TM8100 Mobile Radios
TM8200 Mobile Radios

Installation Guide

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www.taitradio.com

Contact Information

Tait Communications
Corporate Head Office

Tait Limited
P.O. Box 1645
Christchurch
New Zealand

For the address and telephone number of regional offices, refer to our website: www.taitradio.com

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In China, we comply with the Measures for Administration of the Pollution Control of Electronic Information Products. We will comply with environmental requirements in other markets as they are introduced.

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Preface

Scope of Manual

This manual describes the installation of the TM8100/TM8200 mobile radio using the U-bracket, and how to install and connect the microphone, antenna, emergency switch, and external alert device.

The radio can also be installed in many other ways, using different combinations of components and accessories. For information on:

- radio body installation
- remote control head installation
- dual control head installation
- hand-held control head installation
- dual-radio system
- desktop installation

refer to "Installation Options" on page 32, the installation instructions provided with the equipment, and the relevant sections in the service manual.

Some installation options may not be suitable for some models of radio. Consult your nearest Tait Dealer or Customer Service Organization for more information.

For information on installations with two bodies and one control head refer to the TM8260 Installation and Programming Guide (MMA-00041-**xx**).

Associated Documentation

The following associated documentation is available for this product:

- MTA-00011-**xx** Safety and Compliance Information
- MMA-00002-**xx** TM8100 User's Guide
- MMA-00051-**xx** TM8235 User's Guide
- MMA-00003-**xx** TM8250/TM8255 User's Guide
- MMA-00040-**xx** TM8260 User's Guide
- MMA-00041-**xx** TM8260 Installation and Programming Guide
- MMA-00005-**xx** TM8100/TM8200 Service Manual

The characters **xx** represent the issue number of the documentation.

This publication is also available in French (MMA-00044-**xx**), Spanish (MMA-00045-**xx**), and Chinese (MMA-00048-**xx**).

Technical notes are published from time to time to describe applications for Tait products, to provide technical details not included in manuals, and to offer solutions for any problems that arise.

All available TM8100/TM8200 product documentation is provided on the CD supplied with the service kit[1]. Updates may also be published on the Tait support website.

Publication Record

Issue	Publication Date	Description
01	August 2005	First release
02	July 2006	Auxiliary connector information updated TM8235 and TM8260 information added
03	March 2008	References to hand-held control head, remote installations, and multi-head/multi-body installations added. Product codes for trigger-base bodies added. Information on antenna gain for 800MHz radios added. Part numbers for fuses corrected. Instructions on avoiding connection to centre tap of two 12V batteries added. Rating for 24V-to-12V converter added.
04	November 2009	Installation Options section added. Minor corrections and additions.
05	November 2012	New Tait logo

1. Technical notes are only available in PDF format from the Tait support website. Consult your nearest Tait Dealer.

Document Conventions

Please follow exactly any instruction that appears in the text as an 'alert'. An alert provides necessary safety information as well as instruction in the proper use of the product. This manual uses the following types of alert:.

Warning **This alert is used when there is a hazardous situation which, if not avoided, could result in death or serious injury.**

Caution This alert is used when there is a hazardous situation which, if not avoided, could result in minor or moderate injury.

Notice This alert is used to highlight information that is required to ensure procedures are performed correctly. Incorrectly performed procedures could result in equipment damage or malfunction.

This icon is used to draw your attention to information that may improve your understanding of the equipment or procedure.

Within this manual, the following symbols are used to highlight differences between radios with a transmit power of more than 25 W and radios with a transmit power of 25 W:

This symbol highlights information that is relevant to radios with a transmit power >25 W.

This symbol highlights information that is relevant to radios with a transmit power of 25 W.

1 Safety and Regulatory Warnings

This section contains important information on the safe installation of the radio. You must read this information before starting the installation.

You must also read and observe the safety information on radio operation provided in the safety and compliance information and the user's guide.

1.1 RF Exposure Hazard

To comply with FCC RF exposure limits:

For radios with a transmit power >25 W:

- VHF radios must be installed using an antenna mounted centrally on the vehicle roof, with a gain of 2.15 dBi or 5.15 dBi.
- UHF and 800 MHz radios must be installed using an antenna mounted either centrally on the roof with a gain of 2.15 dBi or 5.65 dBi, or centrally mounted on the trunk with a gain of 5.65 dBi.

For radios with a transmit power of 25 W:

- The radio must be installed using an externally mounted antenna with a gain of either 2.15 dBi or 5.15 dBi.

In all cases, the antenna must not be mounted at a location such that any person or persons can come closer than 35 inches (0.9 m) to the antenna.

1.2 Vehicle Manufacturer's Installation Instructions

Installation of this product in a vehicle must be performed according to the instructions provided by the vehicle manufacturer. For more information, refer to the vehicle manufacturer's website or contact the vehicle manufacturer's dealer.

1.3 MPT 1362 Code of Practice

Mobile radios should be installed in accordance with the MPT 1362 Code of Practice.

1.4 Safe Radio Mounting

Warning **Mount the radio securely so that it will not break loose in the event of a collision. An unsecured radio is dangerous to the vehicle occupants.**

- Mount the radio and the microphone where they will not interfere with:
  - the deployment of passenger airbags
  - the vehicle operator controls
  - the vehicle operator's view
- Do not mount the radio vertically, with the control head facing down. This will violate compliance with the standards UL/CSA/EN 60950, Safety of Information Technology Equipment.

1.5 Interference with Vehicular Electronics

Warning **Some vehicular electronic devices may be prone to malfunction due to the lack of protection from RF energy when your radio is transmitting.**

Examples of vehicular electronic devices that may be affected by RF energy are:

- electronic fuel injection systems
- electronic anti-skid braking systems
- electronic cruise control systems
- indicators

If the vehicle contains such equipment, consult the vehicle manufacturer or dealer to determine whether these electronic circuits will perform normally when the radio is transmitting.

1.6 Preparation when Drilling Holes

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

1.7 Radio Installation in Gas or Fuel Tankers

Special conditions must be observed when installing a radio on gas and fuel tankers. Consult your radio provider or Tait-accredited service center for more details.

1.8 Vehicles Powered by Liquefied Petroleum Gas

Warning **Radio installation in vehicles powered by LPG (liquefied petroleum gas) with the LPG container in a sealed-off space within the interior of the vehicle must conform to the National Fire Protection Association Standard NFPA 58. This standard states that the radio equipment installation must meet the following requirements:**

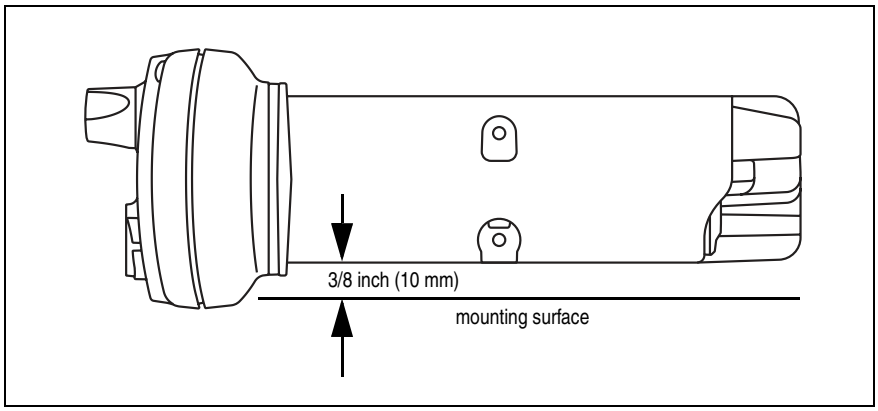
- **The space containing the radio equipment shall be isolated by a seal from the space containing the LPG container and its fitting.**
- **Outside filling connections shall be used for the LPG container and its fittings.**
- **The LPG container space shall be vented to the outside of the vehicle.**

1.9 Non-standard Radio Installations

The installation U-bracket described in this guide has been designed so that there is enough airflow around the radio to provide cooling.

If a non-standard installation method is used, care must be taken that sufficient heat can be dissipated from the heatsink fins and the ridged bottom surface of the radio.

For this to be achieved, there must be a gap of more than 3/8 inch (10 mm) between the bottom surface of the radio chassis and the mounting surface. This is illustrated in the following diagram (TM8200 radio shown):



1.10 Negative Earth Supply

The radios are designed to operate only in a negative earth system.

