TM8260 mobile

Installation and Programming Guide

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Contents

Preface

Scope of Manual

This manual describes the installation and programming of TM8260 dual mobile radio systems. A dual radio system is where one control head is connected to two radio bodies.

The installation of accessories is described in the installation instructions provided with the equipment, and the relevant section in the service manual.

Associated Documentation

TM8260 User's Guide (MMA-00040-xx)

TM8200 Programming Application Online Help

TM8100/TM8200 Service Manual (MMA-00005-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 TM8200 product documentation is provided on the CD supplied with the service kit[1]. Updates may also be published on the Tait support website.

Document Conventions

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 procedures are performed correctly.

1. Technical notes are only available in PDF format from the Tait support website. Consult your nearest Tait Dealer or regional office for more information.

Within this manual, the following symbols are used to highlight differences between the 40 W/50 W and the 25 W radios:

This symbol highlights information that is relevant to 40 W/50 W radios.

This symbol highlights information that is relevant to 25 W radios.

Safety Warnings

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

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

RF Exposure Hazard

To comply with FCC RF exposure limits:

For 40 W/50 W radio bodies:

- 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 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 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.

In all cases, an 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.

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 radios 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 bodies vertically, with the remote interface facing down. This will violate compliance with the standards UL/CSA/EN 60950, Safety of Information Technology Equipment.

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.

Preparation when Drilling Holes

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

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.

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.

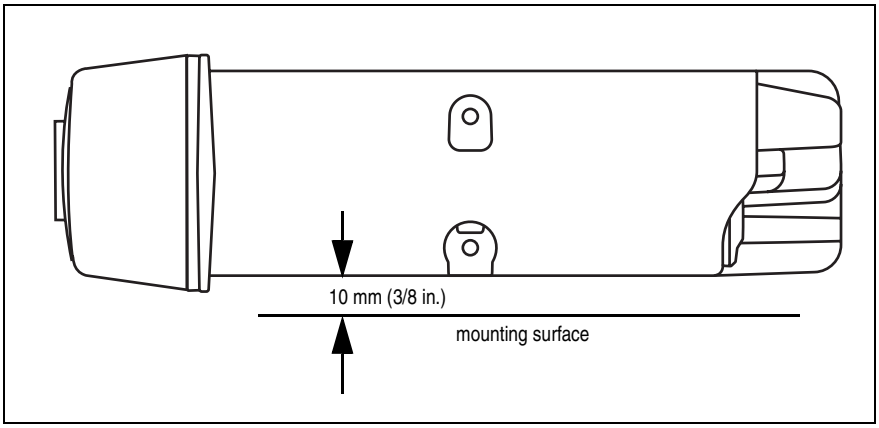
Non-standard Radio Installations

The installation U-bracket has been designed so that there is enough airflow around the radio body 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 10 mm (3/8 inch) between the bottom surface of the radio chassis and the mounting surface. This is illustrated in Figure A.

Figure A Gap between radio chassis and mounting surface



Negative Earth Supply

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

1 Preparing the Installation

This section contains the following information:

- Regulations
- Installation Tools
- Unpacking and Checking the Equipment for Completeness
- Installation Considerations
- Installation Overview.

1.1 Regulations

MPT 1362 Code of Practice

TM8260 mobile radio systems should be installed in accordance with the MPT 1362 Code of Practice.

Vehicle Manufacturer's Installation Instructions

Follow your vehicle manufacturer's instructions for installing mobile radios. For more information, refer to the vehicle manufacturer's website or contact the vehicle manufacturer's dealer.

1.2 Installation Tools

The following tools are required to install the radio system:

- drill and drill bits
- 5mm (3/16 inch) flat-bladed screwdriver
- Torx T-10 screwdriver
- Torx T-20 screwdriver
- Pozidriv screwdriver
- 8 mm (5/16 inch) socket
- wire cutters/strippers
- RF connector crimp tool
- fuse crimp tool
- in-line RF power meter capable of measuring forward and reflected power at the operating frequency of each radio.

1.3 Unpacking and Checking the Equipment for Completeness

To install a dual-radio system (two radio bodies connected to one control head), you require the following equipment.

- 2 x TM8260 radio bodies (for example, TMAB22-B100B and TMAB22-H600B). The firmware of the radio bodies must be the same (see "Required Programming Application and Firmware Versions" on page 31). Each body must also have the SFE (software feature enabling) key for Multi-Body Support (TMAS016).

- 2 x body remote interfaces (TMAC31-0T), with hardware subassembly XMAC31 revision 002[1] (or later), and PCB 220-01720-05 (or later).

50W 40W 25W

- 2 x installation kits suitable for the radio bodies, for example, the TMAA03-17 installation kit (40 W/50 W radios), or TMAA03-01 installation kit (25 W radios).

Note Installation kits are also available without the U-bracket included and with other antenna connector options. Other cradle mounting arrangements are also available. Consult your nearest Tait Dealer or regional office for more information.

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:**

50W 40W 25W

- **40 W/50 W radios: 20 A fuses (Tait IPN 365-00010-81)**
- **25 W radios: 10 A fuses (Tait IPN 365-00010-80).**

- TM8200 graphical-display control head (TMAC40-0T), with the same firmware version as the radio bodies (see Figure 3.2 on page 31), and hardware subassembly XMAC40 revision 009[1] (or later).
- control head remote kit (TMAA03-03), with hardware subassembly XMAA03-03 revision 003[1] (or later), and PCB 220-01721-04 (or later).
- any supported TM8000 microphone, for example, rugged (TMAA02-01) or keypad (TMAA02-08).
- control head remote cable (TMAA04-01).
- radio connecting cable (TMAA04-03).
- 2 x antennas and antenna coaxial cable.

The following equipment is optional, and may need to be ordered separately.

- 2 x remote speakers (TMAA10-03).
- cross-band linking, GPS, and external interface cable (TMAA04-06).
- components to connect the radio system to an external alert device.
- components to connect the radio system to an ignition signal.
- GPS antenna/receiver (TMAA05-01) with plate mount (TMAA05-03) or magnetic mount (TMAA05-04).

