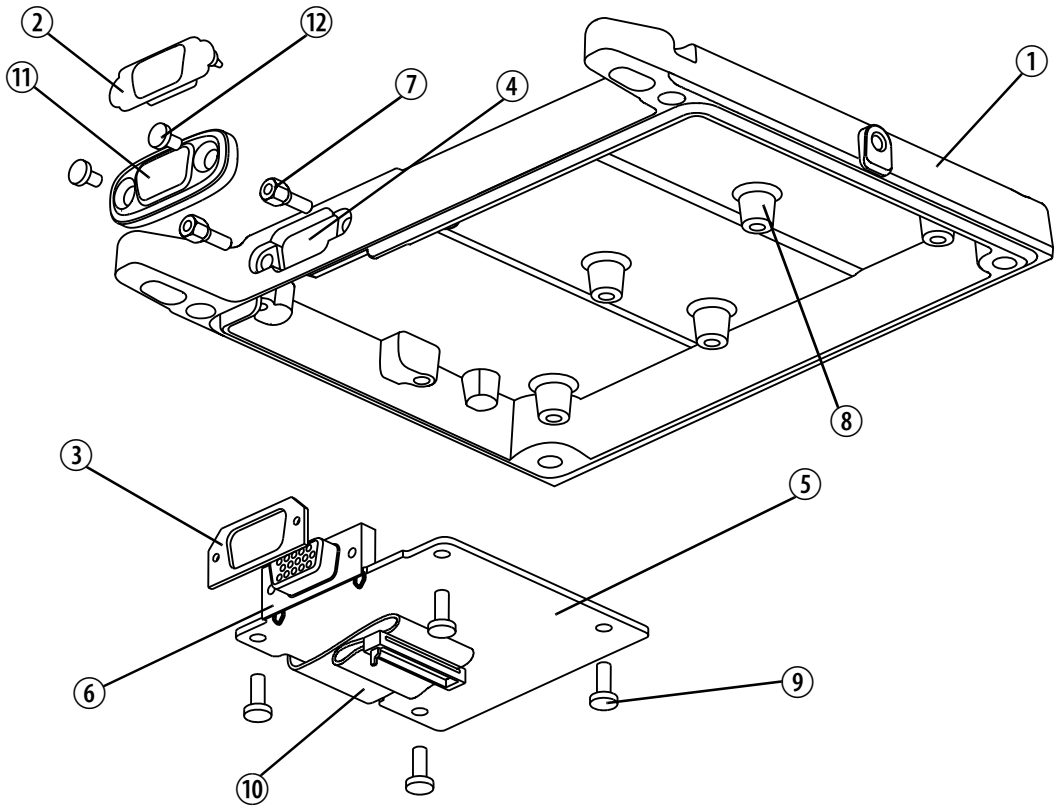
   Tighten the M3x8 screws to a torque of 1.9N·m (17lbf·in)

Important For the options-extender board to be installed correctly in the radio's options cavity, the internal options connector loom ⑩ must be looped in the way shown in Figure 4.2.

8. Plug the unattached end of internal options connector loom ⑩ into the internal options connector on the radio main PCB.

9. Refit the radio lid and top cover to the radio and screw the external options cover seal ⑪ over the external options connector, using the two 4-40x3/16 screws ⑫.

Figure 4.2 Options-extender board installation



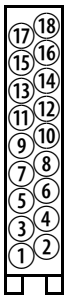
① radio lid
② external options connector bung
③ foam seal
④ external options connector cavity
⑤ options-extender board
⑥ external options connector
⑦ screw-lock fasteners
⑧ mounting posts
⑨ M3x8 self-tapping screws
⑩ internal options loom
⑪ external options cover seal
⑫ 4-40x3/16 screws

4.3 Interface Specification

The following tables summarize the signals used for the options-extender board on the internal options connector (SK1 on the options-extender board) and the external options connector (SK2 on the options-extender board).

Note The TM8000 3DK Hardware Developer's Kit Application Manual (product code MMAA30-01-00-807) contains a detailed electrical specification for the signals available on the radio's internal options connector. This manual is part of the 3DK Resource CD, which can be purchased using product code TMAA30-01.

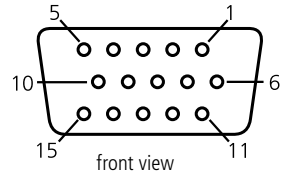
Table 4.3 Internal options connector—pins and signals



top view

Pin	Connector Signal	Description
1	13V8_SW	switched 13V8 supply from the radio
2	AUD_TAP_OUT	Programmable tap point out of the receive or transmit audio chain. DC-coupled
3	AGND	analogue ground
4	AUX_MIC_AUD	Auxiliary microphone input, with electret microphone biasing provided. Dynamic microphones are not supported.
5	RX_BEEP_IN	receive sidetone input, AC-coupled
6	AUD_TAP_IN	Programmable tap point into the receive or transmit audio chain. DC-coupled
7	RX_AUD	not connected
8	RSSI	analogue RSSI output
9-15	IOP_GPIO1 to IOP_GPIO7	programmable function and direction
16	DGND	digital ground
17	IOP_RXD	an RS-232 compliant asynchronous serial port - receive data
18	IOP_TXD	an RS-232 compliant asynchronous serial port - transmit data

Table 4.4 External options connector—pins and signals



Pin	Signal	Description
2	13V8_SW[a]	13V8 supply
6	AUD_TAP_OUT[b]	Programmable tap point out of the Rx or Tx audio chain. DC-coupled
7	AGND	analogue ground
11	AUX_MIC_AUD[b]	Auxiliary microphone input, with electret microphone biasing provided. Dynamic microphones are not supported.
1	AUD_TAP_IN[b]	Programmable tap point into the Rx or Tx audio chain. DC-coupled.
3	RSSI[b]	analogue RSSI output
15	IOP_GPIO1[c]	programmable function and direction
14	IOP_GPIO2[c]	programmable function and direction
13	IOP_GPIO3[c]	programmable function and direction
10	IOP_GPIO4[c]	programmable function and direction
9	IOP_GPIO5[c]	programmable function and direction
5	IOP_GPIO6[c]	programmable function and direction
4	IOP_GPIO7[c]	programmable function and direction
8	IOP_RXD	an RS-232 compliant asynchronous serial port - receive data
12	IOP_TXD	an RS-232 compliant asynchronous serial port - transmit data

a. This can be configured to be 5V. Refer to "Power Supply Line" on page 44.

b. This can be re-configured to be RX_BEEP_IN. Refer to "RX_BEEP_IN Line" on page 44.

c. 3V3 CMOS output via 1kΩ series resistance. 5V tolerant input.

4.4 PCB Information

4.4.1 TMAA01-05 Parts List (PCB IPN 220-65203-00)

Ref.	IPN	Description
C1	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C2	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C3	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C4	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C5	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C6	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C7	018-15100-00	Cap 0603 10n 50v X7r ±10%
C8	014-08100-30	Cap Tant SMD 100u 10v Loesr D
C9	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C10	016-08470-01	Cap Elec SMD 47uf 6*4 16v
C11	014-08100-30	Cap Tant SMD 100u 10v Loesr D
C12	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C13	016-08470-01	Cap Elec SMD 47uf 6*4 16v
C14	018-15100-00	Cap 0603 10n 50v X7r ±10%
C15	018-15100-00	Cap 0603 10n 50v X7r ±10%
C16	018-15100-00	Cap 0603 10n 50v X7r ±10%
C17	015-07220-35	Cap Cer 1210 2u2 X5R 35v
C18	015-06470-01	Cap Cer 1206 470n X7r 20% 50v
C19	018-13470-00	Cap 0603 470p 50v X7r±10%
C20	018-13470-00	Cap 0603 470p 50v X7r±10%
C21	018-13470-00	Cap 0603 470p 50v X7r±10%
C22	018-13470-00	Cap 0603 470p 50v X7r±10%
C23	018-13470-00	Cap 0603 470p 50v X7r±10%
C24	018-13470-00	Cap 0603 470p 50v X7r±10%
C25	018-13470-00	Cap 0603 470p 50v X7r±10%
C26	018-13470-00	Cap 0603 470p 50v X7r±10%
C27	018-13470-00	Cap 0603 470p 50v X7r±10%
C28	018-15100-00	Cap 0603 10n 50v X7r ±10%
C29	015-07220-35	Cap Cer 1210 2u2 X5R 35v
C30	018-14100-00	Cap 0603 1n 50v X7r ±10%
C31	018-14100-00	Cap 0603 1n 50v X7r ±10%
C32	018-14100-00	Cap 0603 1n 50v X7r ±10%
C33	018-14100-00	Cap 0603 1n 50v X7r ±10%
C34	018-14100-00	Cap 0603 1n 50v X7r ±10%
C35	018-14100-00	Cap 0603 1n 50v X7r ±10%
C36	018-14100-00	Cap 0603 1n 50v X7r ±10%
D1	001-10014-03	Diode SMD MBRS140T3 Sch
D2	001-10099-01	Diode BAV99w Dual Ss
D3	001-10099-01	Diode BAV99w Dual Ss
D4	001-10099-01	Diode BAV99w Dual Ss
D5	001-10099-01	Diode BAV99w Dual Ss
D6	001-10099-01	Diode BAV99w Dual Ss
D7	001-10099-01	Diode BAV99w Dual Ss
D8	001-10099-01	Diode BAV99w Dual Ss
IC1	002-10020-20	IC SMD ADM202 Rs-232 Con S0-16
IC2	002-10267-40	IC LM2674 S08 Swtch Volt Regul
L1	057-10100-65	Ind SMD Pwr Cdrh6D38 100UH .65
L2	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L3	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L4	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L5	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L6	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L7	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L8	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L9	057-10010-45	Ind SMD Pwr CDRH2D18 10UH .43A
L10	057-10010-45	Ind SMD Pwr CDRH2D18 10UH .43A
L11	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
L12	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L13	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L14	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L15	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
L16	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L17	057-10010-20	Ind 0603 Blm11-B102s 0.1a
L18	057-10010-20	Ind 0603 Blm11-B102s 0.1a
R2	036-10000-00	RES 0805 0R 1/8W
R4	036-10000-00	RES 0805 0R 1/8W
R6	036-10000-00	RES 0805 0R 1/8W
R8	036-10000-00	RES 0805 0R 1/8W
R11	036-10000-00	RES 0805 0R 1/8W
R12	038-13100-10	RES 0603 100R 1% 1/10W
R13	038-13100-10	RES 0603 100R 1% 1/10W
R14	038-13100-10	RES 0603 100R 1% 1/10W
R15	038-13100-10	RES 0603 100R 1% 1/10W
R16	038-13100-10	RES 0603 100R 1% 1/10W
R17	038-13100-10	RES 0603 100R 1% 1/10W
R18	038-13100-10	RES 0603 100R 1% 1/10W
R19	038-13100-10	RES 0603 100R 1% 1/10W
SK1	240-10000-11	Conn SMD 18w Skt M/Match
SK2	240-00011-67	Skt 15w Drng Ra Slim Dsub 7912
	220-65203-00	PCB TM8000 Options Extender
	402-00008-0X	MANL f/instr TMAA01-05

600-00009-00 Pkg Kit Opt 15w parts:

240-00032-00	Plg 15w Drng Hi-D UL-CSA P/Mtg
240-06010-29	Conn 9w Hood/Cvr Lets

600-00010-00 Pkg Kit Opt Int parts:

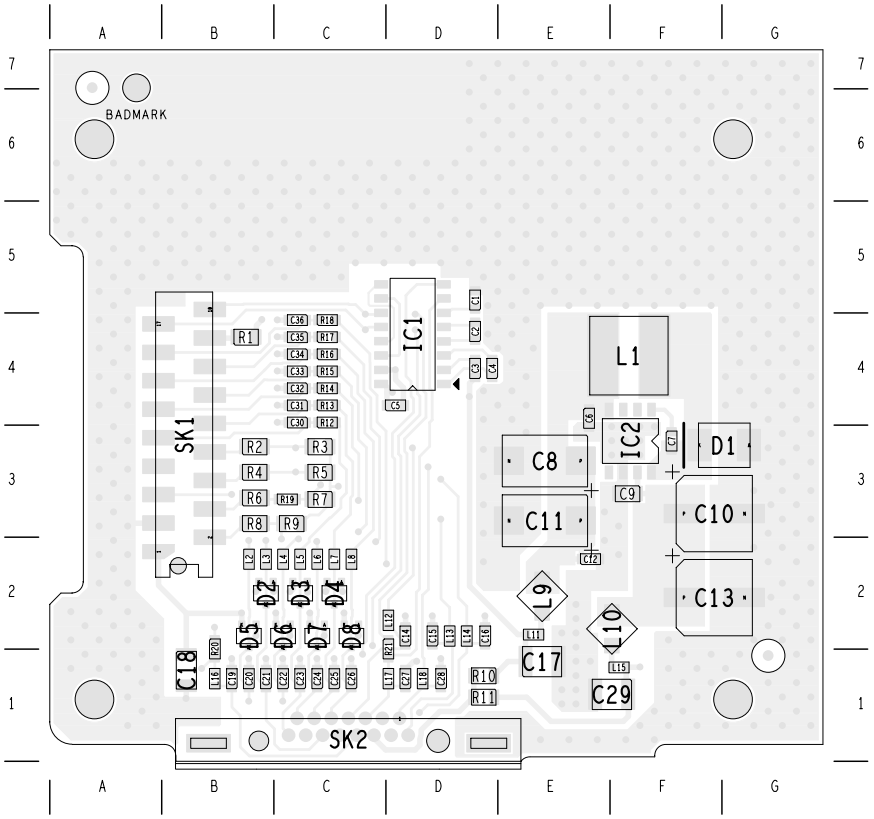
219-00329-00	Loom TMA Int Opt
354-01043-00	Fsnr Scrw Lok 1pr 4-40
362-01108-01	Seal Drng Cvr 9way TMA
362-01111-00	Seal Drng 9way TMA
347-00011-00	Scrw 4-40*3/16 Unc P/P Blk
349-02062-00	Scrw M3*8 T/T P/T ContiR

4.4.2 TMAA01-05 Grid Reference List (PCB IPN 220-65203-00)

Ref.	PCB	Circuit
C1	D5	1G4
C10	F3	1G5
C11	E3	1G8
C12	E2	1G8
C13	F2	1G5
C14	D2	1E2
C15	D2	1D2
C16	D2	1D2
C17	E1	1G9
C18	B1	1G2
C19	B1	1F8
C2	D4	1F2
C20	B1	1C2
C21	B1	1A2
C22	C1	1B3
C23	C1	1D2
C24	C1	1B3
C25	C1	1C3
C26	C1	1B2
C27	D1	1F8
C28	D1	1E2
C29	F1	1G4
C3	D4	1G4
C30	C4	1D1
C31	C4	1C1
C32	C4	1C1
C33	C4	1B1
C34	C4	1B1
C35	C4	1B1
C36	C4	1A1
C4	D4	1G2
C5	D4	1G4
C6	E4	1G7
C7	F3	1G7
C8	E3	1G8
C9	F3	1G6
D1	G3	1G7
D2	B2	1A2
D3	C2	1D2
D4	C2	1C3
D5	B2	1C2
D6	C2	1C3 1B3
D7	C2	1B3
D8	C2	1B2
IC1	D4	1F3
IC2	F3	1G6
L1	F4	1G7
L10	F2	1G5
L11	E2	1G9
L12	D2	1E2
L13	D2	1D2
L14	D2	1E2
L15	F1	1G5
L16	B1	1F7
L17	D1	1F7
L18	D1	1E2
L2	B2	1C2
L3	B2	1A2
L4	C2	1B3
L5	C2	1D2
L6	C2	1B3
L7	C2	1C3
L8	C2	1B2
L9	E2	1G9
R1	B4	1A2
R10	D1	1F9
R11	D1	1G9
R12	C4	1D2
R13	C4	1C2
R14	C4	1C2
R15	C4	1B2
R16	C4	1B2
R17	C4	1B2
R18	C4	1A2
R19	C3	1E2
R2	B3	1E2
R20	B2	1F2
R21	D2	1F2
R3	C3	1E2
R4	B3	1E2
R5	C3	1E2
R6	B3	1E2
R7	C3	1E2
R8	B3	1D2
R9	C3	1D2
SK1	B3	1D2
		1G2
		1E2
		1F2
		1D1
		1C1
		1B1
		1A1
SK2	D1	1D9
		1C9
		1A9
		1B9
		1E9
		1F9

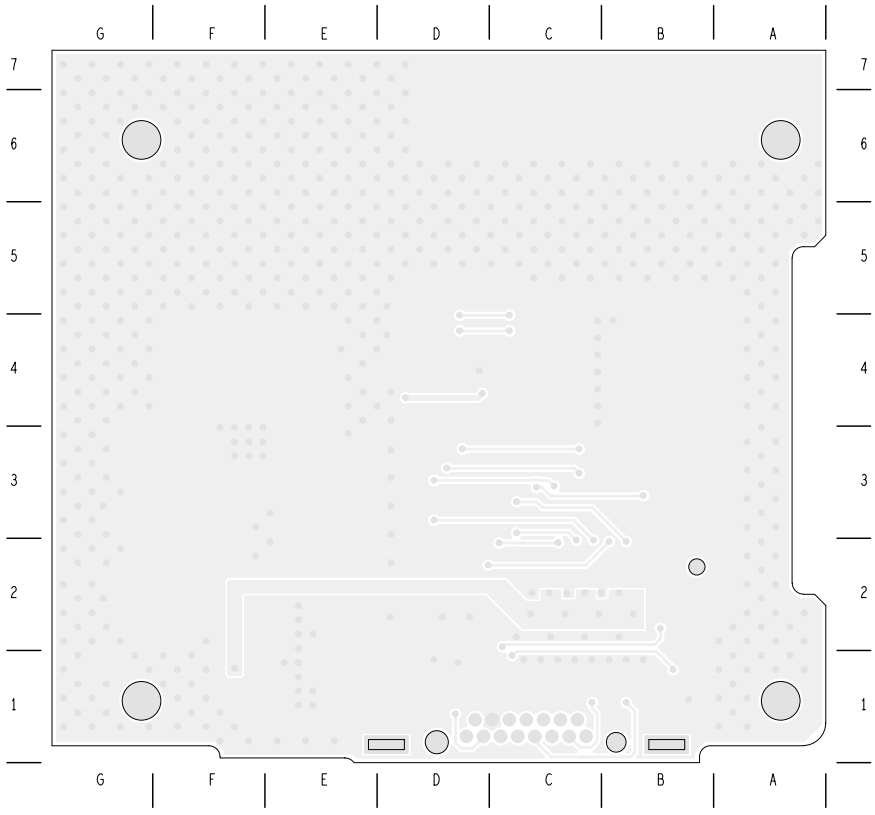
Ref.	PCB	Circuit

4.4.3 Options-Extender Board Layout (top side)



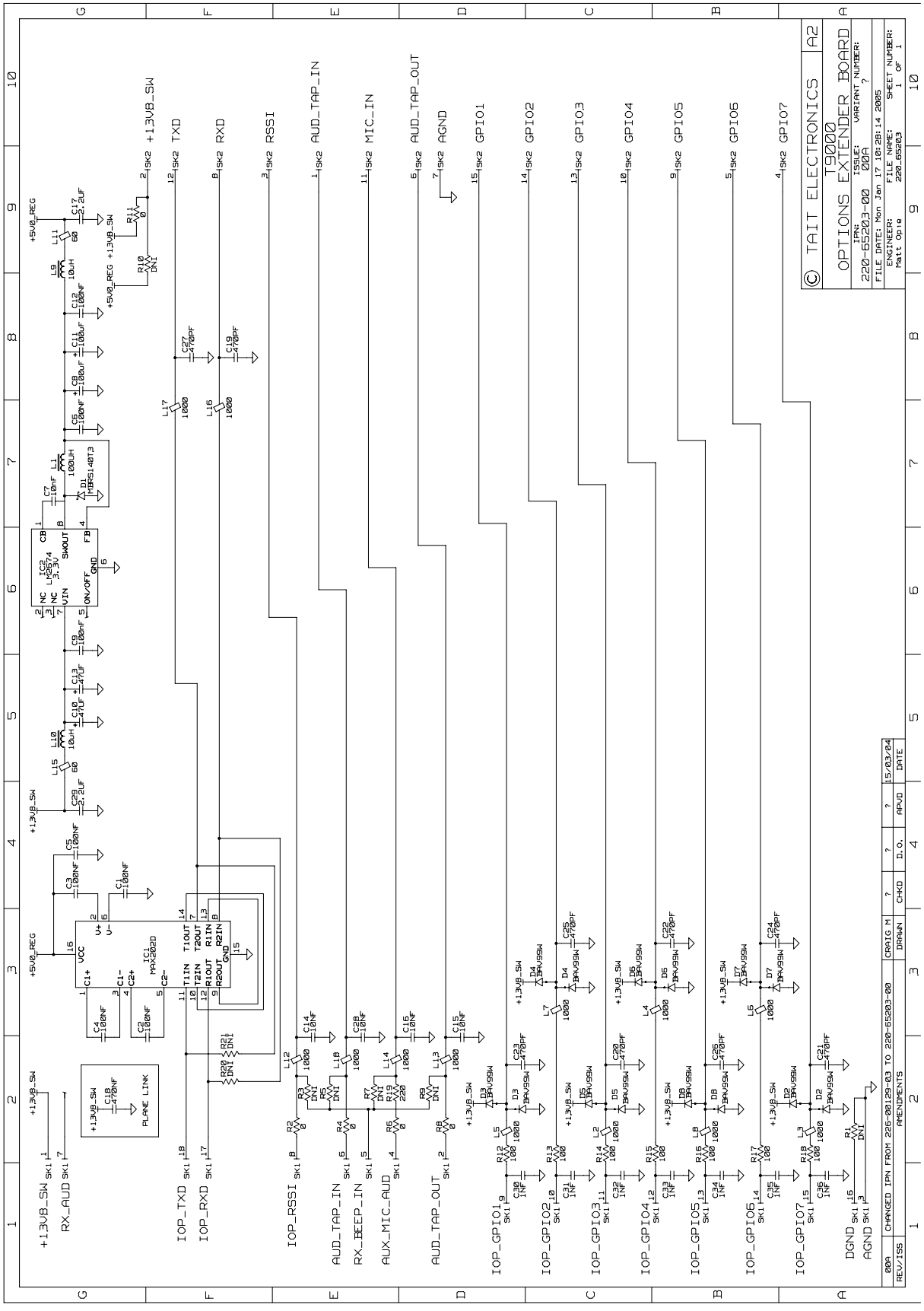
IPN 220-65203-00

4.4.4 Options-Extender Board Layout (bottom side)



IPN 220-65203-00

4.4.5 Options-Extender Board Circuit Diagram



5 TMAA02-02 DTMF Microphone

The TMAA02-02 DTMF microphone plugs into the microphone socket on the radio control head, and enables users to make calls to a PABX or PSTN.

To make a call, enter the required number using the DTMF keypad and the DTMF microphone generates audible DTMF tones as the microphone keys are pressed. Press the PTT key and speak clearly into the microphone then release the PTT key when you have finished speaking.

The microphone button operates a hookswitch, which is closed when the microphone is connected to the microphone clip and open when the microphone is removed from the microphone clip. The function of the hookswitch is determined by the radio programming.

5.1 Installation

Installing the Microphone

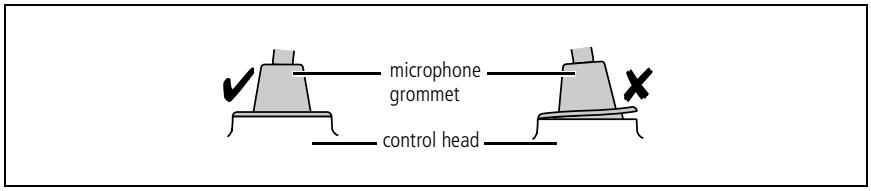
Important

The DTMF microphone grommet must be installed whenever the microphone is plugged into the microphone socket. When installed, the grommet has two functions:

- to prevent damage to the microphone socket when there is movement of the microphone cord, and
- to ensure that the control head is sealed against water, dust and other environmental hazards.

1. Plug the DTMF microphone cord into the microphone socket on the radio control head.
2. Slide the microphone grommet along the microphone cord and push two adjacent corners of the grommet into the microphone socket cavity.
3. Squeeze the grommet and push the remaining corners into position.
4. Check that the grommet is seated correctly in the cavity.

Figure 5.1 Correct DTMF microphone grommet seating



Installing the Microphone Clip

Install the microphone clip in the most convenient location for the radio user. It must be within easy reach of the user, but in such a position that the microphone PTT key cannot be inadvertently activated or jammed on.

Connect the microphone clip to the negative supply if hookswitch operation is required.

5.2 Adjustment

Remove the DTMF microphone back cover and set the DTMF tone level to approximately 60% deviation (±3kHz for wide bandwidth radios and ±1.5kHz for narrow bandwidth radios).

5.3 Radio Programming

The following table shows the settings required for CH_GPIO1 in the Programmable I/O form of the programming application. This setting means that when a key is pressed on the microphone, the DTMF tones are fed into the radio's speaker at a reduced volume, giving the radio user confidence that the tones are being transmitted. Refer to the online help of the programming application for more information.

Table 5.1 DTMF microphone settings in the Programmable I/O form, Digital tab

Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored To
CH_GPIO1	Input	None	Send Mic Audio To Spkr	High	None	None	None

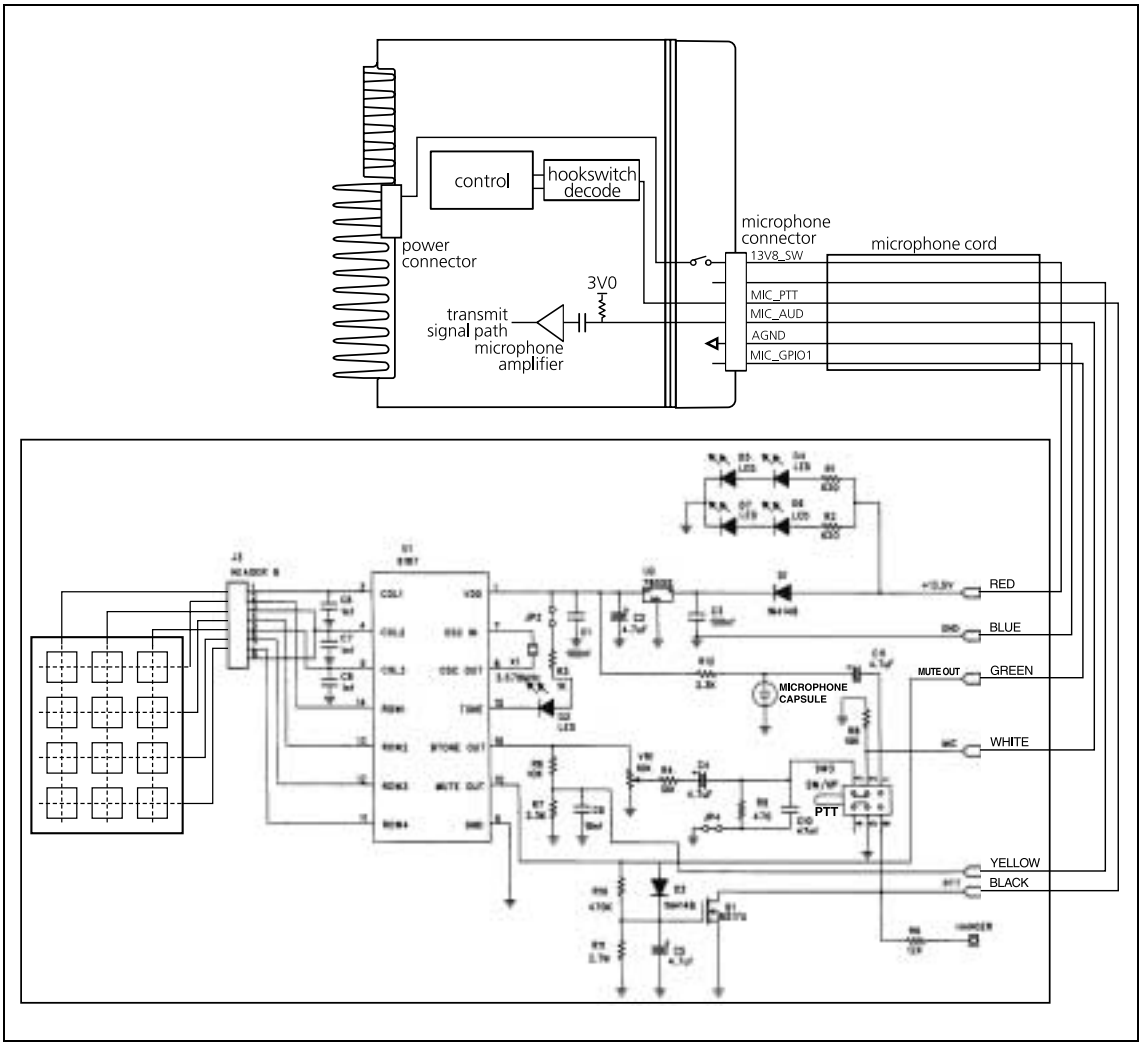
5.4 Interface Specification

The following table and diagram summarizes the signals used for the DTMF microphone on the radio's microphone connector and shows the interface between the DTMF microphone and the radio.