2 Preparing the U-Bracket Installation

This section contains the following information:

- installation tools
- checking the equipment for completeness
- choosing an installation configuration

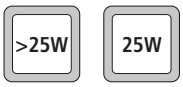
2.1 Installation Tools

The following tools are required to install the radio:

- drill and drill bits
- Pozidriv screwdriver
- 5/16 inch (8mm) socket
- RF connector crimp tool
- fuse crimp tool
- in-line RF power meter capable of measuring forward and reflected power at the operating frequency of the radio

2.2 Checking the Equipment for Completeness

Unpack the radio and check that you have the following:



1. A radio body with one of the following product codes:

   TM8100:

   - TMAB12 standard 25W radio
   - TMAB13 trigger-base 25W radio
   - TMAB14 standard >25W radio

   TM8200:

   - TMAB22 standard 25W radio
   - TMAB23 trigger-base 25W radio
   - TMAB24 standard >25W radio

2. A control head with one of the following product codes:

   TM8100:

   - TMAC10 blank control head (TM8105 radio)
   - TMAC20 2-digit display control head (TM8115 radio)
   - TMAC50 1-digit-display control head (TM8110 radio)

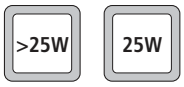
   TM8200:

   - TMAC30 RJ45 control head (TM8252 radio)
   - TMAC40 or TMAC42 graphical-display control head (TM8250 and TM8255 radios)

- TMAC60 3-digit-display control head (TM8235 radio)
- TMAC70 hand-held control head (TM8254 radio), with TMAC34 remote control head, and TMAA10-06 remote speaker (>25 W radio) or TMAA10-03 remote speaker (25 W radio)

The TMAC31, TMAC32 and TMAC34 remote interfaces are similar in appearance to the TMAC30 RJ45 control head of the telemetry radio. However, their electrical characteristics and signals are different. For more information, refer to the installation instructions provided with the remote kits.

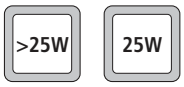
3. TMAA02-01 microphone, TMAA02-08 keypad microphone including microphone clip and screws (not required for the TM8105, TM8252 or TM8254 radio)



4. A TMAA03-17 installation kit (>25 W radio) or TMAA03-01 installation kit (25 W radio), consisting of the following items:
   - U-bracket
   - thumbscrews
   - self-drilling screws and washers
   - power cable with DC connector
   - fuses
   - in-line fuse holders
   - receptacles for a remote speaker (remote speaker not included)
   - antenna connector

   Refer to "Installation Kit Options" below.

Warning **Danger of fire! The radio's protection mechanisms rely on the correct fuses on both the negative and positive power supply leads being present. Failure to fit the correct fuses may result in fire or damage to the radio.**
The correct fuse types are:



- **>25 W radios: 20 A fuses (Tait IPN 265-00010-81)**
- **25 W radios: 10 A fuses (Tait IPN 265-00010-80)**

Installation Kit Options

Installation kits are also available without the U-bracket included and with other antenna connector options. Consult your nearest Tait Dealer or Customer Service Organization for more information.

2.3 Power Source and Ignition Control

The radio allows for different installation configurations for vehicles with respect to ignition signal and standby current. The installation configurations described below are based on the following hardware link configuration:

- hardware link 1 (+13.8V battery power sense): fitted
- hardware link 2 (ignition sense): fitted

For more information on the hardware links, refer to Table 3.4 on page 24 and to the service manual.

Direct Connection to the Power Source

The radio's power cable must always be connected directly to the power source (battery).

Notice Although it is possible to connect the radio in line with the vehicle ignition, this is not recommended, as it may draw too much current and damage the vehicle wiring and steering column or ignition switch. This may also cause the supply voltage of the radio to drop below the specified level.

The radio can always be turned on and off using the on/off button, independent of the ignition signal.

Installation without Ignition Signal

Connect the power cable directly to the power source as described in "Connecting the Power Cable to the Power Source" on page 19.

If hardware link 1 is fitted (factory default) and the ignition signal is not used, the standby current is approximately 50mA. To reduce the standby current to <3mA either:

- remove hardware link 1, or
- connect pin 4 (AUX GPI3) to pin 15 (AGND) of the auxiliary connector

With the above two options, the radio always stays off when power is first applied. The radio can only be turned on with the on/off button.

Installation with Ignition Signal

Connect the power cable directly to the power source as described in "Connecting the Power Cable to the Power Source" on page 19.

Connect pin 4 (AUX GPI3) of the auxiliary connector to the ignition signal as described in "Connecting to the Auxiliary Connector (Ignition Signal, Emergency Switch, External Alert Devices)" on page 22.

The AUX GPI3 line must be programmed to 'Power Sense (Ignition)' and active to 'High'. For more information, refer to the online help of the programming application.

The TMAA04-05 ignition sense kit provides a suitable mating plug for the radio's auxiliary connector. The plug includes wiring for the the ignition signal and analog ground.

3 Installing the Radio

This section contains the following information:

- mounting and removing the control head
- selecting the mounting position
- mounting the U-bracket
- installing the antenna
- connecting the power cable to the power source
- connecting a remote speaker
- connecting to the auxiliary connector (ignition signal, emergency switch, external alert devices)
- installing the radio
- installing the microphone
- checking the installation
- blank control head
- RJ45 control head

For information on other types of installation, refer to "Installation Options" on page 32, the installation instructions provided with the equipment, and the relevant sections in the service manual.

3.1 Mounting and Removing the Control Head

Notice The control head contains devices which can be damaged by static discharges. Always install or remove the control head in a static-safe environment. For information on antistatic precautions, go to the Electrostatic Discharge Association (ESD) website, http://www.esda.org.

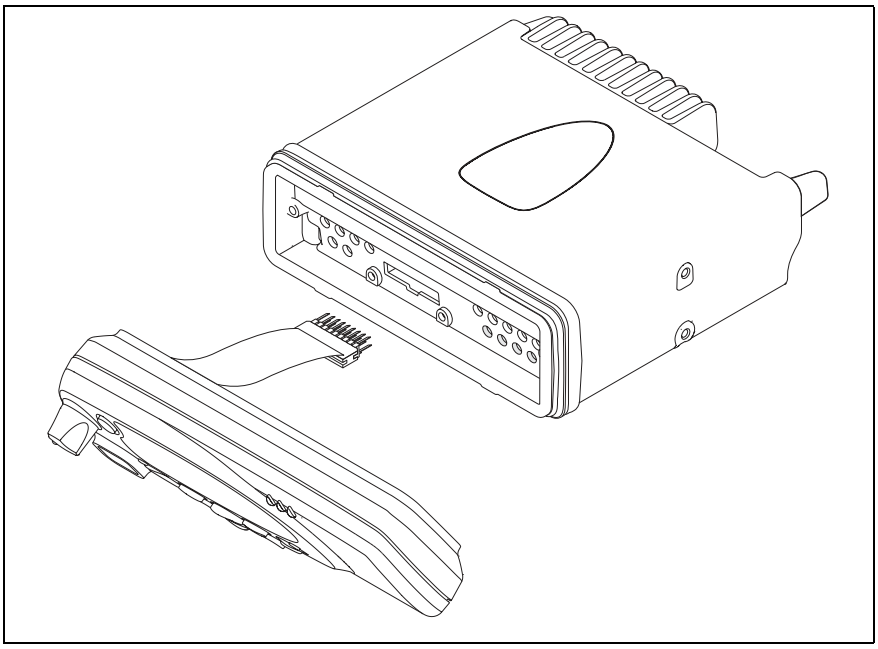
Mounting the Control Head

The control head and its connection loom are delivered separately from the radio body. Before installing the radio, the control head should be mounted on the radio body.

The orientation of the radio body determines which way up the control head is mounted on the radio body.

Notice It may be necessary to mount the radio upside down to maintain a gap of more than 3/8 inch (10 mm) for air circulation between the underside of the radio body and the mounting surface.

Figure 3.1 Mounting the control head

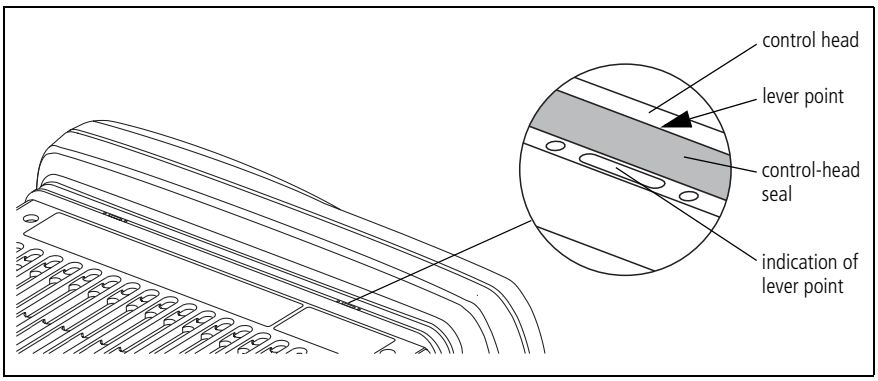


1. Plug the control-head loom onto the control-head connector.
2. Place one edge of the control head on either the top or bottom pair of snap features on the front of the radio body, then rotate to snap the opposite edge into place.

Removing the Control Head

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

Figure 3.2 Removing the control head



On the underside of the radio, two lever points are indicated on the radio body by a dot-dash-dot pattern (○ ⟷ ○). The lever point is between the control-head seal and the control head.

1. At either of the lever points, insert a 3/16 inch (5 mm) flat-bladed screwdriver between the control head and the control-head seal.
2. Use the screwdriver to lift the control head off the snap feature, then repeat in the other position. The control head can now be removed from the radio body.

