TM8000 mobiles

## TM8100 Mobile Radio
Accessories Manual

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Contents

Preface

Scope of Manual

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

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

MM8100-00-03-804 TM8100 User's Guide

MM8100-02-00-812 TM8100 Service Manual

All available TM8100 product documentation is provided on the
TM8100 Product Support CD, product code TMAA20-01. Updates may
also be published on the Tait support website.

Publication Record

Issue	Publication Date	Description
1	September 2003	first release

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
ESD	Electrostatic Discharge
IC	Integrated Circuit
IPN	Internal Part Number
LED	Light Emitting Diode
NB	Narrow Bandwidth (12.5 kHz 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 (25 kHz channel spacing)

1   Safety and Servicing Information

This chapter contains general information about safety and servicing procedures when working with TM8000 radios. While many TM8100 accessories plug into external radio interfaces, some accessories are fitted inside the radio. Refer to the TM8100 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
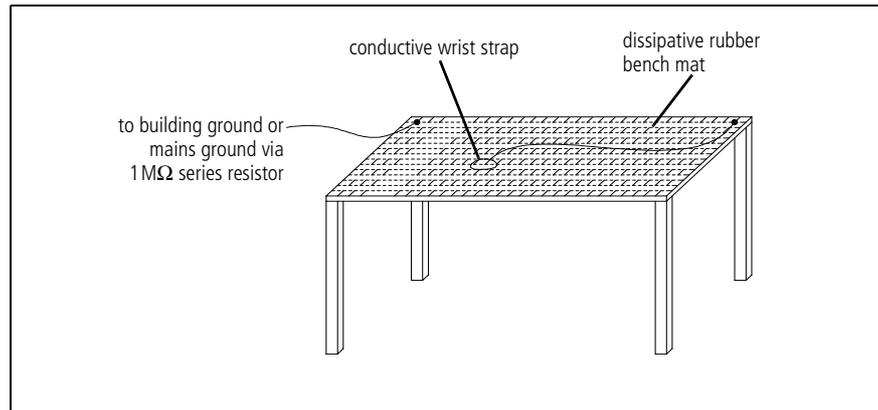
Antenna Load

The TM8100 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 TM8100 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

"star" shaped recess with
six internal notches
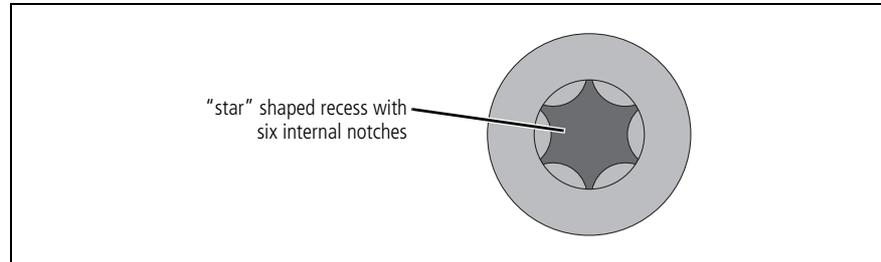
Allen UNC Screws

Allen 4-40 UNC thread screws are used in some locations in the TM8100 radio and cannot be interchanged with M3 screws.

Pozidriv and Philips Screws

Both Pozidriv and Philips head screws are used on certain TM8100 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
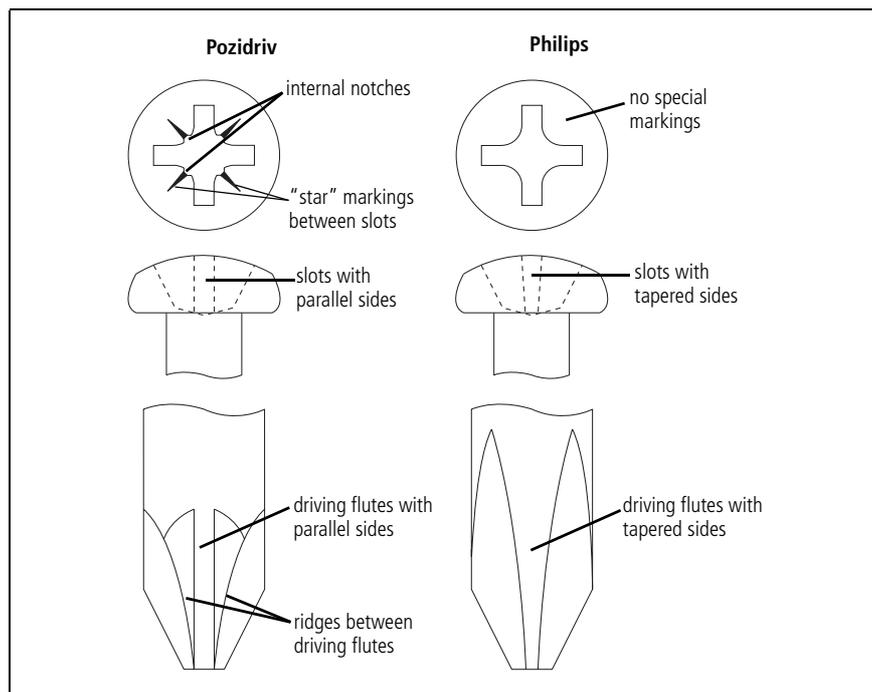
1.4   Regulatory Information

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).