1.4 Installation Considerations

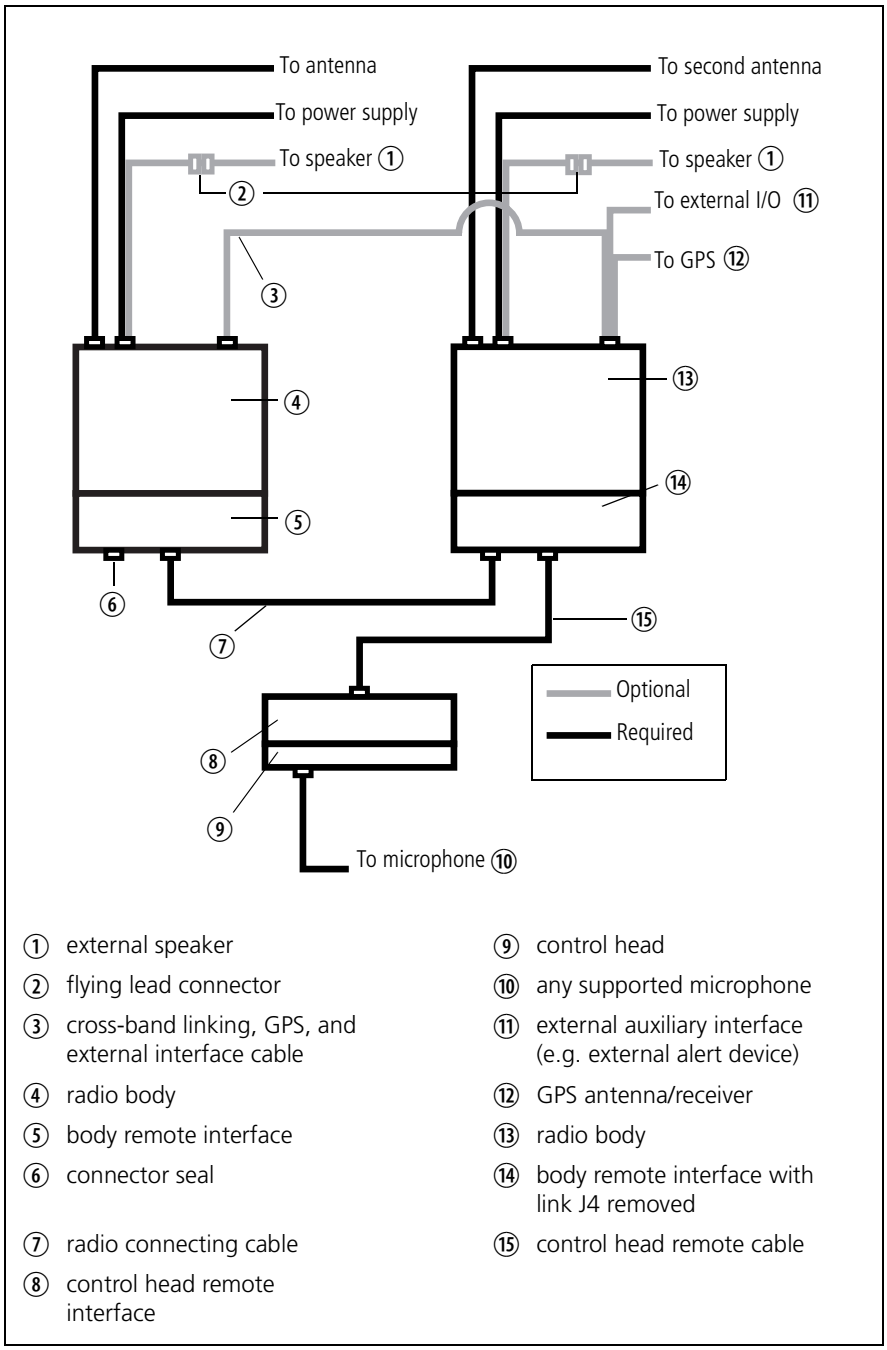
Inspect the vehicle and determine the safest and most convenient position for mounting the radio bodies and control head, and routing the various cables. The radio bodies must be less than 1.5 m (4.9 ft.) apart. The control head must be no further than 6 m (19.6 ft.) from the connecting radio body.

1. For more information on how the hardware subassembly revision number relates to your serial number, contact your regional office or Tait Technical Support (see "Contact Information" on page 2).

1.5 Installation Overview

Figure 1.1 summarizes how the components in a TM8260 dual-radio system are installed. For more detailed instructions, see "Installing a Dual-Radio System" on page 15.

Figure 1.1 TM8260 installation overview



① external speaker
② flying lead connector
③ cross-band linking, GPS, and external interface cable
④ radio body
⑤ body remote interface
⑥ connector seal
⑦ radio connecting cable
⑧ control head remote interface
⑨ control head
⑩ any supported microphone
⑪ external auxiliary interface (e.g. external alert device)
⑫ GPS antenna/receiver
⑬ radio body
⑭ body remote interface with link J4 removed
⑮ control head remote cable

2 Installing a Dual-Radio System

This section contains the following information:

- Installing a Basic Dual-Radio System
- Advanced Dual-Radio Installation
- Checking the Installation.

2.1 Installing a Basic Dual-Radio System

Before you start, make sure you have all the necessary tools and components. See page 11 for more information.

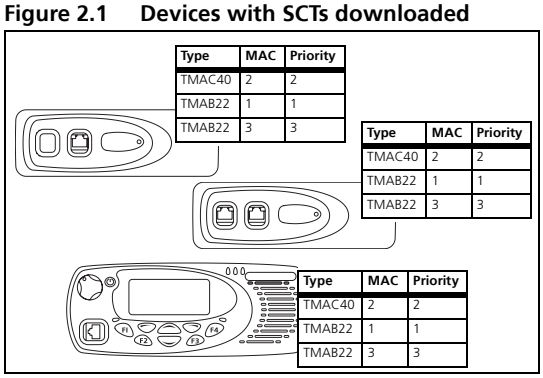
To install a basic dual-radio system:

1. Download MAC addresses to all devices in the system. See "Downloading MAC Addresses" on page 16.
2. Remove link J4 from the radio body interface that will be connected to the control head. See "Removing Link J4" on page 17.
3. Assemble the body interfaces. See "Assembling the Body Interfaces" on page 19.
4. Assemble the control-head interface. See "Assembling the Control Head Interface" on page 20.
5. Mount the control head and radio bodies. See "Mounting the Control Head and Radio Bodies" on page 21.
6. Install the antennas. See "Installing the Antennas" on page 21.
7. Connect the control head and radio bodies. See "Installing the Control Head Remote and Radio Connecting Cables" on page 23.
8. Connect the radios to a power source. See "Connecting the Power Cables to a Power Source" on page 25.
9. Program the radio system. See "Programming a Dual-Radio System" on page 31.

2.1.1 Downloading MAC Addresses

Every device in a dual-radio system must have a system configuration table (SCT) downloaded, with unique MAC (media access control) addresses (Figure 2.1). This enables you to read, program, and upgrade all devices in the radio system via the control head microphone port.

Figure 2.1 Devices with SCTs downloaded



Complete the following steps **before** installing the remote interfaces and assembling and mounting the system.

1. From the Programming Application, click Tools > Multiple Device Configuration.

2. Make sure a table similar to Figure 2.2 is displayed in the dialog.

Note The radio body with the lowest MAC address determines the foreground radio the first time the system is turned on, and each subsequent time if the **Power-up on Last Active Body** check box is cleared in the programming application.

Either:

- click File > **Open**, and open the device configuration file for the system, or
- click Edit > **Add Device** and define the table.

Figure 2.2 Example of a system configuration table

Type	Name	MAC	Priority
Head (TMAC40)	Head	2	2
Body (TMAB22)	VHF Radio	1	1
Body (TMAB22)	UHF Radio	3	3

Important The system configuration table must be downloaded to devices in the order stated within these steps. If not, then the control head may receive the same address as a radio body and you will no longer be able to communicate with all or part of the system.

Important The entire table must be downloaded to each device, not just information about the device that the table is intended for. See Figure 2.1.