3.2 Selecting the Mounting Position

Requirements for Safe and Convenient Installation

Ensure the mounting position complies with the following safety warnings:

Warning **Safe radio mounting!**

- **Mount the radio securely so that it will not break loose in the event of a collision. An unsecured radio is dangerous to the vehicle occupants.**
- **Mount the radio and the microphone where they will not interfere with the deployment of airbags, the vehicle operator controls, the vehicle operator's view.**

Caution The bottom surface of the radio and the heatsink fins can become hot during prolonged operation. When installing the radio, position the radio so that it is not possible for the radio user to touch the bottom surface of the radio and the heatsink fins.

Gap Between Radio Body and Mounting Surface

Notice It may be necessary to mount the radio upside down to maintain a gap of more than 3/8 inch (10 mm) between the bottom surface of the radio body and the mounting surface.

Inspect the vehicle and determine the safest and most convenient position for mounting the radio. Make sure that there is sufficient clearance behind the radio for the heatsink and cables.

IP54 Protection Class Considerations

The radio fulfils the requirements of the IP54 protection class.

Notice However, do not mount the radio in areas where it can be temporarily submerged from an accumulation of water or other liquids (e.g. when using a high-pressure cleaning device).

The IP54 protection class does not apply when:

- the control head is removed from the radio body
- the bungs are removed from the auxiliary connector or the cavity for the external options connector (fitting an auxiliary connector or external options connector will not restore the IP54 protection class)
- the programming connector cover seal is not installed (blank control head)
- the RJ45 connector bungs are not installed (RJ45 control head)
- the grommet of the microphone or hand-held control head is not installed
- an accessory is added which is not rated to IP54 (e.g. control-head interface box or hand-held control head remote interface box)

3.3 Mounting the U-Bracket

The U-bracket can be used to install the radio on the dashboard or on any sufficiently flat surface (e.g. cabin floor or trunk). The U-bracket can be mounted using the self-drilling screws and washers provided in the installation kit, or nuts and bolts (not included).

Caution Although an industrial-strength recloseable fastening system can be used to support the installation, for safety reasons Tait does not recommend this as a mounting option.

Notice When mounting the radio on a surface, check whether the mounting screws will screw into material providing sufficient strength. Reinforce the mounting surface, if required.

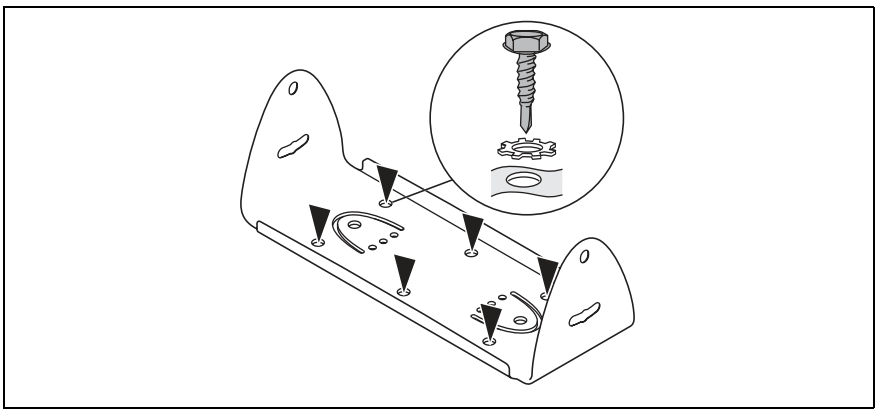
1. If the U-bracket is being mounted over a curved surface, bend the tabs at the bottom of the U-bracket slightly to match the surface shape.
2. Hold the U-bracket in the position chosen for the radio and use the mounting holes as a template to mark the mounting locations. Use at least four screws to install the U-bracket.

The screws provided are self-drilling. For more precise positioning, pre-drill ∅1/8 inch (3 mm) pilot holes for self-drilling screws. Reduce the hole size in metal that is less than 1/32 inch (1 mm) thick.

Notice Ensure that drilling at the selected points will not damage existing wiring.

3. Drill any holes required for cables and install suitable grommets or bushings in the holes.
4. Screw the U-bracket in the chosen mounting position using the self-drilling screws and washers provided. When tightening the screws, ensure that this does not distort the U-bracket.

Figure 3.3 Mounting the U-bracket



3.4 Installing the Antenna

This section provides information on installing an external antenna within the RF exposure limits.

Install the external antenna according to the antenna manufacturer's instructions. Good quality 50 Ω coaxial cable must be used, such as RG58 or UR76.

Notice Route the cable in a manner that minimizes:

- coupling into the electronic control systems of the vehicle
- coupling of electric vehicle systems, such as alternators, into the radio

Avoid sharp bends in the cable. These distort the cable and alter its electrical characteristics.

Warning **RF exposure hazard!**
To comply with FCC RF exposure limits, mount the antenna at a location such that no person or persons can come closer than 35 inches (0.9 m) to the antenna.

>25W

For >25 W radios:

- **VHF radios must be installed using an antenna mounted centrally on the vehicle roof, with a gain of 2.15 dBi or 5.15 dBi.**
- **UHF and 800 MHz radios must be installed using an antenna mounted either centrally on the roof with a gain of 2.15 dBi or 5.65 dBi, or centrally mounted on the trunk with a gain of 5.65 dBi.**

25W

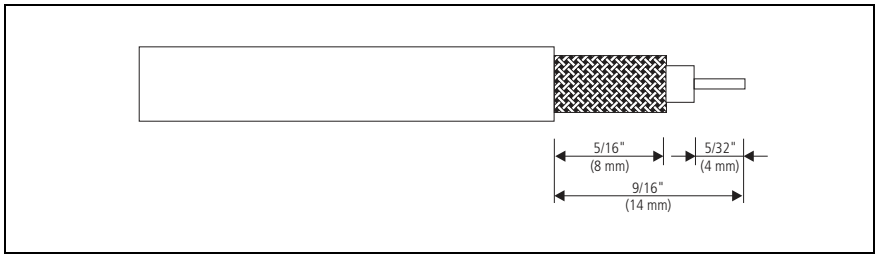
For 25 W radios:

- **The radio must be installed using an externally mounted antenna with a gain of either 2.15 dBi or 5.15 dBi.**

Terminating the Antenna Cable

1. Run the free end of the coaxial cable to the radio's mounting position and cut it to length, allowing approximately 8 inches (200 mm) excess at the radio end.
2. Terminate the free end of the antenna cable with the mini-UHF plug or BNC plug (supplied) as shown in Figure 3.4.

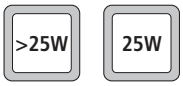
Figure 3.4 Terminating the antenna cable



3.5 Connecting the Power Cable to the Power Source

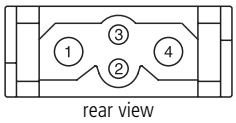
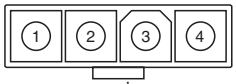
This section provides information on connecting the power cable to the power source.

Power Connector



The power connector is the interface to the vehicle battery and an optional external remote speaker. Connecting a remote speaker is described in "Connecting a Remote Speaker" on page 21.

Table 3.1 Power connector (radio) - pins and signals

Pinout	Pin	Signal name	Description	Signal type
>25W radio  rear view 25W radio  rear view	1	AGND	Earth return for radio body power source	Ground
	2	SPK–	External speaker output. Balanced load configuration	Analog
	3	SPK+	External speaker output. Balanced load configuration	Analog
	4	13V8 BATT	DC power input for radio body and control head	Power

Notice This radio is designed to operate from a nominal 12V negative ground supply and may draw up to 15A of current. The radio will tolerate a supply voltage range of 10.8V to 16.0V at the radio.

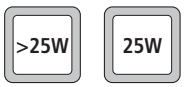
Selecting the Power Source

In passenger vehicles, the radio is always connected directly to the battery using the power cable provided.

Notice Do not connect the radio to the center tap of two 12V batteries! This may result in damage to the radio due to earth loops, in particular when the negative lead is disconnected from the vehicle battery. It may also result in overcharging or undercharging of the batteries, reducing their service life.

In trucks, where direct connection to the battery is often not possible, the radio can be connected to a suitable terminal inside the fuse box that is connected directly to the battery.

24V-to-12V Converter



In vehicles with a supply voltage larger than 16.0V, such as many trucks, it is essential to provide a 24V-to-12V converter with a minimum rating of 15A for radios >25W and 10A for the 25W radio. This will isolate the radio from excessive battery voltage and provide the correct DC operating conditions. Note that most 24V-to-12V converters already fitted are not rated sufficiently.

Standby Current

When connecting the radio to the battery without using the ignition signal as described on page 25, the standby current is approximately 50mA.

When using the ignition signal to turn off the radio, the standby current is reduced to <3mA.

To reduce the standby current from 50mA to <3 mA without using the ignition signal, connect pin 4 (AUX GPI3) and pin 15 (GND) of the auxiliary connector.