Table 5.2 DTMF microphone connector—pins and signals

Pin	Signal	Colour	Description
1	—	—	not connected
2	13V8_SW	red	power supply (switched)
3	—	yellow	not connected
4	MIC_PTT	black	PTT and hookswitch
5	MIC_AUD	white	audio from the microphone
6	AGND	blue	analogue ground
7	—	—	not connected
8	MIC_GPIO1	green	mute out

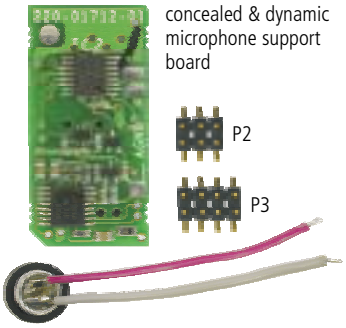
Figure 5.2 DTMF microphone to radio interface



5.5 Circuit Description

The microphone has a standard 12-key telephone keypad. When one of the keypad keys is pressed, a DTMF tone specific to that key is generated on the MIC_AUD line (pin 5). For the duration of the tone, the tone generator activates the PTT, so that the user is not required to press the PTT key to transmit each tone.

6 TMAA02-06 Support Kit for Concealed & Dynamic Microphones



The support kit for concealed and dynamic microphones can be used in two main applications:

- to monitor activity around the radio if the radio is placed in emergency mode, and
- to support the use of a dynamic microphone, such as that used in the TMAA10-02 handset.

The concealed and dynamic microphone support board plugs onto the radio's control head PCB and contains circuitry for a pre-amplifier and a microphone switch circuit. The concealed electret microphone is installed inside the speaker grille of the control head.

6.1 Installation

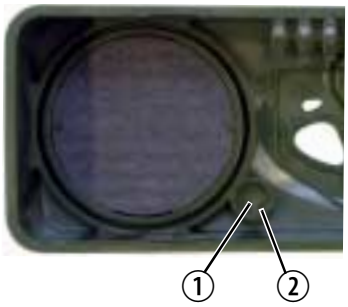
Important This equipment contains devices which are susceptible to damage from static discharges. Refer to "ESD Precautions" on page 11 for more information.

Disassembling the Radio Control Head

To install the concealed-microphone capsule and concealed and dynamic microphone support board, the control head must be removed from the radio and disassembled. For detailed disassembly instructions, refer to the disassembly procedure in the service manual.

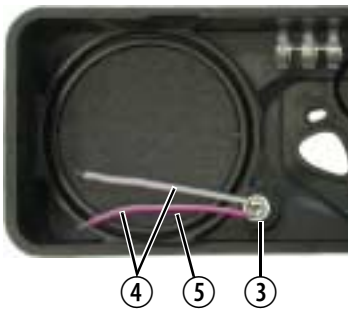
Installing the Microphone Capsule and Dynamic Microphone Board

1. Disassemble the control head in order to gain access to the speaker grille. This will mean removing the control head PCB, the space frame, and the speaker.
2. Drill a 1mm diameter hole in the concealed-microphone cavity ① in the position indicated by the small 'dimple' ②.



Important To maintain the IP54 protection class, great care must be taken when installing the microphone capsule and seal ③ into the concealed-microphone cavity.

3. Push the microphone capsule and seal into the concealed-microphone cavity, with the capsule wires ④ towards the speaker grille ⑤.

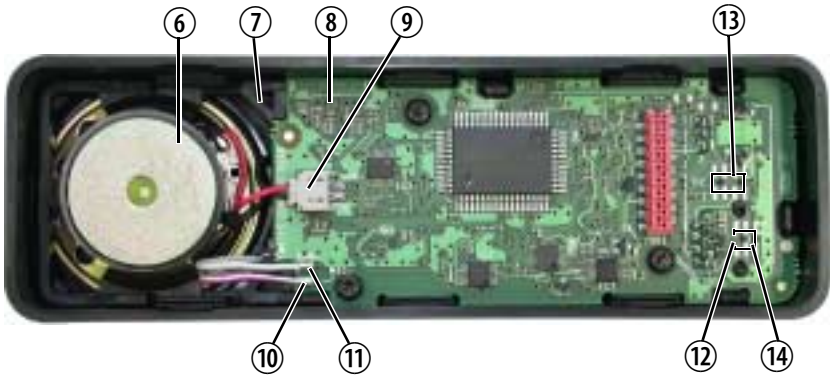


4. Reassemble the control head. This includes reinstalling the speaker ⑥, the space frame ⑦ and the control head PCB ⑧.

   Plug the speaker lead into the speaker connector ⑨.

5. On the control head PCB, solder the positive concealed-microphone wire to the MIC+ pad ⑩ and the negative wire to AGND ⑪.

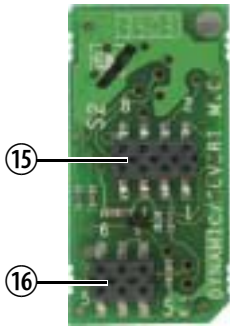
Note The positive wire on the microphone capsule is identified by a red stripe.



6. On the control head PCB, remove R11 ⑫ and solder P2 ⑬ and P3 ⑭ in the positions shown.

7. Plug S2 ⑮ and S3 ⑯ on the concealed and dynamic microphone support board onto P2 and P3 on the control head PCB.

8. Re-install the control head on the radio body.



6.2 Radio Programming

When the support kit for concealed and dynamic microphones is installed in a radio, two fields in the UI Preferences form of the programming application may need to be selected.

- Enable Options Board Preamp: select this field if a dynamic microphone is installed. An example of an accessory that uses a dynamic microphone is the TMAA10-02 handset.
- Emergency Mic: select Concealed if a concealed microphone is installed.

Refer to the online help of the programming application for more information.

6.3 Interface Specification

The following table and diagram summarizes the signals used for the concealed and dynamic microphone support kit and shows the interface between the support kit and the radio control head.

Table 6.1 Concealed and dynamic microphone support board—pins and signals

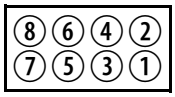
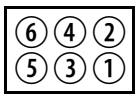
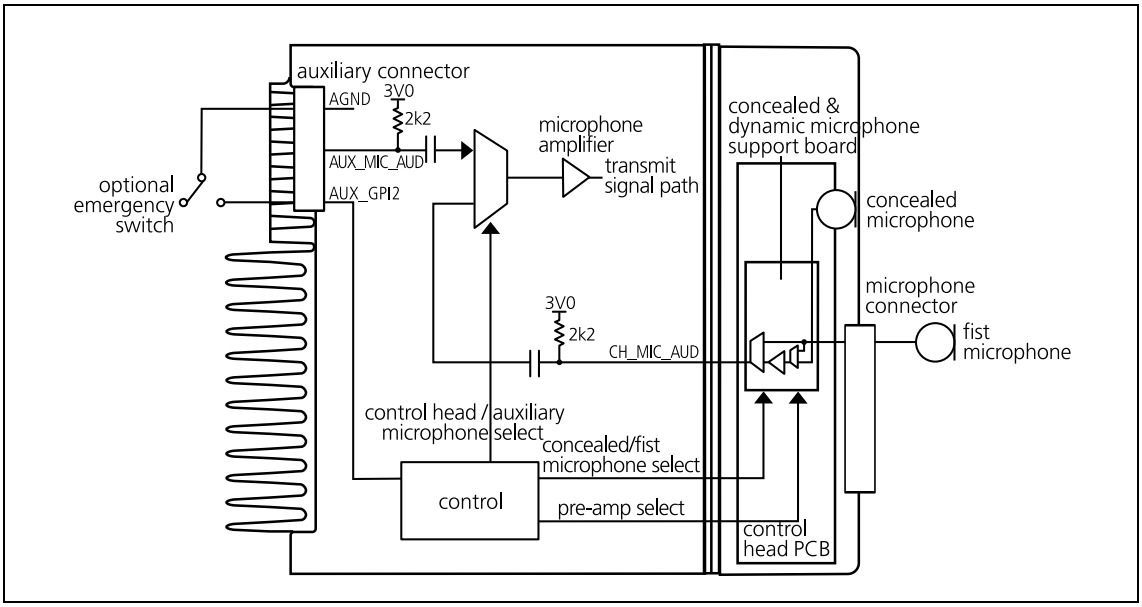
	Pin	Signal	Colour
 S2 top view	1	CH_LE	SPI latch signal to latch microphone select data into the concealed and dynamic microphone board
	2	D2-D3	data from the control head shift register
	3	OE	enables the output of the shift register of the audio switch
	4	CH_SPI_CLK	SPI clock signal to clock microphone select data into concealed and dynamic microphone board
	5	+13V8_SW	power for analogue parts
	6	+3V3	power for digital parts
	7	RST	initialise the concealed and dynamic microphone board shift register
	8	DGND	digital ground
 S3 top view	1	MIC_AUD_IN-P1	microphone audio from microphone interface
	2	MIC_AUD_OUT	processed microphone signal output to radio
	3	—	not connected
	4	MIC_AUD_OUT	processed microphone signal output to radio
	5	MIC+	audio from the concealed microphone
	6	AGND	analogue ground

Figure 6.1 Concealed and dynamic microphone support kit to radio interface



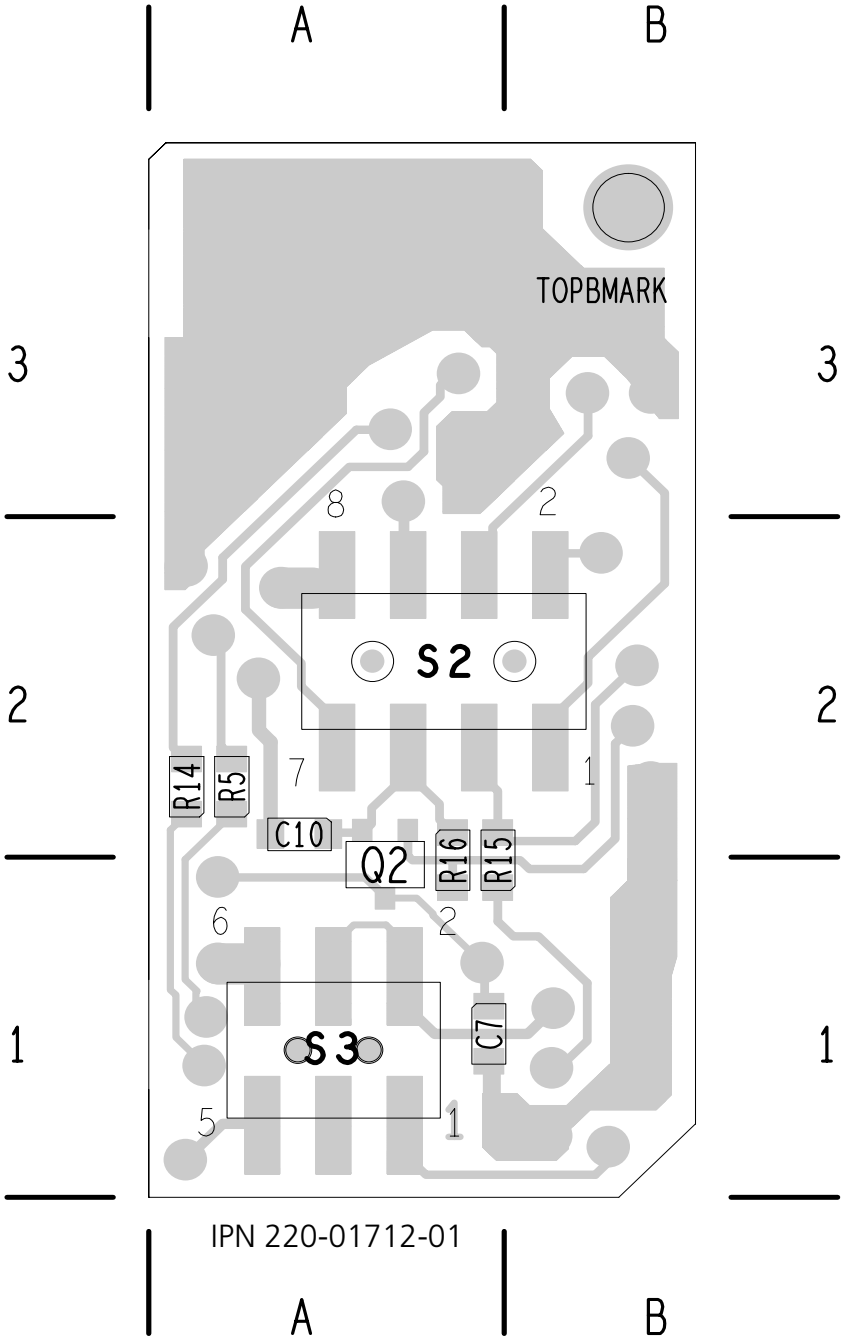
6.4 PCB Information

6.4.1 TMAA02-06 Parts List (PCB IPN 220-01712-01)

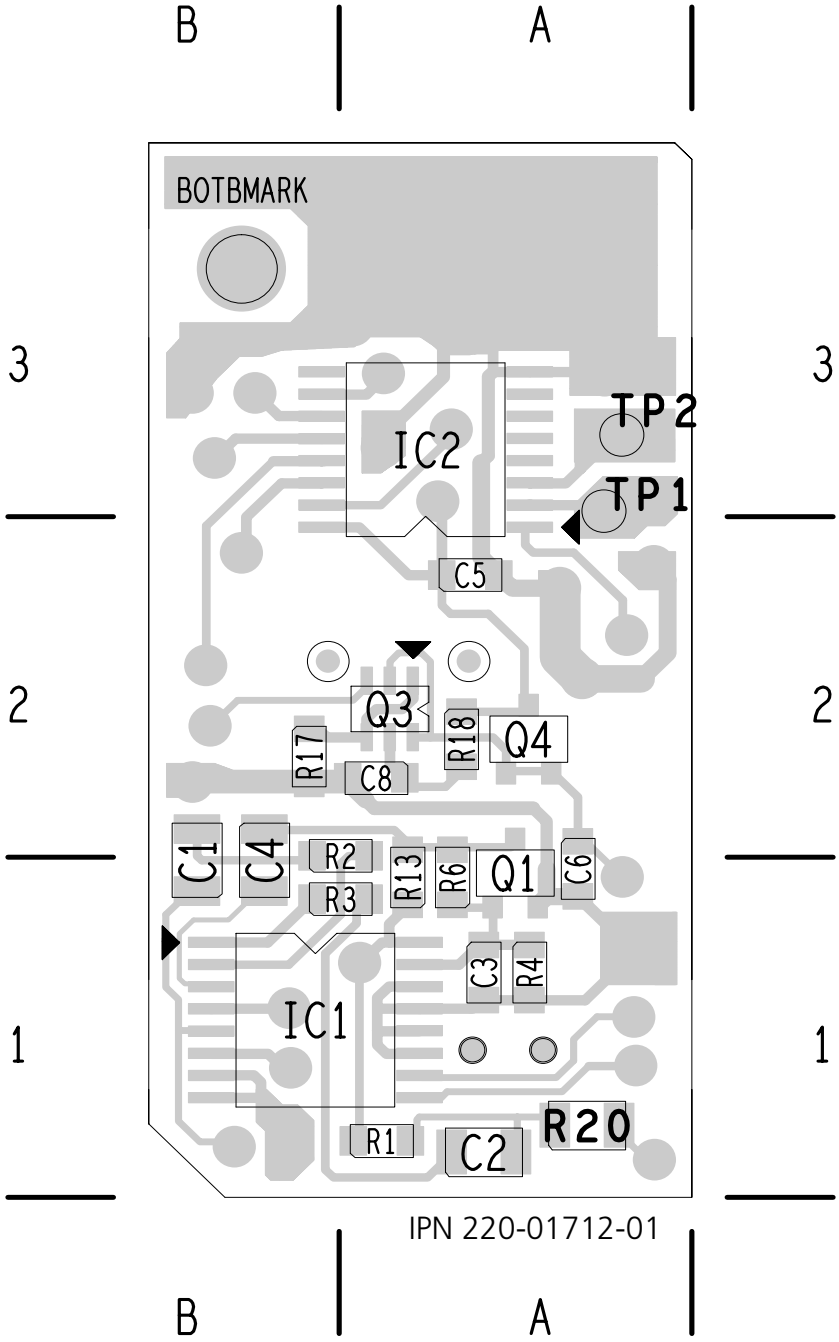
Ref.	IPN	Description
C1	015-26330-08	Cap Cer 0805 330n 5% 10v X7r
C2	015-26330-08	Cap Cer 0805 330n 5% 10v X7r
C3	018-15100-00	Cap 0603 10n 50v X7r +-10%
C4	015-26330-08	Cap Cer 0805 330n 5% 10v X7r
C5	018-16100-00	Cap 0603 100n 16vx7r+-10%
C6	018-16100-00	Cap 0603 100n 16vx7r+-10%
C7	018-16100-00	Cap 0603 100n 16vx7r+-10%
C8	018-16100-00	Cap 0603 100n 16vx7r+-10%
C10	018-16100-00	Cap 0603 100n 16vx7r+-10%
IC1	002-13740-53	IC 74LV4053 Mux/Demux Tssop16
IC2	002-13745-95	IC 74LV595 8BIT SHIFTREG TSSOP
Q1	000-10084-71	Xstr BC847BW NPN SOT323
Q2	000-10085-71	Xstr SMD BC857BW PNP SOT323
Q3	000-10084-62	Xstr BC846S Dual SOT363 NPN
Q4	001-10099-01	Diode BAV99w Dual Ss
R1	038-14220-00	Res 0603 2k2 1/16w +-5%
R2	038-14680-00	Res 0603 6k8 1/16w +-5%
R3	038-14470-00	Res 0603 4k7 1/16w +-5%
R4	038-15470-10	Res 0603 47k 1/16w+-1%
R5	038-14100-10	Res 0603 1k0 1/16w +-1%
R6	038-15330-10	Res 0603 33k 1%
R13	038-15100-10	Res 0603 10k 1/16w +-1%
R14	038-14100-10	Res 0603 1k0 1/16w +-1%
R15	038-14100-10	Res 0603 1k0 1/16w +-1%
R16	038-15470-10	Res 0603 47k 1/16w+-1%
R17	038-15150-10	Res 0603 15K 1% WDS
R18	038-15470-10	Res 0603 47k 1/16w+-1%
R20	036-10000-00	Res M/F SMD 0805 0e 0.125w
S2	240-10002-00	Skt SMD 8w 2x4 Lo-Prof 2mm
S3	240-10001-00	Skt SMD 6w 2x3 Lo-Prof 2mm
	220-01712-01	Pcb Dynamic/Covert Mic
P2	240-10004-00	Hdr SMD 8w 2x4 Lo-Prof 2mm
P3	240-10003-00	Hdr SMD 6w 2x3 Lo-Prof 2mm
	252-00010-41	Mic Capsule Electret 2.7*6mm
	369-01031-00	Rbbr Mic Upper A3M2751 T3K

Ref.	IPN	Description

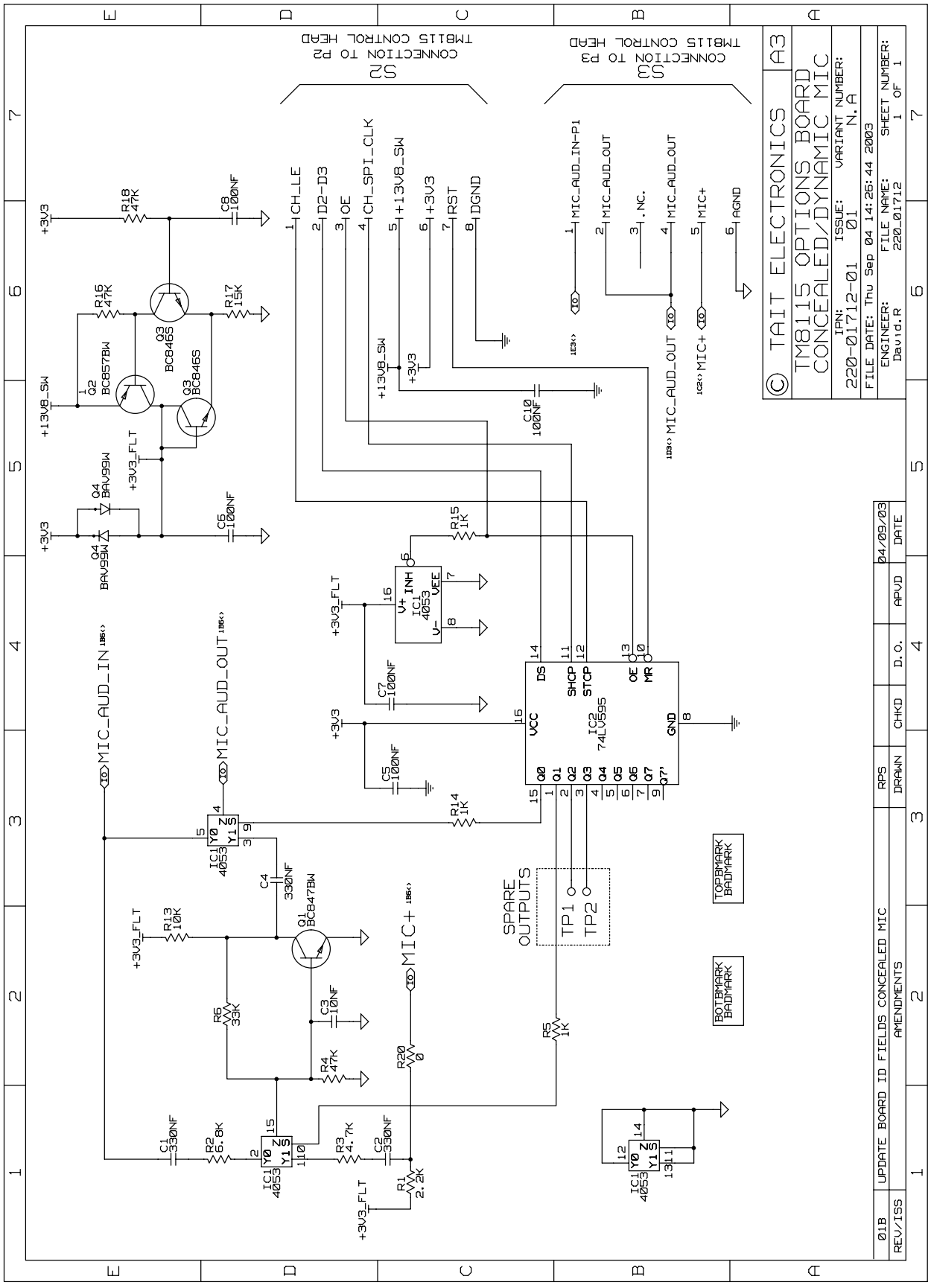
6.4.2 Concealed and Dynamic Microphone Support Board (top side)



6.4.3 Concealed and Dynamic Microphone Support Board (bottom side)



6.4.4 Concealed and Dynamic Microphone Board Circuit Diagram



7 TMAA02-07 Concealed Microphone

concealed microphone
(capsule, rubber seal & wires)

The concealed microphone can be used to monitor activity around the radio if the radio is placed in emergency mode, and is installed beside the speaker grille of the graphical-display control head.

7.1 Installation

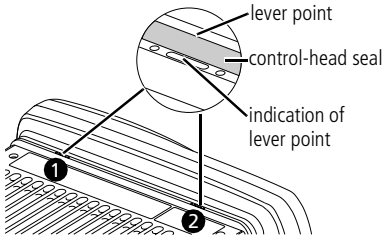
Important This equipment contains devices which are susceptible to damage from static discharges. Refer to "ESD Precautions" on page 11 for more information.

Removing the Radio Control Head

To install the concealed-microphone capsule, the control head must be removed from the radio.

Important During this procedure, take care that the control-head seal is not damaged. Damage to this seal reduces environmental protection.

1. On the underside of the radio, insert a 5mm (3/16 inch) flat-bladed screwdriver between the control head and the control-head seal, in either position ❶ or ❷.

   Insertion points ❶ and ❷ are lever points and are indicated on the radio chassis by a dot-dash-dot pattern (•—•).

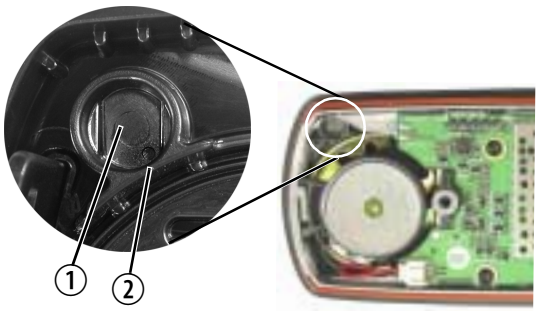
2. Use the screwdriver to lift the control head off the chassis clip, then repeat in the other position.

3. Unplug the control head loom from the radio body.

Installing the Microphone Capsule

1. Unscrew the two screws holding the adaptor flange to the control head. The adaptor flange can now be separated from the control head.

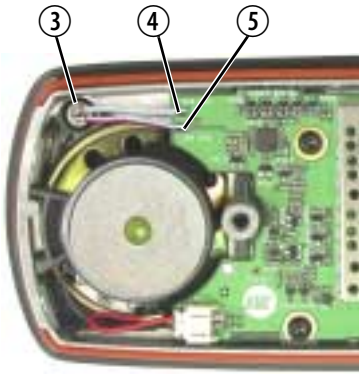
2. Drill a 1mm diameter hole in the concealed-microphone cavity ①, in the position indicated by the small 'dimple' ②.

Important To maintain the IP54 protection class, great care must be taken when installing the microphone capsule and seal ③ into the concealed-microphone cavity.

3. Push the microphone capsule and seal into the concealed-microphone cavity.

4. On the control head PCB, solder the negative wire to the COV MIC- pad ④ and the positive concealed-microphone wire to the COV MIC+ pad ⑤.

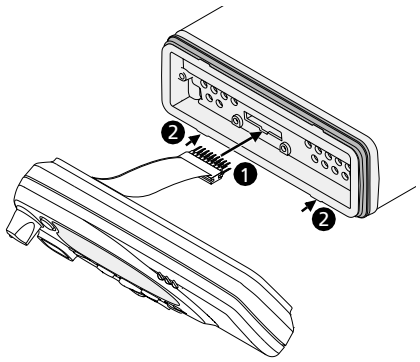


Note The positive wire on the microphone capsule is identified by a red stripe.

5. Re-install adaptor flange onto the control head.

6. Plug the control head loom onto the control head connector ❶.

7. Insert the bottom edge of the control head onto the two clips in the front of the radio chassis ❷, then snap into place.



7.2 Radio Programming

When the concealed microphone is installed in a radio for use in emergency situations, a field in the UI Preferences form, Audio tab of the programming application may need to be selected.

- Emergency Mic: select Concealed.

Refer to the online help of the programming application for more information.

8 TMAA02-08 Keypad Microphone

The TMAA02-08 keypad microphone plugs into the microphone socket on the graphical-display radio control head, and enables users to make calls to other radios, groups, or to a PABX or PSTN. The types of call that you can make depends on the way your radio has been programmed.

As well as the PTT key, there are twelve alphanumeric keys, two scroll keys, and a left and right selection key on the keypad microphone. The selection keys and scroll keys duplicate the keys on the control head and the 12 alphanumeric keys on the keypad microphone are used to dial call strings and enter text.

The microphone button operates a hookswitch, which is closed when the microphone is connected to the microphone clip, and open when the microphone is removed from the microphone clip. The function of the hookswitch is determined by the way the radio is programmed.

8.1 Operation

Dialling Characters

If an incorrect character has been dialled, use the left selection key on either the microphone keypad or control head to clear it and move back one character.

Dialling Text Messages

When the keypad microphone is used to enter a text message, the microphone keys have special functions. Use the # key to toggle between upper and lower case characters and use the left selection key to delete a character from the display.

The alphanumeric keys 0 to 9WXYZ are used to enter letters, numbers and punctuation. Repeated presses of these keys will give you the characters shown in the table below.

Key	Characters					Key	Characters				
1	.	,	?	!	1	7PQRS	P	Q	R	S	7
2ABC	A	B	C	2		8TUV	T	U	V	8	
3DEF	D	E	F	3		9WXYZ	W	X	Y	Z	9
4GHI	G	H	I	4		0	space	0			
5JKL	J	K	L	5		*	*				
6MNO	M	N	O	6							

8.2 Installation

Installing the Microphone

Important The keypad microphone grommet must be installed whenever the microphone is plugged into the microphone socket. When installed, the grommet has two functions:

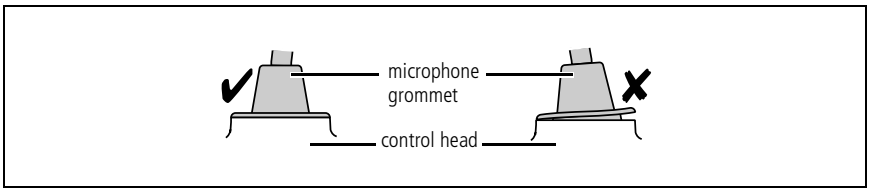
- to prevent damage to the microphone socket when there is movement of the microphone cord, and
- to ensure that the control head is sealed against water, dust and other environmental hazards.