Figure 2.3 UHF radio body connected directly to the control head

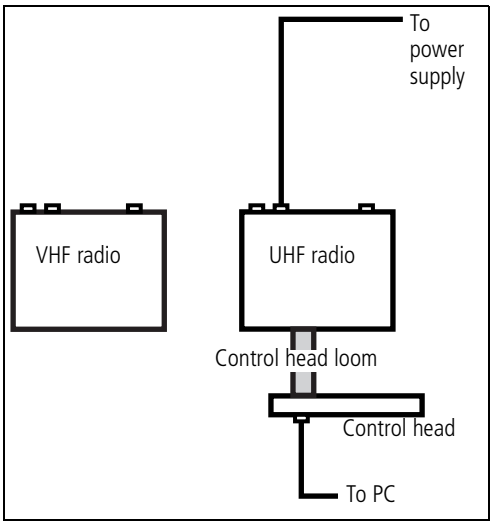
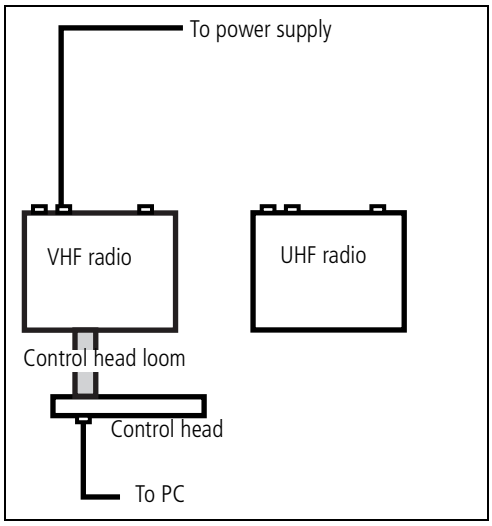


Figure 2.4 VHF radio body connected directly to the control head



3. Connect the control head directly to the radio body that you want to assign with the highest numerical MAC address value (in the example table in Figure 2.2, this is the UHF radio), and apply power. See Figure 2.3.

Important Connect **one** radio body at a time. Do not attempt to download MAC addresses if both radio bodies are connected together and have power applied.

4. Connect the control head microphone port to your PC.
5. Click Radio > **Download MAC Address**, and download the table to device TMAB22 with the higher address.
6. Connect the control head directly to the radio body that will have the lowest numerical MAC address value (in the example table in Figure 2.2, this is the VHF radio), and apply power. See Figure 2.4.
7. Click Radio > **Download MAC Address** again, and download the same table to device TMAB22 with the lower address.
8. Click Radio > **Download MAC Address** a third time, and download the same table to the control head (device TMAC40).
9. Check that all red indicators in the table are now green.

2.1.2 Removing Link J4

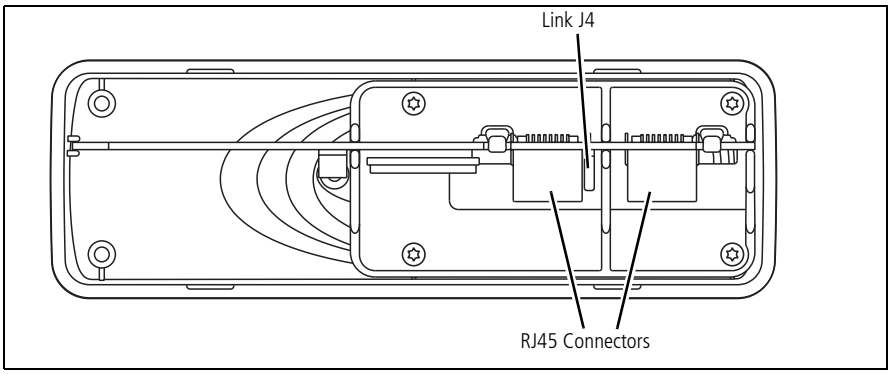
Every body remote interface (TMAC31-0T) is manufactured, by default, with a 120Ω termination resistor across the RS485 signal lines. The control head remote (TMAA03-03) also has this termination.

This termination is required at the ends of an RS485 network. In the case of a TM8260 dual-radio system, the radio body with the two connections (to the control head and to the other radio body) is a node on the network and must not have this termination.

To remove this termination, use your fingernail (or similar) to remove the jumper (shorting link) J4. Link J4 is located between the two RJ45 connectors (see Figure 2.5), and can be removed without removing the PCB.

This must only be removed on the body remote interface connected to the control head (see "Installation Overview" on page 13), and can only be removed when the interface is separate from the radio body. If the interface has already been installed, see "Removing the Body Interface" below.

Figure 2.5 Location of Link J4

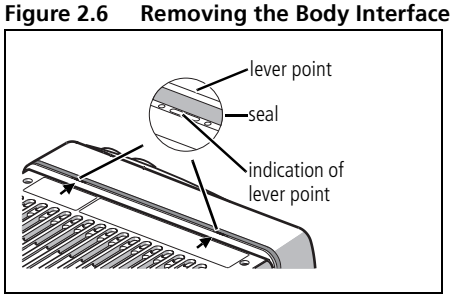


Removing the Body Interface

1. On the underside of the radio, insert a 5mm (3/16in.) flat-bladed screwdriver between the body interface and the seal, in the positions shown (Figure 2.6).

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

Figure 2.6 Removing the Body Interface



Caution **Take care that the seal is not damaged. Damage to this seal reduces environmental protection.**

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

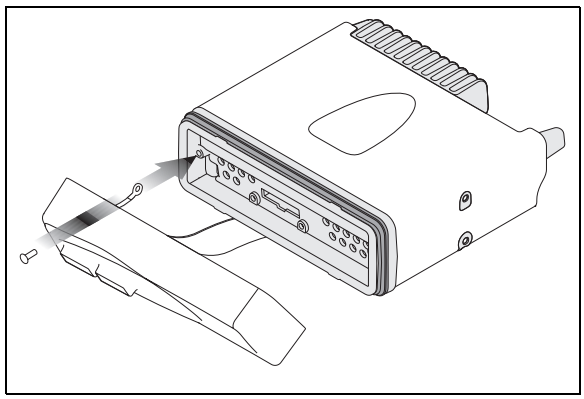
   You should now be able to inspect, and if necessary remove, shorting link J4. It is not necessary to remove the body interface loom or the earthing tag to remove the link.

2.1.3 Assembling the Body Interfaces

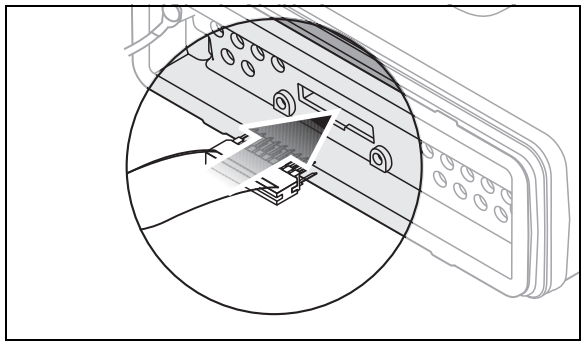
The following steps show how to connect a body remote interface to a radio body. Complete these steps for both radio bodies.

Important One remote interface must have link J4 removed. See "Removing Link J4" on page 17 for more information. After you install the interface with link J4 removed, make sure you can identify that radio body when connecting the cables afterwards.

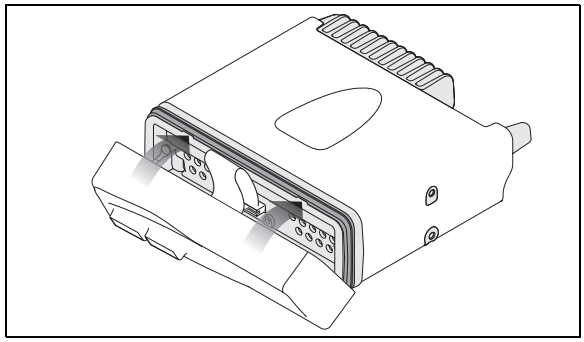
1. Screw the earthing tag onto the left screw boss on the radio chassis, using the Torx T-10 screw provided.



2. Plug the body-interface loom onto the control-head connector.



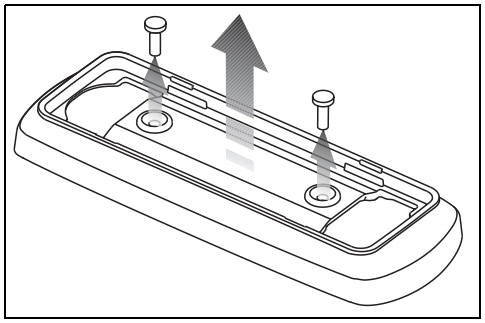
3. Insert the bottom edge of the control head onto the two clips in the front of the radio chassis, then snap into place.