2 TMAA01-05 Options-Extender Board

D-range hood parts

D-range plug

internal options connector

options-extender board

external options connector

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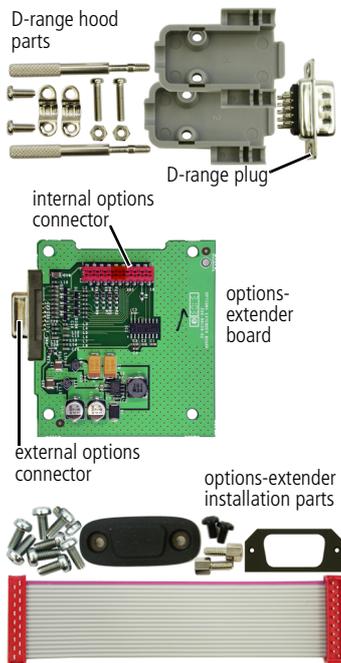
The TMAA01–05 options-extender board provides external access to most of the signal lines provided by the radio's internal options connector.

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.

2.1 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 2.1   Options-extender board linking resistor locations
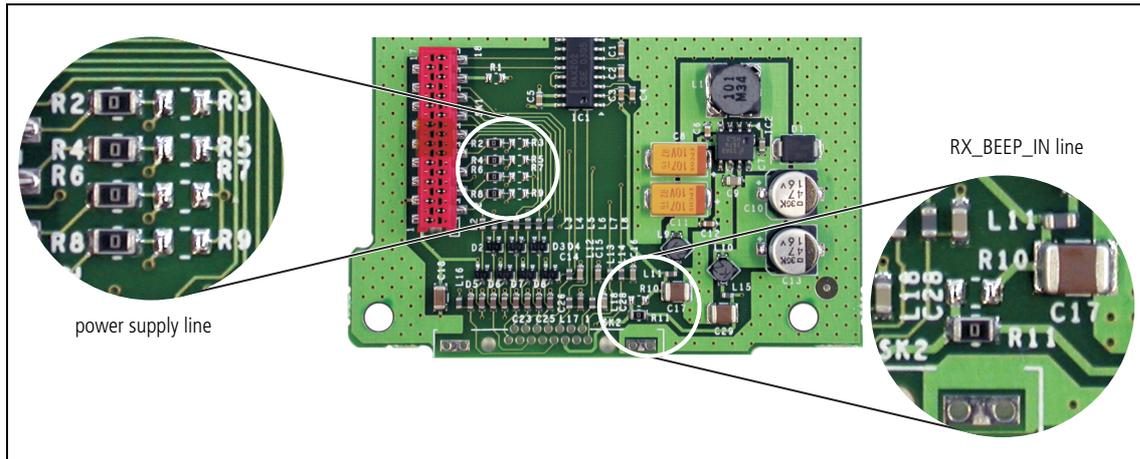
2.1.1   Power Supply Line

The power supply output available on pin 2 of the external options connector is factory-set to 13.8 V. The output on this pin can be changed to 5 V if R11 (a 0 Ω surface mount resistor) is moved to position R10. Figure 2.1 at the top of the page shows the component locations.

2.1.2   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 2.1 at the top of the page shows the component locations.

Table 2.1   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

2.2 Installing the Options-Extender Board

2.2.1 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 2.2 and are used to connect to the radio's external options connector.

Table 2.2 Options-extender installation parts required

Quantity	Internal Part Number	Description	Figure 2.2 Reference
1	362-01110-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.

2.2.2 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 TM8100 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 0.9N·m (8lbf·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 (17 lbf·in)

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   Options-extender board installation