Connecting the Power Cable

Notice Although it is possible to connect the radio in line with the vehicle ignition, this is not recommended, as it may draw too much current and damage the vehicle wiring and steering column or ignition switch. This may also cause the supply voltage of the radio to drop below the specified level.

Notice Disconnecting the vehicle's battery may cause problems with some electronic equipment, such as vehicle alarms, engine management systems, and in-vehicle entertainment systems. Check that the vehicle owner has the necessary information to make all electronic equipment function correctly after battery reconnection.

Notice If the battery is not disconnected, exercise extreme caution during the installation and install the fuses only when the installation is ready to be checked. For more information, refer to "Checking the Installation" on page 29.

1. Disconnect the vehicle's battery unless specifically prohibited from doing so by the customer, vehicle manufacturer, agent, or supplier.

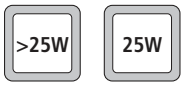
   Notice Route the cable in a manner that minimizes coupling of electric vehicle systems such as alternators into the radio.

   Notice Protect the power cable from engine heat, sharp edges and from being pinched or crushed.

2. Run the power cable between the radio's mounting position and the power source and cut it to length, allowing approximately 8 inches (200 mm) excess at the radio end.

3. Plug the power cable into the power connector of the radio.

Warning **Danger of fire! The radio's protection mechanisms rely on the correct fuses on both the negative and positive power supply leads being present. Failure to fit the correct fuses may result in fire or damage to the radio.**
The correct fuse types are:



- **>25 W radios: 20 A fuses (Tait IPN 265-00010-81)**
- **25 W radios: 10 A fuses (Tait IPN 265-00010-80)**

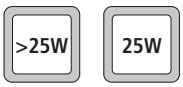
4. Cut the negative and the positive wires where the in-line fuse holders will be placed (as close to the power source as possible).

Notice Do not install the fuses until the installation is ready to be checked. For more information, refer to "Checking the Installation" on page 29.

5. Insert each end of the negative wire into each of the fuse crimp-terminals and crimp them to force the metal contacts onto the wires.
6. Push the two crimp-terminals into the clear plastic fuse cover. Close the cover while the next steps are completed.
7. Repeat steps 5 and 6 for the positive wire.
8. Connect the negative wire to the battery ground terminal.
9. Connect the positive wire to the battery positive terminal.

Notice Do not install the fuses until the installation is ready to be checked. For more information, refer to "Checking the Installation" on page 29.

3.6 Connecting a Remote Speaker



If a high-power remote speaker is required, Tait recommends using:

- TMAA10-06 high-power remote speaker for >25 W radios
- TMAA10-03 high-power remote speaker for 25 W radios

The remote speaker is installed in parallel with the radio's existing internal speaker. It can 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.

If a different speaker is used, receptacles for the speaker pins of the power connector are provided with the installation kit.

- Connect the speaker to pins 2 (SPK–) and 3 (SPK+) of the power connector described on page 19.

For more information, refer to the installation instructions provided with the speaker, or to the relevant section of the service manual.

3.7 Connecting to the Auxiliary Connector (Ignition Signal, Emergency Switch, External Alert Devices)

The auxiliary connector can be used to connect external devices and signals that are typically connected to a radio. These devices and signals include:

- the ignition signal to power up and power down the radio
- an emergency switch to power up the radio (if required) and then enter emergency mode
- external alert devices

Auxiliary Connector

The radio's auxiliary connector is a 15-way standard-density D-range socket.

The space for a mating plug is limited to 1 5/8 inch (41 mm) in width and 11/16 inch (18 mm) in height. Although most plugs will fit this space, it is recommended that you test the plug to be used before manufacturing a cable.

Some input levels of the auxiliary connector depend on how the internal hardware links are fitted (refer to Table 3.3). For more information on hardware links refer to "Hardware Links and Power-Sense Options" on page 24.

Table 3.2 Auxiliary connector (radio) - pins and signals

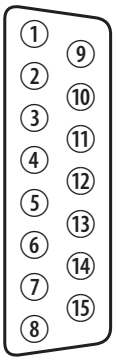
Pinout	Pin	Signal name	Description	Signal type
 rear view	12	AUX GPI1	General purpose digital input. Programmable function	Digital, 3.3V CMOS.
	5	AUX GPI2		
	4	AUX GPI3	General purpose input (ignition sense)	3.3V levels. Protected for +13.8V (refer to Table 3.3).
	10	AUX GPIO4	Programmable function and direction Pads available to fit a higher power driver transistor on GPIO4 line	Digital, 3.3V CMOS input; open collector output with pullup
	2	AUX GPIO5		
	9	AUX GPIO6		
	1	AUX GPIO7		
	11	AUX TXD	Asynchronous serial port - Transmit data	Digital, 3.3V CMOS
	3	AUX RXD	Asynchronous serial port - Receive data	Digital, 3.3V CMOS
	7	AUD TAP IN	Programmable tap point into the Rx or Tx audio chain. DC-coupled	Analog
	13	AUD TAP OUT	Programmable tap point out of the Rx or Tx audio chain. DC-coupled	Analog
	14	AUX MIC AUD	Auxiliary microphone input. Electret microphone biasing provided. Dynamic microphones are not supported	Analog
	6	RSSI	Analog RSSI output	Analog
	8	+13V8 SW	Switched 13.8V supply. Supply is switched off when radio body is switched off	Power
	15	AGND	Analog ground	Ground

Table 3.3 Auxiliary connector - input levels

Parameter	Voltage[1]			Test method and conditions	Comments
	min.	max.	units		
Input low level:					
All inputs		0.7	V	No hardware links fitted[2].	Includes AUX_GPI3 with LK1/2 fitted.
AUX_GPI2		V_S–4	V	LK3 fitted.	Configured as emergency power sense input.
Input high level:					
All inputs	1.7		V	No hardware links fitted[2].	
AUX_GPI2	V_S–1.5		V	LK3 fitted.	Configured as emergency power sense input.
AUX_GPI3	2.6		V	LK1 and/or 2 fitted.	Configured as power sense input.
Safe DC input limits:					
AUX_GPI1-3	–0.5	V_S+0.5	V		The input current must not exceed ±50mA. This is the rating of the clamping diodes.
AUX_GPIO4-7	–0.5	V_S+0.5	V		
AUX_RXD	–25V	V_S+0.5	V		
AUX_TXD[3]	–10	V_S+0.5	V		

1. The radio will tolerate a supply voltage range of 10.8V to 16.0V at the radio.
2. For more information on hardware links refer to Table 3.4 on page 24 and to the service manual.
3. This output is protected against accidental input to the limits specified.

Hardware Links and Power-Sense Options

The radio provides four hardware links (LK1 to LK4) on the top-side of the main board which can be configured to attain different power-sense options.

Table 3.4 shows the configuration of the hardware links LK1, LK2 and LK4 for the individual power-sense options. It also lists the dependence of the power-sense options with respect to the GPI lines, which can or cannot be used.

Hardware link LK3 is used for 'emergency power sense'.

Table 3.4 Configuration of hardware links for power-sense options

Power-sense option	Links required	Configuration of remaining links and use of AUX GPI3 and IOP GPIO7	Voltages required
13.8V battery power sense	LK1 in LK4 out	LK2 in: AUX GPI3 must be left floating. LK2 out: AUX GPI3 can be used as GPI[1]. IOP GPIO7 can be used as GPIO.	10.8V≤ supply≤16V
auxiliary power sense (ignition sense)	LK2 in LK4 out	LK1 in: Input line must sink >1mA from AUX GPI3 (which is pulled to 13.8V by a 33kΩ resistor). The impedance between the vehicle ignition signal and ground must be ≤1kΩ. LK1 out: Input line must be active high[2]. IOP GPIO7 can be used as GPIO.	AUX GPI3≤0.7V off AUX GPI3≥2.6V high (active) ignition-sense tolerant to 3.3V, 5V and 12V
internal power sense	LK1 out LK2 out LK4 in	 AUX GPI3 can be used as GPI. With LK4 in, the input line must be active high[3].	IOP GPIO7≤0.7V off IOP GPIO7≥2.6V high (active) ignition-sense tolerant to 3.3V and 5V only
no power sense	LK1 out LK2 out LK4 out	 AUX GPI3 can be used as GPI. IOP GPIO7 can be used as GPIO.	10.8V≤ supply≤16V

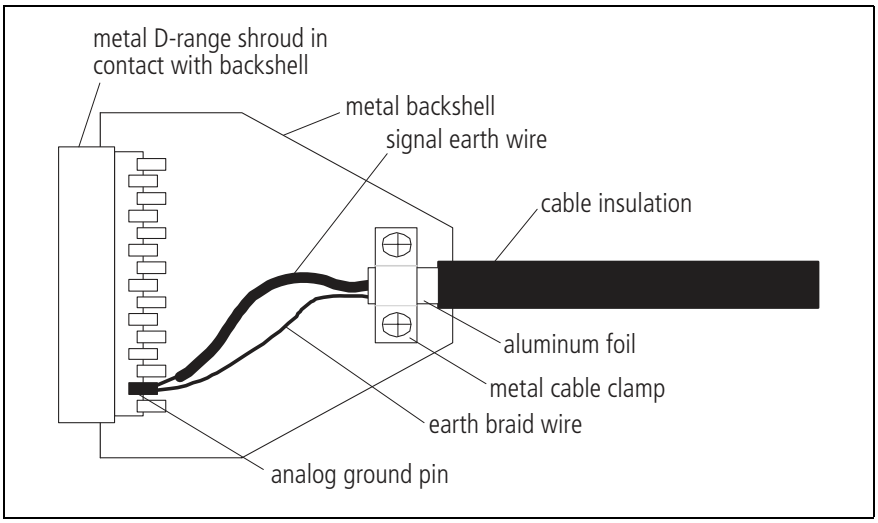
1. If LK2 is out and AUX GPIO is not used, R775 (33kΩ) should be placed to ensure that AUX GPI3 does not float (R775 is not placed by factory default).
2. If LK1 is out and R775 is placed, AUX GPI3 should be driven low as well.
3. If LK 4 is in and R723 is placed, IOP GPIO7 should be driven low as well. (R723 is placed by factory default.)