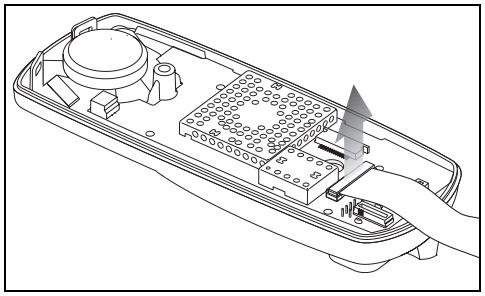
2.1.4 Assembling the Control Head Interface

The following steps show how to connect the control head remote interface to the control head.

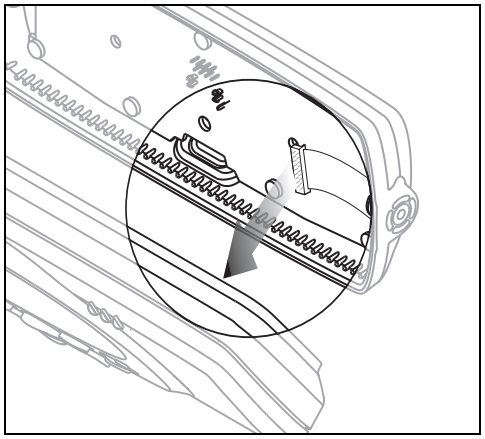
1. Undo the two Torx T-20 screws and remove the adaptor flange.



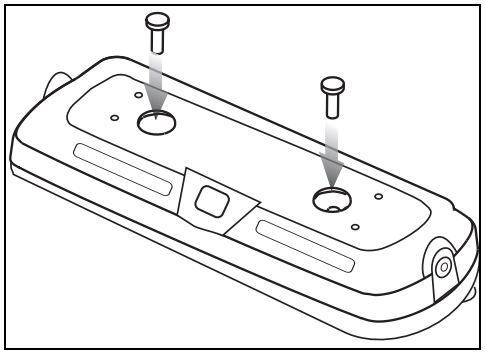
2. Unplug the control-head loom and discard.



3. Plug the control-head interface loom into the connector on the control head.



4. Use the two Torx T-20 screws from the first step to fit the control-head remote interface to the control head. Be careful not to damage the space-frame seal.



2.1.5 Mounting the Control Head and Radio Bodies

Use the bracket and screws provided to mount the control head. The control head must be no further than 6m (19.6ft.) from the radio body with link J4 removed.

Mount the two radio bodies less than 1.5 metres (4.9ft.) apart using the preferred mounting method (such as U-brackets, slide-in cradles, or security brackets).

For more information, refer to the instructions included with the cradle or bracket installation kit.

2.1.6 Installing the Antennas

A separate antenna for each radio is recommended, rather than a single antenna configuration (such as a multi-band antenna with a duplexer or splitter). See "Installation Overview" on page 13. Use ground-independent antennas if no suitable ground plane is available.

It is important that the antennas are separated as far as possible from each other to reduce interference. MPT 1362 recommends a separation of at least ¼ wavelength for transmit frequencies below 600 MHz and one wavelength for transmit frequencies above 600MHz. See Table 2.1 below, and "Regulations" on page 11.

If dual-transmit will be used for extended periods of time, the antennas must be separated even further (such as on opposite widths of the vehicle).

Table 2.1 Approximate frequency to wavelength conversion

Band Name	Frequency (MHz)	Wavelength (cm)	1/4 Wavelength (cm)
A4 (lower range)	66	454	114
A4 (upper range)	88	341	85
B1 (lower range)	136	220	55
B1 (upper range)	174	172	43
H6 (lower range)	450	67	17
H6 (upper range)	530	57	14

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

Important Route the cables 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 cables. These distort the cable and alter its electrical characteristics.

Warning!! RF exposure hazard

To comply with FCC RF exposure limits:

1. Mount the antennas at a location such that no person or persons can come closer than 35 inches (0.9 m) to the antenna.

50W 40W

2. For 40 W/50 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 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.

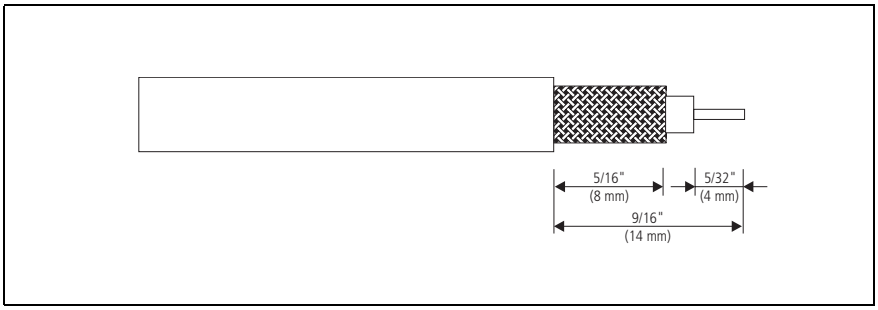
25W

3. 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 one antenna cable (not supplied) from an antenna to the mounting location of the matching radio body. Cut the cable to length, allowing approximately 20 cm (8 in.) 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 2.7.
3. Repeat steps 1 and 2 for the other antenna and matching radio body.

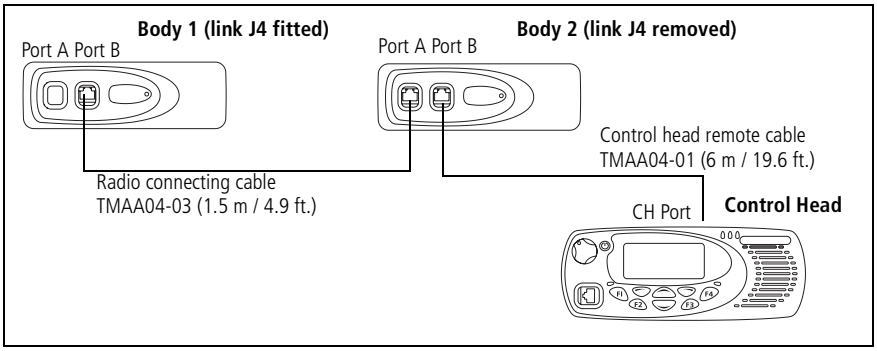
Figure 2.7 Terminating the antenna cable



2.1.7 Installing the Control Head Remote and Radio Connecting Cables

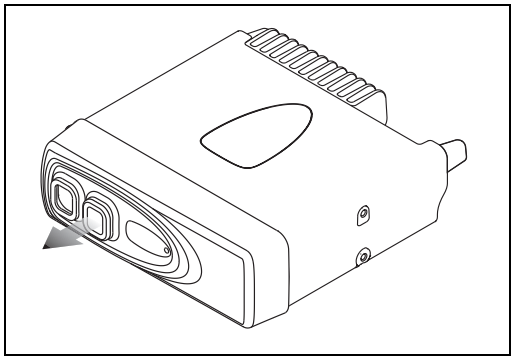
Figure 2.8 contains an overview of the connections between the radio bodies and the control head. For information on the pins and signals of all ports, see "Pins and Signals" on page 24.