1. Make sure the radio is turned off, then plug the keypad microphone cord into the microphone socket on the radio control head.

Important The radio will only recognize the presence of the keypad microphone when the radio is powered on, so that if the microphone is plugged in after the radio has been powered on, it will not recognize the keypad microphone. Also, if the keypad microphone is plugged in on power up but is later unplugged, then plugged back in, the radio will not recognize it again until the next power cycle.

2. Slide the microphone grommet along the microphone cord and push two adjacent corners of the grommet into the microphone socket cavity.
3. Squeeze the grommet and push the remaining corners into position.
4. Check that the grommet is seated correctly in the cavity.

Figure 8.1 Correct keypad microphone grommet seating



Installing the Microphone Clip

Install the microphone clip in the most convenient location for the radio user. It must be within easy reach of the user, but in such a position that the microphone PTT key cannot be inadvertently activated or jammed on.

8.3 Radio Programming

The radio does not need to be programmed to recognize the presence of a keypad microphone, as this is automatically done when the radio is powered on. However, there are a few related fields that should be configured, as required, to enable the keypad microphone to be used effectively.

Note You **must** power-cycle the radio after replacing the keypad microphone with a programming lead, in order to read or program the radio.

Conventional Forms

In conventional mode, there are check boxes labelled "Selcall Call Dialling", "DTMF Call Dialling" and "Phone Patch Call Dialling". There is also an option "Conventional Dialling Type" field, where you can program the radio to dial labels or channels from the default display.

Refer to the online help of the programming application for more information about these programming options.

MPT Trunked Forms

In MPT trunked mode, there may be check boxes labelled "DTMF Dialling", "PABX Calls" and "PSTN Calls". These check boxes need to be selected before you can make these types of calls.

Refer to the online help of the programming application for more information about these programming options.

8.4 Interface Specification

The following table and diagram summarizes the signals used for the keypad microphone on the radio's microphone connector and shows the interface between the keypad microphone and the radio.

Table 8.1 Keypad microphone connector—pins and signals

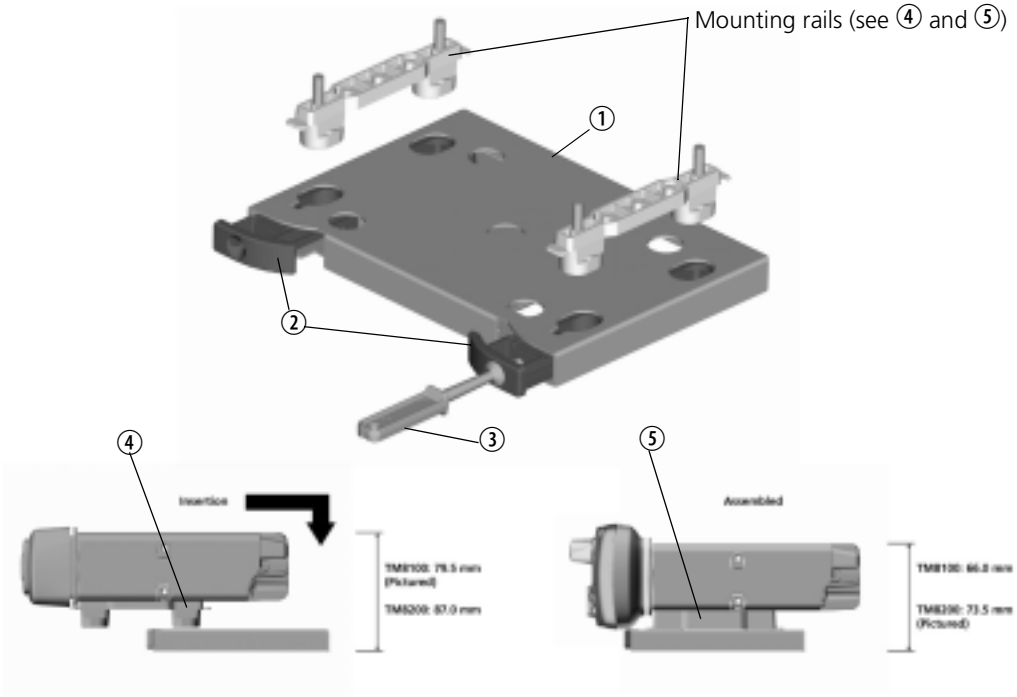
Pin	Signal	Colour	Description
1	RX audio	—	not connected
2	13.8V	black	power supply
3	TXD	green	transmit serial data
4	PTT	white	PTT and hookswitch
5	MIC	blue	audio from the microphone
6	GND	red	ground
7	RXD	yellow	receive serial data
8	IO	—	not connected

9 TMAA03-02 Security Bracket

The TMAA03-02 security bracket can be used in place of the standard U-bracket in locations where you want to stop opportunistic removal of the radio by a third party, or where you want to have a quick release setup that allows you to swap over radios (e.g. leasing situation). The security bracket also provides electrical isolation to the radio.

The parts of the TMAA03-02 security bracket are illustrated in Figure 9.1.

Figure 9.1 Parts of the TMAA03-02 security bracket



Description	Quantity		
① security bracket cradle base	1	④ short mounting rails for TM8100	2
② slide locks	1 left 1 right	screws (M4x25 T/T P/T ContiR) - for attaching short mounting rails to TM8100 radio (not pictured)	4
③ slide lock key	2	⑤ tall mounting rails for TM8200	2
self-tapping screws (10Gx20 hex/ poz) - for fixing security bracket in place (not pictured)	4	screws (M4x30 T/T P/T ContiR) - for attaching tall mounting rails to TM8200 (not pictured)	4
anti-vibration washers for self-tapping screws (not pictured)	4		

Note: ① and ② are pre-assembled

9.1 Installing the Security Bracket and Radio

9.2 Installation Planning

Before installing the security bracket, make sure that the site you have chosen for the installation meets the following criteria:

1. The site has enough height for the radio to be easily installed and removed.

   The measurements given at the bottom of Figure 9.1 are the heights of the radios and base only. Allow extra space for manipulation.

Note You will need more space if you are installing a TM8200 radio.

2. The site has enough depth for the radio.

   Check that the front and rear overhang of the radios will fit where you are mounting the security bracket.

3. The site allows for good air circulation, particularly at the rear of the radio.

Installation Procedure

Important The security bracket must be securely installed. Otherwise there is a risk that the whole assembly of the radio and security bracket may become loose over time, or as a result of serious impact.

Note Because some model control heads are taller than others, each security bracket kit comes with two different heights of mounting rail and mounting screws, depending on the radio type you are installing.

Once you have identified a suitable site for the security bracket and radio, installation is as follows:

1. Use the four self-tapping screws and washers to fix the security bracket base in place. The base actually has five screw holes available, but the centre screw hole does not need to be used. The layout and dimensions of the five screw holes is identical to that of the T2000 cradle.

2. Depending on whether you are installing a TM8100 or TM8200 radio, select the correct height mounting rails and screws, and attach a rail to each side of the bottom of the radio body (two screws per rail, minimum torque 20in.lbf [2.26N.m]).

3. To insert the radio, with the mounting rails attached, into the security bracket base, check that the left and right slide locks are open.

4. If the slide locks are closed, open them by inserting the slide lock key into the keyhole. Rotate the key 90° (it will slip into a detent), and pull.

   Two slide lock keys are supplied so that you can either use them both at once, or so that you can keep one as a spare.

5. Place the radio over the security bracket base so that the feet of the mounting rails fit securely into the base.

6. Close the slide locks by pressing them into the base. You should hear an audible click as the internal spring lock mechanism engages.

Warning!! **For continued safe operation, replace and do not re-use Security Bracket once it has been involved in a crash greater than 50km/h.**

9.3 Removing a Radio from the Security Bracket

Remove the radio from the security bracket as follows:

1. Open the slide locks by inserting the slide lock key into the keyhole. Rotate the key 90° (it will slip into a detent), and pull. The pull will be need to be quite firm to open each slide lock.

2. Remove the radio and its mounting rails by lifting it up and out of the security bracket base.

3. If required, remove the mounting rails from the radio body base by unscrewing them.

9.4 Replacing the Radio in the Security Bracket

To replace the radio in a security bracket, first follow the steps in "Removing a Radio from the Security Bracket" on page 73, and then follow from step 2 in "Installing the Security Bracket and Radio" on page 72.

9.5 Disassembling the Security Bracket

Disassemble the security bracket as follows:

1. Remove the radio from the security bracket by following the steps in "Removing a Radio from the Security Bracket" on page 73.

2. Unscrew the four self-tapping screws holding the security bracket base in place.

9.6 Re-Ordering Extra Parts

The following parts can be re-ordered separately in case of loss, or in situations where, for example, one security bracket is installed where several different radios may be installed at different times.

Part	Part Number	Quantity
Security Crdl Key TM8 (slide lock key)	319-60004-XX[a]	2
Security Crdl Mtg Short TM8 (short mounting rails for TM8100)	319-60002-XX[a]	2
Scrw M4*25 T/T P/T ContiR (for attaching short mounting rails to TM8100 radio)	349-02063-XX[a]	4
Security Crdl Mtg Tall TM8 (tall mounting rails for TM8200)	319-60003-XX[a]	2
Scrw M4*30 T/T P/T ContiR (for attaching tall mounting rails to TM8200 radio)	349-02068-XX[a]	4

a. Contact Technical Support for the exact IPN.

10 Installing a Remote Kit

A TMAA03-16 remote kit can be used to install the control head of a graphical-display radio remotely from the radio body. The diagram below shows the parts used for this installation.

Note Although the torso interface is similar in appearance to the dual-RJ45 on the telemetry radio, the control head on the telemetry radio cannot be used for remote installation.

Note The interfaces in the TMAA03-16 single-head remote kit appear similar to the TMAA03-03, TMAC34-0T or TMAC34-1T. However, the interfaces in the TMAA03-16 are not compatible with TMAA03-03, TMAC34-0T or TMAC34-1T control-head interfaces.

10.1 Installation

Warning!! **Mount the remote U-bracket with the remote control-head assembly and the U-bracket with the radio body securely. These units must not break loose in the event of a collision. Unsecured radio units are dangerous to the vehicle occupants.**

Caution **Observe the installation warnings and safety regulations in the installation procedures of the radio.**

Important This equipment contains devices which are susceptible to damage from static discharges. Refer to "ESD Precautions" on page 11 for more information.

Note Torx T10 and T20 screwdrivers are required for most of the screws in this installation.

The circled numbers in the following sections refer to the items in Figure 10.1 on page 76.

10.1.1 Overview

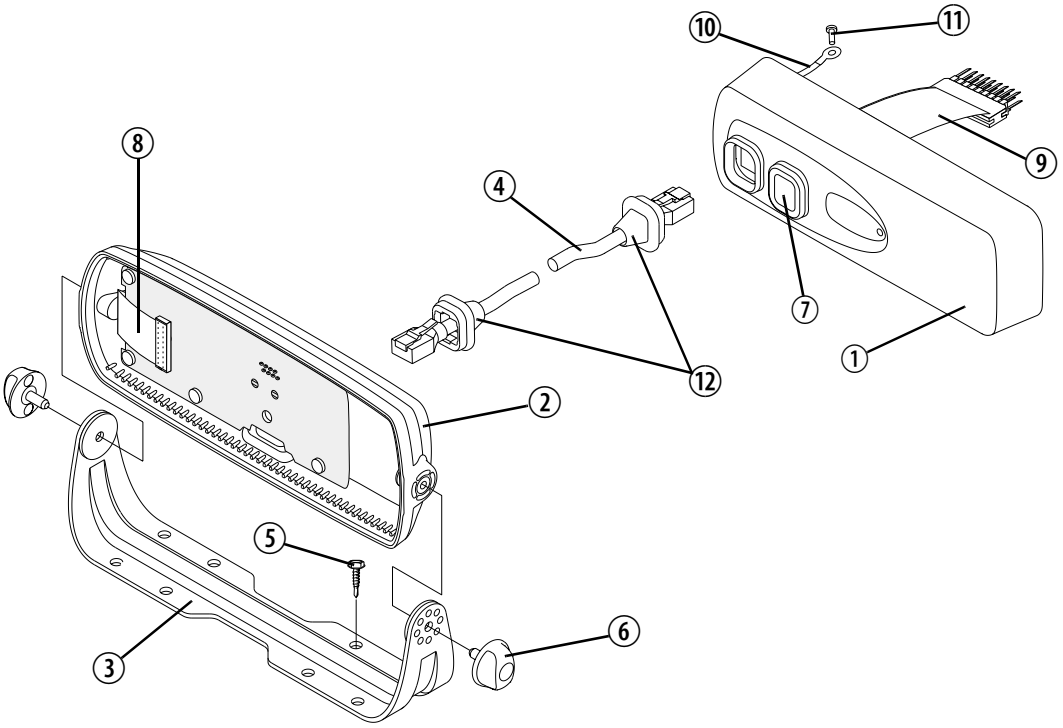
Installing the control head remotely is done in six steps:

1. Remove the control head from the radio body, if necessary.
2. Install the torso interface ① onto the radio body.
3. Mount the remote U-bracket ③ in the required position.
4. Install the control-head interface ② onto the control head and install the remote control-head assembly in the remote U-bracket.
5. Mount the U-bracket in the required position and install the radio body in the U-bracket.
6. Route the remote cable ④ between the remote control-head assembly and the radio body.

10.1.2 Parts Required

The following diagram identifies the parts for remote control-head installation and shows how they fit together.

Figure 10.1 Parts for remote control-head installation



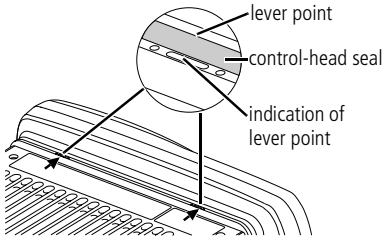
① torso interface
② control-head interface
③ remote U-bracket
④ remote cable
⑤ self-drilling screw
⑥ thumb screw
⑦ RJ45 bung
⑧ control-head interface loom
⑨ torso-interface loom
⑩ earthing tag
⑪ earthing-tag screw
⑫ remote cable grommets

10.1.3 Removing the Control Head from the Radio Body (if necessary)

Caution **During this procedure, take care that the control-head seal is not damaged. Damage to this seal reduces environmental protection.**

1. On the underside of the radio, insert a 5mm (3/16 inch) flat-bladed screwdriver between the control head and the control-head seal, in the positions shown.

   Insertion points and are lever points and are indicated on the radio chassis by a dot-dash-dot pattern (•—•).



2. Use the screwdriver to lift the control head off the chassis clip, then repeat in the other position.

3. Unplug the control-head loom from the radio body.

   The control head is now separate from the radio body.

10.1.4 Installing the Torso Interface

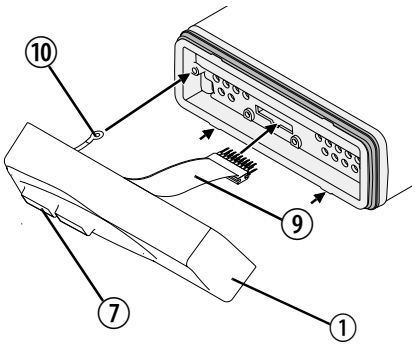
The torso interface must be installed onto the radio body, in place of the existing control head.

1. Screw the solder tag ⑩ onto one of the screw bosses on the radio chassis.

2. Plug the torso-interface loom ⑨ onto the control-head connector.

3. Insert the bottom edge of the torso interface ① onto the two clips in the front of the radio chassis, then snap into place.

4. Remove the bung ⑦ covering the outer RJ45 connector. The remote cable ④ will plug into this connector once the installation is complete.



Important The inner RJ45 cavity is not used and has no connector installed so the RJ45-cavity bung must be installed at all times.

This ensures that the torso interface is sealed against water, dust and other environmental hazards.

10.1.5 Mounting the Remote U-Bracket

The remote U-bracket with its self-drilling screws, is used to install the remote control-head assembly on the dashboard or on any sufficiently flat surface.

Caution **When drilling holes in the vehicle, check that drilling at the selected points will not damage existing wiring.**

Important Check that the remote U-bracket is not distorted when the screws are tightened.

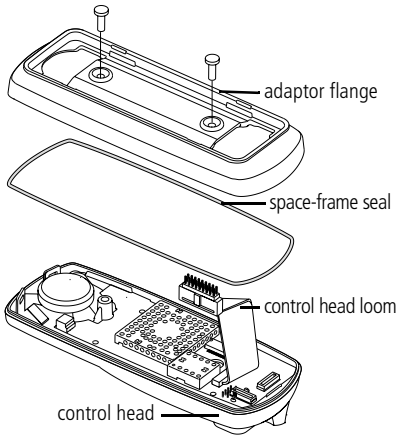
1. Drill any holes required for cables and install suitable grommets or bushings in the holes.
2. If precise positioning is required, predrill ∅ 3mm (1/8 inch) pilot holes for the self-drilling screws. Reduce the hole size in metal that is less than 1mm (1/32 inch) thick.
3. Screw the remote U-bracket in the chosen mounting position using the self-drilling screws provided. Use all four screws provided.

10.1.6 Installing the Control-Head Interface

With the control head separated from the radio body, the control-head interface ② must be installed on the rear of the control head.

1. Undo the two Torx T-20 screws on the adaptor flange of the control head, and remove the adaptor flange.
2. Unplug the control-head loom.

   The adaptor flange and control-head loom are not used for the remote control-head installation. Keep the two screws for step (4).
3. Plug the control-head interface loom ⑧ into the connector on the control head.



Important When fitting the control-head interface to the control-head, be careful not to damage the space-frame seal.

4. Use the two screws from step (2) to fit the control-head interface to the control head through the two screw holes at the rear of the control-head interface.

Installing the Remote Control-Head Assembly in the Remote U-Bracket

1. Position the control-head assembly in the remote U-bracket and position it for a good viewing angle.

Note Adjusting the contrast on the control-head display may also improve its readability.

2. Screw the remote control-head assembly into position using the two thumb screws provided.

10.1.7 Mounting the U-Bracket and Installing the Radio Body

Mounting the U-Bracket

Install the U-bracket on any sufficiently flat surface, using self-drilling screws and washers.

Caution **When drilling holes in the vehicle, check that drilling at the selected points will not damage existing wiring, petrol tanks, fuel lines, brake pipes or battery cables.**

Important When mounting the U-bracket, check whether the mounting surface needs to be reinforced.

Important Install the U-bracket using at least four screws.

1. If the U-bracket is being mounted over a curved surface, bend the U-bracket tabs slightly, to match the surface shape.

2. Drill any holes required for cables and install suitable grommets or bushings in the holes.

Important Check that the U-bracket is not distorted when the screws are tightened.

3. If precise positioning is required, predrill ∅ 3mm (1/8 inch) pilot holes for the self-drilling screws. Reduce the hole size in metal that is less than 1mm (1/32 inch) thick.

4. Screw the U-bracket in the chosen mounting position using the self-drilling screws washers.

Installing the Radio Body in the U-Bracket

1. Connect the antenna and power cables to the rear of the radio.

2. Position the radio body in the U-bracket so that the holes in the U-bracket line up with the holes in the radio chassis.

3. Screw the radio into position using the four thumb screws.

10.1.8 Connecting the Remote Cable

Caution **When drilling holes in the vehicle, check that drilling at the selected points will not damage existing wiring, petrol tanks, fuel lines, brake pipes or battery cables.**

1. Drill any holes required for cables and install suitable grommets or bushings in the holes.
2. Plug one end of the remote cable into the control-head interface.
3. Run the remote cable to the torso interface and plug it into the RJ45 connector without a bung.

Installing the Remote-Cable Grommets

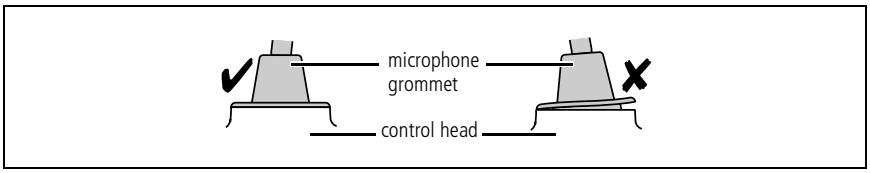
Install both the remote cable grommets, using the following procedure.

Important The remote cable grommets must be installed whenever the remote cable is plugged into the RJ45 sockets. When installed, the grommets have two functions:

- to prevent damage to the RJ45 sockets when there is movement of the remote cable, and
- to ensure that the radio and remote control-head assembly is sealed against water, dust and other environmental hazards.

1. Slide the grommet along the remote cable and push two adjacent corners of the grommet into the RJ45 socket cavity.
2. Squeeze the grommet and push the remaining corners into position.
3. Check that the grommet is seated correctly in the cavity.

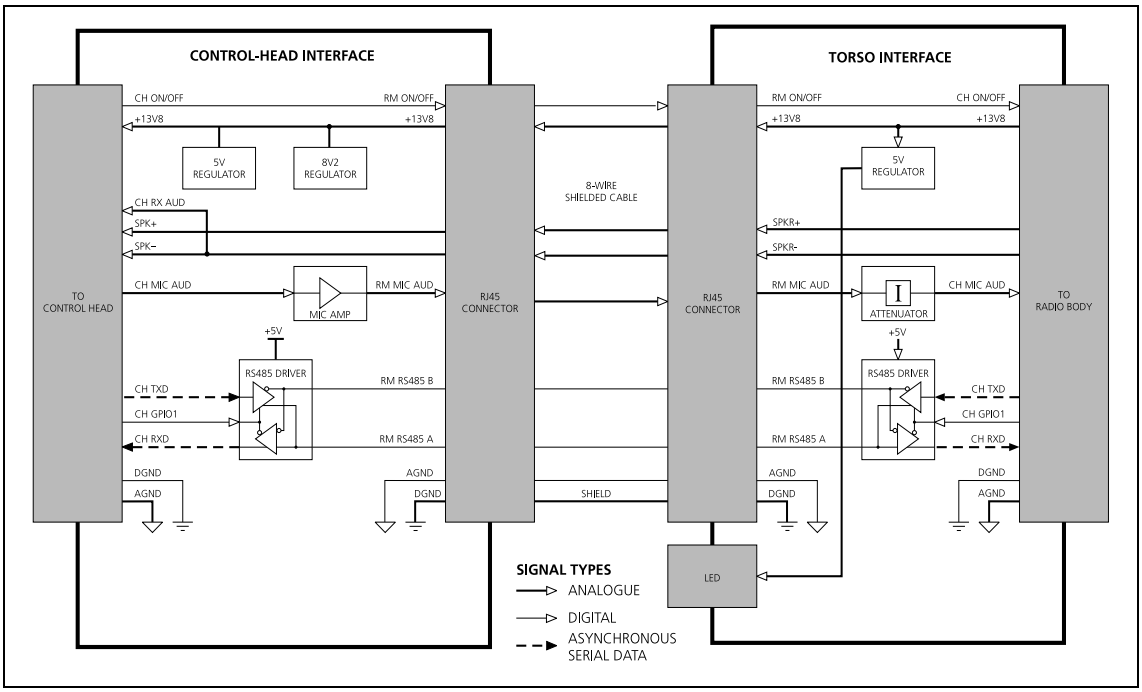
Figure 10.2 Correct remote cable grommet seating



10.2 Circuit Description

Figure 10.3 shows a block diagram of the remote control-head installation. The control heads contain circuit boards with RS-485 driver components and an audio amplifier or attenuator.

Figure 10.3 Block diagram of remote control-head installation



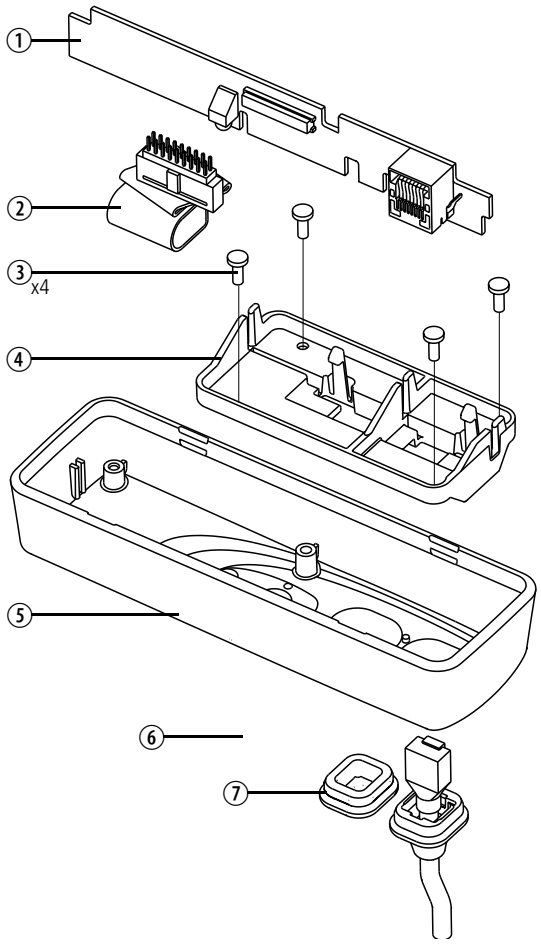
10.3 Servicing the Remote Kit Parts

10.3.1 Disassembling the Torso Interface

Disassemble only as much as is necessary to replace the defective parts. Re-assembly is carried out in reverse order of disassembly.

1. Remove the remote cable from the RJ45 connector.
2. Release the clips of the PCB bracket ④ and remove the control-head board ①.
3. Disconnect the torso-interface loom ②.
4. Unscrew the four PT type screws ③ and remove the PCB bracket ④.

Figure 10.4 Parts of the torso interface



Description	IPN
① control-head board	
② torso-interface loom	219-02882-00
③ 3 x 8 PT screw (x4)	346-10030-XX[a]
④ PCB bracket	302-10063-XX[a]
⑤ front panel	316-06843-XX[a]
⑥ label	365-01751-XX[a]
⑦ RJ45 bung	302-50002-XX[a]

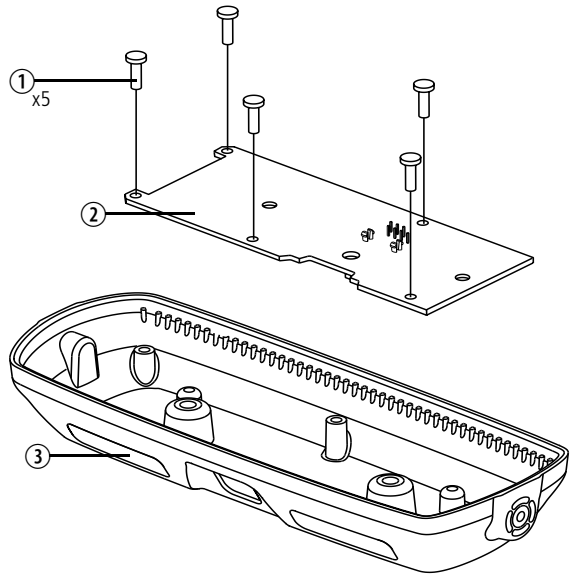
[a] Contact Technical Support for the exact IPN.

10.3.2 Disassembling the Control-Head Interface

Disassemble only as much as necessary to replace the defective parts or to swap the Micromatch connector loom. Re-assembly is carried out in reverse order of disassembly.

1. Remove the remote cable from the RJ45 connector.
2. Unscrew the seven PT type screws ① and remove the PCB ②.
3. Remove the control-head interface loom (not illustrated).

Figure 10.5 Parts of the control-head interface



	Description	IPN
①	3 x 8 PT screw (x5)	346-10030-XX[a]
②	control-head interface PCB	
③	control-head interface	316-06842-XX[a]
	control-head interface loom	219-02914-00

[a] Contact Technical Support for the exact IPN.