For more information on hardware links and power-sense options refer to the service manual.

Shielding

If the auxiliary cable is longer than 4 feet (1 m) it is recommended that the cable and connector backshell are shielded. Figure 3.5 shows the recommended shielding arrangement. The earth braid wire (bare copper) and aluminum foil should only be earthed at the radio end of the cable.

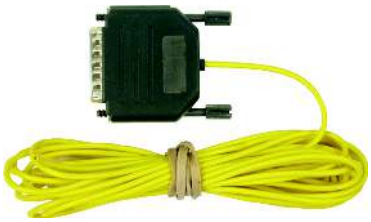
Figure 3.5 Auxiliary cable and connector shielding



Ignition Signal

The ignition signal can be used to power up and power down the radio. This will turn the radio off when the ignition key is off to avoid flattening the battery, and will turn the radio on or return to its previous state (as programmed) when the ignition key is on.

A TMAA04-05 ignition sense kit is available. The kit comprises a mating plug for the radio's auxiliary connector and a 13 foot (4 m) length of cable to connect to the vehicle's ignition signal. Refer to the installation instructions supplied in the kit for full details.



Notice The AUX GPI3 line **must** be programmed to 'Power Sense (Ignition)' and active to 'High'. For more information, refer to the online help of the programming application.

- Connect the ignition signal to pin 4 (AUX GPI3) of the auxiliary connector.

Notice The logic thresholds for AUX GPI3 are based on 3V3 levels. However, AUX GPI3 can be connected directly to a +13.8 V ignition signal (for input levels, refer to Table 3.3 on page 23).

Emergency Switch

The radio allows for connection of an emergency switch to any input line to enter the emergency mode. If connected to the AUX GPI2 input line, the radio can also use 'emergency power sense' to power up the radio to enter the emergency mode.

The selected input line must be programmed to 'Enter Emergency Mode' and active to 'Low'. To use 'emergency power sense', hardware link LK3 must be fitted (factory default), and AUX GPI2 must be used. For more information, refer to "Hardware Links and Power-Sense Options" on page 24, the service manual and the online help of the programming application.

- Connect a normally open switch between the pin of the input line (pin 5 for AUX GPI2) and pin 15 (AGND) of the auxiliary connector.

External Alert Device

The radio allows for output to external alert devices using the digital GPIO lines of the auxiliary connector and the internal options connector.

AUX GPIO4 can be fitted with a power MOSFET (Q707) to directly connect external alert devices (e.g. flashing light, buzzer, horn relay) to the radio. Also, resistor R768 must be removed.

> **Notice** While the MOSFET is rated at 12 A (with heat sink), the maximum allowable current of the connector and radio's earthing system is 2 A. Therefore, a horn must not be connected directly to the radio. A horn relay must be used.

The selected output line must be programmed to 'External Alert 1 or 2', active to 'Low', and signal state to 'Momentary'.

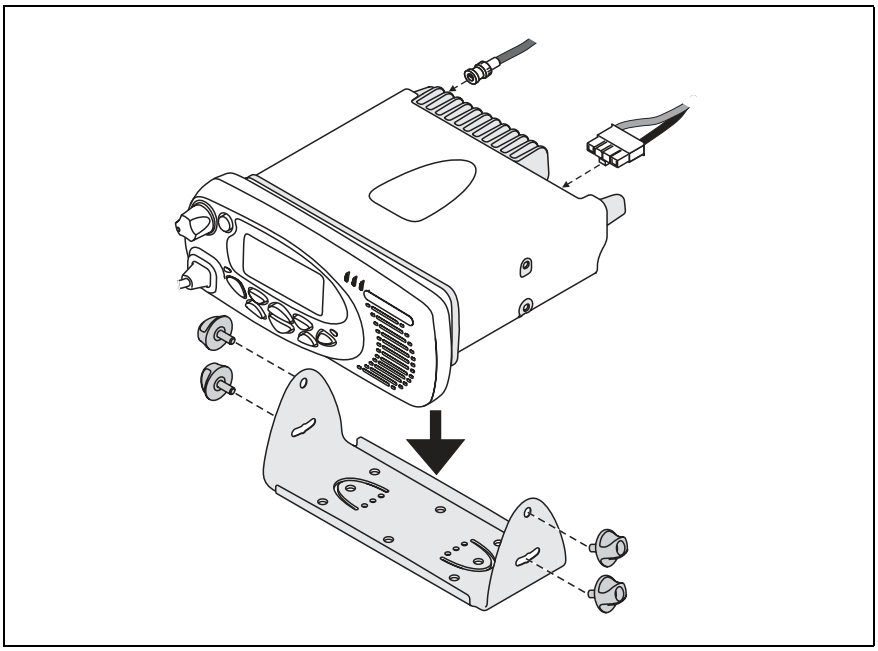
- Connect the external alert device to the pin of the output line (pin 10 for AUX GPIO4) and pin 8 (+13V8 SW) of the auxiliary connector (or a different positive battery connection).

This means that the negative side of the alert device must be connected to AUX GPIO4 and the positive side to pin 8 (+13V8 SW). The external alert device must be capable of accepting a voltage of between 10 V and 18 V.

3.8 Installing the Radio

1. Connect the antenna cable, power cable, and (if applicable) the auxiliary cable to the rear of the radio.
2. Position the radio 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 provided, but without fully tightening the screws.
4. Adjust the position of the radio in the U-bracket for the best viewing angle, then tighten the thumb screws.

Figure 3.6 Installing the radio in the U-bracket



3.9 Installing the Microphone

This section describes the radio's microphone connector and the information required to connect the microphone and install the microphone clip.

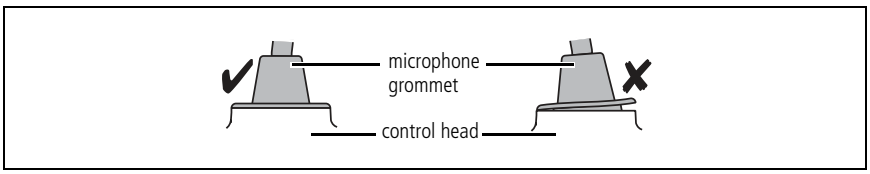
Notice The microphone grommet must be installed whenever the microphone is plugged into the microphone socket:

- 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

Connecting the Microphone

1. Plug the microphone into the microphone socket.
2. Slide the 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 3.7 Correct remote cable grommet seating



Installing the Microphone Clip

Warning **Safe radio mounting! Mount the microphone where it will not interfere with:**

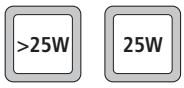
- **the deployment of passenger airbags**
- **the vehicle operator controls**
- **the vehicle operator's view**

Notice Only install the microphone clip provided. If a non-standard microphone clip is used, the correct operation of the microphone hook-switch cannot be guaranteed.

Install the microphone clip in the most convenient location using the screws provided. The microphone must be within reach of the user but in such a position that the PTT (press-to-talk) key cannot be inadvertently activated or jammed.

3.10 Checking the Installation

Warning **Danger of fire! The radio's protection mechanisms rely on the correct fuses on both the negative and positive power supply leads being present. Failure to fit the correct fuses may result in fire or damage to the radio.**



The >25 W radios use 20 A fuses; the 25 W radios use 10 A fuses. For part numbers of the fuses, refer to "Checking the Equipment for Completeness" on page 11.

1. Insert the fuses into the power leads.
2. Switch on the radio to confirm that it is operational, but do not transmit.
3. Connect an in-line power meter between the radio and the antenna.
4. Transmit and measure the forward and reflected power levels. Less than 4% of the forward power should be reflected. If this is not achieved, check the installation, including the antenna length.
5. Start reducing the length of the antenna in steps of 0.1 inches to 0.2 inches (2 to 5 mm). Measure the power levels at each step.

   Notice Some antennas are pre-tuned and must not be cut. Check with the manufacturers' instructions.