Figure 2.8 Overview of connections between radio bodies and control head



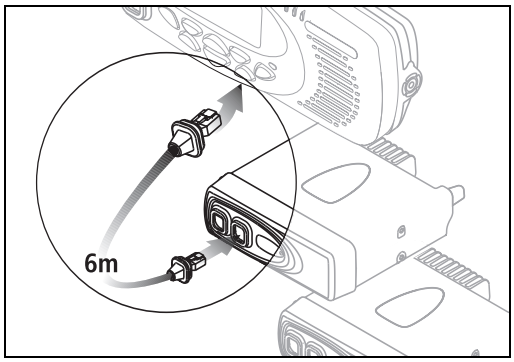
Detailed Steps

1. Remove all connector seals.



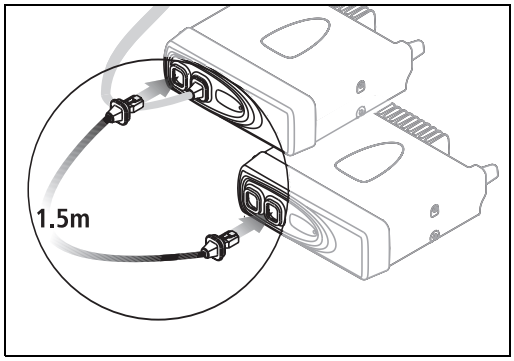
2. Attach one end of the control head remote cable to port B of the radio body with link J4 removed.

3. Attach the other end of the cable to the rear port of the control head.

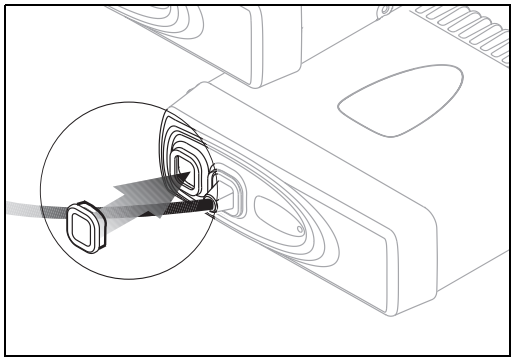


Important If a radio body does not have link J4 removed, or you cannot identify the correct radio body to use, you will need to disassemble one or both interfaces. See "Removing the Body Interface" on page 18 for more information.

4. Attach one end of the radio connecting cable to port A of the body connected to the control head, and the other end to port B of the second body with link J4 fitted.



5. Insert a connector seal in the port with no cable (port A of the body with link J4 fitted).



Pins and Signals

The pinouts in Table 2.2 are for the two RJ45 ports on the radio body interface, and single RJ45 port on the control head interface.

Table 2.2 Remote Interface Ports—Pins and Signals

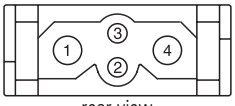
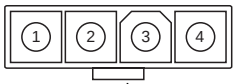
	Pin	Name	Description
 front view	1	RX_AUDIO	Analogue receive audio – after volume control.
	2	13V8	Default setting is a switched +13V8 line.
	3	RS485+	RS485 data.
	4	AGND/PTT	Default setting is analogue ground.
	5	MIC AUDIO	Analogue electret mic input.
	6	RS485	RS485 data.
	7	DGND	Digital ground.
	8	ON/OFF	Radio on/off control.

2.1.8 Connecting the Power Cables to a Power Source

To provide power to TM8260 radio systems, you must connect each radio body separately to a power source or sources. TM8260 radio systems do not currently support a single lead-to-battery connection.

It is important to ensure that both radio bodies have a solid and secure power supply. Unexpected behaviour can arise if the power supply to one body operates at a lower voltage than the other, or is momentarily interrupted, as might occur with a poorly formed or intermittent wiring termination.

Table 2.3 Radio body power connector—pins and signals

Pinout	Pin	Signal name	Description	Signal type
40W/50W 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

Important Each radio is designed to operate from a nominal 12V negative ground supply. Each radio may draw up to 15A of current. Each 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 system is always connected directly to the battery.

In trucks, where direct connection to the battery is often not possible, each 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 suitably rated 24V-to-12V converter. This will isolate the radios 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 using the ignition signal to turn off the radio system, the standby current is reduced to <6mA. Otherwise, the standby current is approximately 60mA.

Connecting the Power Cable

Important Although it is possible to connect the radio system 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.

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

Important 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 28.

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

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

Important Protect the power cables from engine heat, sharp edges and from being pinched or crushed.

2. Run the power cable between one radio's mounting position and the power source and cut it to length, allowing approximately 20 cm (8 in.) excess at the radio end.
3. Plug the power cable into the power connector of the radio.
4. Cut the negative (black) and the positive (red) wires where the in-line fuse holders will be placed (as close to the power source as possible).

Important Do not install the fuses until the installation is ready to be checked. For more information, refer to "Checking the Installation" on page 28.

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.
10. Repeat steps 2 to 9 for the other radio body.

Important Do not install the fuses until the installation is ready to be checked. For more information, refer to "Checking the Installation" on page 28.

Power During Radio Operation

It is important that both radio bodies power on at the same time. If that does not happen (for example, the Power On Mode is set to Power On in the programming application and power is applied to each body in sequence) you must turn the system off then on again via the on/off key. It is not recommended that you remove or apply power to a single radio body while operating the radio system.

If power to one radio body is disrupted, you must turn the system off then on again via the on/off key. If there is no power supply to one radio body after the radio system is switched on, the other body and control head will continue to operate as a single radio unit.

Important The ignition signal may fail to turn the remaining radio body on and off if there is no power to one radio body. In this situation, the on/off key must be used to continue operating the radio.

2.2 Advanced Dual-Radio Installation

This section contains the following information about additional features:

- Connecting Remote Speakers
- Connecting the Cross-band Linking, GPS, and External Interface Cable

2.2.1 Connecting Remote Speakers

Remote speakers can be installed with one or both radio bodies, to operate in parallel with the control head's existing internal speaker. The remote speakers can be installed at some distance from the control head, or can be used to increase the volume of the audio from the internal speaker.

The remote speaker will only sound audio from the radio that it is connected to. Audio is never fed to a remote speaker from the other radio body. If a radio is at the background and dual receive is activated, the attached remote speaker will sound received audio from that radio at a reduced volume. If a radio is at the foreground, the attached remote speaker will sound received audio from that radio at full volume, and audible indicators.

The following high-power remote speakers are recommended:

- TMAA10-06 high-power remote speaker for 40W/50W radios
- TMAA10-03 high-power remote speaker for 25W radios.

If a different speaker is used, receptacles for the speaker pins of the power connector are provided with the installation kit. The installation kit also contains a flying lead connector that, when installed, enables the speaker to be easily removed and re-installed as required.

The speaker is connected to pins 2 (SPK–) and 3 (SPK+) of the power connector. See Table 2.3 on page 25. For more information, refer to the installation instructions provided with the speaker, or to the relevant section of the service manual.

2.2.2 Connecting the Cross-band Linking, GPS, and External Interface Cable

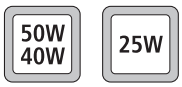
To enable cross-band repeater operation, a linking cable TMAA04-06 must be attached between the auxiliary connectors of the radio bodies. Programmable I/O and external PTT 1 settings must also be programmed using the programming application.

To enable dual-body GPS operation, the linking cable also provides a single-point connection to a GPS antenna. The GPS connector is the correct type for the antenna, therefore the adaptor that is supplied with the GPS antenna is not required. For GPS information to be displayed on the radio, you must purchase and program the software feature enabling (SFE) key for GPS Support (TMAS015).