10.4 PCB Information

10.4.1 Control-Head Interface (PCB IPN 220-02122-02)

Parts List

Ref.	IPN	Description
C101	015-06470-01	Cap Cer 1206 470n X7r 20% 50v
C102	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C103	015-07220-08	Cap Cer 1206 2u2 16v X7r
C104	015-07220-08	Cap Cer 1206 2u2 16v X7r
C105	015-26220-18	CAP CER 0805 220N 10% X7R 50V
C106	018-14470-00	Cap 0603 4n7 50v X7r±10%
C107	015-23270-05	Cap 0805 270p 1% 200v Grm40
C108	015-23270-05	Cap 0805 270p 1% 200v Grm40
C109	018-14470-00	Cap 0603 4n7 50v X7r±10%
C110	015-23270-05	Cap 0805 270p 1% 200v Grm40
C111	015-23270-05	Cap 0805 270p 1% 200v Grm40
C112	015-07220-08	Cap Cer 1206 2u2 16v X7r
C113	018-14470-00	Cap 0603 4n7 50v X7r±10%
C114	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C115	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C116	015-07220-08	Cap Cer 1206 2u2 16v X7r
C117	015-07470-20	CAP Cer 1206 4u7 10% 25V X7R
D101	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D102	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D103	001-10153-00	Diode SMD SM15T30a TranSll Smc
D104	001-00010-47	Diode 1SMA5923 8v2 1.5w Zen
D105	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D106	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D107	001-10084-33	Diode SMD BZX84C3V3 Zen SOT23
E101	057-10020-02	Ind 0603 BlM18pg300 Emi Supr
E102	057-10020-02	Ind 0603 BlM18pg300 Emi Supr
E103	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
E104	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
E105	057-10020-02	Ind 0603 BlM18pg300 Emi Supr
E106	057-10020-02	Ind 0603 BlM18pg300 Emi Supr
E107	057-10020-02	Ind 0603 BlM18pg300 Emi Supr
E108	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
E109	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
F101	265-10150-00	Fuse SMD 1A 50V 0805 UL Cert
J100	240-00016-00	Conn RJ45 Shld 8P8C LP RA TH
J101	240-10000-11	Conn SMD 18w Skt M/Match
Q101	000-10084-73	Xstr BC847BPNNPN/PNP SOT363
R101	038-10000-00	Res 0603 Zero 0hm 1/16w ± 5%
R102	036-03100-10	Res 2512 100R 5% 1W
R103	036-03100-10	Res 2512 100R 5% 1W
R104	038-13100-10	Res 0603 100R 1/10w 1%
R105	038-15100-10	Res 0603 10k 1/10w 1%
R106	038-14220-00	Res 0603 2k2 1/10w 5%
R107	038-15100-10	Res 0603 10k 1/10w 1%
R108	038-13560-10	Res 0603 560R 1/10w 1%
R109	038-13100-10	Res 0603 100R 1/10w 1%
R110	036-02270-10	Res 1206 27.0e 1%
R111	036-02270-10	Res 1206 27.0e 1%
R112	038-13100-10	Res 0603 100R 1/10w 1%
R113	038-12100-10	Res 0603 10e 1%
R114	038-15100-10	Res 0603 10k 1/10w 1%
R115	038-16150-10	Res 0603 150k 1%
R116	038-16330-10	Res 0603 330k 1/10w 1%
R117	038-14270-00	Res 0603 2k7 1/10w 5%
R118	038-13560-10	Res 0603 560R 1/10w 1%
R119	038-16100-10	Res 0603 100k 1/10w 1%
R120	038-14220-00	Res 0603 2k2 1/10w 5%
R121	038-13560-10	Res 0603 560R 1/10w 1%
R122	038-13390-10	Res 0603 390R 1/10w 1%
R123	038-16100-10	Res 0603 100k 1/10w 1%
U101	002-10078-00	IC SMD MC78M05CDT5v Reg0.5a
U102	002-10014-85	IC ADM1485 RS485 Transc S08
	220-02122-02	PCB MFx Single Rmt Head I/F

Mechanical Parts for the Control-Head Interface and the Torso Interface

219-02882-00	Loom Control Head TMA
219-02914-00	Loom MFX Remote Head
219-02918-00	Cbl Rmt Ctrl Hd Kit
302-10062-00	Brkt Remote Head TM8200
302-10063-00	Brkt PCB Remote TM8200 Body
316-06842-00	Pnl Rear TM8200 MF2
316-06843-00	Pnl Frt Remote TM8200 MF0
349-02062-00	Scrw M3*8 T/T P/T ContiR
402-00020-00	F/Inst TMAA03-16 Sngl Hd Rmt
302-05263-00	Brkt U Thumb Scrw TMA
302-50002-00	Bung RJ45 MFO
353-05007-00	Wshr Rubber M4*19*1.0 S/A
354-01052-00	Fsnr Bush PSM SHK-B-M4 Ins
349-00060-00	Scrw 10GX20 SLFDRL Hex/Poz TMA

Remote Cable Parts

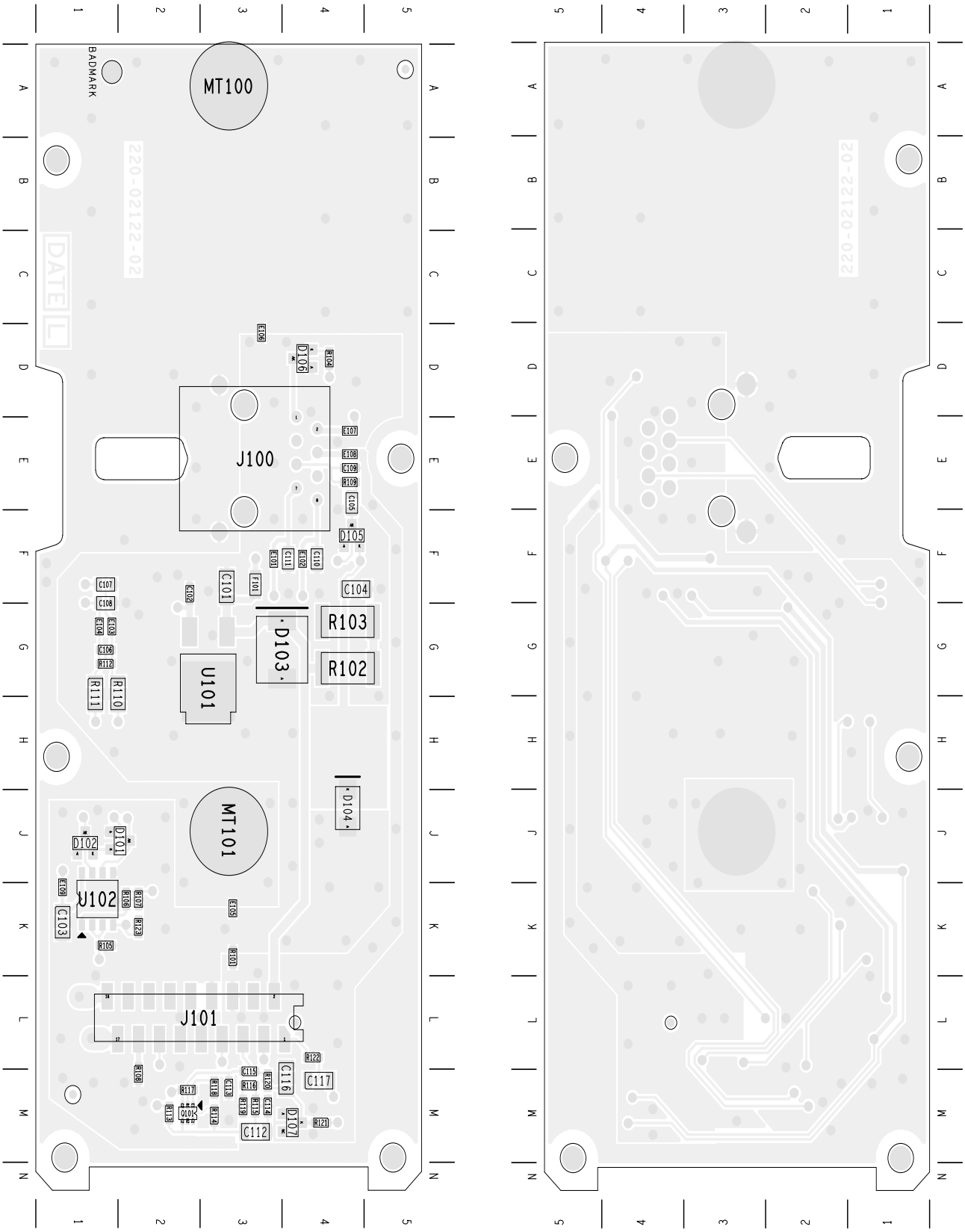
219-02918-00	**Cbl Rmt Ctrl Hd Kit, comprising:**
240-02158-00	Conn Shld RJ45 Shortbody Plg
360-02022-00	Grommet Mic TMA

Grid Reference List

Ref.	PCB	Circuit
C101	F3	1D2
C102	F2	1D3
C103	K1	1D5
C104	F4	1E3
C105	E4	1D3
C106	G1	1C4
C107	F1	1C2
C108	G1	1C3
C109	E4	1C3
C110	F4	1B2
C111	F4	1B2
C112	M3	1E5
C113	M3	1D5
C114	M3	1E6
C115	M3	1D6
C116	M4	1D6
C117	M4	1D6
D101	J2	1C4 1C5
D102	J1	1C4
D103	G4	1E2
D104	J4	1E3
D105	F4	1D4 1D3
D106	D4	1B2
D107	M4	1D7
E101	F3	1B2
E102	F4	1B3
E103	G1	1C3
E104	G1	1C3
E105	K3	1D1
E106	D3	1D1
E107	E4	1D2
E108	E4	1C2
E109	K1	1D5
F101	F3	1D2
J100	E4	1C1
J101	L2	1C7
MT100	A3	1E1
MT101	J3	1E1
Q101	M2	1E5
R101	K3	1D1
R102	G4	1E3
R103	G4	1E3
R104	D4	1B3
R105	K1	1B6
R106	K2	1C5
R107	K2	1B5
R108	M2	1B6
R109	E4	1D3
R110	G2	1C4
R111	G1	1C4
R112	G1	1C4
R113	M2	1E4
R114	M3	1E5
R115	M3	1E6
R116	M3	1E6
R117	M2	1D5
R118	M3	1D5
R119	M3	1D6
R120	M3	1D6
R121	M4	1E7
R122	L4	1D6
R123	K2	1B6
U101	G3	1D3
U102	K1	1C5

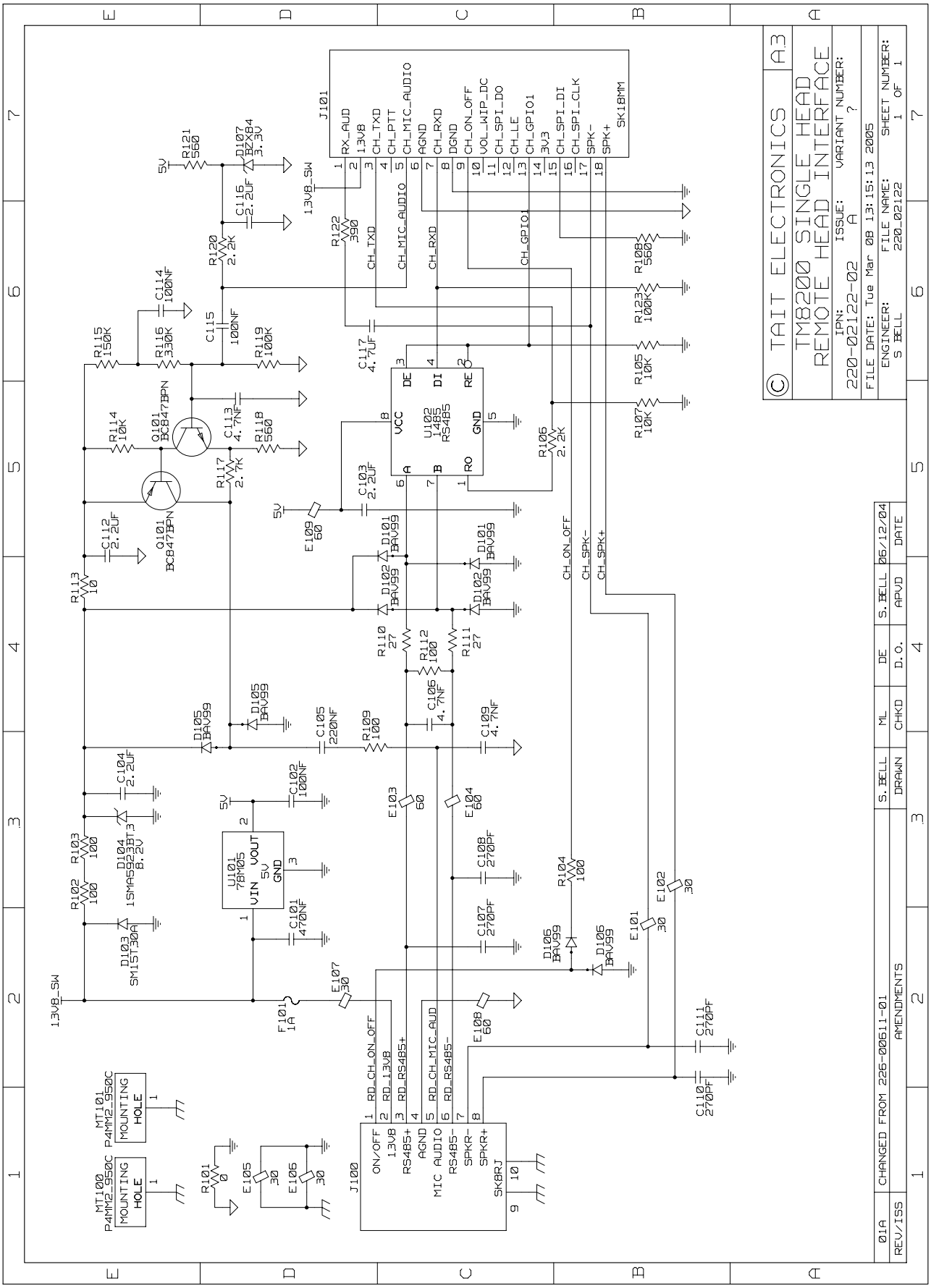
Ref.	PCB	Circuit

Board Layout



IPN 220-02122-02

Circuit Diagram



10.4.2 RJ-45 Control Head (PCB IPN 220-02123-01)

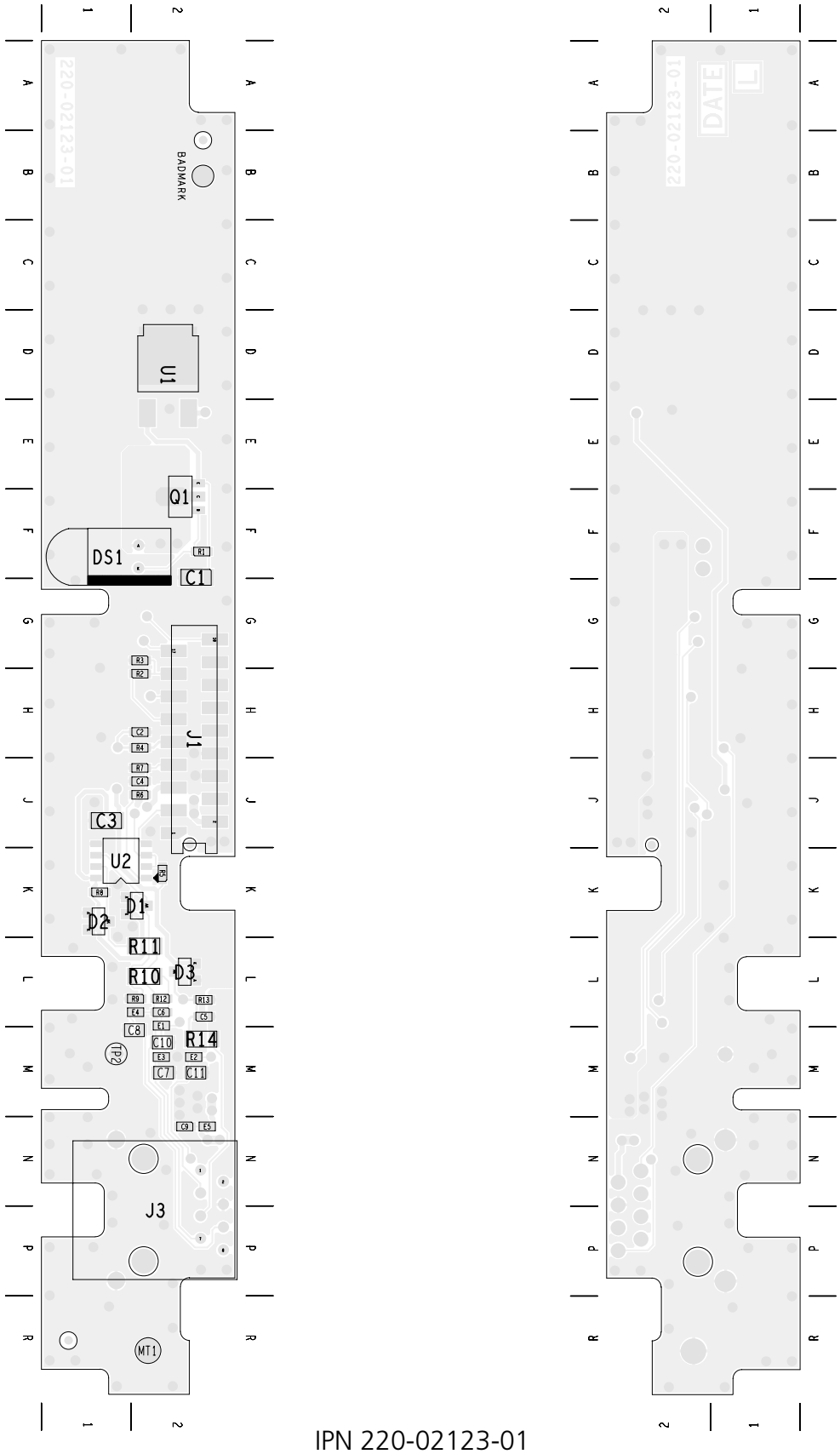
Parts List

Ref.	IPN	Description
C1	015-06470-01	Cap Cer 1206 470n X7r 20% 50v
C2	018-14470-00	Cap 0603 4n7 50v X7r±10%
C3	015-07220-08	Cap Cer 1206 2u2 16v X7r
C4	018-13470-00	Cap 0603 470p 50v X7r±10%
C5	018-13470-00	Cap 0603 470p 50v X7r±10%
C6	018-14470-00	Cap 0603 4n7 50v X7r±10%
C7	015-23270-05	Cap 0805 270p 1% 200v Grm40
C8	015-23270-05	Cap 0805 270p 1% 200v Grm40
C9	018-15330-00	Cap 0603 33n 50v X7r10%
C10	015-23270-05	Cap 0805 270p 1% 200v Grm40
C11	015-23270-05	Cap 0805 270p 1% 200v Grm40
D1	001-10000-99	Diode SMD BAV99 D-Sw SOT23
DS1	008-00014-74	LED Hp Red Rang PCB Mtg
D2	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D3	001-10000-99	Diode SMD BAV99 D-Sw SOT23
E1	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
E2	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
E3	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
E4	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
E5	057-10020-02	Ind 0603 BlM18pg300 Emi Supr
J1	240-10000-11	Conn SMD 18w Skt M/Match
J3	240-00016-00	Conn RJ45 Shld 8P8C LP RA TH
Q1	000-10561-60	XSTR BCX56-16 AF NPN SOT89
R1	038-13100-10	Res 0603 100R 1/10w 1%
R3	038-15100-10	Res 0603 10k 1/10w 1%
R4	038-13100-10	Res 0603 100R 1/10w 1%
R5	038-16100-10	Res 0603 100k 1/10w 1%
R6	038-14220-00	Res 0603 2k2 1/10w 5%
R7	038-15100-10	Res 0603 10k 1/10w 1%
R8	038-13560-10	Res 0603 560R 1/10w 1%
R9	038-13560-10	Res 0603 560R 1/10w 1%
R10	036-02270-10	Res 1206 27.0e 1%
R11	036-02270-10	Res 1206 27.0e 1%
R12	038-13120-00	Res 0603 120R 1/10w 5%
R13	038-16100-10	Res 0603 100k 1/10w 1%
R14	036-05100-01	Res M/F 1206 10k 5%
U1	002-10078-00	IC SMD MC78M05CDT5v Reg0.5a
U2	002-10014-85	IC ADM1485 RS485 Transc S08
	220-02123-01	PCB Single Rmt Radio I/F

Grid Reference List

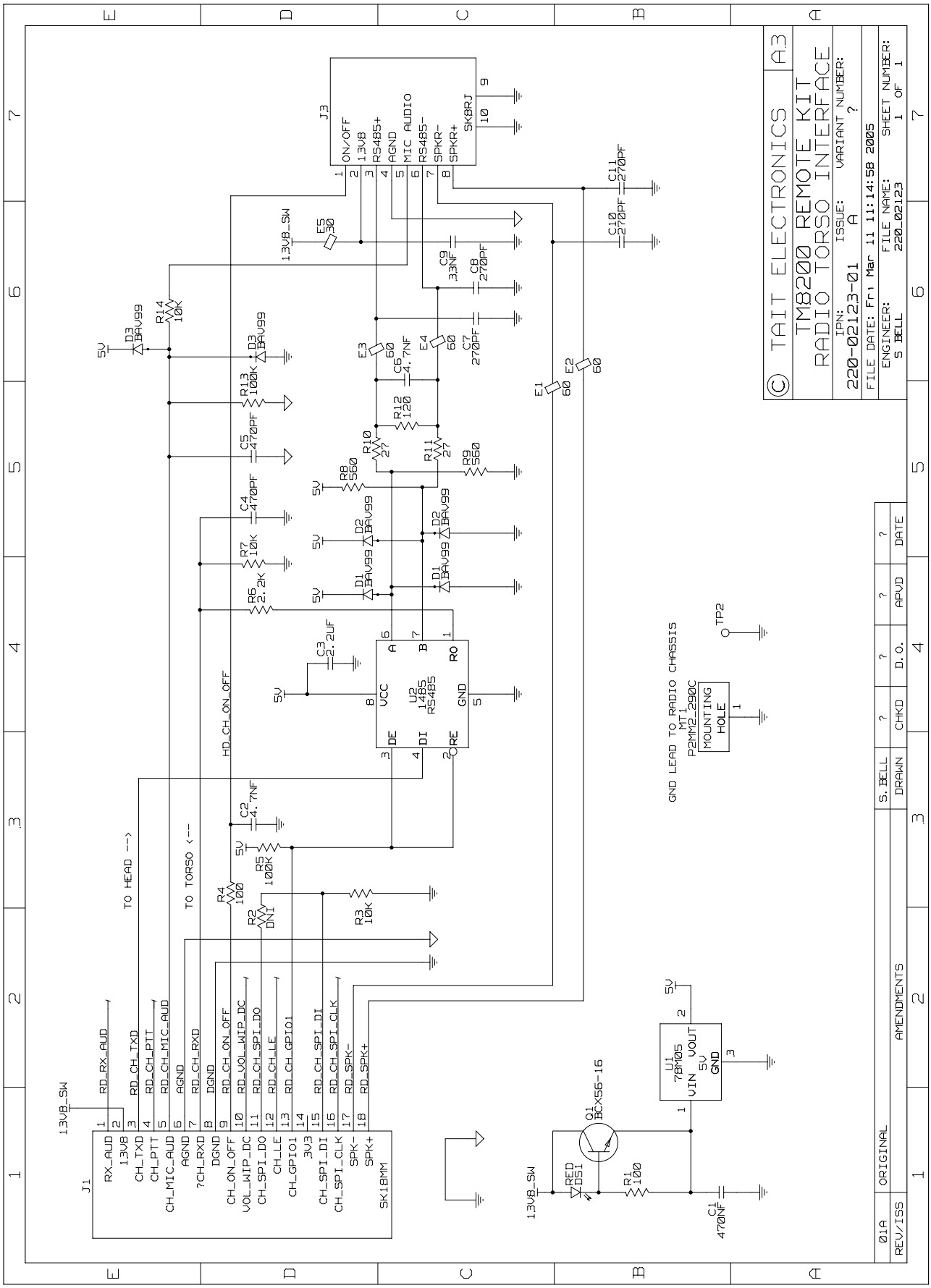
Ref.	PCB	Circuit
C1	F2	1B1
C10	M2	1B6
C11	M2	1B7
C2	H2	1D3
C3	J1	1D4
C4	J2	1D5
C5	L2	1D5
C6	L2	1C6
C7	M2	1C6
C8	M2	1C6
C9	N2	1C6
D1	K2	1C4 1D4
D2	K1	1C5 1D5
D3	L2	1D6 1E6
DS1	F2	1B1
E1	L2	1C5
E2	M2	1B6
E3	M2	1D6
E4	L2	1C6
E5	N2	1D6
J1	H2	1D1
J3	N2	1C7
MT1	R2	1B4
Q1	F2	1B1
R1	F2	1B1
R10	L2	1D5
R11	L2	1C5
R12	L2	1C5
R13	L2	1D5
R14	M2	1E6
R2	H2	1D2
R3	G2	1D3
R4	H2	1D3
R5	K2	1D3
R6	J2	1D4
R7	J2	1D4
R8	K1	1D5
R9	L2	1C5
TP2	M1	1B4
U1	D2	1B2
U2	K1	1C4

Board Layout



IPN 220-02123-01

Circuit Diagram



11 Installing an Enhanced Remote Kit

The control head of a graphical-display radio can be installed remotely from the radio body. The diagram below shows the parts used for this installation.

TMAA03-03 remote control-head back (includes remote U-bracket)	TMAA04-01 remote cable	TMAC34-0T (TM8200) or TMAC34-1T(TM9100) torso interface

Note Although the torso interface is similar in appearance to the dual-RJ45 on the telemetry radio, the control head on the telemetry radio cannot be used for remote installation.

11.1 Installation

Warning!! **Mount the remote U-bracket with the remote control-head assembly and the U-bracket with the radio body securely. These units must not break loose in the event of a collision. Unsecured radio units are dangerous to the vehicle occupants.**

Caution **Observe the installation warnings and safety regulations in the installation procedures of the radio.**

Important This equipment contains devices which are susceptible to damage from static discharges. Refer to "ESD Precautions" on page 11 for more information.

Note Torx T10 and T20 screwdrivers are required for most of the screws in this installation.

The circled numbers in the following sections refer to the items in Figure 11.1 on page 92.

11.1.1 Overview

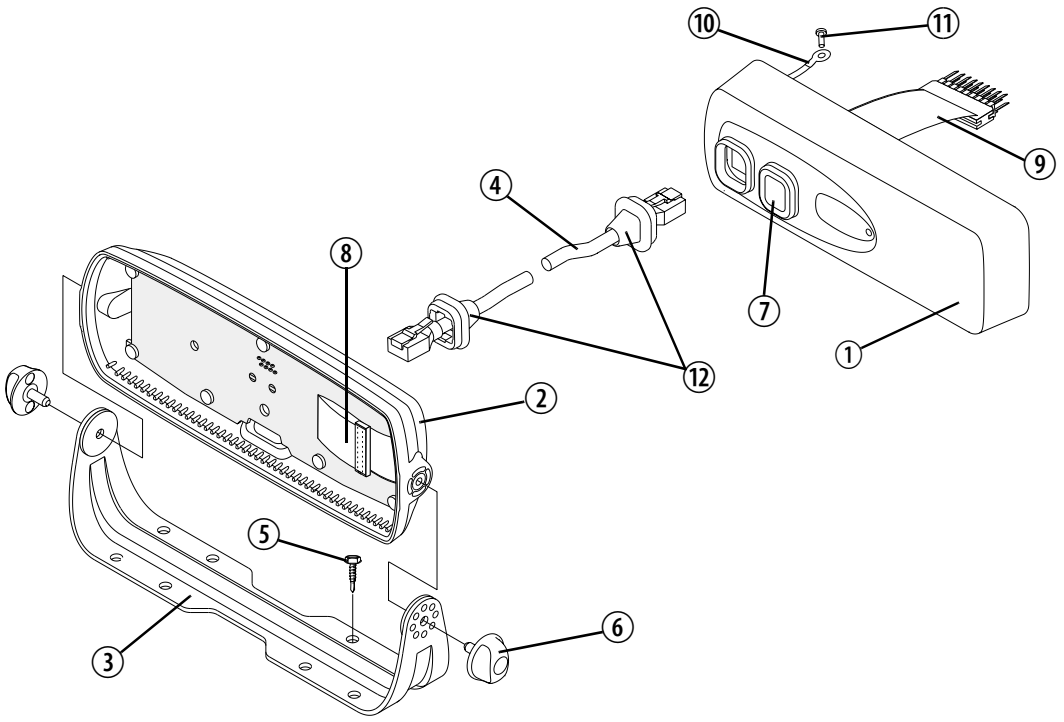
Installing the control head remotely is done in six steps:

1. Remove the control head from the radio body, if necessary.
2. Install the torso interface ① onto the radio body.
3. Mount the remote U-bracket ③ in the required position.
4. Install the control-head interface ② onto the control head and install the remote control-head assembly in the remote U-bracket.
5. Mount the U-bracket in the required position and install the radio body in the U-bracket.
6. Route the remote cable ④ between the remote control-head assembly and the radio body.

11.1.2 Parts Required

The following diagram identifies the parts for remote control-head installation and shows how they fit together.

Figure 11.1 Parts for remote control-head installation



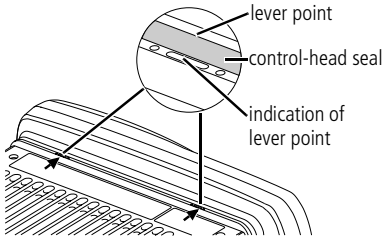
① torso interface
② control-head interface
③ remote U-bracket
④ remote cable
⑤ self-drilling screw
⑥ thumb screw
⑦ RJ45 bung
⑧ control-head interface loom
⑨ torso-interface loom
⑩ earthing tag
⑪ earthing-tag screw
⑫ remote cable grommets

11.1.3 Removing the Control Head from the Radio Body (if necessary)

Caution **During this procedure, take care that the control-head seal is not damaged. Damage to this seal reduces environmental protection.**

1. On the underside of the radio, insert a 5mm (3/16 inch) flat-bladed screwdriver between the control head and the control-head seal, in the positions shown.

   Insertion points and are lever points and are indicated on the radio chassis by a dot-dash-dot pattern (•—•).