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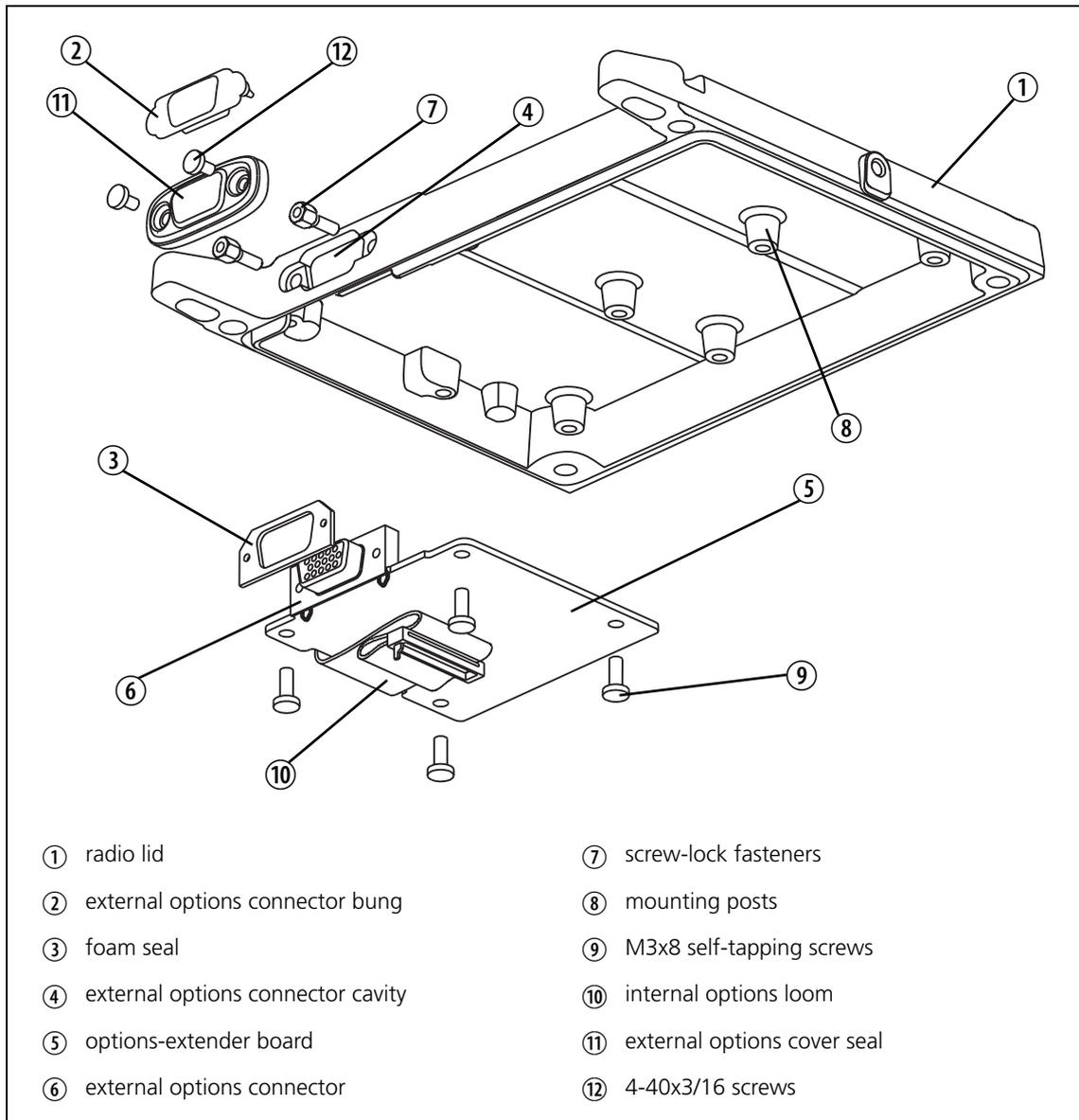
2.3   Interface Specification

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 2.3   Internal options connector - pins and signals

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

top view

Table 2.4   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
	12	IOP_RXD	an RS-232 compliant asynchronous serial port - receive data
	8	IOP_TXD	an RS-232 compliant asynchronous serial port - transmit data
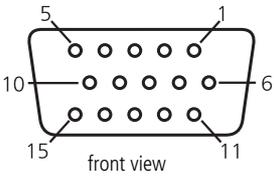
a. This can be configured to be 5V. Refer to "Power Supply Line" on page 16.

b. This can be re-configured to be RX_BEEP_IN. Refer to "RX_BEEP_IN Line" on page 16.

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

2.4 PCB Information

2.4.1 TMAA01-05 Parts List (PCB IPN 226-00129-02)

Ref.	IPN	Description	Ref.	IPN	Description
C1	018-16100-00	Cap 0603 100n 16vx7r+-10%	R2	036-10000-00	Res M/F SMD 0805 0e 0.125w
C2	018-16100-00	Cap 0603 100n 16vx7r+-10%	R4	036-10000-00	Res M/F SMD 0805 0e 0.125w
C3	018-16100-00	Cap 0603 100n 16vx7r+-10%	R6	036-10000-00	Res M/F SMD 0805 0e 0.125w
C4	018-16100-00	Cap 0603 100n 16vx7r+-10%	R8	036-10000-00	Res M/F SMD 0805 0e 0.125w
C5	018-16100-00	Cap 0603 100n 16vx7r+-10%	R11	036-10000-00	Res M/F SMD 0805 0e 0.125w
C6	018-16100-00	Cap 0603 100n 16vx7r+-10%			
C7	018-15100-00	Cap 0603 10n 50v X7r +-10%	SK1	240-10000-11	Conn SMD 18w Skt M/Match
C8	014-08100-30	Cap Tant SMD 100u 10v Loesr D	SK2	240-00011-67	Skt 15w Drng Ra Slim Dsub 7912
C9	015-26100-08	Cap Cer 0805 100n 10% X7r 50v			
C10	016-08470-01	Cap Elec SMD 47uf 6*4 16v		226-00129-02	PCB TMAA01-05 Opts Brd
C11	014-08100-30	Cap Tant SMD 100u 10v Loesr D			
C12	018-16100-00	Cap 0603 100n 16vx7r+-10%		240-00010-80	Plg 15w Drng Hi-D
C13	016-08470-01	Cap Elec SMD 47uf 6*4 16v		240-06010-29	Conn 9w Hood/Cvr Lets
C14	018-15100-00	Cap 0603 10n 50v X7r +-10%			
C15	018-15100-00	Cap 0603 10n 50v X7r +-10%		219-00329-00	Loom TMA Int Opt
C16	018-15100-00	Cap 0603 10n 50v X7r +-10%		347-00011-00	Scrw 4-40*3/16 Unc P/P Blk
C17	015-07220-35	Cap Cer 1210 2u2 X5R 35v		349-02062-00	Scrw M3*8 T/T P/T Conti Rmnc
C18	015-06470-01	Cap Cer 1206 470n X7r 20% 50v		354-01043-00	Fsnr Scrw Lok 1pr 4-40
C19	018-13470-00	Cap 0603 470p 50v X7r+-10%		362-01108-00	Seal Drng Cvr 9way TMA
C20	018-13470-00	Cap 0603 470p 50v X7r+-10%		362-01111-00	Seal Drng 9way TMA
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			
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			