The cable also provides access to certain programmable I/O lines. These lines can be used to power a TM8260 system on using ignition sense, and provides an output for a dual-body external alert.

For more information, refer to Appendix A on page 39.

2.3 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. 40W/50W radios use 20A fuses; 25W radios use 10A fuses. For part numbers of the fuses, refer to "Unpacking and Checking the Equipment for Completeness" on page 11.**

1. Insert the fuses into the power leads. The radio will turn on automatically at this point.
2. Switch the radio off then on again using the front panel control, but do not transmit.
3. Connect an in-line power meter between one radio and its 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.

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

6. Once the reflected power levels are within tolerance, repeat steps 3, 4 and 5 for the second radio.

7. Test the dual-radio functions.
   - Compare the receive functions (such as sensitivity) of one radio, while the other radio is and is not transmitting. Ensure there is no significant difference.
   - Compare the transmit functions (such as coverage) of one radio, while the other radio is and is not transmitting.
   - Test all other functions, such as dual-receive and cross-band repeater operation. Check that those functions operate as expected.

   If issues are found, move the radio bodies and/or antennas further apart and re-test.

3 Programming the Radio System

After you have downloaded MAC addresses and assembled the system, you can select individual devices to read or program. Each time you attempt to communicate with the radio system, the Select Device(s) dialog appears (Figure 3.1).

Figure 3.1 Select Device(s) dialog

This section contains the following information:

- Programming a Dual-Radio System
- Recommended Dual-Radio Settings
- Upgrading Radio Firmware
- Calibrating the Radio System
- Troubleshooting.

Figure 3.2 Required Programming Application and Firmware Versions

Software or Firmware Type	Version Required
TM8200 Programming Application	v3.00 or higher
TM8000 Calibration Application	v2.91 or higher
Boot Code (radio bodies and control head)	v1.04 or higher
Radio Application (radio bodies and control head)	v3.01 or higher
FPGA Image (radio bodies and control head)	v1.05 or higher
DSP (radio bodies)	v3.01 or higher

3.1 Programming a Dual-Radio System

The following steps for programming a dual-radio system assume:

- all the devices in the system have supported versions of firmware, and you have installed supported versions of programming and calibration software. See Figure 3.2.
- all the devices in the system have unique MAC addresses assigned. See "Downloading MAC Addresses" on page 16.
- all radio bodies in the system have the optional feature for dual-radio operation enabled. See "Checking the Optional Feature for Multi-Body Support" on page 36.

Step 1—Create a template file

1. Using the Programming Application, enter the information into the fields that are common between the radios. See "Recommended Dual-Radio Settings" on page 33.
2. Click File > **Save**.
3. Enter a descriptive name for the template, for example, "TM8260_Master_File".

Step 2—Program each device in the system

1. Using the Programming Application, open the template file created for the radio system.
2. Set the radio's **Band** (Global > Specification form).
3. Enter a **Radio Name** (recommended).

Note The length of the radio name restricts the length of all channel and group labels. Therefore a three-character radio name such as "UHF" or "VHF" is recommended, as it will allow group and channel labels up to 10 characters (such as "Channel 99").

4. Add all information relating to the band selected in step 2, including channels (Conventional > Channel Setup > Channels form) and groups (Scan Groups form).
5. Click File > **Save As** to save the device's file to disk as a new file.
6. Click Radio > **Program**.
7. In the Select Device(s) dialog, select the radio body that matches the Band selected in step 2, and optionally, the control head. See Figure 3.1.

Note You cannot select more than one of the same device type (for example, two radio bodies). The Select Device(s) dialog will automatically select the radio body with the matching operating band (step 2).

Note The recommended sequence for programming a dual-radio system is a radio body (TMAB22-) in the first session, then the other body (TMAB22-) and the head (TMAC40-) together in the second session.

8. Repeat steps 1 to 7 and program the other radio body and the control head.

3.2 Recommended Dual-Radio Settings

The programming configuration of all devices must be as similar as possible, with the exception of the operating band, radio name, channels and groups. If features relating to the user interface (such as function keys, radio menus, and backlighting), and other features like the security lock are different, there may be unexpected behaviour when powering on or switching between the radios.

The following settings are recommended for a dual-radio system. Use this table when setting up a template file, before programming the system (see "Programming a Dual-Radio System" on page 31).

Field/Feature	Location	Comments
Radio Name	Global > Specifications form	The radio name, if used, should be different for both radio bodies in the system.
Power On Mode	Global > Start-up form	The power on mode must be the same for all devices in the system.
Power-up on Last Active Body	Global > Start-up form	This check box must be the same for all devices in the system.
Reset on Error	Global > Start-up form	The Reset on Error check box must be the same for all devices in the system.
Security Lock on Power Up and Security PIN	Global > Start-up form	If the security PIN is enabled, it must be enabled (and have the same PIN) for all devices in the system.
PTT fields	Global > PTT form	PTT settings for both radio bodies are used when in dual-transmit mode and the radio user presses the PTT. Care should be taken if programming PTT behaviour differently between the radio bodies. PTT settings are typically set the same for all devices in the system.
Startup (Channel or Group)	Conventional > Conventional UI form	You can program this option for the foreground radio (the radio body with the lowest MAC address) to start on a specific channel or group each time the radio system is turned on. You can also program this option for the background radio to default to a specific channel or group after the radio system is turned on, and the radio user subsequently switches the active radio or enables dual receive.
Selcall Stun and Revive	Conventional > Selcall > Control Status form	Selcall stun and revive functionality is currently not supported for TM8260 radio systems. If the stun and revive control status types are used, set the equivalent Rx Processing fields to No for all devices.

Field/Feature	Location	Comments
Conv Key Settings	Conventional > Conv Key Settings form	Dual body functionality such as dual transmit and receive, and changing the foreground radio, can only be accessed via function keys. Add the Dual Body Mode and Single Body Mode actions to separate keys, or Dual/Single Body Mode to a single key. Add the Switch Active Radio action to a different function key.
Other Function Key Settings and the Radio Menu	Conventional > Conventional Menu form	The radio's function key settings (Conv Key Settings form) and menu (Conventional Menu form) must be the same for all devices in the system.
Left Selection Key and Scroll Keys	Conventional > Conv Key Settings form	If options are programmed for the left selection key and/or scroll keys, they must be the same for all devices in the system.
UI Preferences and Conventional UI	Global > UI Preferences form, and Conventional > Conventional UI form	UI preferences must be configured identically for all devices in the system. For example, backlighting, keypress tones, the RSSI icon, and the default dialling type.
Programmable I/O	Programmable I/O form	All radio body I/O pins are supported, and all actions are supported except the output F1 to F4 Key Status. The control head I/O pin (CH_GPIO1) is limited to outputs only, and those outputs will always reflect the foreground radio. The following actions are dependant on the current mode, and state of the active radio body. **External PTT 1 and 2**: The radio body that the PTT is connected to will transmit, unless transmission is invalid (for example, that radio is the background radio in single-body mode). **Toggle F1 and F4 Key LED**: The function key LED will reflect the state of the relevant I/O pin on the foreground radio. **Radio Ready**: The radio at the background in single-body mode is not considered ready, so will not activate the output pin. Note: the cross-band linking, GPS, and external interface cable requires specific programmable I/O settings for both radio bodies. For more information, see Appendix A on page 39.
Trunked MPT		Trunked MPT settings are currently not supported with TM8260 radio systems. Do not attempt to program these fields or enable the optional feature for MPT 1327 Trunking.