6. Once the reflected power levels are within tolerance, make a call to another party on the radio.

3.11 Blank Control Head

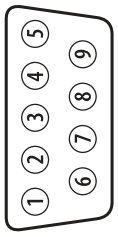
The blank control head on the TM8105 radio has a 9-way D-range plug on the control head for programming (using the TMAA20-02 RJ45 to 9-way D-range adaptor).

Notice When the programming connector is not in use, the connector seal must be installed. This ensures that the control head is sealed against water, dust and other environmental hazards.

Figure 3.8 TM8105 radio with the blank control head

The pin allocations for the programming connector are explained in the following table.

Table 3.5 Programming connector for the blank control head - pins and signals

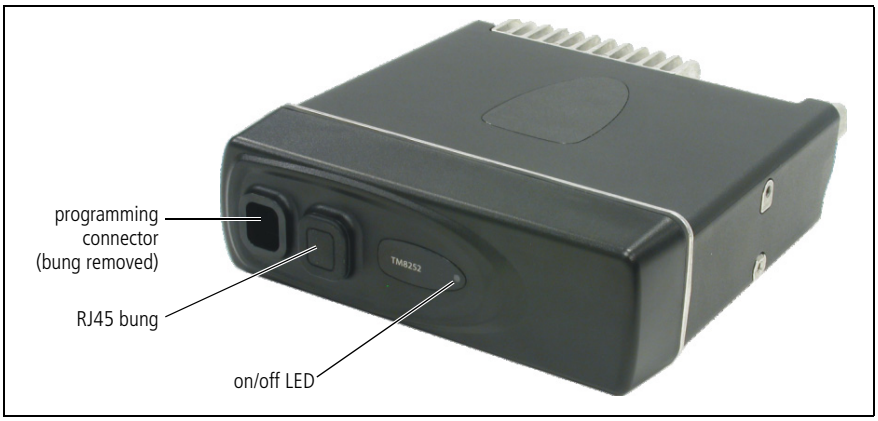
Pinout	Pin	Signal name	Description
 front view	1	RX AUD	Receive audio output (after volume control)
	2	TXD	Asynchronous serial port: transmit data
	3	MIC AUD	Microphone audio input
	4	RXD	Asynchronous serial port: receive data
	5	ON/OFF	Hardware power on/software power off input (active low)
	6	+13.8V	Unswitched 13.8V power supply
	7	PTT	PTT input
	8	AGND	Analogue ground
	9	DGND	Digital ground

3.12 RJ45 Control Head

The RJ45 control head on the TM8252 telemetry radio has one RJ45 socket installed and a cavity where another RJ45 can be installed. The control head also has a power on/off LED.

Notice When a connector is not in use, the RJ45 bung for the connector must be installed. This ensures that the control head is sealed against water, dust and other environmental hazards.

Figure 3.9 TM8252 telemetry radio



The pin allocations for the RJ45 programming connector are explained in the following table.

Table 3.6 Programming connector for the RJ45 control head - pins and signals

Pinout	Pin	Signal name	Description
 front view	1	RX AUD	Receive audio output (after volume control)
	2	+13.8V	Unswitched 13.8V power supply
	3	TXD	Asynchronous serial port: transmit data
	4	PTT	PTT input
	5	MIC AUD	Microphone audio input
	6	AGND	Analogue ground
	7	RXD	Asynchronous serial port: receive data
	8	ON/OFF	Hardware power on/software power off input (active low)

4 Installation Options

This section provides an overview of the accessory kits that are currently available for installing the following components:

- radio body
- remote control head
- dual control heads
- hand-held control head
- dual-radio system
- desktop power supply.

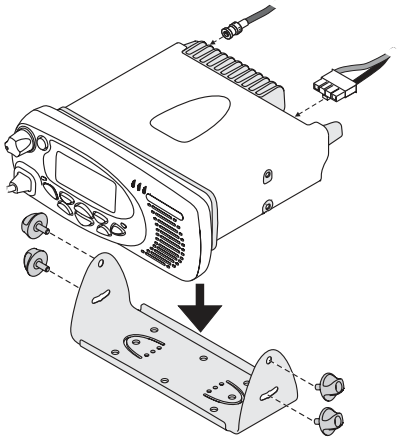
Some installation options may not be suitable for some models of radio. Consult your nearest Tait Dealer or Customer Service Organization for more information.

4.1 Radio Body

U-Bracket

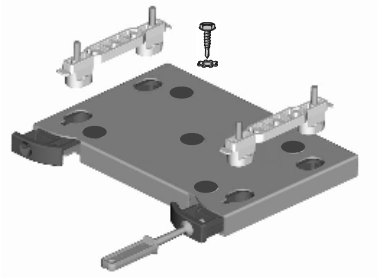
The U-bracket is supplied as standard for mounting a radio fitted with either a local control head or a remote interface (for a remote mounted control head).

For full details on mounting the U-bracket and radio, refer to "Mounting the U-Bracket" on page 17 and "Installing the Radio" on page 27.



Security Bracket

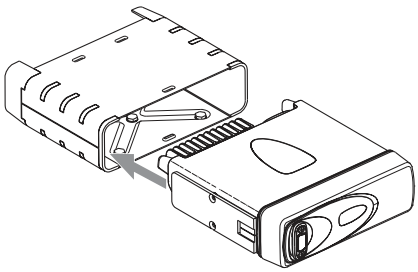
The TMAA03-02 security bracket can be used in place of the standard U-bracket in locations where you want to stop opportunistic removal of the radio by a third party, or where you want to have a quick release setup that allows you to swap over radios (e.g. leasing situation). The security bracket also provides electrical isolation to the radio. Refer to the TMAA03-02 Security Bracket Installation Instructions (402-00014-xx) for full details.



Assembled
(TM8200 shown)

Cradle

The TMAA03-18/TMAA03-39 cradle provides a means of mounting the radio in a wrap-around protective enclosure. The radio slides into the cradle and locks in place. It can only be removed by inserting a plastic key. The cradle is not suitable for >25 W radios or radios with a local graphical-display control head. Refer to the TMAA03-18/TMAA03-39 Cradle Installation Instructions (MMA-00019-xx) for full details.



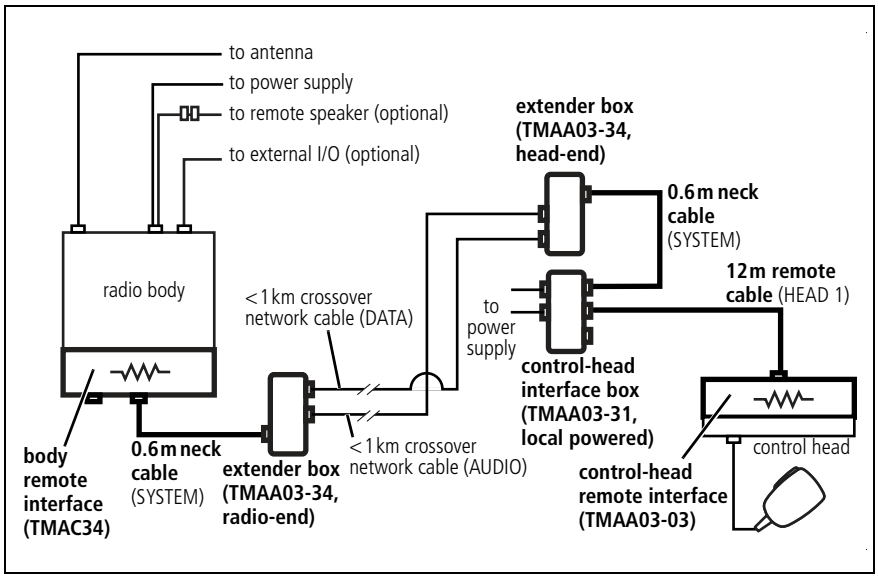
4.2 Remote Control Head

Remote Control Head

A 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 additional parts used for this installation. Refer to the Instructions for Installing a Remote Control Head (402-00020-xx) for full details.

Extended Remote Control Head

An extended remote kit can be used when extended distances are required between a TM8250 or TM8255 radio body and its graphical-display control head. This enables the control head to be installed up to 1 km away from the radio body. The items named or shown in **bold** below are part of the upgrade kit. Refer to the TMAA11-06 Extended Single Head Upgrade Kit Installation Instructions (402-00047-xx) for full details.