2. Use the screwdriver to lift the control head off the chassis clip, then repeat in the other position.

3. Unplug the control-head loom from the radio body.

   The control head is now separate from the radio body.

11.1.4 Installing the Torso Interface

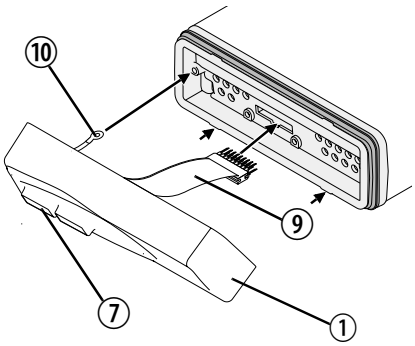
The torso interface must be installed onto the radio body, in place of the control head.

1. Screw the solder tag ⑩ onto one of the screw bosses on the radio chassis.

2. Plug the torso-interface loom ⑨ onto the control-head connector.

3. Insert the bottom edge of the remote control head ① onto the two clips in the front of the radio chassis, then snap into place.

4. Remove one of the bungs ⑦ covering the RJ45 connectors. The remote cable ④ will plug into this connector once the installation is complete.



If the remote cable is not installed in the RJ45 cavity, then the RJ45 bung must be installed. This ensures that the torso interface is sealed against water, dust and other environmental hazards.

11.1.5 Mounting the Remote U-Bracket

The remote U-bracket with its self-drilling screws, is used to install the remote control-head assembly on the dashboard or on any sufficiently flat surface.

Caution **When drilling holes in the vehicle, check that drilling at the selected points will not damage existing wiring.**

Important Check that the remote U-bracket is not distorted when the screws are tightened.

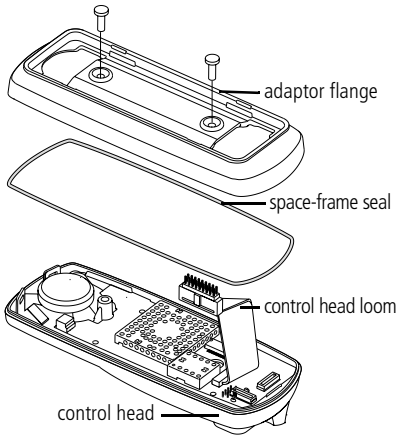
1. Drill any holes required for cables and install suitable grommets or bushings in the holes.
2. If precise positioning is required, predrill ∅ 3mm (1/8 inch) pilot holes for the self-drilling screws. Reduce the hole size in metal that is less than 1mm (1/32 inch) thick.
3. Screw the remote U-bracket in the chosen mounting position using the self-drilling screws provided. Use all four screws provided.

11.1.6 Installing the Control-Head Interface

With the control head separated from the radio body, the control-head interface ② must be installed on the rear of the control head.

1. Undo the two Torx T-20 screws on the adaptor flange of the control head, and remove the adaptor flange.
2. Unplug the control-head loom.

   The adaptor flange and control-head loom are not used for the remote control-head installation. Keep the two screws for step (4).
3. Plug the control-head interface loom ⑧ into the connector on the control head.



Important When fitting the control-head interface to the control-head, be careful not to damage the space-frame seal.

4. Use the two screws from step (2) to fit the control-head interface to the control head through the two screw holes at the rear of the control-head interface.

Changing the Remote U-Bracket Orientation

The control-head interface is configured for installation with the RJ45 socket facing downwards (U-bracket below control head, as in Figure 11.1). If the RJ45 socket is required to face upwards (control head hanging from

U-bracket), the control-head interface loom ⑧ must be moved, so that it can reach the control head connector.

To move the control-head interface loom:

1. Undo the seven Torx T-10 screws on the control-head board, and remove the control-head interface board from the control-head interface.
2. Change the control-head interface loom ⑧ to the opposite connector.
3. Reinstall the control-head interface board.

Installing the Remote Control-Head Assembly in the Remote U-Bracket

1. Position the control-head assembly in the remote U-bracket and position it for a good viewing angle.

Note Adjusting the contrast on the control-head display may also improve its readability.

2. Screw the remote control-head assembly into position using the two thumb screws provided.

11.1.7 Mounting the U-Bracket and Installing the Radio Body

Mounting the U-Bracket

Install the U-bracket on any sufficiently flat surface, using self-drilling screws and washers.

Caution **When drilling holes in the vehicle, check that drilling at the selected points will not damage existing wiring, petrol tanks, fuel lines, brake pipes or battery cables.**

Important When mounting the U-bracket, check whether the mounting surface needs to be reinforced.

Important Install the U-bracket using at least four screws.

1. If the U-bracket is being mounted over a curved surface, bend the U-bracket tabs slightly, to match the surface shape.
2. Drill any holes required for cables and install suitable grommets or bushings in the holes.

Important Check that the U-bracket is not distorted when the screws are tightened.

3. If precise positioning is required, predrill ∅ 3mm (1/8 inch) pilot holes for the self-drilling screws. Reduce the hole size in metal that is less than 1mm (1/32 inch) thick.

4. Screw the U-bracket in the chosen mounting position using the self-drilling screws washers.

Installing the Radio Body in the U-Bracket

1. Connect the antenna and power cables to the rear of the radio.
2. Position the radio body in the U-bracket so that the holes in the U-bracket line up with the holes in the radio chassis.
3. Screw the radio into position using the four thumb screws.

11.1.8 Connecting the Remote Cable

Caution **When drilling holes in the vehicle, check that drilling at the selected points will not damage existing wiring, petrol tanks, fuel lines, brake pipes or battery cables.**

1. Drill any holes required for cables and install suitable grommets or bushings in the holes.
2. Plug one end of the remote cable into the control-head interface.
3. Run the remote cable to the torso interface and plug it into the RJ45 connector without a bung.

Installing the Remote-Cable Grommets

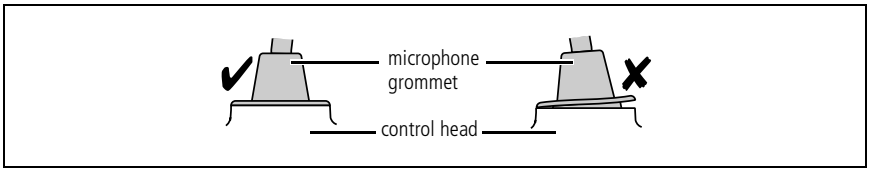
Install both the remote cable grommets, using the following procedure.

Important The remote cable grommets must be installed whenever the remote cable is plugged into the RJ45 sockets. When installed, the grommets have two functions:

- to prevent damage to the RJ45 sockets when there is movement of the remote cable, and
- to ensure that the radio and remote control-head assembly is sealed against water, dust and other environmental hazards.

1. Slide the grommet along the remote cable and push two adjacent corners of the grommet into the RJ45 socket cavity.
2. Squeeze the grommet and push the remaining corners into position.
3. Check that the grommet is seated correctly in the cavity.

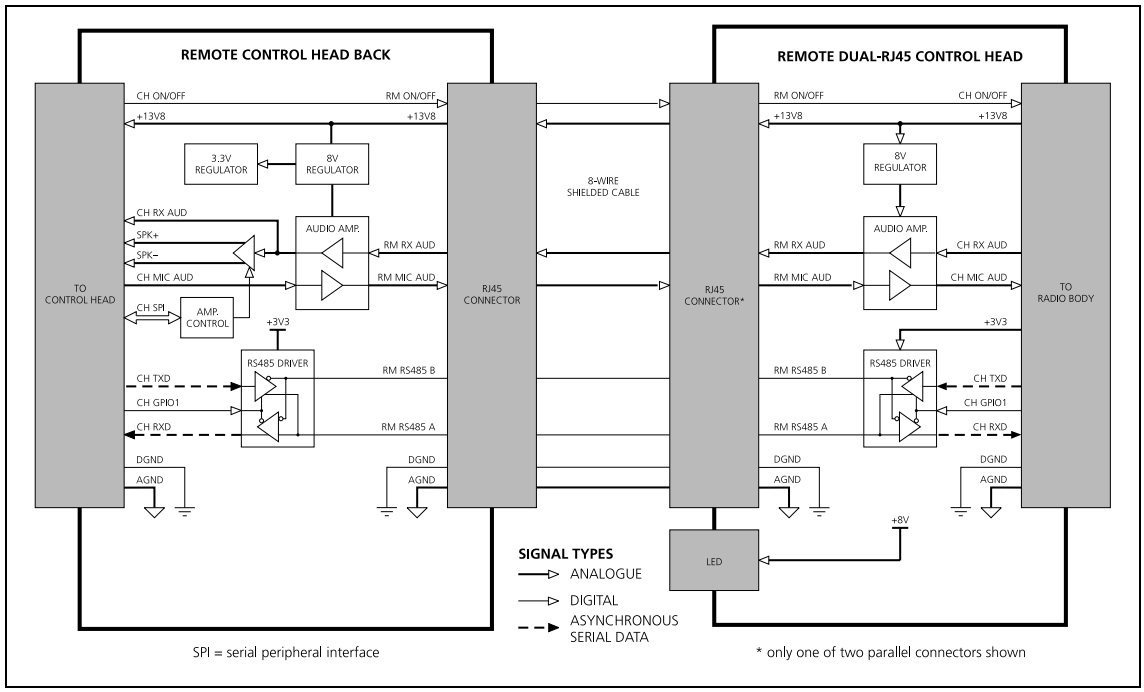
Figure 11.2 Correct remote cable grommet seating



11.2 Circuit Description

Figure 11.3 shows a block diagram of the remote control-head installation. Both control heads contain a circuit board with audio amplifiers and RS-485 driver components.

Figure 11.3 Block diagram of remote control-head installation



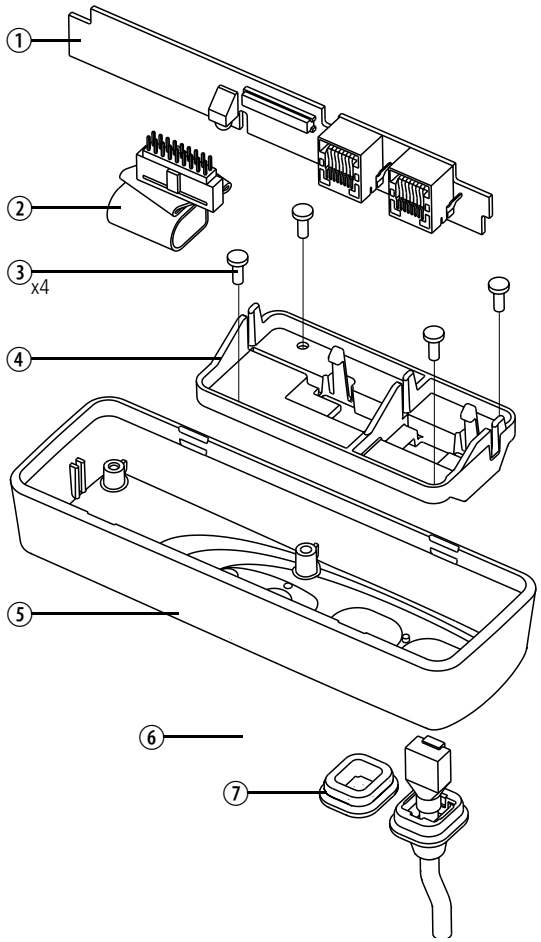
11.3 Servicing the Remote Control-Head Installation Parts

11.3.1 Disassembling the Torso Interface

Disassemble only as much as is necessary to replace the defective parts. Re-assembly is carried out in reverse order of disassembly.

1. Release the clip of the PCB bracket ④ and remove the control-head board ①.
2. Disconnect the torso-interface loom ②.
3. Unscrew the four PT type screws ③ and remove the PCB bracket ④.

Figure 11.4 Parts of the torso interface



	Description	IPN
①	control-head board	
②	torso-interface loom	219-02882-XX[a]
③	3 x 8 PT screw (x4)	346-10030-XX[a]
④	PCB bracket	302-10063-XX[a]
⑤	front panel	316-06843-XX[a]
⑥	label	365-01751-XX[a]
⑦	RJ45 bung	302-50002-XX[a]

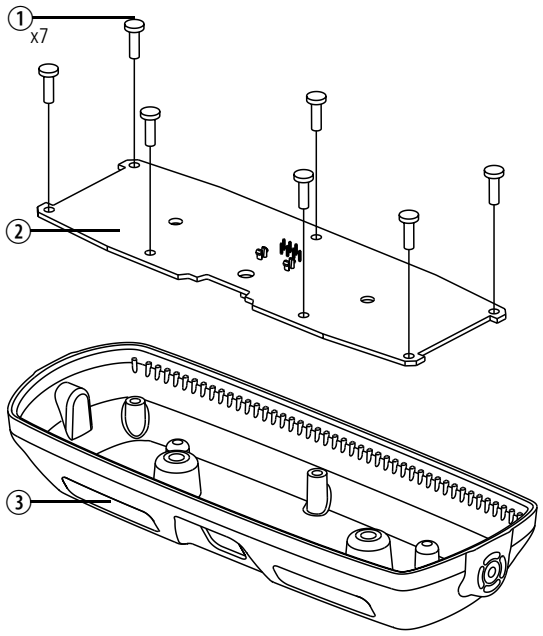
[a] Contact Technical Support for the exact IPN.

11.3.2 Disassembling the Control-Head Interface

Disassemble only as much as necessary to replace the defective parts or to swap the Micromatch connector loom. Re-assembly is carried out in reverse order of disassembly.

1. Unscrew the seven PT type screws ① and remove the PCB ②.
2. Remove the control-head interface loom (not illustrated).

Figure 11.5 Parts of the control-head interface



	Description	IPN
①	3 x 8 PT screw (x7)	346-10030-XX[a]
②	control-head interface PCB	
③	control-head interface	316-06842-XX[a]
	control-head interface loom	219-02914-XX[a]

[a] Contact Technical Support for the exact IPN.

11.4 PCB Information

11.4.1 TMAA03-03 Control-Head Interface (PCB IPN 220-01721-04)

Parts List

Ref.	IPN	Description
C1	016-08100-03	Cap Elec SMD 10uF 35V 105/2000
C100	018-14100-00	Cap 0603 1n 50v X7r ±10%
C101	018-14100-00	Cap 0603 1n 50v X7r ±10%
C102	015-02470-06	Cap Cer 1210 47p NPO 500v
C103	015-02470-06	Cap Cer 1210 47p NPO 500v
C110	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C300	015-06470-01	Cap Cer 1206 470n X7r 20% 50v
C301	016-07470-01	Cap Elec SMD 4u7 6*4 16v 20%
C310	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C312	014-07470-05	Cap Tant SMD 4u7 16v 10% A
C320	016-08100-03	Cap Elec SMD 10uF 35V 105/2000
C400	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C401	015-07220-08	Cap Cer 1206 2u2 16v X7r
C410	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C411	018-13100-00	Cap 0603 100p 50v NPO ±5%
C420	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C421	018-13100-00	Cap 0603 100p 50v NPO ±5%
C422	015-07220-08	Cap Cer 1206 2u2 16v X7r
C423	015-07220-08	Cap Cer 1206 2u2 16v X7r
C430	015-07220-08	Cap Cer 1206 2u2 16v X7r
C500	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C600	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C601	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C610	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C611	015-07220-08	Cap Cer 1206 2u2 16v X7r
C612	015-07220-08	Cap Cer 1206 2u2 16v X7r
C700	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C701	015-07220-35	Cap Cer 1210 2u2 X5R 35v
C702	015-07220-35	Cap Cer 1210 2u2 X5R 35v
C703	015-06470-01	Cap Cer 1206 470n X7r 20% 50v
C704	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C705	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C706	018-13220-00	Cap 0603 220p 50v NPO±5%
C707	015-06470-01	Cap Cer 1206 470n X7r 20% 50v
C708	015-07220-35	Cap Cer 1210 2u2 X5R 35v
C710	015-07220-35	Cap Cer 1210 2u2 X5R 35v
C711	015-07220-35	Cap Cer 1210 2u2 X5R 35v
C712	015-07220-35	Cap Cer 1210 2u2 X5R 35v
C730	015-26220-18	CAP CER 0805 220N 10% X7R 50V
C731	015-26220-18	CAP CER 0805 220N 10% X7R 50V
C732	018-14100-00	Cap 0603 1n 50v X7r ±10%
C733	018-14100-00	Cap 0603 1n 50v X7r ±10%
C734	015-07220-08	Cap Cer 1206 2u2 16v X7r
C735	015-07220-08	Cap Cer 1206 2u2 16v X7r
D100	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D101	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D102	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D103	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D104	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D110	001-10084-91	Diode SMD BZX84C9V1 Zen SOT23
D201	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D211	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D300	001-10000-99	Diode SMD BAV99 D-Sw SOT23
D720	001-10841-10	Diode SMD BZX84C11v ZEN SOT23
D730	001-10014-03	Diode SMD MBRS140T3 Sch
D731	001-10014-03	Diode SMD MBRS140T3 Sch
E100	057-10081-06	Ind 1806 Blm41p750s Emi Supr
E101	057-10081-06	Ind 1806 Blm41p750s Emi Supr
E102	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
E103	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
E105	057-10081-06	Ind 1806 Blm41p750s Emi Supr
E710	057-10600-05	Ind 0603 Blm11p600s .5a F/Bead
E711	057-10081-06	Ind 1806 Blm41p750s Emi Supr
E730	057-10081-06	Ind 1806 Blm41p750s Emi Supr
E731	057-10081-06	Ind 1806 Blm41p750s Emi Supr
J100	240-00016-00	Conn RJ45 Shld 8P8C LP RA TH
J200	240-10000-11	Conn SMD 18w Skt M/Match
J201	240-10000-11	Conn SMD 18w Skt M/Match
L712	057-10100-65	Ind SMD Pwr Cdrh6D38 100UH .65
L730	057-10470-10	Ind SMD Pwr CDRH104R 47uH 1A
L731	057-10470-10	Ind SMD Pwr CDRH104R 47uH 1A
Q610	000-10084-71	Xstr BC847BW NPN SOT323
Q720	000-10084-71	Xstr BC847BW NPN SOT323
Q721	000-10442-71	Xstr SI4427BDY PCH MOSFET SO8
R100	038-13100-10	RES 0603 100R 1% 1/10W
R110	038-15100-10	RES 0603 10k 1% 1/10W
R200	038-13100-10	RES 0603 100R 1% 1/10W
R201	038-13100-10	RES 0603 100R 1% 1/10W
R202	038-13100-10	RES 0603 100R 1% 1/10W
R210	038-13100-10	RES 0603 100R 1% 1/10W
R211	038-13100-10	RES 0603 100R 1% 1/10W
R212	038-13100-10	RES 0603 100R 1% 1/10W
R320	036-00000-01	RES 1206 0R 5% 0.25W
R401	038-15820-10	RES 0603 82k 1% 1/10W
R402	038-15820-10	RES 0603 82k 1% 1/10W
R410	038-15150-10	RES 0603 15k 1% 1/10W
R411	038-16150-10	RES 0603 150k 1% 1/10W
R412	038-13100-10	RES 0603 100R 1% 1/10W
R420	038-15330-10	RES 0603 33k 1% 1/10W
R421	038-15220-10	RES 0603 22k 1% 1/10W
R422	038-12470-00	RES 0603 47R 5% 1/10W
R430	038-14220-00	RES 0603 2k2 5% 1/10W
R431	038-14220-00	RES 0603 2k2 5% 1/10W
R441	038-14470-10	Res 0603 4k7 1% 100ppm
R442	038-14470-10	Res 0603 4k7 1% 100ppm
R501	038-15100-10	RES 0603 10k 1% 1/10W
R510	038-13120-00	RES 0603 120R 5% 1/10W
R511	038-10000-00	RES 0603 0R
R600	038-15100-10	RES 0603 10k 1% 1/10W
R601	038-16470-00	RES 0603 470k 5% 1/10W
R602	038-10000-00	RES 0603 0R
R603	038-10000-00	RES 0603 0R
R604	038-10000-00	RES 0603 0R
R605	038-10000-00	RES 0603 0R
R606	038-15100-10	RES 0603 10k 1% 1/10W
R607	038-15100-10	RES 0603 10k 1% 1/10W
R608	038-15100-10	RES 0603 10k 1% 1/10W
R609	038-15100-10	RES 0603 10k 1% 1/10W
R611	038-15100-10	RES 0603 10k 1% 1/10W
R612	038-14470-10	Res 0603 4k7 1% 100ppm

Ref.	IPN	Description
R701	038-16120-10	RES 0603 120k 1% 1/10W
R710	036-13100-10	RES 0805 100R 1% 1/8W
R720	038-15100-10	RES 0603 10k 1% 1/10W
R721	038-14220-00	RES 0603 2k2 5% 1/10W
R722	038-14470-10	Res 0603 4k7 1% 100ppm
R730	038-12470-00	RES 0603 47R 5% 1/10W
R731	038-12470-00	RES 0603 47R 5% 1/10W
U300	002-10800-00	IC LDO REG LF80C 8V@1A PPAKT/R
U310	002-14931-00	IC L4931CD33 3.3v 250Ma Regso8
U400	002-19120-00	IC TS912ID Cmos R2R Opamp
U500	002-13483-00	IC XCVR RS485 LTD SLEW RATE 3V
U600	002-15595-00	IC 74AHC595 8bit Shiftreg Tsop
U610	002-10126-71	IC SMD DS1868 Dgtl Pot Tsop20
U700	002-13001-00	IC TPA3001 20W Mono PA TSSOP24
	220-01721-04	PCB MFX Head Remote
	219-02914-00	LOOM MFX Remote Head

Ref.	IPN	Description
	302-05263-00	Brkt U Thumb Scrw TMA
	302-10062-00	Brkt Remote Head TM8200
	316-06842-00	Pnl Rear TM8200 MF2
	346-10030-08	Scrw P/T Wn1412 Kc30x08 Zbc
	349-00060-00	Scrw 10G*20 SLFDRL Hex/Poz TMA
	353-05007-00	Wshr Rubber M4*19*1.0 S/A
	354-01052-00	Fsnr Bush PSM SHK-B-M4 Ins
	402-00015-00	MANL f/instr TMAA03-05
	410-01183-02	Pkg Box 220x82x65 TMA
	410-01197-01	Pkg Ins Lg Ctrl Hd TMA

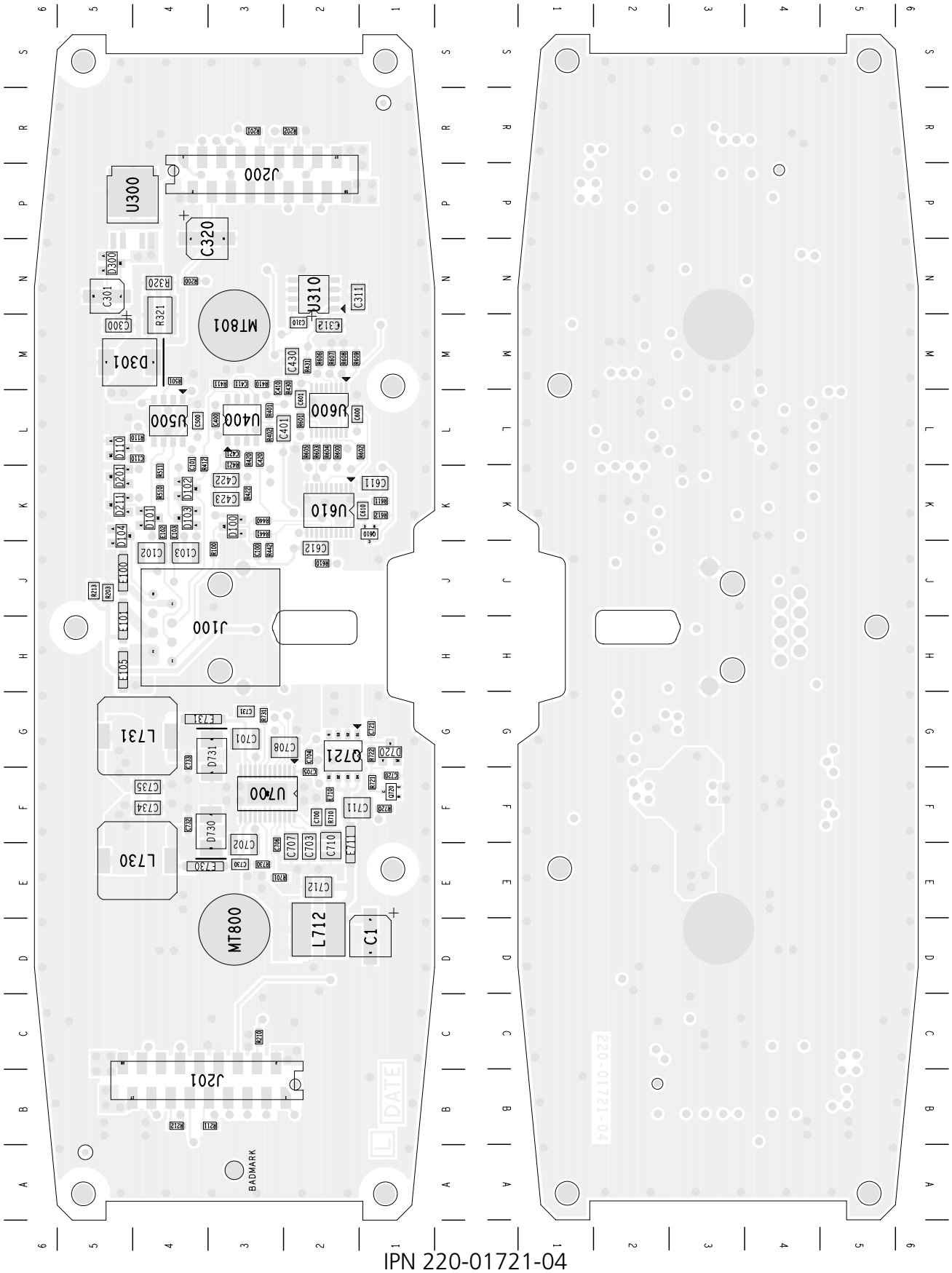
TMAA04-01 Remote Cable Parts

219-02918-00	Cbl Rmt Ctrl Hd Kit, comprising:
219-00025-00	loom 6m shld Bonded+Drain
240-02158-00	Conn Shld RJ45 Shortbody Plg
360-02022-00	Grommet Mic TMA