3.3 Upgrading Radio Firmware

The download dialog (from the programming application, click Tools > **Download**) contains a column called NTID. This shows the MAC (media access control) address for each device. When reporting a radio system's configuration, the table will list the various types of firmware for all devices in the system.

Important Reporting the configuration will also show SCT (System Configuration Table) files for each device, which must exist for a radio system. These files are the result of downloading MAC addresses (see "Downloading MAC Addresses" on page 16). Do not attempt to delete these files.

When you download firmware to hardware of a particular type (for example, the target hardware shows as a radio body), it will be sent to all devices in the system of the same hardware type. The firmware will be downloaded to each device in sequence.

3.4 Calibrating the Radio System

TM8260 dual radio systems do not support calibration of the radio system as a whole. The system must first be disassembled to a single head / single body configuration. If calibration is required after repair, the radio body must be calibrated outside of the system before re-installation.

3.5 Troubleshooting

If reporting the configuration shows only two devices when three are expected, or the Select Device(s) dialog does not appear when reading or programming the radio system:

- Make sure all cables are connected correctly, and securely.
- Make sure power is applied to both radio bodies.
- One or more devices may not have the correct system configuration table of MAC addresses. Re-download the table to all devices in the system. See "Downloading MAC Addresses" on page 16.

If an "incorrect band" message appears when attempting to program a radio body, the band of the selected device to program is different to the band selected in the programming application. Either change the **Band** field on the Specifications form, or select the matching radio body in the Select Device(s) dialog.

If an "unlicensed feature" message appears in the programming application, or the LEDs on one or both radio bodies flash on and off when powering up the system, the optional feature for Multi-Body Support may not be enabled. To check this, refer to the steps below.

Checking the Optional Feature for Multi-Body Support

1. Click Tools > **Optional Features** from the programming application.
2. Connect the control head directly to one radio body, and to your PC. See Figure 2.3 or Figure 2.4 on page 17.
3. Click the **Read Radio** button.
4. Check that the Status is showing **Enabled** next to Multi-Body Support.
5. Repeat steps 2 to 4 for the other radio body.

If this feature is showing as **Disabled** for one or both radios, you will need obtain and program SFE (software feature enabling) keys. Contact Tait Electronics Limited for more information.

4 Quick reference

❑ All components are present and are the correct versions of hardware and firmware.	See page 11.
❑ The system configuration table is downloaded to the control head and radio bodies.	See "Downloading MAC Addresses" on page 16.
❑ Link J4 is removed from the radio body connected to the control head.	See "Removing Link J4" on page 17.
❑ The remote interfaces are installed on the radio bodies and control head.	See page 19 and page 20.
❑ For each body remote interface, the earthing tag is attached onto the radio chassis.	See page 19.
❑ Antennas are connected to both radio bodies.	See page 21.
❑ The cables are attached into the correct ports.	See page 23.
❑ There is a solid and secure power supply to both radio bodies.	See page 25.
❑ The correct fuses are fitted to the power supply leads.	See page 28.
❑ The radio system is programmed so the user can access dual-radio features.	See "Programming a Dual-Radio System" on page 31.

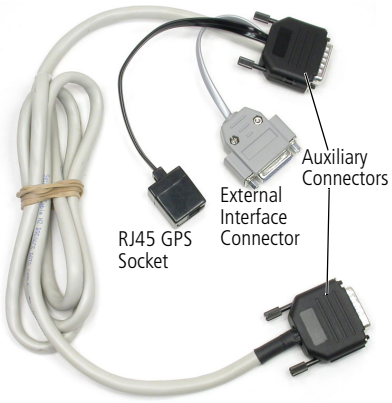
Appendix A Cross-band Linking, GPS and External Interface Cable

This section contains the following information:

- Introduction
- Cross-band Repeater Operation
- Connecting to a GPS Device
- Connecting to the Ignition Signal
- Connecting to an External Alert Device
- Connecting to other External Devices or Signals
- Interface Specification.

A.1 Introduction

The TMAA04-06 cross-band linking, GPS, and external interface cable is used to extend the features available with TM8260 dual radio systems. The cable connects to both radio's auxiliary ports so the radio system can be used as a cross-band repeater, provides an RJ45 socket to connect to a GPS antenna, and also provides an external interface connector. The external interface can be used to power a TM8260 dual radio system on using ignition sense, and also connect to an external alert device.



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

A.2 Cross-band Repeater Operation

Cross-band repeater mode allows a TM8260 dual radio system be used as a temporary repeater. Any activity received on one radio will be automatically transmitted on the other radio, and vice versa.

A.2.1 Installation

1. Remove the rubber bung that cover the auxiliary connector on each radio body.
2. Plug an auxiliary connector into the auxiliary port of a radio body.
3. Plug the second auxiliary connector into the auxiliary port of the other radio body.

Note The cable can be plugged in either way—its orientation has no impact on radio performance. However, to reduce the cabling required, orient the cable so the external interface connector and GPS socket are closest to the device or devices to connect to.

4. Tightly fasten the jackscrew-type locks.

A.2.2 Radio Programming

Programmable I/O and Audio Settings

At a minimum, settings in Table A.1, Table A.2, and Table A.3 must be programmed for both radios.

Table A.1 Cross-band settings in the Programmable I/O form, Digital tab

Pin	Mode	Direction	Label	Action	Active	Debounce
AUX_GPI1	Conventional	Input	XBAND_TX	Crossband Tx Input	Low	10
AUX_GPIO5	Conventional	Output	BUSY	Busy Status[1]	Low	None
				Signalling Audio Mute Status[2]		

Table A.2 Cross-band settings in the Programmable I/O form, Audio tab

Pin	Tap In	Tap In Type	Tap In Unmute	Tap Out	Tap Out Type	Tap Out Unmute
Rx	None	A-Bypass In	On PTT	R7	D-Split	Busy Detect[1]
						Busy Detect + Subaud[2]
EPTT1	T5	A-Bypass In	On PTT	None	C-Bypass 0	On PTT

Notes:

1. Select Busy Status and Busy Detect to re-transmit any signal.
2. Select Signalling Audio Mute Status and Busy Detect + Subaud to transmit valid signalling only. This is recommended if the repeater is to operate on a scan group where member channels require valid subaudible signalling. Otherwise the radio may re-transmit short bursts of activity when a channel is busy but not captured due to invalid activity.

Table A.3 Cross-band settings in the PTT form, External PTT (1) tab

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

Receive and Transmit Settings

The cross-band repeater receives signals based on the radio's squelch (carrier) mute, and re-transmits signals based on external PTT 1. If programmed to only re-transmit valid signals, the radio's signalling mutes are also taken into account, which are affected by the radio's monitor function (such as the hookswitch monitor when the microphone is off the hook). If monitor settings are programmed, the radio user must not enable monitor (such as having the microphone off the hook) while entering, or during, cross-band repeater mode.

The transmit timer, if enabled, limits the maximum duration of cross-band repeater transmissions. If a transmit lockout period is programmed then further repeater transmissions will also be inhibited until the lockout timer expires. However, if a valid received signal is present when the lockout timer expires then the radio does not automatically resume transmission.The received signal must first drop and return before re-transmission resumes.

Priority scanning also affects the transmit timer during cross-band repeater transmissions. If a non-priority channel in the group is captured, the radio will re-transmit that activity and the transmit timer will begin counting down. However, each time the radio samples the priority channel or channels there is a brief break in reception, which will cause the transmit timer to restart.

Squelch override is not compatible with cross-band repeater operation. Avoid programming this feature to a function key, and consider removing the menu option.