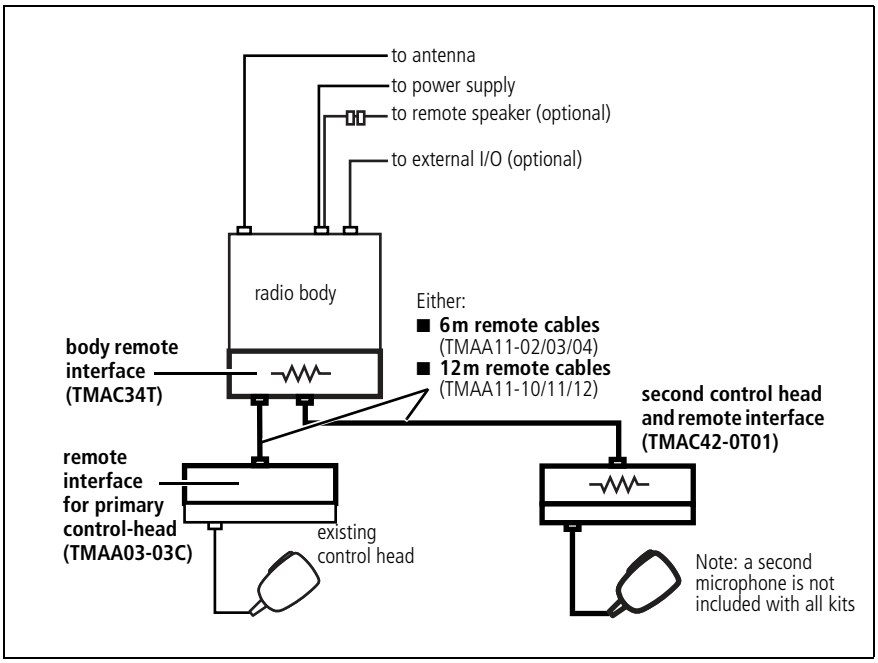


4.3 Dual Control Heads

In a dual-head radio system, elements of the user interface (such as display content, internal speaker audio, and LEDs) are duplicated on both control heads. This enables multiple users to share the same radio.

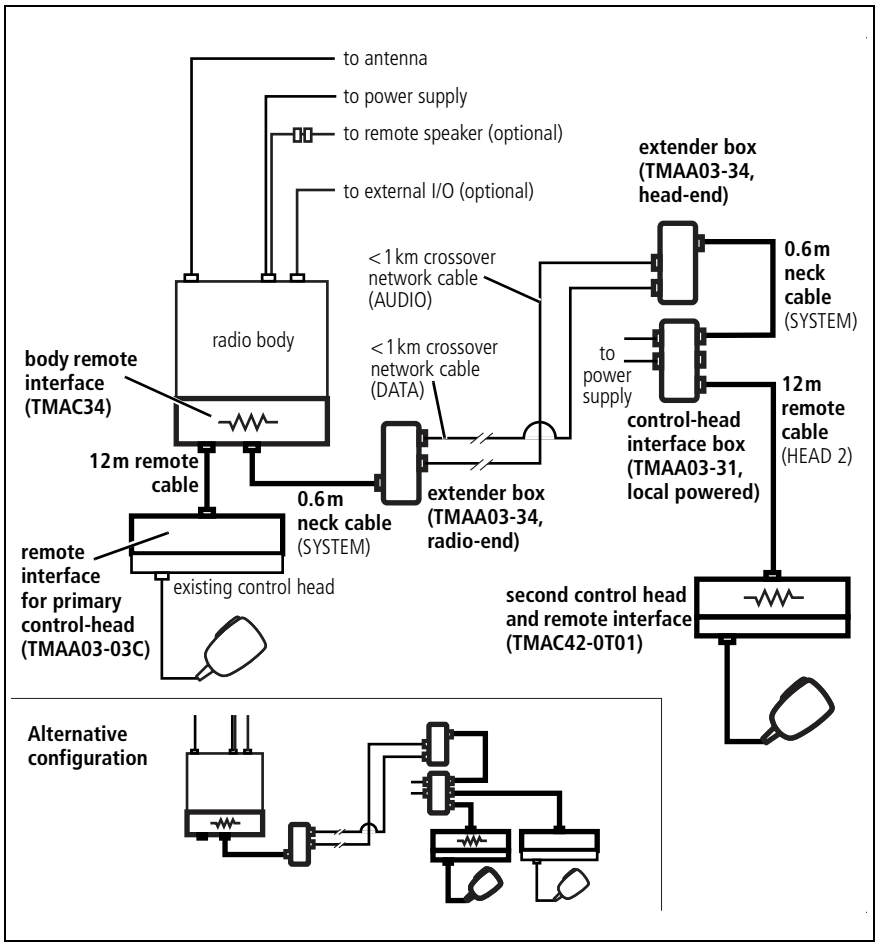
Dual Control Heads

The TMAA11-02/03/04 or TMAA11-10/11/12 upgrade kits can be used to convert a TM8250 or TM8255 mobile radio (single radio body and graphical-display control head) to a dual-head radio system. The following diagram summarizes how the components are installed. Items named or shown in **bold** are part of the upgrade kits. Refer to the TM8200 Dual Head Upgrade Kits Installation Instructions (402-00050-xx) for full details.



Extended Dual Control Heads

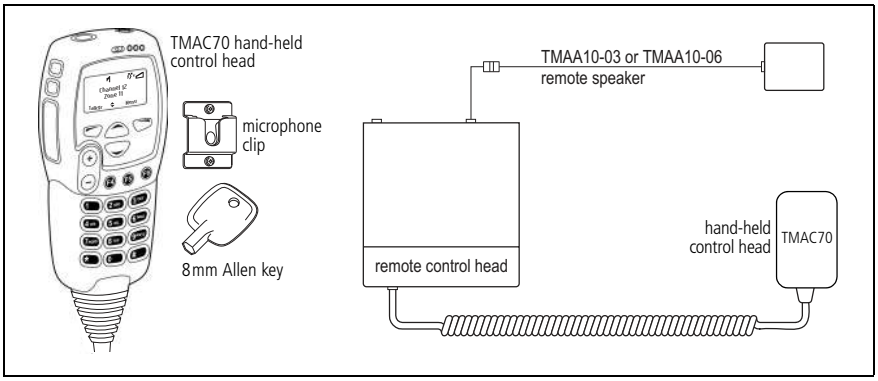
The TMAA11-07 or TMAA11-08 upgrade kits can be used to convert a TM8250 or TM8255 mobile radio (single radio body and graphical-display control head) to a dual-head radio system. The upgrade kits allow one or both control heads to be installed away from the radio body in difficult or isolated locations, up to a maximum of 1 km. The following diagram summarizes how the components are installed. Items named or shown in **bold** are part of the upgrade kits. Refer to the TMAA11-07 and TMAA11-08 Extended Dual Head Upgrade Kits Installation Instructions (402-00052-xx) for full details.



4.4 Hand-Held Control Head

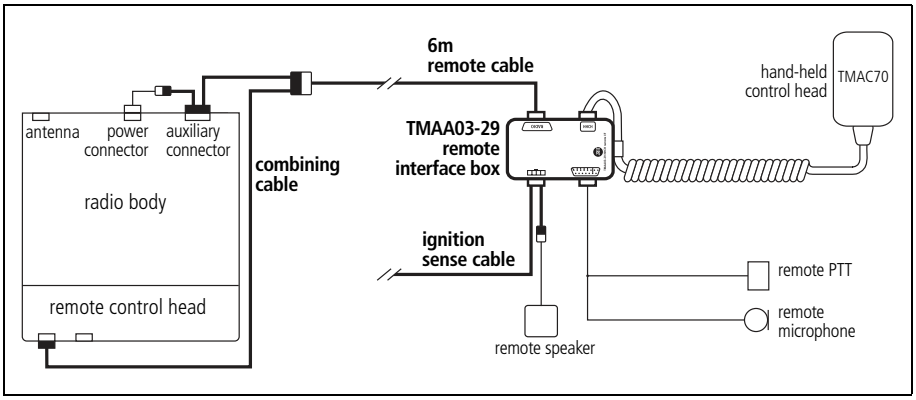
Hand-Held Control Head

The TMAC70 is a hand-held control head for mobile radios that enables the user to operate the radio at a distance from the radio body. The hand-held control head plugs into one of the RJ45 sockets on the appropriate remote control head. A remote speaker is required when a hand-held control head is installed. Refer to the TMAC70 Hand-Held Control Head Installation Instructions (402-00042-xx) for full details.



Remote Hand-Held Control Head

The TMAA03-32 is an installation kit for remotely mounting the TMAC70 hand-held control head. The following diagram summarizes how the components are installed. The items named or shown in **bold** below are part of the kit. Refer to the TMAA03-32 Hand-Held Control Head Remote Interface Kit Installation Instructions (402-00044-xx) for full details.