Grid Reference List

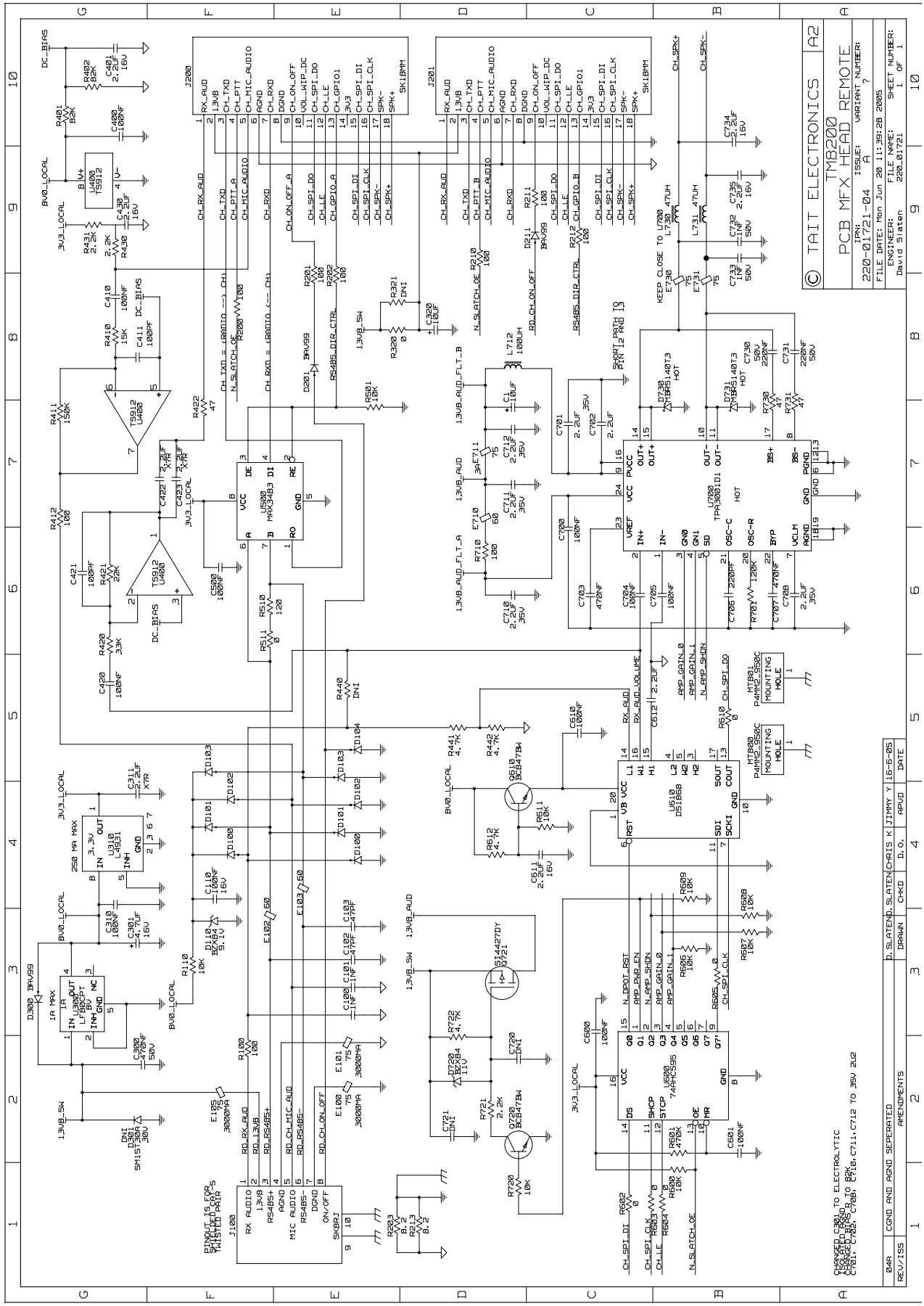
Ref.	PCB	Circuit
C1	D1	D7
C100	J3	E3
C101	L4	E3
C102	J4	E3
C103	J4	E3
C110	L4	F4
C300	M5	G2
C301	N5	G3
C310	M2	G4
C311	N2	G4
C312	M2	G5
C320	P4	D8
C400	L3	G10
C401	L3	G10
C410	M3	G8
C411	M3	G8
C420	L3	G5
C421	L3	G6
C422	K3	F7
C423	K3	F7
C430	M2	G9
C500	L4	F6
C600	L2	C3
C601	L2	B2
C610	K1	C5
C611	K1	C4
C612	J2	C5
C700	F2	C6
C701	G3	C7
C702	E3	C7
C703	E2	C6
C704	G2	C6
C705	F2	B6
C706	E3	B6
C707	E2	B6
C708	G2	A6
C710	E2	D6
C711	F2	D7
C712	E2	D7
C720	F1	D2
C721	G1	D2
C730	E3	B8
C731	G3	A8
C732	F4	B9
C733	G4	B9
C734	F4	B10
C735	F4	B9
D100	K3	F4
		E4
D101	K4	E4
		F4
D102	K4	F4
		E4
D103	K4	E5
		F5
D104	K5	E5
D110	L5	F3
D201	K5	E8
D211	K5	C9
D300	N5	G3
D301	M5	G2
D720	G1	D2
D730	F3	B7
D731	G3	B7
E100	J5	E2
E101	H5	E2
E102	K4	F3
E103	K4	E4
E105	H5	F2
E710	F2	D7
E711	E2	D7
E730	E4	B8
E731	G4	B8
J100	H4	E1
J200	P3	E10
J201	B4	C10
L712	D2	D8
L730	E4	B9
L731	G4	B9
MT800	D3	B5
MT801	M3	B5
Q610	K1	D4
Q720	F1	D2
Q721	G2	D3
R100	J3	F2
R110	L4	F3
R200	N4	F8
R201	R3	E8
R202	R2	E8
R203	J5	E1
R210	C3	D9
R211	B3	C9
R212	B4	C9
R213	J5	D1
R320	N4	E8
R321	M4	E8
R401	L3	G10
R402	L3	G10
R410	M3	G8
R411	M3	G7
R412	L4	G7
R420	L3	G6
R421	L3	G6
R422	K3	F7
R430	M2	G9
R431	M2	G9
R440	K3	E5
R441	K3	D5
R442	J3	D5
R501	M4	E7
R510	K4	F6
R511	K4	F6
R600	L2	B1
R601	L2	B2
R602	L1	C1
R603	L2	C1
R604	L2	B1
R605	L2	B3
R606	M2	B3
R607	M2	B3
R608	M2	B3
R609	M2	B4
R610	J2	B5
R611	K1	C4
R612	K1	D4
R701	E3	B6
R710	F2	D6
R720	F1	D1
R721	F1	D2
R722	G1	D2
R730	E3	B7
R731	G3	A7
U300	P5	G3
U310	N2	G4
U400	L3	F6
		G7
		1G9
U500	L4	F7
U600	L2	B2
U610	K2	B4
U700	F3	B7

Board Layout



IPN 220-01721-04

Circuit Diagram



11.4.2 TMAC34-0T Torso Interface (PCB IPN 220-01720-03)

Parts List

Ref.	IPN	Description
C1	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C2	015-07470-20	CAP Cer 1206 4u7 10% 25V X7R
C3	015-06470-01	Cap Cer 1206 470n X7r 20% 50v
C4	018-13100-00	Cap 0603 100p 50v NPO ±5%
C7	015-27100-08	Cap Cer 0805 X7R 1uF 16V 10%
C9	018-13100-00	Cap 0603 100p 50v NPO ±5%
C10	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C13	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C15	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C17	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C101	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C102	015-07470-20	CAP Cer 1206 4u7 10% 25V X7R
C103	015-07470-20	CAP Cer 1206 4u7 10% 25V X7R
C203	018-13270-00	Cap 0603 270p 50v NPO±5%
C207	018-13270-00	Cap 0603 270p 50v NPO±5%
C209	018-13270-00	Cap 0603 270p 50v NPO±5%
C213	018-13270-00	Cap 0603 270p 50v NPO±5%
DS1	008-00014-73	LED Hp Grn Rang PCB Mtg
J1	240-10000-11	Conn SMD 18w Skt M/Match
J2	240-00016-00	Conn RJ45 Shld 8P8C LP RA TH
J3	240-00016-00	Conn RJ45 Shld 8P8C LP RA TH
R1	038-13120-00	RES 0603 120R 5% 1/10W
R2	038-10000-00	RES 0603 0R
R3	038-15820-10	RES 0603 82k 1% 1/10W
R4	038-15820-10	RES 0603 82k 1% 1/10W
R6	038-15220-10	RES 0603 22k 1% 1/10W
R7	038-15100-10	RES 0603 10k 1% 1/10W
R8	038-15820-10	RES 0603 82k 1% 1/10W
R9	038-13100-10	RES 0603 100R 1% 1/10W
R10	038-15100-10	RES 0603 10k 1% 1/10W

Ref.	IPN	Description
R12	038-16100-10	RES 0603 100k 1% 1/10W
R13	038-16100-10	RES 0603 100k 1% 1/10W
R14	036-13560-10	RES 0805 560R 1% 1/8W
R15	038-15820-10	RES 0603 82k 1% 1/10W
R16	038-15100-10	RES 0603 10k 1% 1/10W
R17	038-15220-10	RES 0603 22k 1% 1/10W
R18	038-13220-10	RES 0603 220R 1% 1/10W
R19	038-14120-10	RES 0603 1k2 1% 1/10W
R20	038-10000-00	RES 0603 0R
R21	038-10000-00	RES 0603 0R
R30	038-13390-10	RES 0603 390R 1% 1/10W
R31	038-13390-10	RES 0603 390R 1% 1/10W
R40	036-00000-01	RES 1206 0R 5% 0.25W
R103	038-12100-10	RES 0603 10R 1% 1/10W
R104	038-15100-10	RES 0603 10k 1% 1/10W
R203	038-13100-10	RES 0603 100R 1% 1/10W
R207	038-13100-10	RES 0603 100R 1% 1/10W
R209	038-13100-10	RES 0603 100R 1% 1/10W
R213	038-13100-10	RES 0603 100R 1% 1/10W
R911	036-00000-01	RES 1206 0R 5% 0.25W
R915	036-00000-01	RES 1206 0R 5% 0.25W
R917	038-10000-00	RES 0603 0R
U1	002-19120-00	IC TS912ID Cmos R2R Opamp
U2	002-12523-17	IC LM317l Reg T0252 0.5a
U3	002-13483-00	IC XCVR RS485 LTD SLEW RATE 3V
	219-02950-00	CBL MFX Remote Kit Gnd Lead
	220-01720-03	PCB MFX Radio Remote
	219-02882-00	Loom Control Head TMA
	302-10063-00	Brkt PCB Remote TM8200 Body
	302-50002-00	Bung RJ45 MFO
	316-06843-00	Pnl Frt Remote TM8200 MF0

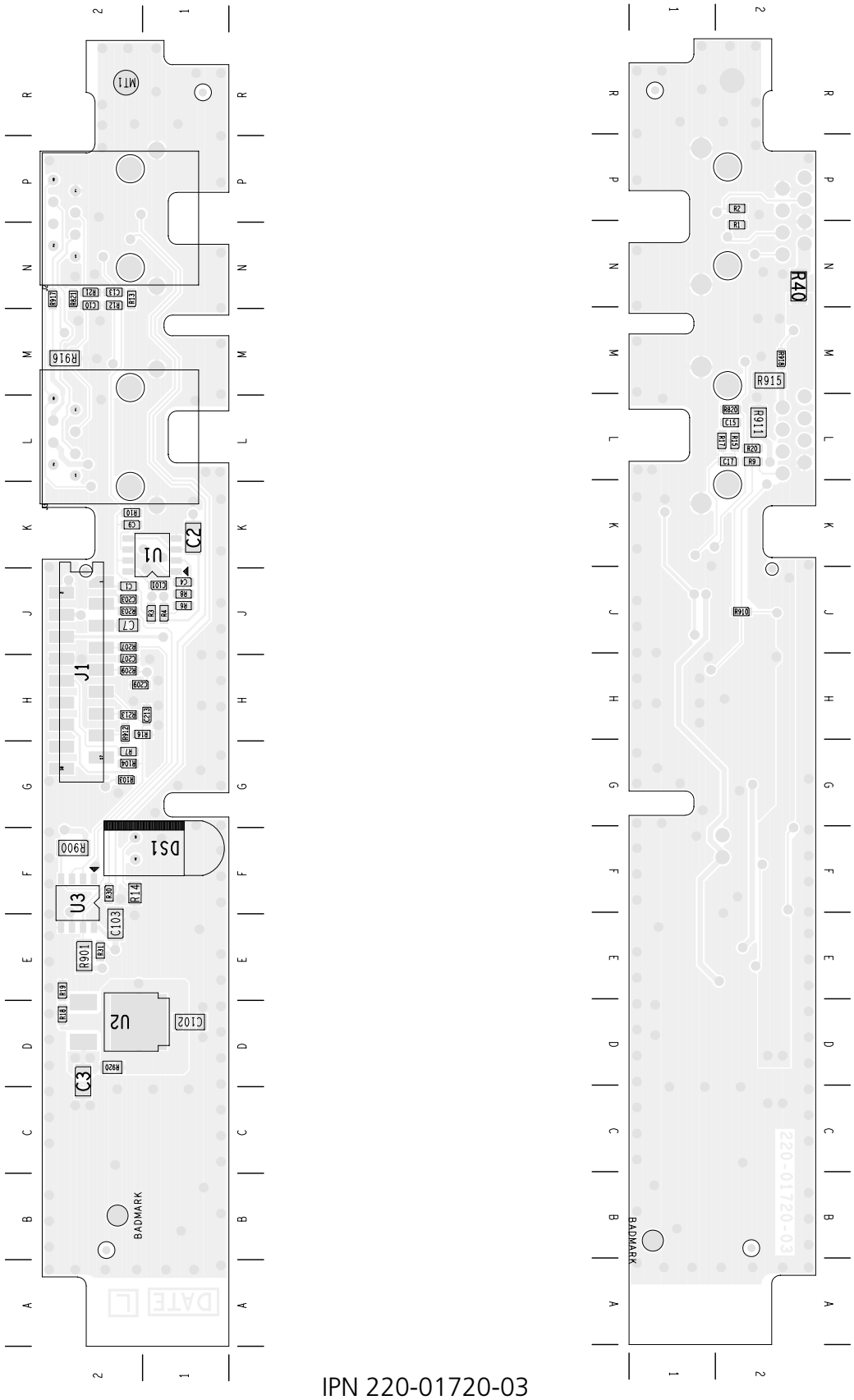
Grid Reference List

Ref.	PCB	Circuit
C1	1:J2	1F5
C2	1:K1	1F4
C3	1:D2	1F1
C4	1:J1	1F6
C7	1:J2	1E5
C9	1:K2	1E6
C10	1:N2	1E7
C13	1:N2	1E7
C15	2:L2	1F8
C17	2:L2	1F6
C101	1:J1	1F3
C102	1:D1	1F2
C103	1:E2	1B5
C203	1:J2	1B4
C207	1:H2	1B3
C209	1:H2	1B4
C213	1:H1	1B4
DS1	1:F2	1F2
J1	1:H2	1C1
J2	1:N2	1C10
J3	1:L2	1E10
MT1	1:R2	1D10
R1	2:N2	1C8
R2	2:P2	1C7

Ref.	PCB	Circuit
R3	1:J1	1G4
R4	1:J1	1F4
R6	1:J1	1F5
R7	1:G2	1C3
R8	1:J1	1F6
R9	2:L2	1G6
R10	1:K2	1E6
R12	1:N2	1E7
R13	1:N2	1E7
R14	1:F2	1F2
R15	2:L2	1F7
R16	1:H2	1B3
R18	1:D2	1F2
R17	2:L2	1F7
R19	1:E2	1F2
R20	2:L2	1F8
R21	1:N2	1E7
R30	1:F2	1B8
R31	1:E2	1C7
R40	2:N2	1D9
R103	1:G2	1B5
R104	1:G2	1C5
R203	1:J2	1C3
R207	1:J2	1C3
R209	1:H2	1C3
R213	1:H2	1B3
R820	2:L2	1F8
R821	1:N2	1E8

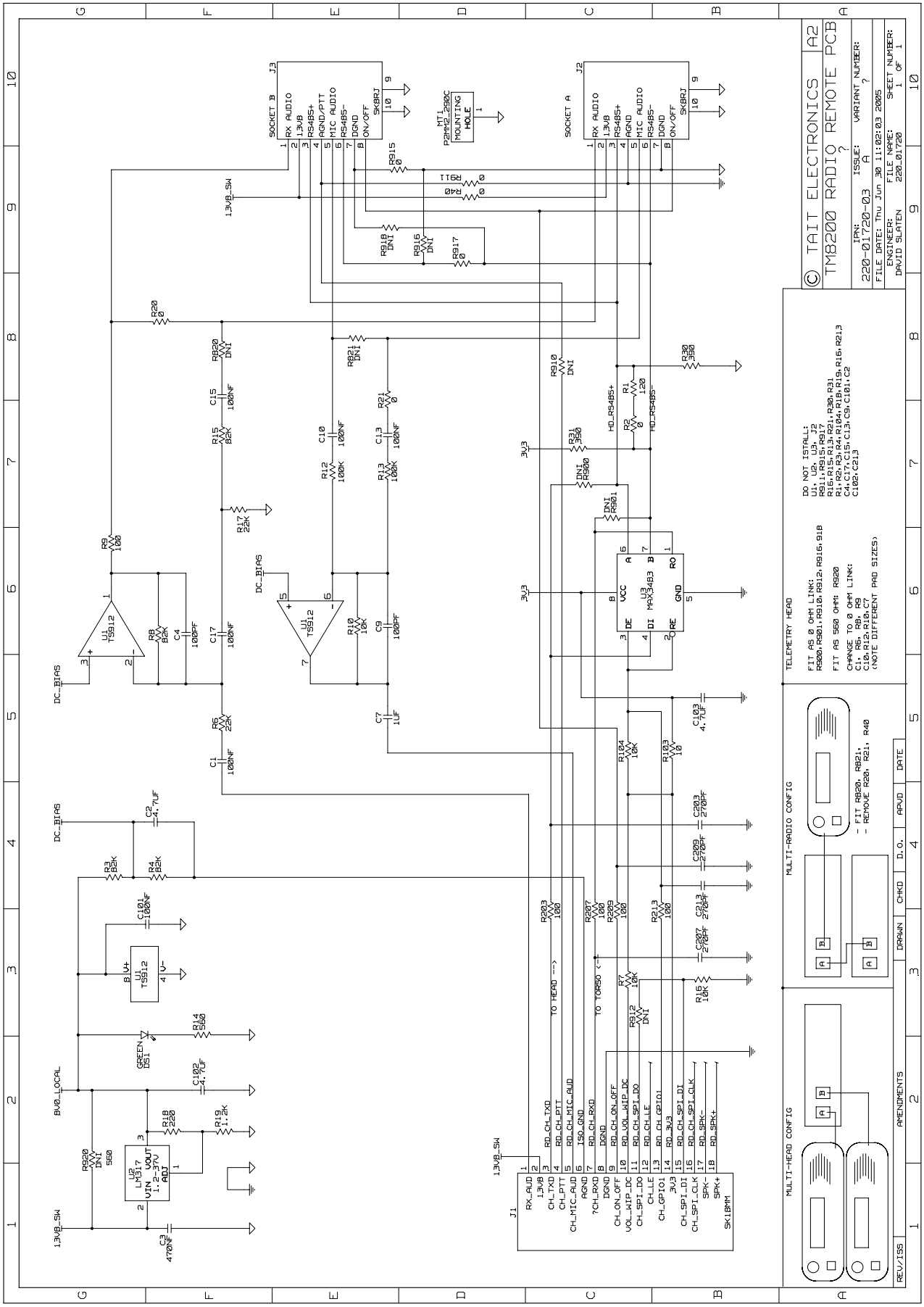
Ref.	PCB	Circuit
R900	1:F2	1C7
R920	1:D2	1G2
R910	2:J2	1C8
R901	1:E2	1C7
R911	2:L2	1D9
R912	1:H2	1C3
R915	2:M2	1D9
R916	1:M2	1D9
R917	1:N2	1D9
R918	2:M2	1E9
U1	1:K1	1G6
		1E6
		1F3
U2	1:D2	1F1
U3	1:F2	1C6

Board Layout



IPN 220-01720-03

Circuit Diagram



12 TMAA04-04 Crossband Linking Cable

The TMAA04-04 crossband linking cable is used to connect the auxiliary connectors of two radios configured as a crossband repeater. Components in the TMAA04-04 are optomized for voice applications.

Important The radio does not meet the IP54 protection standard once the auxiliary connector rubber bung has been removed and a crossband linking cable has been installed. Care must be taken when the radio is being operated in an environment where there is water, dust or other environmental hazards.

12.1 Installation

1. Remove the rubber bung that covers the auxiliary connector on each of the radios.
2. Plug each end of the crossband linking cable into the auxiliary connector on each radio.

12.2 Radio Programming

After the transmit and receive channels have been programmed for both radios, settings in the following forms must also be configured:

- PTT form (refer to Table 12.1)
- Programmable I/O form — Digital tab (refer to Table 12.2)
- Programmable I/O form — Audio tab (refer to Table 12.3).

If a repeater transmit tail is required, settings in the following forms must be configured in both radios:

- PTT form (TM8100 radios only) (refer to Table 12.4)
- Basic Settings form—Subaudible Signalling tab (TM8200 radios and optional for TM8100 radios) (refer to Table 12.5 and Table 12.6).

Some of the settings shown in the tables are default settings and may not need to be changed. In all cases, refer to the online help of the programming application for more information.

Crossband Settings in the PTT Form

The following table shows the crossband linking settings required in the External PTT (1) tab of the PTT form.

Table 12.1 Crossband settings in the PTT form, External PTT (1) tab

Field		Setting
Advanced EPTT1	PTT Transmission Type	Voice
	Audio Source	Audio Tap In

Programmable I/O Form—Digital Tab

The following table shows the crossband linking settings required in the Digital tab of the Programmable I/O form.

Table 12.2 Crossband settings in the Programmable I/O form, Digital tab

Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored To
AUX_GPI1	Input	PTT_INS	External PTT 1	Low	10	None	None
AUX_GPIO5	Output	BUSY	Busy Status[a]	Low	None	None	None

a. To transmit only when the signalling is valid, set this field to **Signalling Audio Mute Status**.

Programmable I/O Form—Audio Tab

The following table shows the crossband linking settings required in the Audio tab of the Programmable I/O form.

Table 12.3 Crossband settings in the Programmable I/O form, Audio tab

Pin	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[a]
EPTT1	T5	A-Bypass In	On PTT	None	C-Bypass 0	On PTT

a. This can be set to **Busy Detect + Sub** if the mute is to open only when valid subaudible signalling is present with the transmission.

12.2.1 Repeater Transmit Tail Settings

TM8100 Radios

If the transmitter requires a "tail", then this can be set in the External PTT (1) tab of the PTT form. During the PTT deactivation delay period, any signalling, such as CTCSS or DCS, is still present.

Table 12.4 Transmit tail settings in the PTT form, External PTT (1) tab

Field		Setting
Advanced EPTT1	PTT Deactivation Delay	up to 1000ms

If a **further** transmitter tail is required, then this can be configured in the Subaudible Signalling tab of the Basic Settings form. During the lead-out delay period, no signalling, such as CTCSS or DCS, is present.

Table 12.5 Additional Transmit tail in the Basic Settings form, Subaudible Signalling tab

Field		Setting
CTCSS Settings	Lead-Out Delay	any duration, up to 1000ms
DCS Settings	Lead-Out Delay	any duration, up to 1000ms

TM8200 Radios

If the transmitter requires a "tail", then this can be configured in the Subaudible Signalling tab of the Basic Settings form. During the lead-out delay period, no signalling, such as CTCSS or DCS, is present.

Table 12.6 Transmit tail in the Basic Settings form, Subaudible Signalling tab

Field		Setting
CTCSS Settings	Lead-Out Delay	any duration, up to 1000ms
DCS Settings	Lead-Out Delay	any duration, up to 1000ms

12.3 Operational Testing

1. On the receiving radio, inject an on-channel RF signal at a level of -70 dBm, modulated to ±3 kHz deviation (wide bandwidth channel) or ±1.5 kHz (narrow bandwidth channel), at 1 kHz AF.

2. On the transmitting radio, the resulting deviation should be:
   - ±3 kHz (with a tolerance of ±200 Hz) on a 25 kHz wide bandwidth channel.
   - ±1.5 kHz (with a tolerance of ±200 Hz) on a 12.5 kHz narrow bandwidth channel.

12.4 Interface Specification

The following table and diagram summarizes the signals used for the crossband linking cable on the radios' auxiliary connectors and shows the interface between the cable and the radios.

Figure 12.1 TMAA04-04 crossband linking cable

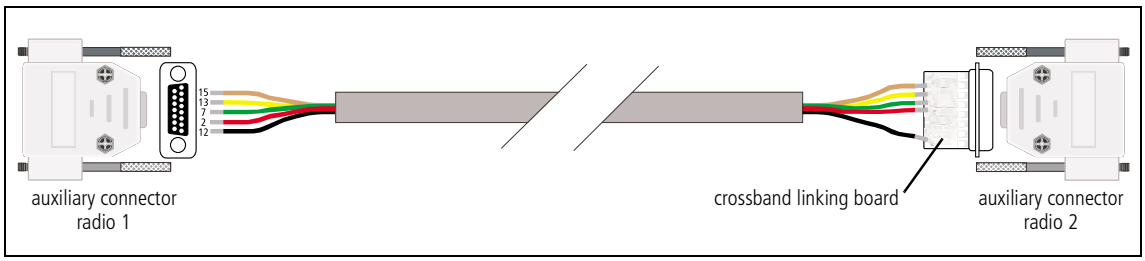
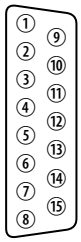


Table 12.7 Auxiliary connectors—pins and signals

	Pin	Signal name	Description
 rear view	2	AUX_GPIO5	busy (output)
	7	AUD_TAP_IN	audio tap input
	12	AUX_GPI1	PTT (input)
	13	AUD_TAP_OUT	audio tap output
	15	AGND	analogue ground

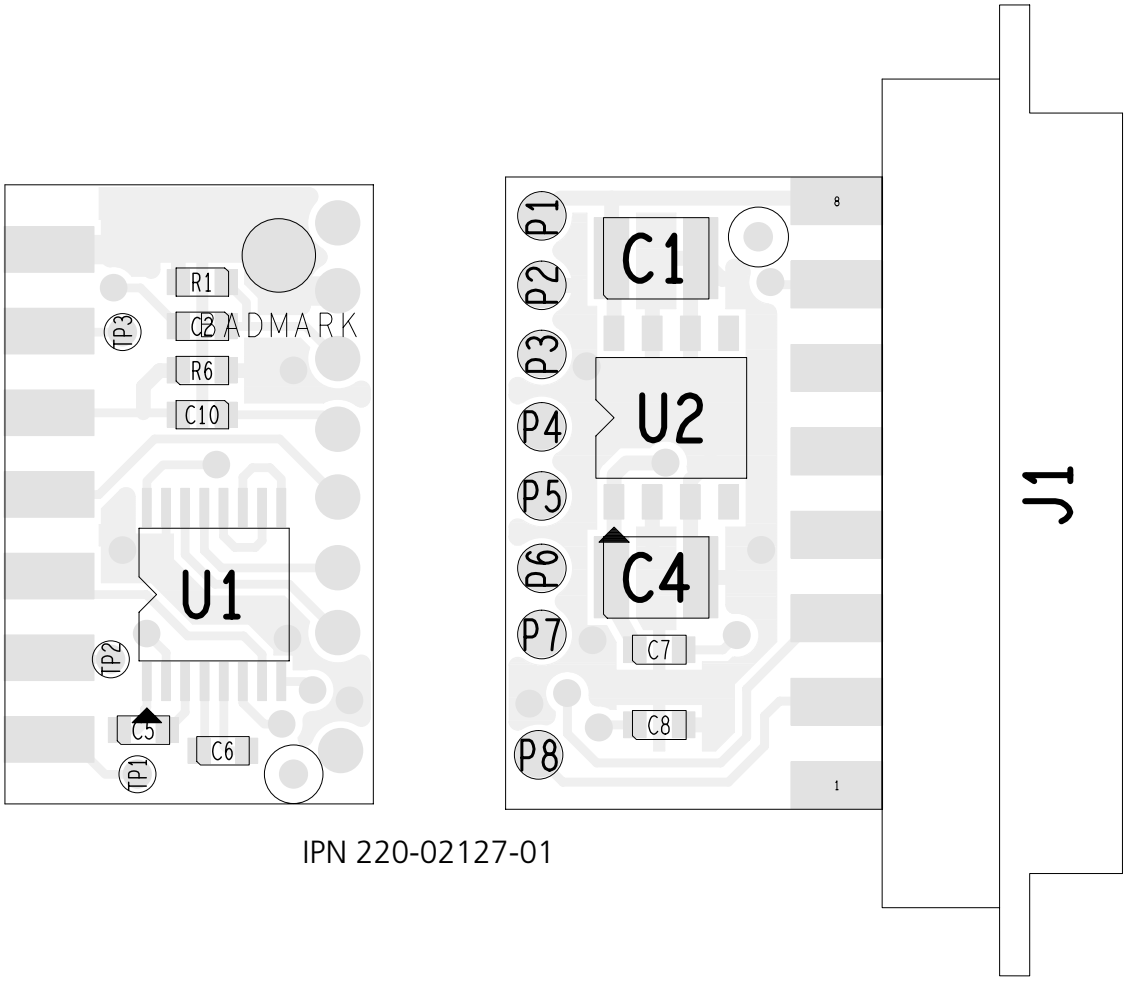
12.5 PCB Information

12.5.1 TMAA04-04 Parts List (PCB IPN 220-02127-01)

Ref.	IPN	Description
C2	018-16100-00	Cap 0603 100n 16v x7r + - 10%
C10	018-16100-00	Cap 0603 100n 16v x7r + - 10%
J1	240-00031-00	Plg 15w Drng UL-CSA Pnl Mtg
R1	038-13560-10	RES 0603 560R 1% 1/10W
R6	038-13560-10	RES 0603 560R 1% 1/10W
	205-00110-50	CBL 8wy Oval Std Telecom
	219-03005-00	CBL TMA X-Band
	220-02127-01	PCB MFX Programming cable
	240-00031-00	Plg 15w Drng UL-CSA Pnl Mtg
	240-06010-18	Conn 15w Hood/Cvr Drng MDJ15
	402-00030-0X	MANL f/instr TMAA04-04 XB

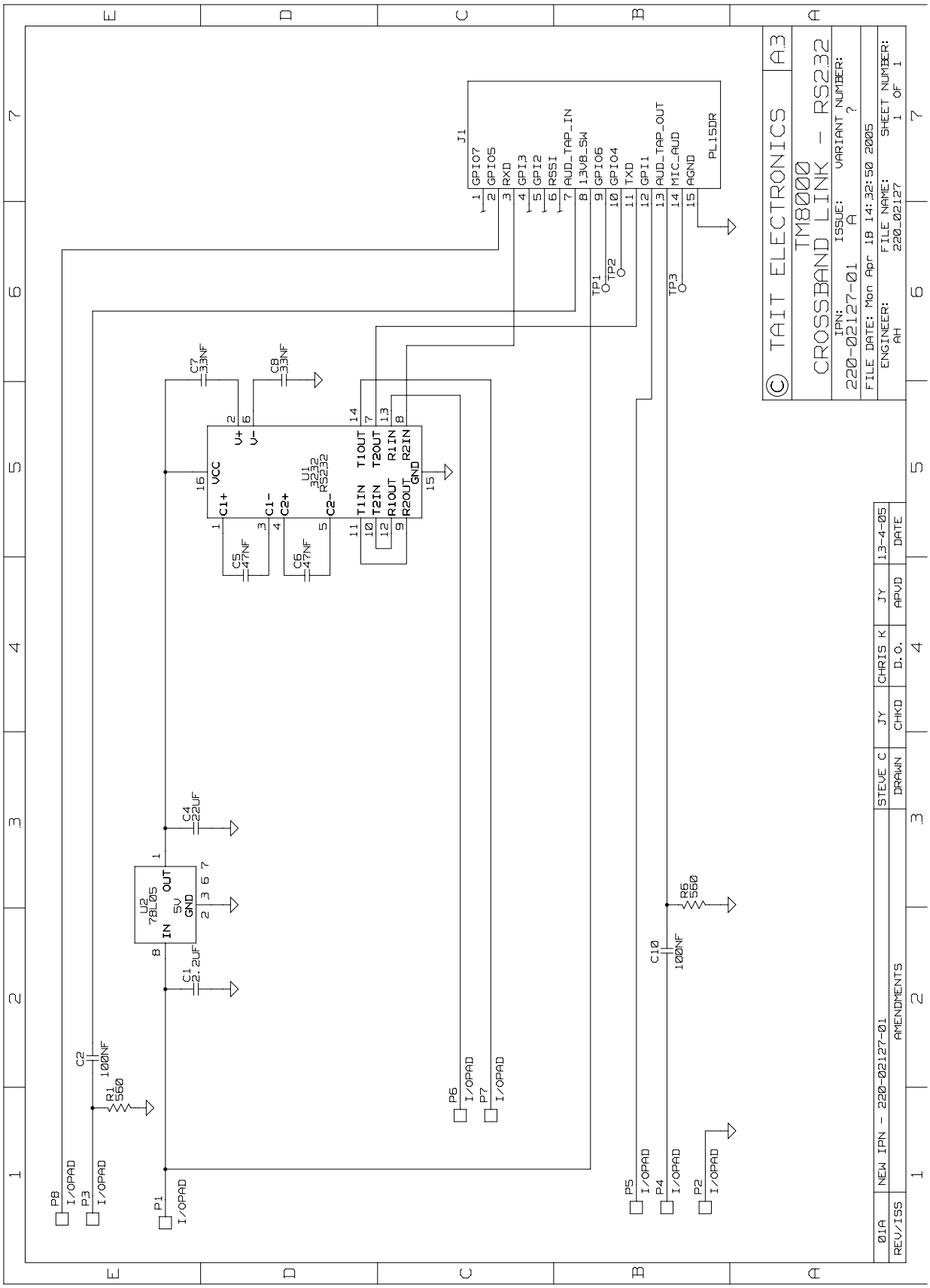
Ref.	IPN	Description

12.5.2 Crossband Linking Board Layouts

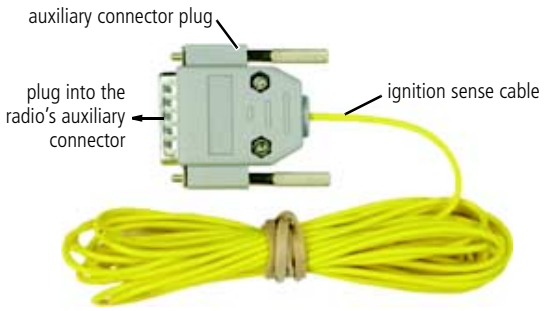


IPN 220-02127-01

12.5.3 Crossband Linking Board Circuit Diagram



13 TMAA04-05 Ignition Sense Kit



The TMAA04-05 ignition sense kit provides a mating plug for the radio's auxiliary connector. The four metre length of cable from pin 4 of the plug connects to the vehicle's ignition signal.