2.4.2   Options-Extender Board Layout (top side)
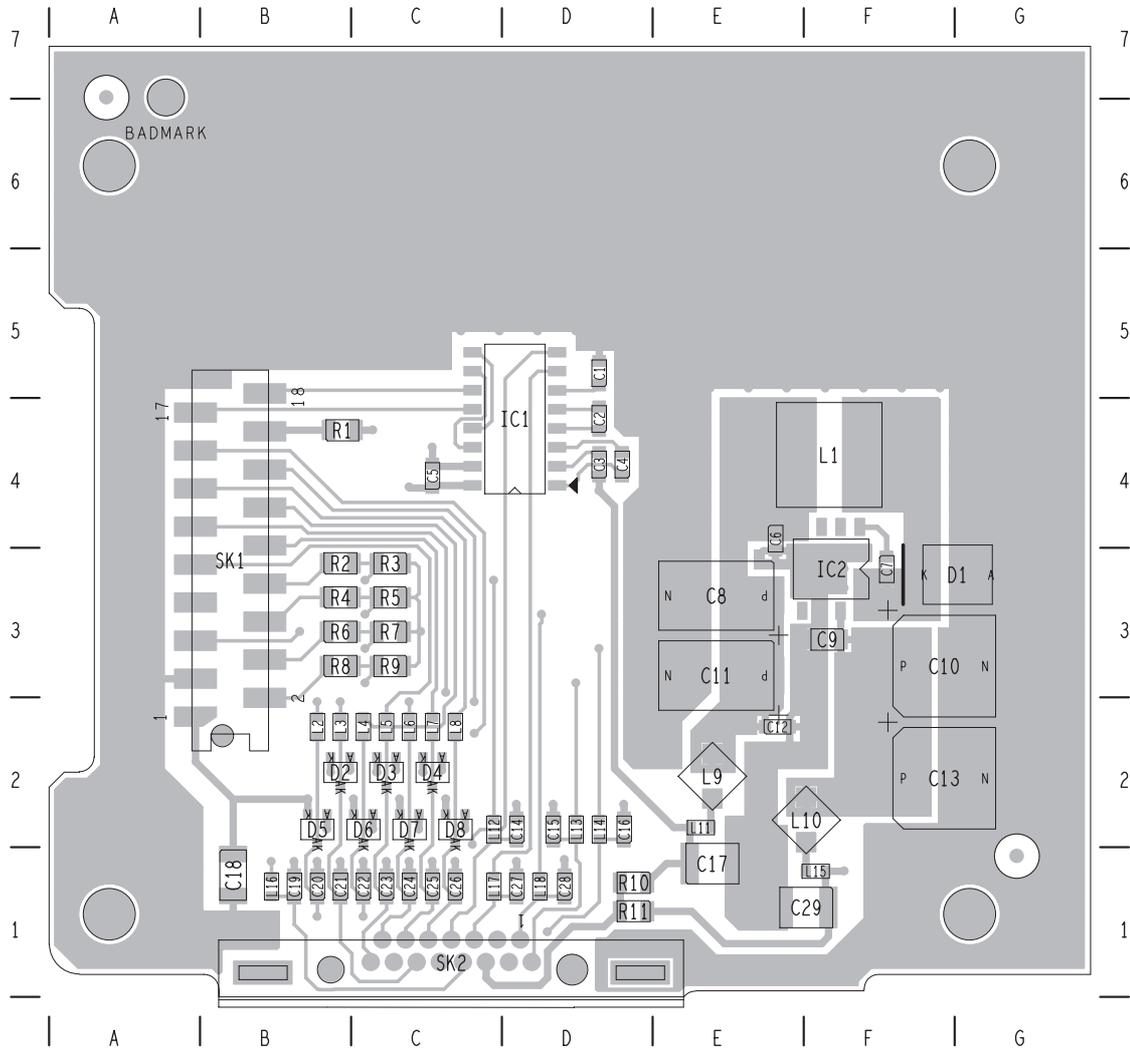
IPN 226-00129-02

2.4.3 Options-Extender Board Layout (bottom side)
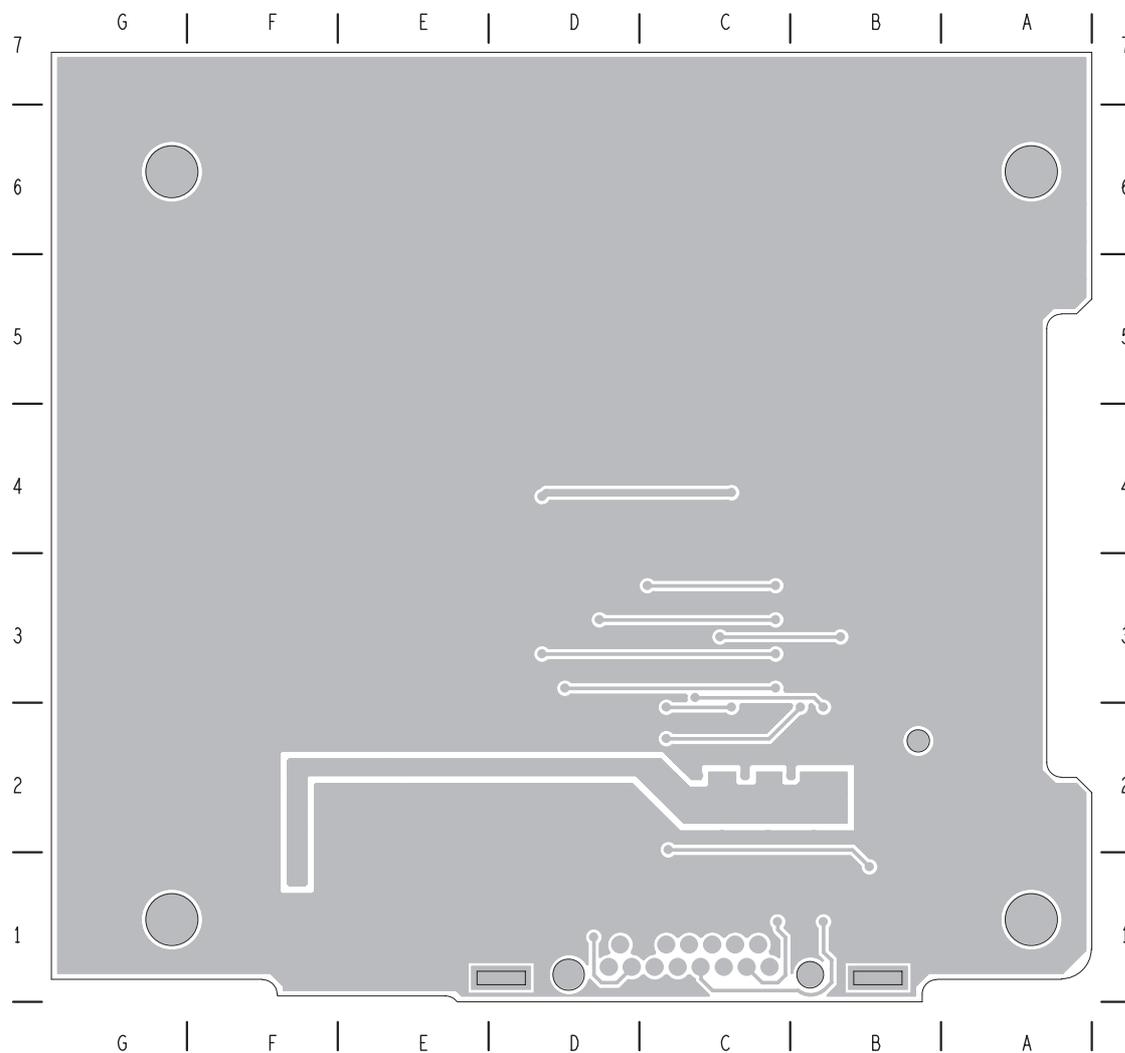
IPN 226-00129-02

2.4.4 Options-Extender Board Circuit Diagram
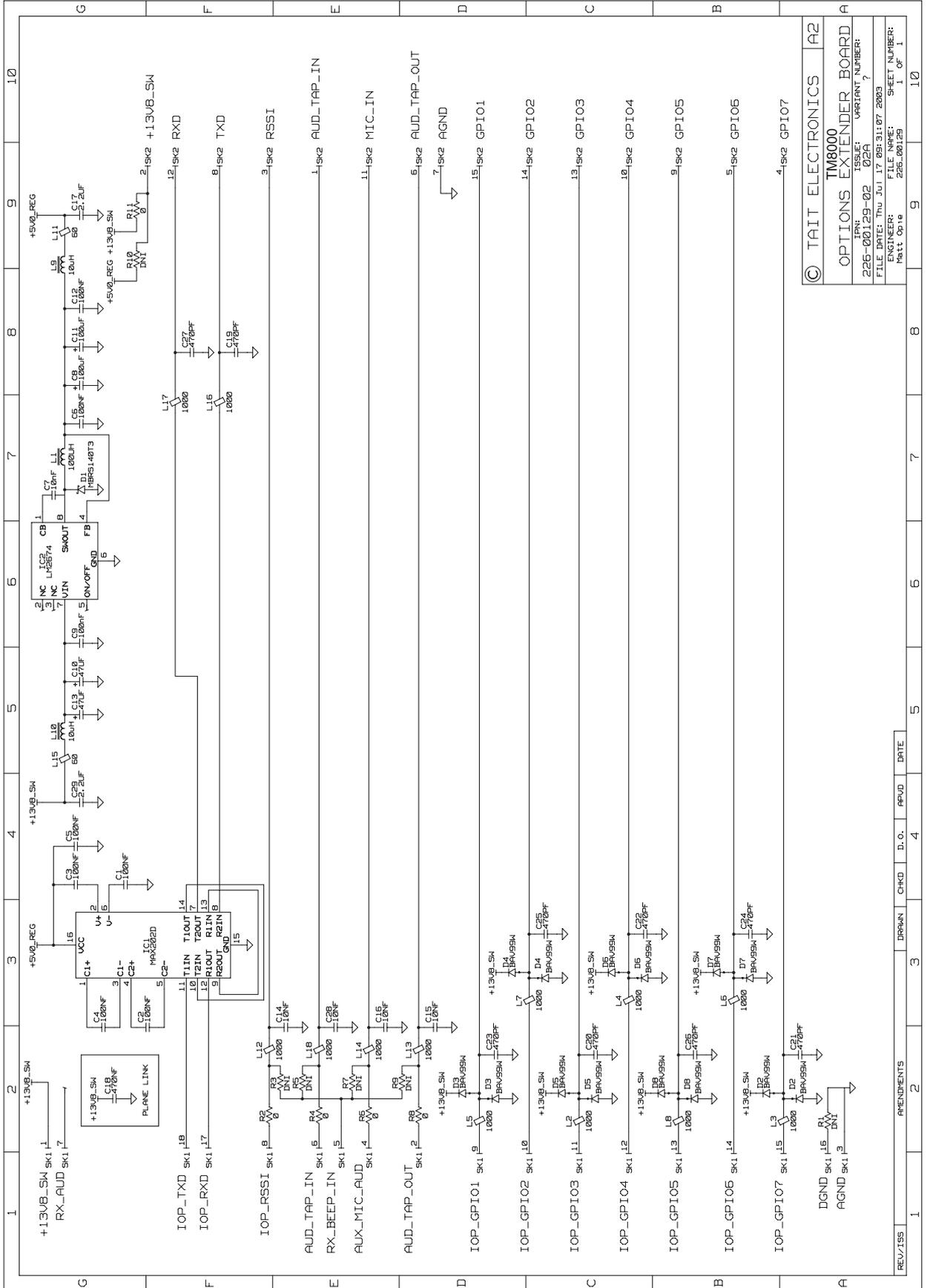
3   TMAA02-02 DTMF Microphone

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 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.

## 3.1   Installation

3.1.1   Installing the Microphone

Important The DTMF microphone grommet must be installed when-ever 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 3.1   Correct DTMF microphone grommet seating