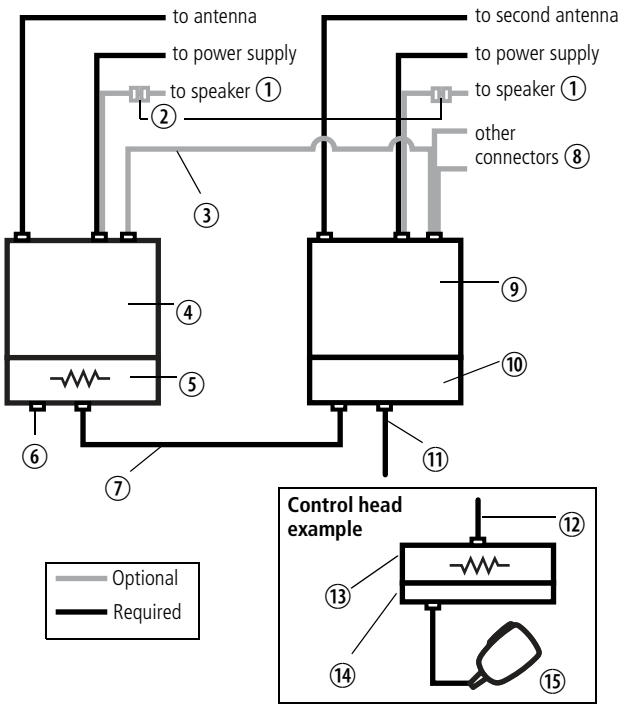
Hand-Held Control Head Extension

The TMAA04-14/15/16/17 kits can be used to extend the distance between a hand-held control head and the radio body or remote interface box by between 5ft (1.5m) and 30ft (9.2m), depending on the kit. A housing unit and gasket enclose the extension cable socket, and provide additional strain relief and some protection from water and dust ingress. Refer to the TMAA04-14/15/16/17 Hand-Held Control Head Extension Kits Installation Instructions (402-00067-xx) for full details.

4.5 Dual-Radio System

Dual Radio Bodies

In a dual-radio system one control head is connected to two radio bodies. A dual-radio system can operate as a crossband repeater, where transmissions received on one radio can automatically be transmitted on the other. It can also allow the user to receive and transmit simultaneously on two separate frequency bands without the need for manual switching. The following diagram summarizes how the components are installed. The items shown in **bold** are part of a typical dual-radio system. Other equipment listed may need to be obtained or ordered separately. Refer to the TM8260 Mobile Installation and Programming Guide (MMA-00041-xx) for full details.



① external speaker

② flying lead connector

③ cross-band linking, GPS, and external interface cable

④ radio body

⑤ body remote interface

⑥ grommet

⑦ radio connecting cable

⑧ other connectors from cross-band cable, for example, to GPS antenna/receiver, external alert device, ignition signal

⑨ radio body

⑩ body remote interface with link J4 removed

⑪ to control head, such as graphical-display (see example) or hand-held

Control head example:

⑫ control head remote cable

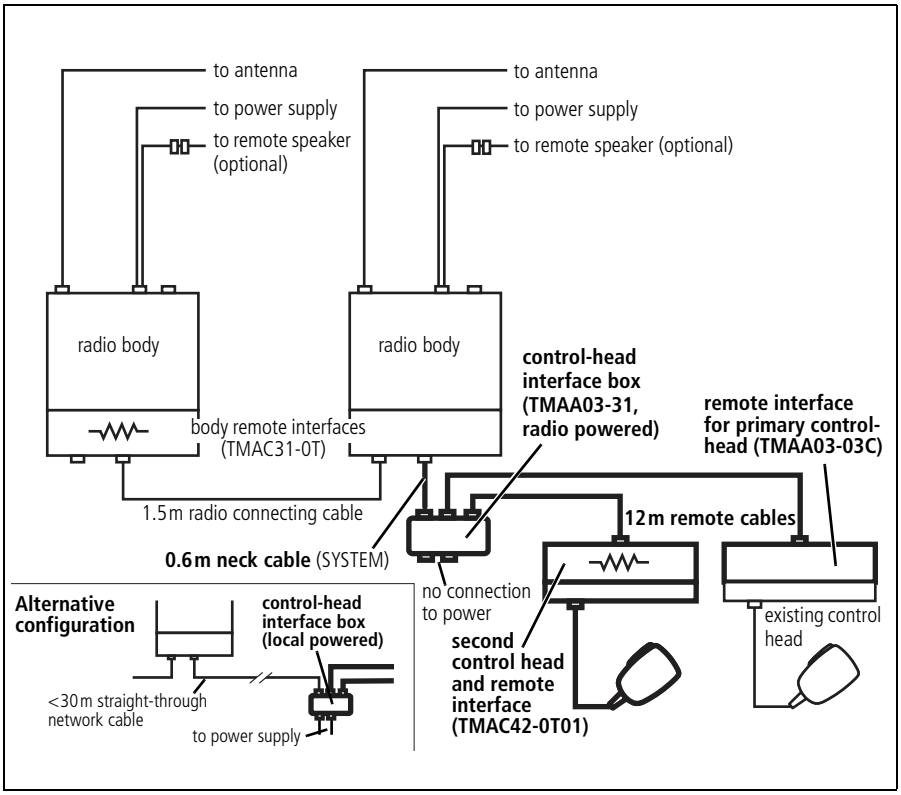
⑬ control head remote interface

⑭ graphical-display control head

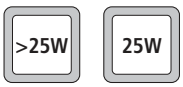
⑮ supported microphone

Dual Control Heads

The TMAA11-09 upgrade kit can be used to convert a TM8260 dual-body mobile radio to a TM8260 dual-body dual-head radio system. The following diagram summarizes how the components are installed. Items named or shown in **bold** are part of the upgrade kit. Refer to the TMAA11-09 TM8260 Dual Head Upgrade Kit Installation Instructions (402-00043-xx) for full details.



4.6 Desktop Power Supply

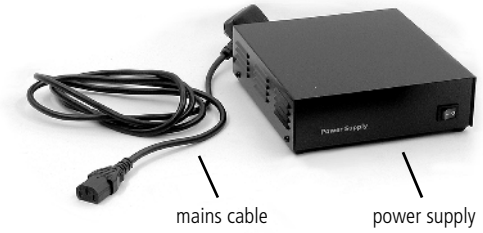


The TMAA13 power supply enables you to use a TM8000 mobile radio as a desktop radio. The TMAA13 operates on an input voltage of 100–130 VAC or 200–250 VAC, depending on the model, and can be used with both >25 W (high power) and 25 W (standard power) radios. The mobile radio can be installed at a distance from the power supply, or it can be mounted on top of the power supply using a plinth or U-bracket. The following diagram shows the components included in each kit. Refer to the TMAA13 Power Supplies User's Guide (MMZ-00002-xx) for full details.

Notice Radios fitted with a graphical control head do not fit the U-bracket and must use the plinth.

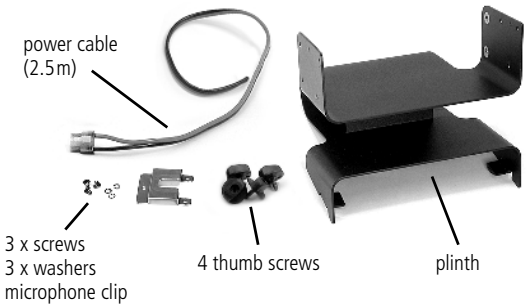
Power Supply Kit

TMAA13



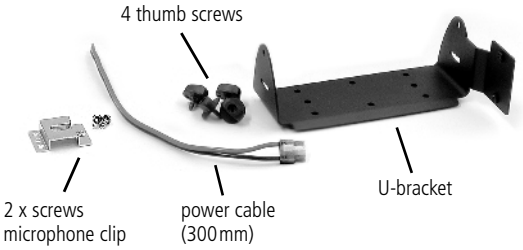
Plinth Kit

TMAA03-12: >25W radios
TMAA03-09: 25W radios



U-bracket Kit

TMAA03-13: >25W radios
TMAA03-06: 25W radios



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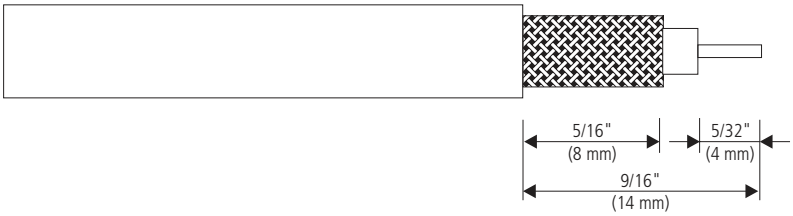
Cable Connections

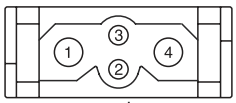
Terminating the Antenna Cable



For more information, refer to "Installing the Antenna" on page 18.

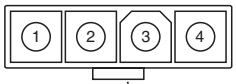
Power and Remote Speaker Connections

>25W radio



rear view

25W radio

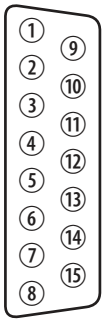


rear view

Pin	Signal	Function
1	AGND	Earth return
2	SPK–	External speaker –
3	SPK+	External speaker +
4	+13V8 BATT	DC power input (10.8V to 16.0V)

For more information, refer to "Connecting the Power Cable to the Power Source" and "Connecting a Remote Speaker" on page 21.

Ignition Sense, Emergency Switch, and External Alert Device Connections



rear view

Pin	Signal	Function
4	AUX GPI3	Ignition sense
5	AUX GPI2	Emergency switch +
8	+13V8 SW	External alert device +
10	AUX GPIO4	External alert device –
15	AGND	Emergency switch –

For more information, refer to "Connecting to the Auxiliary Connector (Ignition Signal, Emergency Switch, External Alert Devices)" on page 22.