Once the kit is installed, the ignition signal is used to power up and power down the radio, so that the radio turns off when the vehicle ignition is off. This avoids any possibility that the radio may flatten the vehicle's battery. When the vehicle ignition is turned on, the radio either turns on, or returns to the state that it was in when the vehicle ignition was turned off.

Important The radio does not meet the IP54 protection standard once the bung for the auxiliary connector is removed. Therefore, once the TMAA04-05 ignition sense kit is installed, mount the radio in areas where it is not exposed to water, dust or other environmental hazards.

13.1 Installation

1. Connect the auxiliary connector plug to the radio's auxiliary connector
2. Connect the ignition sense cable to the 13.8 V signal controlled by the vehicle's ignition key.

13.2 Radio Programming

Program the AUX GPI3 line to 'Power Sense (Ignition)' and active to 'High'.

Refer to the online help of the programming application for more information.

14 TMAA10-01 Desktop Microphone

The TMAA10-01 desktop microphone is an omnidirectional dynamic microphone which can be used in dispatch situations, where the microphone is positioned on a flat surface. The desktop microphone plugs into the microphone socket on the radio control head.

The desktop microphone has an internal pre-amplifier and an adjustable sensitivity control on the underside of the desktop microphone base.

14.1 Operation

Hold down the monitor key and check whether the channel is clear.

If the channel is clear, press the PTT key to transmit. Speak clearly into the microphone and release the PTT key when you have finished talking.

Note The monitor key can be locked in the 'on' position. To do this, hold the monitor key down and slide the monitor key towards you. The monitor key should now be locked on.

14.2 Installation

Important The desktop microphone grommet must be installed whenever the desktop microphone is plugged into the microphone socket. When installed, the grommet has two functions:

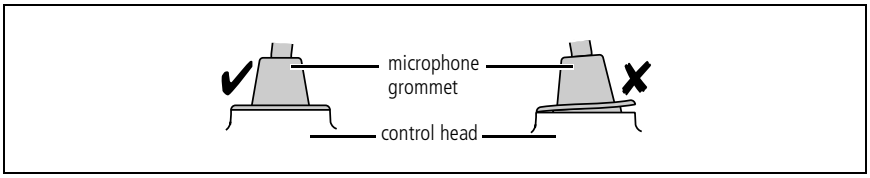
- to prevent damage to the microphone socket when there is movement of the microphone cord, and
- to ensure that the control head is sealed against water, dust and other environmental hazards.

1. Plug the microphone cord into the microphone socket on the radio control head.
2. Slide the grommet along the cord and push two adjacent corners of the grommet into the microphone socket cavity.

3. Squeeze the grommet and push the remaining corners into position.

4. Check that the grommet is seated correctly in the cavity.

Figure 14.1 Correct desktop microphone grommet seating



14.3 Adjustment

Adjust the output sensitivity of the desktop microphone using R5. R5 is accessible from the underside of the desktop microphone, as shown.

The microphone sensitivity is set to maximum by rotating R5 counterclockwise.

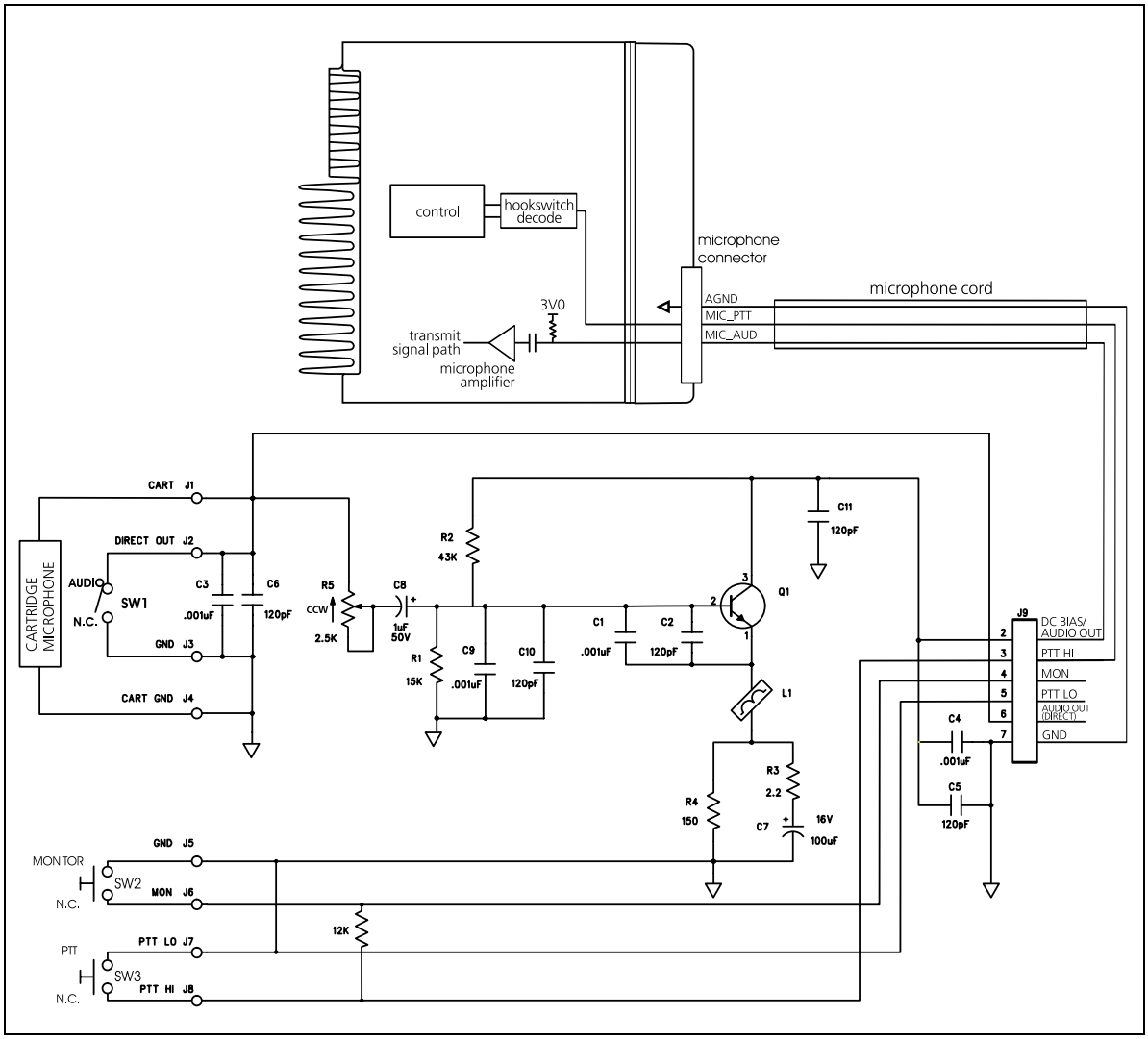
14.4 Interface Specification

The following table and diagram summarizes the signals used for the desktop microphone on the radio's microphone connector and shows the interface between the desktop microphone and the radio.

Table 14.1 Desktop microphone connector—pins and signals

Pin	Signal	Colour	Description
1	—	—	not connected
2	—	—	not connected
3	—	—	not connected
4	MIC_PTT	yellow	PTT
5	MIC_AUD	red	audio from the microphone
6	AGND	bare	analogue ground
7	—	—	not connected
8	—	—	not connected

Figure 14.2 Desktop microphone to radio interface



14.5 Circuit Description

The desktop microphone uses a dynamic microphone capsule and contains a pre-amplifier (Q1) to boost the microphone level to that required by the radio. Power for the pre-amplifier is provided by the electret microphone bias circuit within the radio. R5 is used to adjust the gain.

PTT and hookswitch signals are combined onto one line and fed to the control head PTT input of the radio.

15 TMAA10-02 Handset

The TMAA10-02 handset provides the user with privacy and also improves the audio quality in noisy environments. The handset uses a dynamic microphone capsule, so for TM8100 radios, the TMAA02-06 support kit for concealed and dynamic microphones needs to be installed.

When your radio receives a call and the handset is mounted in its locking cradle, the radio unmutes and you can hear the call from your radio's internal speaker and from any connected remote speaker.

If you remove the handset from its cradle when you receive a call, the radio unmutes and you can hear the call from your radio's internal speaker, from any connected remote speaker and from the handset earpiece.

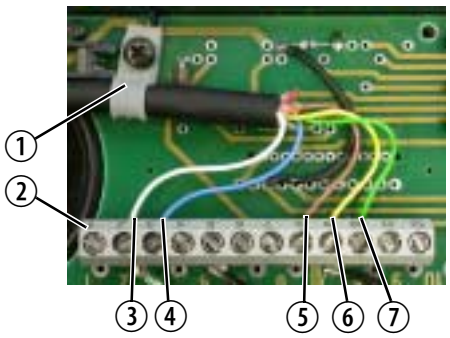
Using private handset mode, the radios internal and external speakers are muted and the call can only be heard from the handset earpiece.

15.1 Installation

15.1.1 Handset Wiring

1. Drill a hole in the chosen mounting surface for the radio to handset cord and pass the cord through the hole.
2. Prepare the radio to handset cord, as follows.
   - Cut the radio to handset cord to the required length.
   - Strip away about 60 mm (2 inches) of the cable outer sheath on the end without a connector.
   - Cut off the exposed orange, red, black and bare wires.
   - Strip about 6 mm (0.2 inches) of the coating off each of the five remaining wires.
3. Secure the radio to handset cord in the handset PCB P-clip ①, as shown in the diagram.
4. Connect the five wires to the handset PCB connector ②.

Table 15.1 Handset PCB connector wiring

	Handset PCB Connector	Colour	Reference
	2	white or violet	③
	3	blue	④
	8	brown	⑤
	9	yellow	⑥
	10	green	⑦

15.1.2 Handset Installation

1. Press the pushbutton and remove the handset from the locking cradle.
2. Disassemble the locking cradle by removing the four locking cradle screws.
3. Screw the handset mounting plate to the required mounting surface. Note that mounting screws are not provided in this kit.
4. Clamp the top part of the locking cradle onto the mounting plate, and secure it with the four locking cradle screws.

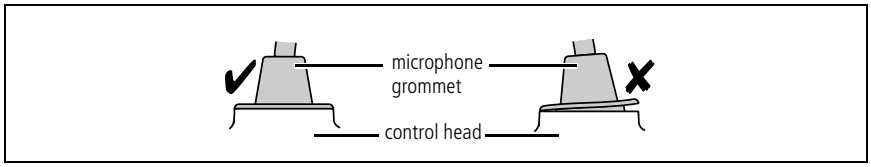
15.1.3 Connecting the Handset to the Radio

Important The handset microphone grommet must be installed whenever the handset to radio cord is plugged into the microphone socket. When installed, the grommet has two functions:

- to prevent damage to the microphone socket when there is movement of the microphone cord, and
- to ensure that the control head is sealed against water, dust and other environmental hazards.

1. Plug the radio to microphone cord into the microphone socket on the radio control head.
2. Slide the grommet along the cord and push two adjacent corners of the grommet into the microphone socket cavity.
3. Squeeze the grommet and push the remaining corners into position.
4. Check that the grommet is seated correctly in the cavity.

Figure 15.1 Correct handset microphone grommet seating



15.2 Radio Programming

Dynamic Microphone Support

Dynamic microphone support must be enabled in the UI Preferences form of the radio's programming application, so that audio is optomized for dynamic microphones. Refer to the online help of the programming application for more information.

Table 15.2 Handset settings in the UI Preferences form (TM8100 Programming Application)

Field	Setting	Selected/Cleared
Audio Setup	Enable Options Board Preamp	selected

Table 15.3 Handset settings in the UI Preferences form (TM8200, TM9000/TP9000 Programming Application)

Field	Setting	Selected/Cleared
Audio>Audio Setup	Dynamic Mic Support	selected

Private Handset Mode

If private handset mode is required, the radio needs to be programmed to mute the audio power amplifier when the handset is out of the cradle. The audio path is then only through the RX AUDIO line to the handset earpiece.

The following table shows the settings required in the Programmable I/O form of the radio's programming application. Refer to the online help of the programming application for more information.

Note If private handset mode is programmed, then no audio will be heard from the speakers if the handset is unplugged.

Table 15.4 Handset settings in the Programmable I/O form, Digital tab

Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored To
CH_GPIO1	Input	None	Force Audio PA Off	High	25	None	None

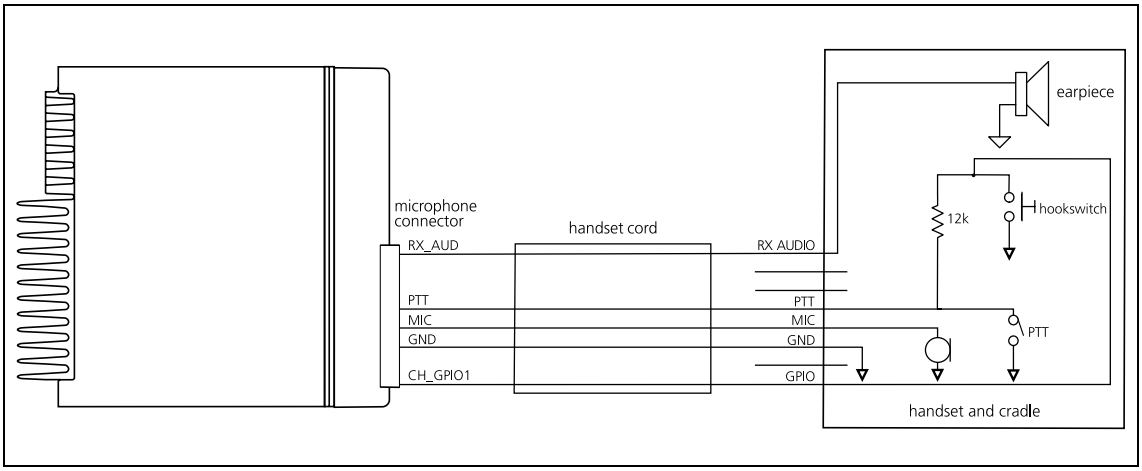
15.3 Interface Specification

The following table and diagram summarizes the signals used for the handset on the radio's microphone connector and shows the interface between the handset and the radio.

Table 15.5 Handset microphone connector—pins and signals

	Pin	Signal	Handset PCB Connector	Colour	Description
	1	RX_AUD	8	brown	receive audio to handset
	2	—	—	—	not connected
	3	—	—	—	not connected
	4	PTT	2	white	PTT and hookswitch
	5	MIC	9	yellow	audio from the handset to dynamic-mic support board
	6	GND	10	green	analogue ground
	7	—	—	—	not connected
	8	CH_GPIO1	3	blue	programmable line controlling private mode

Figure 15.2 Handset to radio interface



16 TMAA10-03 and TMAA10-06 High-Power Remote Speakers

The TMAA10-03 remote speaker (for the 25 W radio) and the TMAA10-06 remote speaker (for the 40 W/50 W radio) are installed in parallel with the radio's existing internal speaker. The remote speaker can then be installed at some distance from the radio, or it can be used to increase the volume of the audio from the radio's existing internal speaker.

The remote speaker cable is terminated with two receptacles. These receptacles are different between the TMAA10-03 and the TMAA10-06 remote speakers.

Two spare receptacles are included with the remote speaker, along with four mounting screws and washers.

16.1 Installation

Remote Speaker Mounting

1. Choose a mounting position for the remote speaker where it will not interfere with the operation of any of the vehicle controls.
2. Remove the remote speaker from the mounting bracket and use the screws and washers provided to fix the mounting bracket securely in the chosen location.

Important Check before drilling that the drill will not damage any components or wiring behind the mounting location.

- If mounting the bracket onto a metal surface, drill two 3.5 mm (0.14 inch) holes in the appropriate locations and secure the bracket with the supplied self tapping screws.
- If mounting the bracket to any other material, such as plastic, drill two 4.5 mm (0.18 inch) holes and attach the bracket with screws and captive nuts, or similar.

3. Attach the speaker to the mounting bracket using the thumbscrews.
4. Run the free end of the speaker cable to the radio power cable and install the two receptacles in the power connector, as described in the "Power Connector Wiring" procedure.

Important Check that the speaker cable is protected from engine heat, sharp edges and from being pinched or crushed.

Power Connector Wiring

Insert the remote speaker receptacles into the power connector socket, as shown in the diagrams below.

Note The positive remote speaker wire has a white stripe.
With the TMAA10-03 remote speaker (25 W radio), insert the positive remote speaker wire into the position nearest to the red wire.
With the TMAA10-06 remote speaker (40 W/50 W radio), insert the positive remote speaker wire into the upper position (marked "3").

Figure 16.1 Power connector wiring of the TMAA10-03 remote speaker

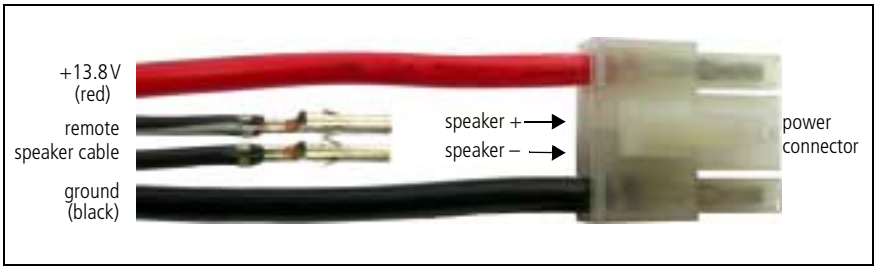
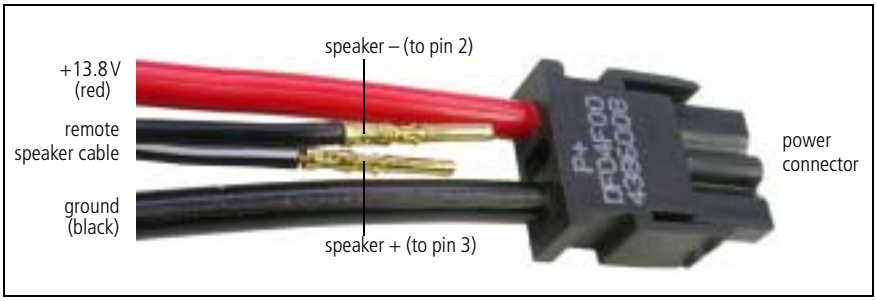


Figure 16.2 Power connector wiring of the TMAA10-06 remote speaker



17 TMAA10-04 Remote PTT Kit and TMAA10-05 Hands-Free Kit

The TMAA10-04 remote PTT kit and the TMAA10-05 hands-free kit plug into the radio's auxiliary connector. Both kits use the remote electret microphone to replace communication through the usual rugged microphone. The rugged microphone can still provide hookswitch operation, if this is required.

The TMAA10-04 kit uses a conveniently mounted remote PTT key for PTT operation. When the remote PTT is activated, the remote microphone is used for communication.

There are three mounting options for the remote microphone and an extension lead is provided for the remote PTT in the TMAA10-04 kit.

Important These kits do not meet the IP54 protection standard. Care must be taken when a radio with a TMAA10-04 or TMAA10-05 kit installed is being operated in an environment where there is water, dust or other environmental hazards.

17.1 VOX Operation (TMAA10-05 Hands-Free Kit)

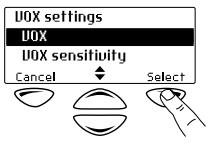
Your radio may able to detect the sound of your voice, so that you can make calls without using the PTT key. Voice-operated transmit (VOX) is turned on and off either by using a function key programmed for VOX or by using the radio's Main menu.

Changing to VOX Using a Function Key

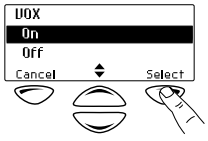
The function key programmed for VOX toggles VOX between on and off. When VOX is turned on, it remains on until the function key is pressed again.

Changing to VOX by using the Main Menu

1. Select Menu>Radio Settings>Function Settings>VOX.



2. In the VOX menu, choose **On**.



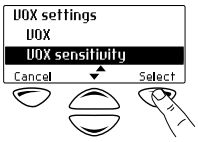
3. Press **Select**.

While VOX is on, the VOX indication may be programmed to appear below the channel information on your display.

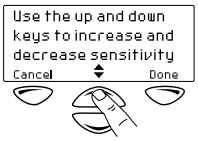
Changing the Sensitivity of VOX

You may need to change the threshold at which the radio detects your voice and makes a call. To do this, you use the VOX Sensitivity menu.

1. Select Menu>Radio Settings> Function Settings>VOX Sensitivity.



2. In the VOX Sensitivity menu, use the scroll keys or to adjust the VOX sensitivity to the desired level.



3. Press **Done** to save this setting.

17.2 Installation

Important Care should be taken to avoid routing any cables near vehicle pedal controls, steering column and other moving parts.

Installing the Remote Microphone

1. Choose one of the three mounting options provided for the remote microphone and determine its most appropriate location.

   The mounting position of the microphone should be no more than 50 cm (20 inches) from the user's mouth.

2. Route the remote microphone cable so as not to distract the driver.

3. Mount the remote microphone in the chosen location and check that the microphone and cable are clear of all the usual movements performed by the user.

Installing the Remote PTT (TMAA10-04)

Important The remote PTT must be operable from a normal driving position.

1. Secure the remote PTT in position using the velcro strap and plug the remote PTT cord into the remote PTT extension lead.

   A common position for the remote PTT is on the gear lever of the vehicle.

2. Check that the cord and lead do not interfere with the safe operation of the vehicle.

17.3 Radio Programming for the TMAA10-04 Remote PTT Kit

Remote PTT Settings in the PTT Form

The following table shows the settings required in the PTT form of the programming application. Some of these settings are default settings and may not need to be changed. Refer to the online help of the programming application for more information.

Note If hookswitch operation is programmed for the rugged microphone and the Inhibit PTT Transmission When Mic On Hook field is selected in the PTT tab of the PTT form, then the hands-free remote PTT cannot transmit when the rugged microphone hookswitch is closed (the microphone is on the microphone clip).

Table 17.1 Remote PTT settings in the PTT form, External PTT (1) tab

Field		Setting
Advanced EPTT1	PTT Transmission Type	Voice
	Audio Source	AUX MIC

Remote PTT Settings in the Programmable I/O Form

The following table shows the settings required in the Programmable I/O form of the programming application. Some of these settings are default settings and may not need to be changed. Refer to the online help of the programming application for more information.

Note The Programmable I/O form setting for AUX_GPIO4 must have the default programming settings and the AUX_GPIO4 pullup resistor on the radio main PCB must be set for the factory default of 3.3V (R769 fitted).

Table 17.2 Remote PTT settings in the Programmable I/O form, Digital tab

Pin	Direction	Label	Action	Active	Debounce	Signal State	Mirrored To
AUX_GPI1	Input	None	External PTT 1	Low	25	None	None
AUX_GPIO4	None	None	No Action	None	None	None	None

17.4 Radio Programming for the TMAA10-05 Hands-Free Kit

VOX Settings in the PTT Form

The following table shows the settings required in the PTT form of the programming application. For detailed instructions on how to configure a radio for VOX operation, refer to the section "Configuring VOX" in the online help of the programming application.

Table 17.3 VOX settings in the PTT form, External PTT (2) or VOX tab

Field		Setting
EPTT2 or VOX Inhibit	Inhibit PTT When Emergency Active	select[a]
	Inhibit PTT Transmission When Mic on Hook	clear[a]
	Indicate PTT Inhibit to User	clear[a]
Advanced EPTT2 or VOX	PTT Transmission Type	Voice
	Audio Source	AUX MIC
	PTT Priority	Highest[a]

a. These are recommended settings only.

VOX Settings in the Key Settings Form

In the Key Settings form of the programming application, one of the function keys on the control head can be programmed to activate VOX.

Table 17.4 VOX settings in the Key Settings form

Field		Setting
Function Key Actions	Key 1[a]	VOX Activation

a. Select the required function key.

17.5 Interface Specification

The following table and diagram summarizes the signals used for the remote PTT and hands-free kits on the radio's auxiliary connector and shows the interface between the kits and the radio.

Table 17.5 Auxiliary connector—pins and signals

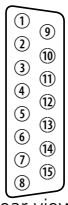
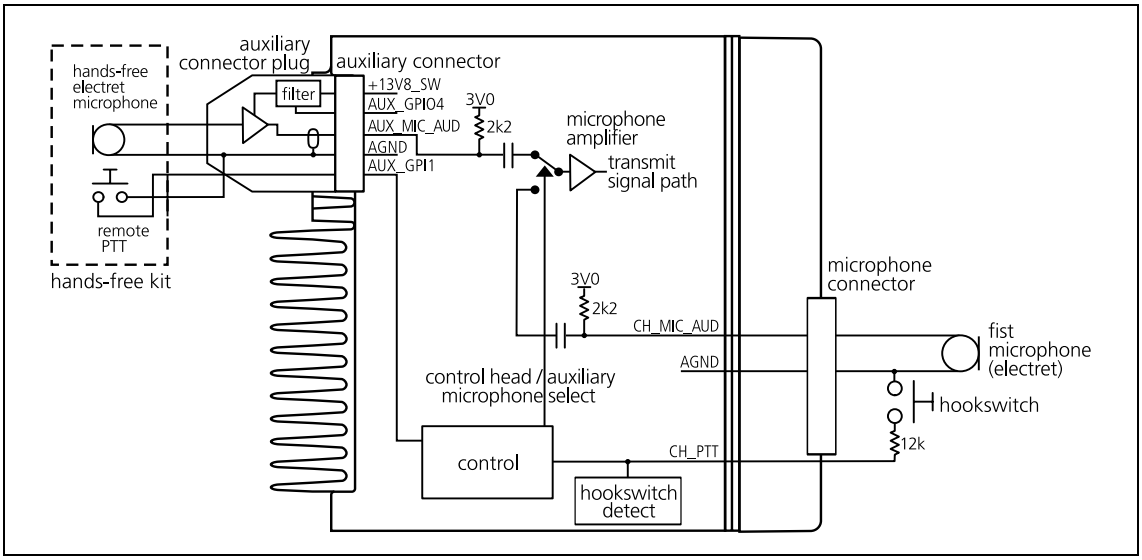
	Pin	Signal name	Description
 rear view	8	+13V8_SW	power to hands-free microphone pre-amplifier
	10	AUX_GPIO4	reference voltage to pre-amplifier regulator
	12	AUX_GPI1	PTT signal from hands-free kit
	14	AUX_MIC_AUD	microphone audio to the radio
	15	AGND	analogue ground

Figure 17.1 TMAA10-04/TMAA10-05 to radio interface



17.6 Circuit Description

The remote microphone signal is amplified by a pre-amplifier in the auxiliary connector plug. The power supply to this amplifier is provided by the +13.8V supply on the auxiliary connector. This supply is filtered and regulated down to approximately 3.3V. The reference voltage for the regulator is provided by AUX_GPIO4 line.