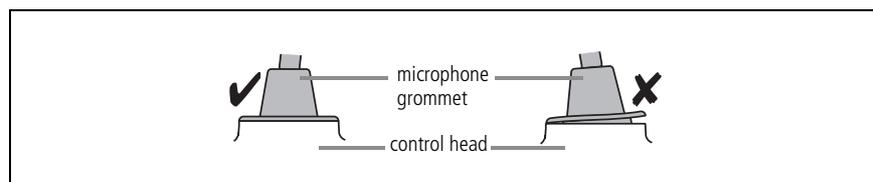
3.1.2   Installing the Microphone Clip

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.

3.2   Adjustment

Remove the DTMF microphone back cover and set the DTMF tone level to approximately 80% deviation (± 4kHz for wide bandwidth radios and ± 2kHz for narrow bandwidth radios).

3.3   Radio Programming

Radio input and output lines can be configured in the Programmable I/O form of the TM8000 Programming Application. When a DTMF microphone is installed, the radio must have the CH_GPIO1 pin set to No Action. This is the default setting for this pin.

3.4   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 3.1   DTMF microphone connector - pins and signals
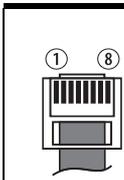
Pin	Signal	Colour	Description
1	—	—	not connected
2	13V8_SW	red	power supply (switched)
3	—	yellow	not connected
4	MIC_PTT	black	PTT and hookswitch
5	MIC_AUD	white	audio from the microphone
6	AGND	blue	analogue ground
7	—	—	not connected
8	MIC_GPIO1	green	mute out

Figure 3.2   DTMF microphone to radio interface
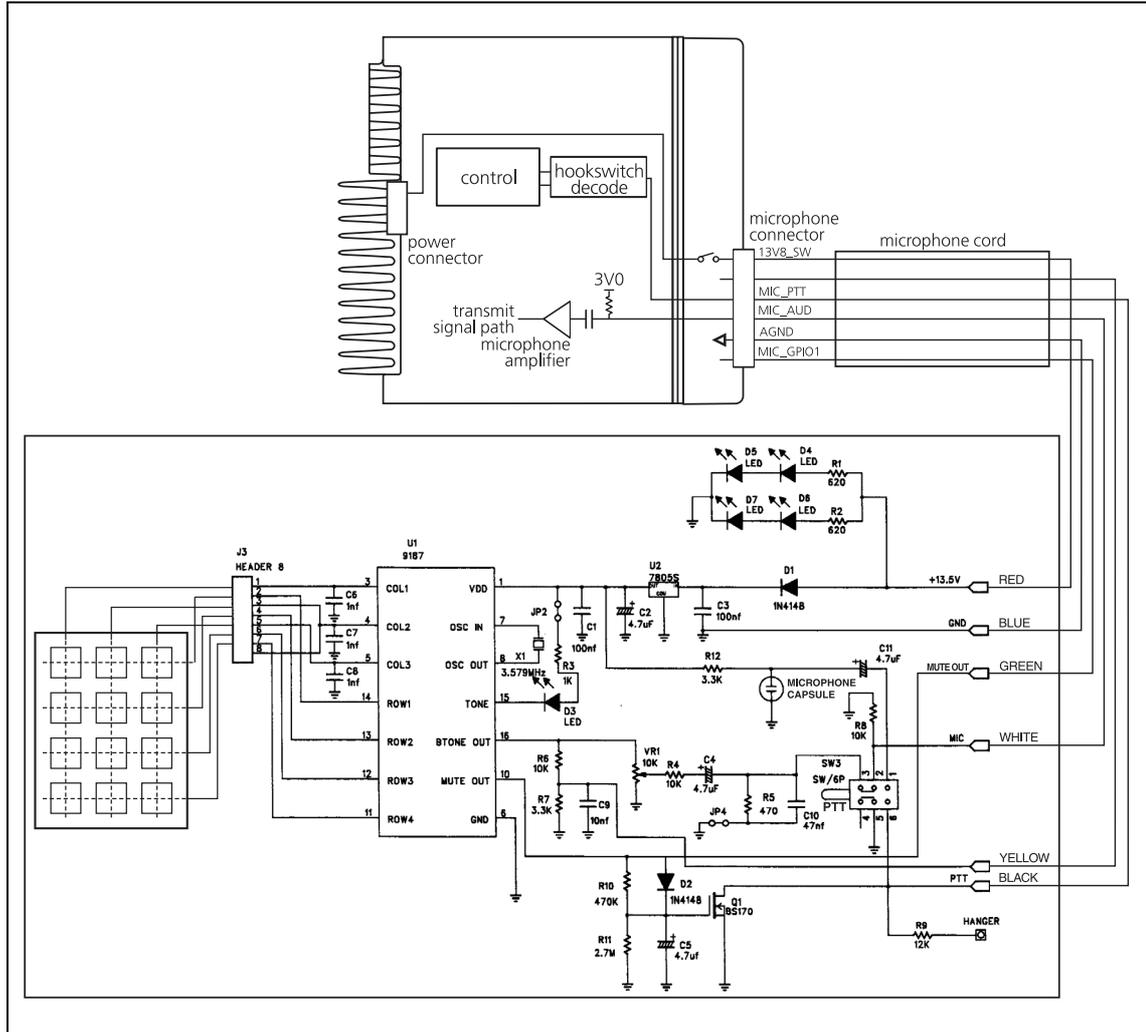
3.5   Circuit Description