Transmit Inhibit

If both radios are receiving activity when cross-band repeater mode is activated, the radio system can rapidly cycle between transmit and receive. Set Tx Inhibit to **Busy** to prevent this from happening by not allowing the radio system to transmit when there is another busy signal. An alternative is to set different debounce times for each radio (such as 10 and 100 ms), which will separate each radio's entry into cross-band repeater mode.

If the cross-band repeater is programmed to only re-transmit valid signals, and one radio is receiving an invalid signal (such as invalid CTCSS), the mute will stay closed and no re-transmission will occur. However, if the other radio then receives a valid signal, the radio will attempt to re-broadcast this over the other signal. Set Tx Inhibit to **Busy** or **Mute** to prevent this re-transmission occurring.

System Timing

For the cross-band repeater to operate correctly with other base stations or repeaters, system timing must be taken into account. If using subaudible signalling and the transmitter requires a "tail", then this can be configured according to Table A.4. During the lead-out delay period, no signalling, such as CTCSS or DCS, is present.

Table A.4 Transmit tail in the Basic Settings form, Subaudible Signalling tab

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

A.2.3 Operational Testing

1. Enable cross-band repeater mode.
2. On the receiving radio, inject an on-channel RF signal at a level of -70 dBm, modulated to ±3 kHz deviation (wide bandwidth channel) or ±1.5 kHz (narrow bandwidth channel), at 1 kHz AF.
3. On the transmitting radio, the resulting deviation should be:
   - ±3 kHz (with a tolerance of ±200 Hz) on a 25 kHz wide bandwidth channel.
   - ±1.5 kHz (with a tolerance of ±200 Hz) on a 12.5 kHz narrow bandwidth channel.

A.3 Connecting to a GPS Device

The cable provides an RJ-45 socket, which is used to connect a TM8260 dual radio system to a GPS device such as a Garmin-16HVS antenna/ receiver (product code TMAA05-01). GPS data is sent from the antenna to both radios.

A.3.1 Installation

Plug the GPS receiver/antenna directly into the RJ-45 socket. The socket is the correct type for the antenna, therefore the adaptor that is supplied with the GPS antenna is not required. For information on antenna mounting, refer to the instructions provided with your GPS device.

A.3.2 Radio Programming

Program one or both radios with GPS settings as required. For detailed configuration and programming information contact your local Tait dealer.

A.4 Connecting to the Ignition Signal

The cable's external interface connector can be used to connect a TM8260 dual radio system to the vehicle's ignition signal. This will turn the radio system off when the ignition key is off to avoid draining the battery, and will turn the radio system on when the ignition key is on.

Note A TMAA04-05 ignition sense kit is available. The kit comprises a mating plug for the radio's auxiliary connector and a 13 foot (four metre) length of cable to connect to the vehicle's ignition signal.

A.4.1 Installation

Connect pin 4 of the external interface connector (AUX-GPI3) to the 13.8V signal controlled by the vehicle's ignition key.

Important Make sure the ignition switch and the radio links LK1 and LK2 are properly configured to reduce the radio's power consumption. Refer to the TM8200 Service Manual for more information.

A.4.2 Radio Programming

Program both radios as shown in Table A.5.

Table A.5 Ignition sense settings in the Programmable I/O form, Digital tab

Pin	Mode	Direction	Label	Action	Active	Debounce
AUX_GPI3	All	Input	IGN_SENS	Power Sense (Ignition)	High	10

A.5 Connecting to an External Alert Device

The cable's external interface connector can be used to connect a TM8260 dual radio system to an external alert device in the vehicle. This enables both radios to drive the same external alert device.

A.5.1 Installation

The external alert lines used to connect to an external device are open collector outputs. Connect pin 9 (radio closest to connector) and pin 10 (radio furthest from connector) of the external interface connector to an input on the interface to the external alert device. Connect the pins together to drive the same external alert device. Connect the pins separately to drive separate external alert devices.

Important The high current sink capability of the radio's auxiliary lines cannot be accessed with this cable. That means you cannot connect directly to an external alert device—an interface to the external alert (such as a controller box) must be used.

Important The internal pullups normally available from the auxiliary lines are not available via this cable. If the external alert requires a logic-type signal on the output lines, the lines must be pulled up to a suitable voltage level by an external resistor.

A.5.2 Radio Programming

Program both radios as shown in Table A.6.

Table A.6 External alert settings in the Programmable I/O form, Digital tab

Pin	Mode	Direction	Label	Action	Active	Debounce
AUX_GPIO6	Conventional	Output	EXT_ALRT	External Alert 1	Low	None

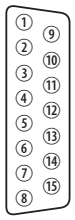
A.6 Connecting to other External Devices or Signals

The cable does not currently support any other programmable I/O actions, or connection to other external devices or signals.

A.7 Interface Specification

The following tables summarize the signals used for all connectors on the cable, and shows the interfaces between the cable and the radios.

Figure A.1 Auxiliary connectors—pins and signals



rear view

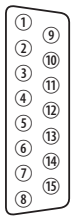
Pin	Signal name	Description
2	AUX_GPIO5	busy (output)
3	RXD	receive data
4	AUX_GPI3	ignition sense
7	AUD_TAP_IN	audio tap input
8	+13V8	power supply to GPS device
9	AUX_GPIO6	external alert
12	AUX_GPI1	PTT (input)
13	AUD_TAP_OUT	audio tap output
15	AGND	ground

Figure A.2 GPS socket—pins and signals

front view

Pin	Signal name	Description
1	+13V8	power supply from radio
2	GND	ground
3	GND	ground
5	GPS_TXD	transmit data

Figure A.3 External interface connector—pins and signals



rear view

Pin	Signal name	Description
4	AUX_GPI3	ignition sense
9	AUX_GPIO6	external alert (radio closest to connector)
10	AUX_GPIO6	external alert (radio furthest from connector)
15	GND	ground

Glossary

background radio	The radio in a dual-radio system that is not currently showing on the radio display, or is showing in a smaller font.
control head	The device in a radio system that provides the user-interface.
cross-band linking, GPS, and external interface cable	A cable used to connect the auxiliary ports of the two radio bodies in a dual-radio system. The cable enables the radio system to be used as a cross-band repeater, provides an RJ45 socket to connect to a GPS antenna, and also provides an external interface connector.
cross-band repeater	A mode in a dual-radio system where the system receives on one radio, and immediately re-transmits that reception on the other radio.
device	A component (control head or radio body) in a radio system. A device is known as target hardware when upgrading radio firmware.
dual body mode	The function on a dual-radio system that enables you to turn on dual receive and dual transmit
dual-radio system	A control head connected to two radio bodies.
dual receive	A state in a dual-radio system where the system receives on both the foreground radio and background radio simultaneously.
dual transmit	A state in a dual-radio system where the system transmits on both the foreground radio and background radio simultaneously. Dual transmit includes dual receive.
foreground radio	The radio in a dual-radio system that is currently showing on the radio display, or showing in a larger font.
MAC address	The unique identifier that is assigned to each device in a radio system.
primary radio	The radio body in a dual-radio system with the lowest MAC address. The primary radio is at the foreground each time the system is turned on.
radio	A radio body, when connected directly or indirectly with a control head.
radio body	The device in a radio system that provides standalone transmit and receive on a single operating band, and also other functionality such as digital processing. Also known as a torso.
radio system	See dual-radio system.

single body mode

The function on a dual-radio system that enables you to return to single receive and single transmit.

single receive and single transmit

A state in a dual-radio system where the system transmits and receives on the foreground radio only.

system configuration table

The table that is downloaded to every device in a radio system. The table contains information about the system, including all devices, device names, MAC addresses, and priorities.

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