The remote microphone signal is fed via AUX_MIC_AUD and an input selector to the radio's internal microphone amplifier. The microphone input selected depends on the PTT source used to make the call. If the remote PTT is used, then AUX_MIC_AUD is selected. If the control head microphone PTT is used, then CH_MIC_AUD is selected. Test points for all other auxiliary connections are provided on the auxiliary connector plug PCB to facilitate the connection of other devices or signals e.g ignition switch signal.

17.7 PCB Information

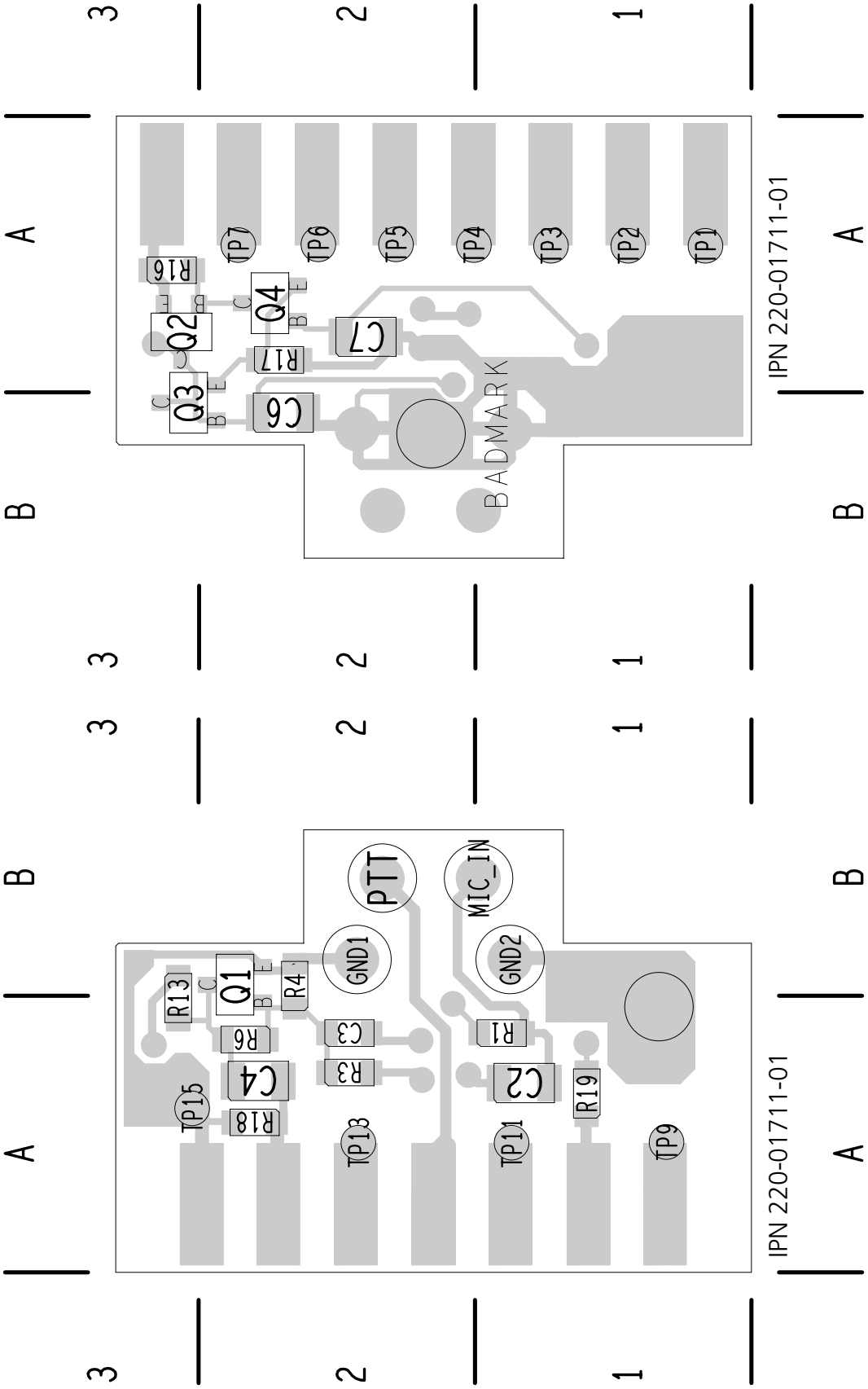
17.7.1 TMAA10-04/TMAA10-05 Parts List (PCB IPN 220-01711-01)

Ref.	IPN	Description
C2	015-26330-08	Cap Cer 0805 330n 5% 10v X7r
C3	018-15100-00	Cap 0603 10n 50v X7r +-10%
C4	015-26330-08	Cap Cer 0805 330n 5% 10v X7r
C6	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
C7	015-26100-08	Cap Cer 0805 100n 10% X7r 50v
Q1	000-10084-71	Xstr BC847BW NPN SOT323
Q2	000-10085-71	Xstr SMD BC857BW PNP SOT323
Q3	000-10084-71	Xstr BC847BW NPN SOT323
Q4	000-10084-71	Xstr BC847BW NPN SOT323
R1	038-14220-00	Res 0603 2k2 1/16w +-5%
R3	038-14390-10	Res 0603 3k9 1%
R4	038-15470-10	Res 0603 47k 1/16w+-1%
R6	038-15330-10	Res 0603 33k 1%
R13	038-15100-10	Res 0603 10k 1/16w +-1%
R16	038-15470-10	Res 0603 47k 1/16w+-1%
R17	038-15150-00	Res 0603 15k 1/16w +-5%
R18	038-15100-10	Res 0603 10k 1/16w +-1%
R19	038-15100-10	Res 0603 10k 1/16w +-1%
	219-00305-00	cable
	220-01711-01	Pcb HFree
	240-06010-18	Conn 15w Hood/Cvr Drng MDJ15
	252-00010-72	Mic Electret Unidir 2.5mm Plg
	402-00006-01	F/Inst TMAA10-04/TMAA10-05 Eng

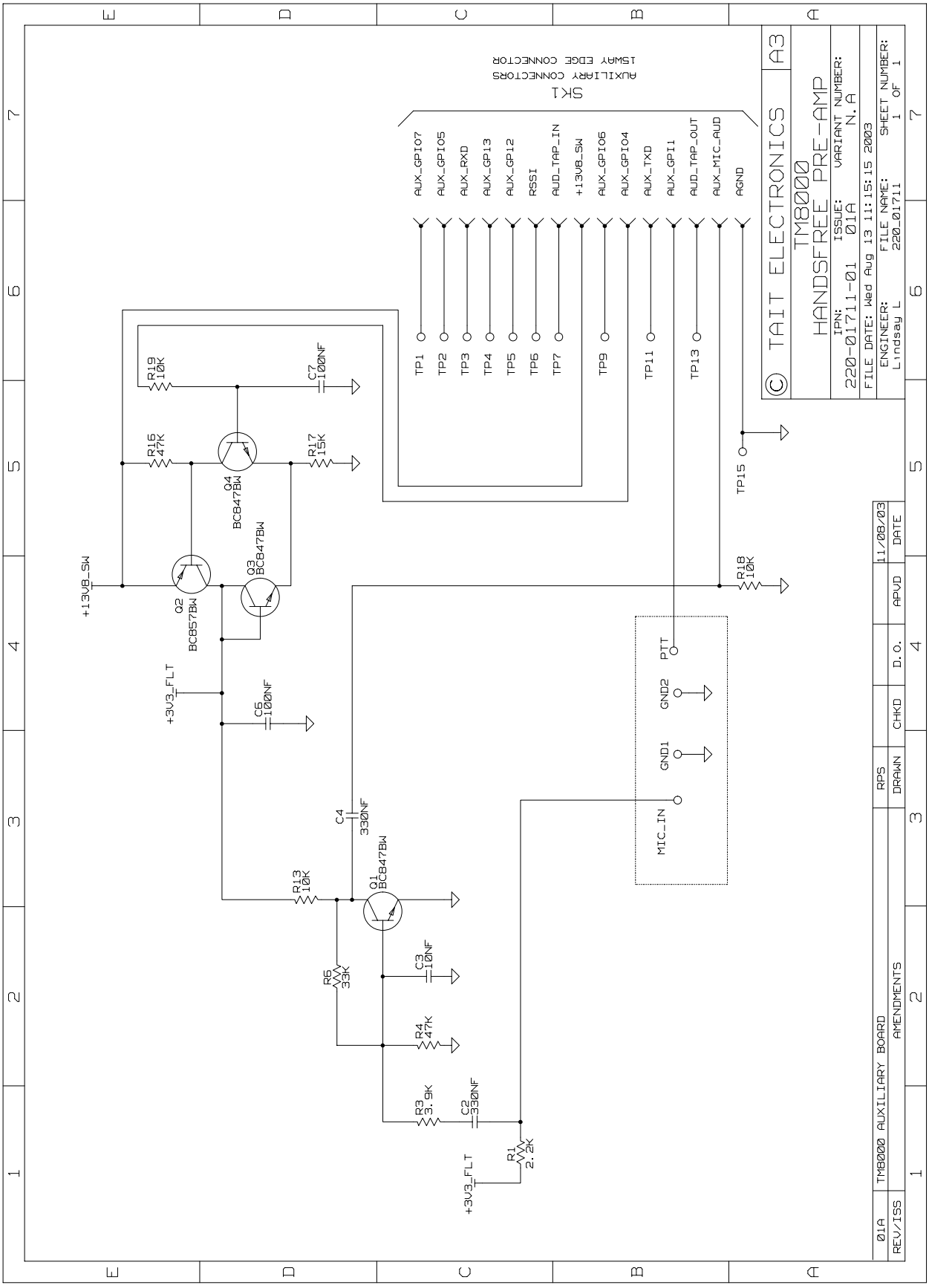
TMAA10-04 Remote PTT only

	236-00001-00	Sw Ptt W/Cbl & Strap

17.7.2 Pre-Amplifier Board Layout



17.7.3 Pre-Amplifier Board Circuit Diagram

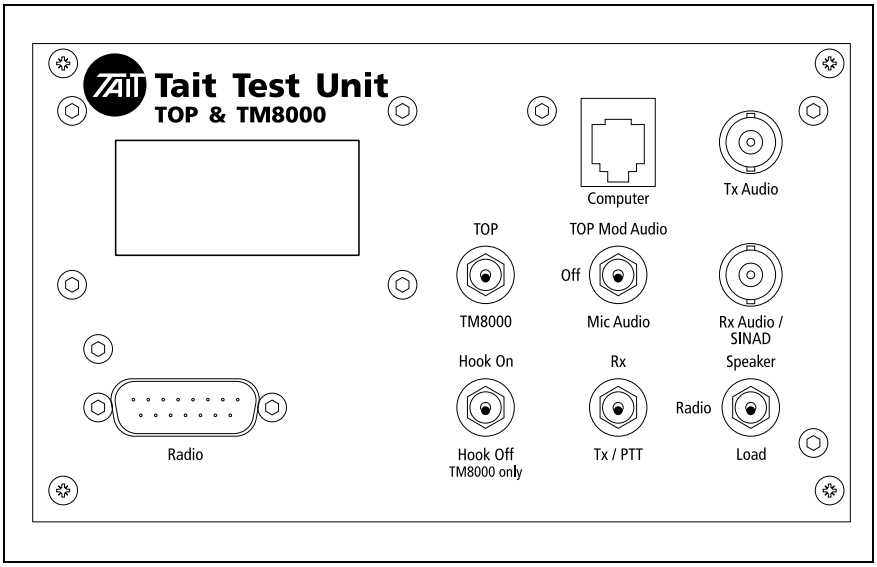


18 TOPA-SV-024 Test Unit

The TOPA-SV-024 test unit is used to test and maintain Tait Orca portables (TOP) and TM8000 radios by providing an interface between the radio, a test PC, and an RF communications test set.

The diagram below shows the front panel of the test unit.

Figure 18.1 TOPA-SV-024 test unit

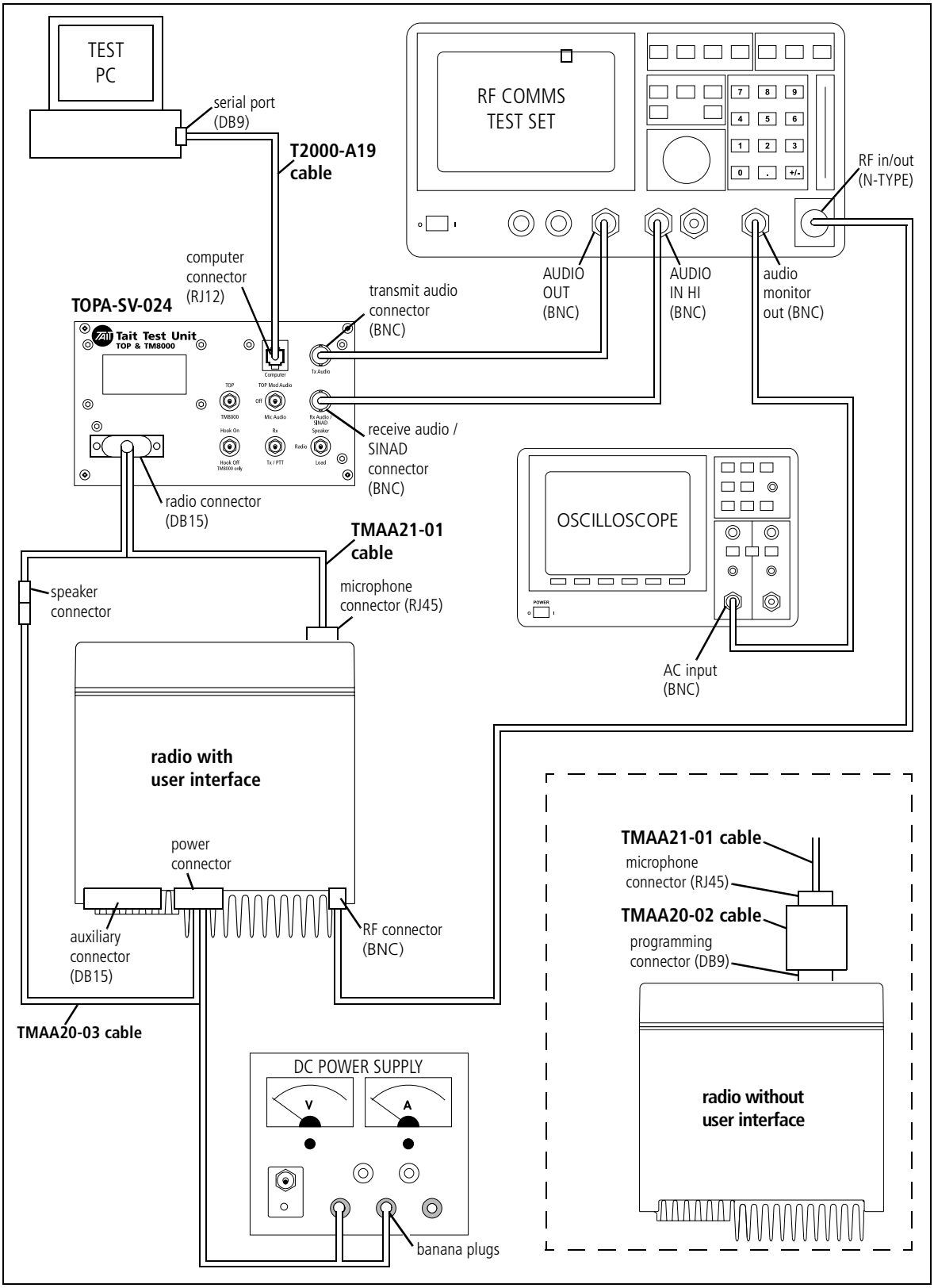


18.1 Test Equipment Setup

The diagram on the following page shows how the test unit is connected to the radio, the test PC, and the RF communications test set.

Note The test unit can also be connected to a T2000 radio using the T2000-11 cable. Use with T2000 radios is not described in this document.

Figure 18.2 Test setup



18.2 Operation

This section explains the function of the TOPA-SV-024 test unit controls. The procedure for using the test unit is described in the section of the service manual covering test equipment.

18.2.1 TOP / TM8000 switch

This 2-way toggle switch is used to switch attenuation resistors (R4, R5, R6) in and out of the line from the radio's positive speaker output to the positive receive audio/SINAD output of the test unit (before the isolating transformer).

- When set to **TOP**, the attenuation resistors are switched out.
- When set to **TM8000**, the attenuation resistors are switched in (attenuation 10:1).

Important Selecting the wrong switch position can result in incorrect SINAD readings.

18.2.2 TOP Mod Audio / Off / Mic Audio switch

This 3-way toggle switch is used to switch between **Mod Audio** (Tait Orca portables only), **Mic Audio**, and **Off** (no audio signal).

- With the Tait Orca portables, this switch can be used for setting up dual point modulation by applying modulation to different parts of the radio.
- For normal transmit deviation tests (Tait Orca portables and TM8000), this switch is set to **Mic Audio**.

18.2.3 Hook On / Hook Off switch

Important When using the test unit with Tait Orca portables, the **Hook On** / **Hook Off** toggle switch **must** be set to **Hook Off**. Tait Orca portables do not have a hookswitch, and if the switch is set to **Hook On**, the Tait Orca portable F1 function is activated.

This 2-way toggle switch is used to simulate the microphone hookswitch opening ("hook off") and closing ("hook on"). This is done by switching a 12kΩ resistor (R3) in or out of the MIC_PTT line.

- When set to **Hook Off**, the 12kΩ resistor (R3) is switched out of the MIC_PTT line. This simulates the microphone being removed from the microphone clip.
- When set to **Hook On**, a 12kΩ resistor (R3) is switched into the MIC_PTT line. This simulates the microphone being placed on the microphone clip.

18.2.4 Rx / Tx/PTT switch

This 2-way toggle switch is used to switch between receive and transmit mode.

- When set to **Rx**, the PTT line is switched to high impedance.
- When set to **Tx/PTT**, the PTT line is pulled to ground.

18.2.5 Speaker / Radio / Load switch

This 3-way toggle switch is used during receive audio tests to switch the audio to the test unit speaker (**Speaker**), to the radio's internal speaker (**Radio**) or to a dummy load consisting of R1 and R2 (**Load**).

Note This switch does not disconnect the radio's internal speaker on M8100 radios with a user interface. If the switch is set to **Speaker** or **Load**, this simulates an external speaker being connected in parallel to the radio's internal speaker. TM8000 radios without a user interface do not have an internal speaker.

With all settings, a low level audio signal is available for testing through the SINAD port.

Tait Orca portables

- When set to **Speaker**, only the speaker of the test unit is active.
- When set to **Radio**, only the speaker of the Tait Orca portable is active.
- When set to **Load**, no speaker is active. The audio signal is terminated in the test unit dummy load.

TM8000 radios with user interface

- When set to **Speaker**, the speakers of the test unit and the TM8000 are both active. The speaker of the TM8000 cannot be disconnected.
- When set to **Radio**, only the speaker of the TM8000 is active.
- When set to **Load**, the TM8000 speaker remains active.

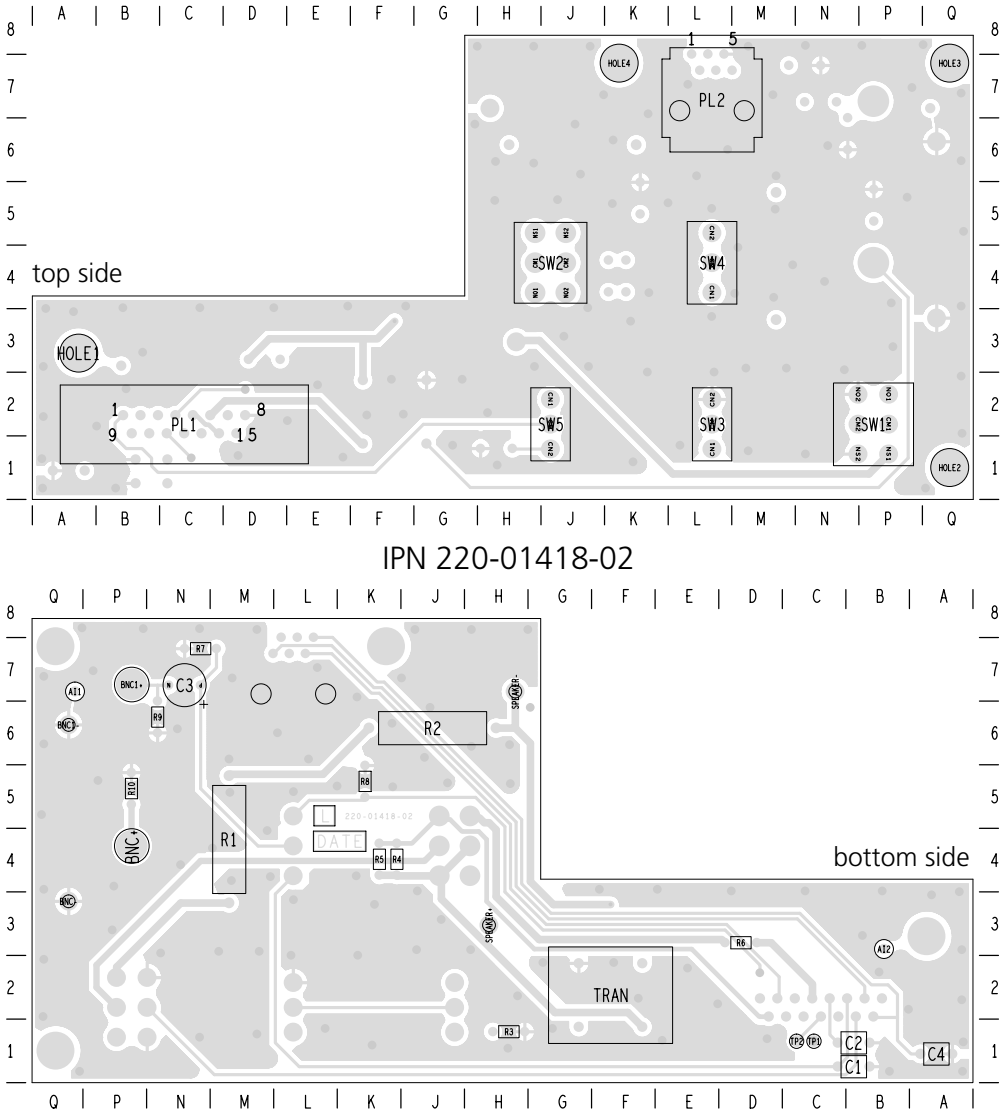
18.3 PCB Information

18.3.1 Parts List (PCB IPN 220-01418-02A Rev. 4)

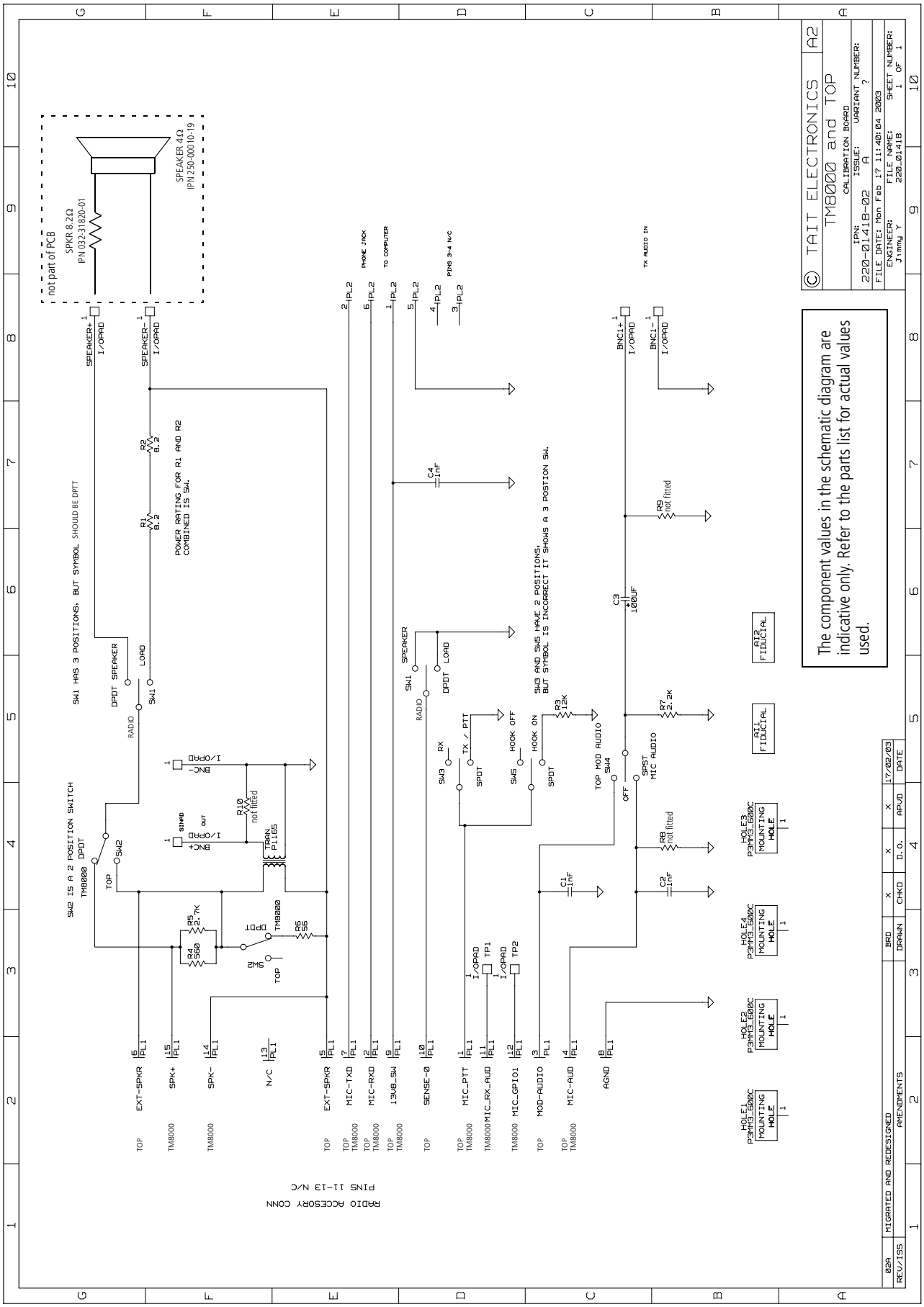
Ref.	IPN	Description
BNC1	240-02100-11	Skt Coax BNC 3.5mm Pnl N/Tag
BNC2	240-02100-11	Skt Coax BNC 3.5mm Pnl N/Tag
C1	011-54100-01	Cap Cer Al 1n 10% T/C B 50v
C2	011-54100-01	Cap Cer Al 1n 10% T/C B 50v
C3	020-59100-06	Cap Elec Rdl 100m 16v 6.3x11
C4	011-54100-01	Cap Cer Al 1n 10% T/C B 50v
PL1	240-00010-55	Plg 15w Drng W-Wrap Pnl Mtg
PL2	240-04021-60	Skt 6w Modr Ph Vrt T-Ent
R1	032-31820-01	Res M/F Pwr 17x5 8e2 5% 2.5w
R2	032-31820-01	Res M/F Pwr 17x5 8e2 5% 2.5w
R3	030-55120-20	Res Flm 4x1.6 12k 5% 0.4w
R4	030-53560-20	Res Flm 4x1.6 560e 5% 0.4w
R5	030-54270-20	Res Flm 4x1.6 2k7 5% 0.4w
R6	030-52560-20	Res Flm 4x1.6 56e 5% 0.4w
R7	030-55100-20	Res Flm 4x1.6 10k 5% 0.4w

Ref.	IPN	Description
SW1	230-00010-42	Sw Tgl On Off On Dpdt Ms500hb
SW2	230-00010-57	Sw Tgl Dpdt On-On Pnl Mtg
SW3	230-00010-03	Sw Tgl Spst Mini Pnl Mtg
SW4	230-00010-16	Sw Tgr Spst 3-Pos Pnl Mtg
SW5	230-00010-03	Sw Tgl Spst Mini Pnl Mtg
TRAN	054-00010-17	Xfmr Line 600 Ohm 1:1
Not part of the PCB:		
SPKR	032-31820-01	Res M/F Pwr 17x5 8e2 5% 2.5w
	250-00010-19	Spkr C/W Rubber Sealing Ring

18.3.2 PCB Layout



18.3.3 Circuit Diagram



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