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.

4 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.

grille

microphone base

PTT key

monitor key

grommet

4.1 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.

4.2 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 4.1   Correct desktop microphone grommet seating
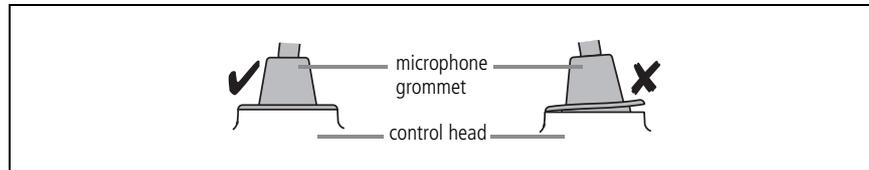
4.3   Adjustment

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.

adjust R5 here

4.4   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 4.1   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 4.2   Desktop microphone to radio interface
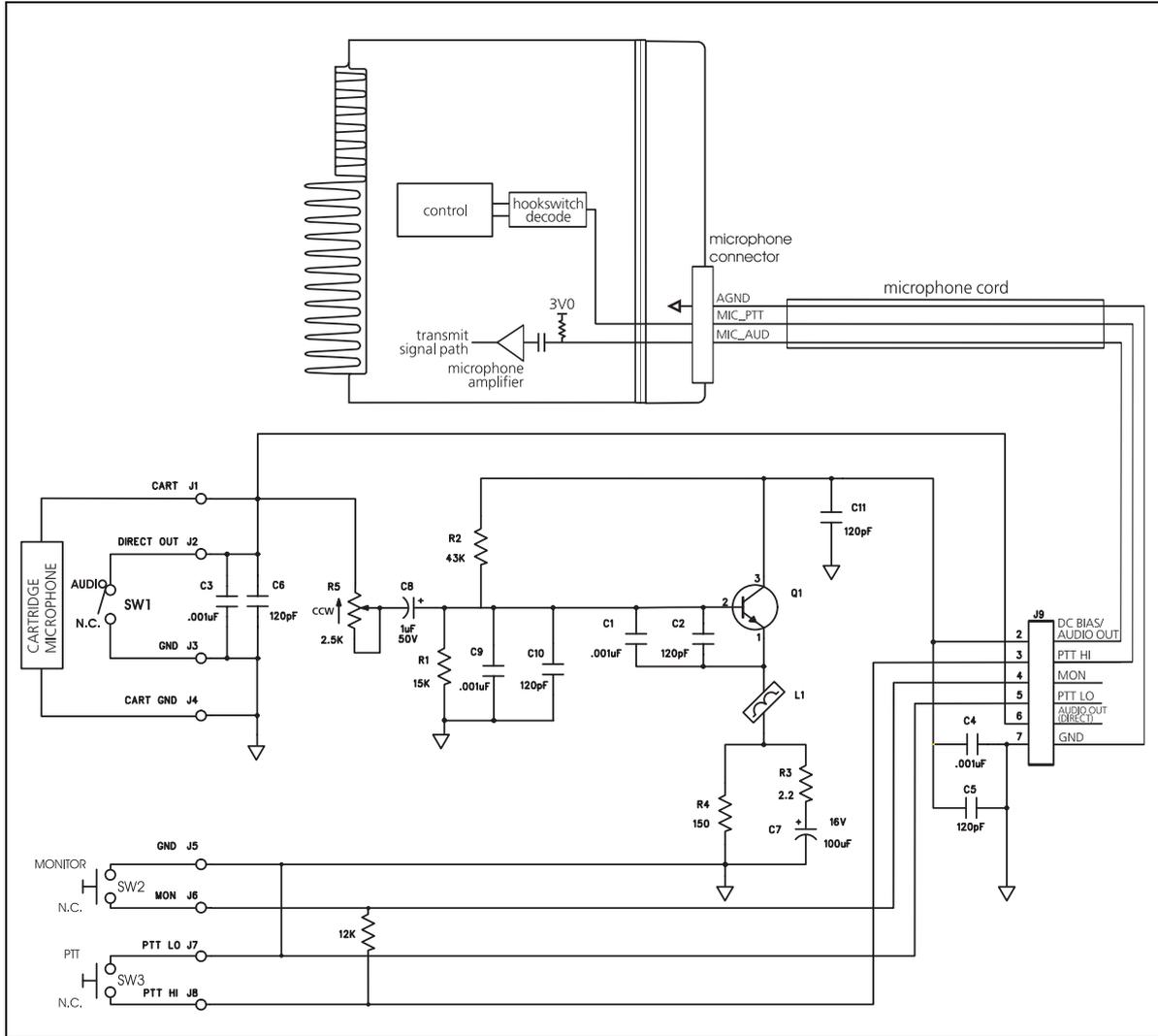
4.5   Circuit Description

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.

5 TMAA10-04 Hands-Free Kit

remote PTT

extension lead
for remote PTT

auxiliary
connector plug

remote microphone

remote microphone
mounting options

The TMAA10-04 hands-free kit plugs into the radio's auxiliary connector and can be used in conjunction with the radio's rugged microphone. When hands-free operation is required, the user activates the PTT using the conveniently located remote PTT key, and the remote electret microphone replaces communication through the usual rugged microphone.

An extension lead is provided for the remote PTT and there are three mounting options for the remote microphone.

Note that the hands-free kit does not provide hookswitch operation. If this is required, the rugged microphone can provide this.

Important   The radio does not meet the IP54 protection standard once a hands-free kit has been installed.

5.1 Installation

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

5.1.1 Installing the Microphone

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

    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.

5.1.2 Installing the Remote PTT

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.

5.2 Radio Programming

The following tables show the settings required in the PTT form and Programmable I/O form of the TM8000 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.

5.2.1 Hands-Free PTT Form Settings

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 5.1   Hands-free settings in the PTT form, External PTT (1) tab

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

5.2.2 Hands-Free Programmable I/O Form Settings

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 5.2   Hands-free 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

5.3   Interface Specification

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

Table 5.3   Auxiliary connector - pins and signals

	Pin	Signal name	Description
① ⑨ ② ⑩ ③ ⑪ ④ ⑫ ⑤ ⑬ ⑥ ⑭ ⑦ ⑮ ⑧ 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
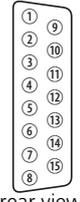
Figure 5.1   Hands-free to radio interface
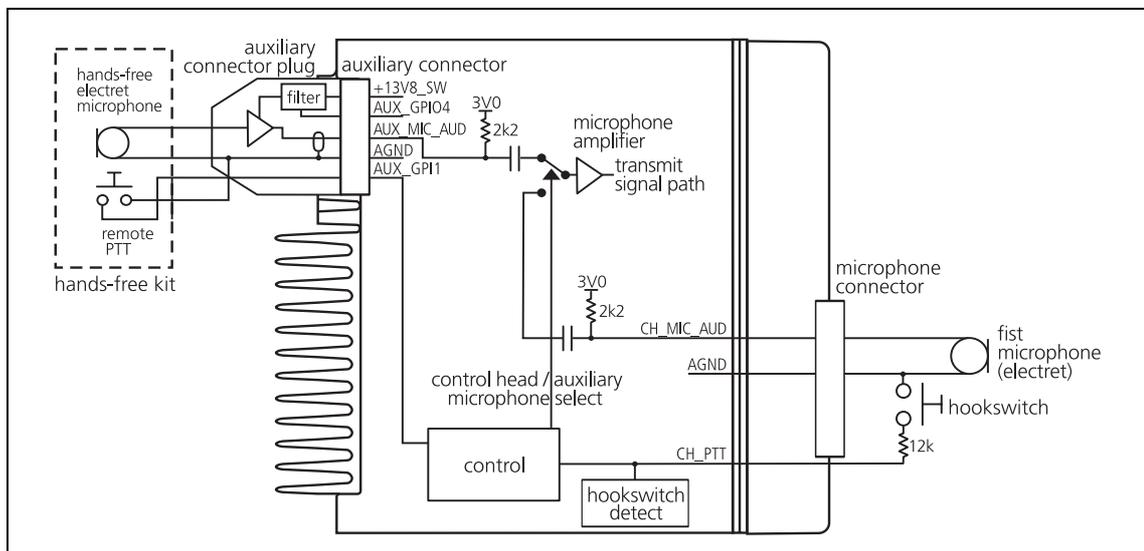
5.4   Circuit Description

The hands–free 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 hands–free 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.

5.5 PCB Information

5.5.1 TMAA10-04 Parts List (PCB IPN 220-01711-01)

Ref.	IPN	Description	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			
	236-00001-00	Sw Ptt W/Cbl & Strap			
	240-00020-55	Plg 15w Drng 105 Deg Pnl Mtg			
	240-06010-18	Conn 15w Hood/Cvr Drng MDJ15			
	252-00010-72	Mic Electret Unidir 2.5mm Plg			

5.5.2 Hands-Free Pre-Amplifier Board Layout (top side)

A   B

3   3

TP15   R13
                              C
R18 C4 R6 Q1
                        B   E

2   TP13   R3 C3   GND1   PTT   2

                              MIC_IN

TP11 C2 R1 GND2

R19

1   TP9   1

IPN 220-01711-01

A   B

5.5.3 Hands-Free Pre-Amplifier Board Layout (bottom side)

IPN 220-01711-01

5.5.4 Hands-Free Pre-Amplifier Board Circuit Diagram