

Unscheduled Maintenance

The unscheduled maintenance detailed in this documentation describes diagnosis using the Built-In-Test facility and rectification by module replacement.

WARNING



Heavy Item

An M7 radio weighs up to 26 kg. A minimum of two people should be used to lift the radio. Special consideration should be given if the radio has to be lifted at height, for example from the top of an equipment cabinet. Failure to take the necessary precautions can result in injury to personnel.

All procedures given in this topic assume that the faulty radio has been removed from its operational position and placed on a suitable work-bench.

Caution



ESDs

This equipment contains devices sensitive to electrostatic discharge. Precautions applicable to handling such equipment, including anti-static work surfaces and protection using wrist straps connected to earth, should always be taken.

Tools and Test Equipment

The following tools and test equipment will be required to perform the unscheduled maintenance procedures detailed in this documentation:

- (1) Torx Screwdriver, size T10.
- (2) Torx Screwdriver, size T15.
- (3) Torx Screwdriver, size T20.
- (4) Frequency counter able to measure 10.000 000 MHz. (when replacing the Processor module).

Part Numbers

Part numbers for the modules and other replaceable items are listed in [Table 5-1](#).

**Table 5-1 Part Numbers**

Description	Park Air Part Number	Notes
Modules:		
PSU	B68-70000701	
Processor module	B68-70000711	
RF control module	B68-70000712	
Control head	B68-70000714	
Interface module	B68-70000715	
RF PA	B68-70000716	Transceiver only
RF switch	B68-70000735	Receiver only
Guard receiver module	B68-70000725	Optional module
Custom interface module	Allocated for an individual user.	Optional module
Parts:		
Coaxial cables	See separate list – Table 5-6 on page 5-38	
Cable Lemo to USB	17N12000021	For use with DLA
Heatsink fan 1 and 2	69S12833142H	See Fig 5-7 on page 5-13
Main chassis fan	69S12833142M	See Fig 5-7 on page 5-13
Thermal pad for PSU	46-00000615	
Thermal pad for RF PA	46-00000591	
Fuse (F1) dc input, F30A 32V	29-01460202	
Fuse (F2) ac input, T10AH 250 V	29-01100102	

Built-in-Test (BIT)

The BIT facility continuously monitors key radio parameters and indicates BIT status at the Control Head.

The Control Head's BIT button lights to provide the indications shown in Fig 5-4.

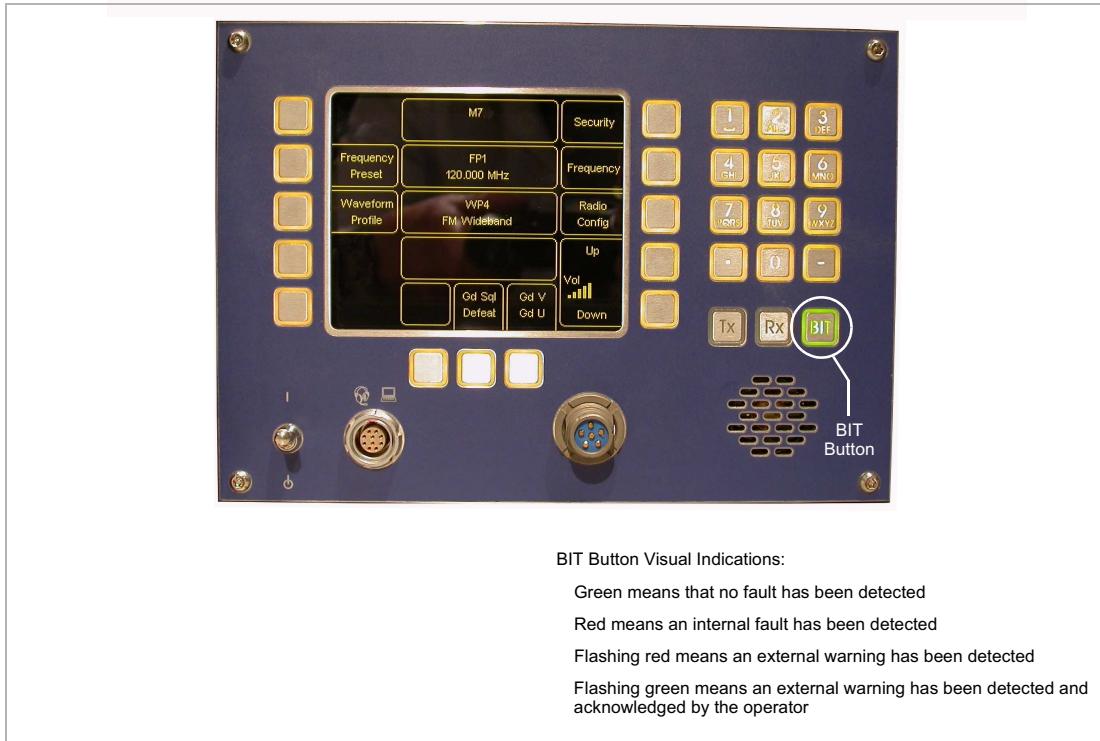
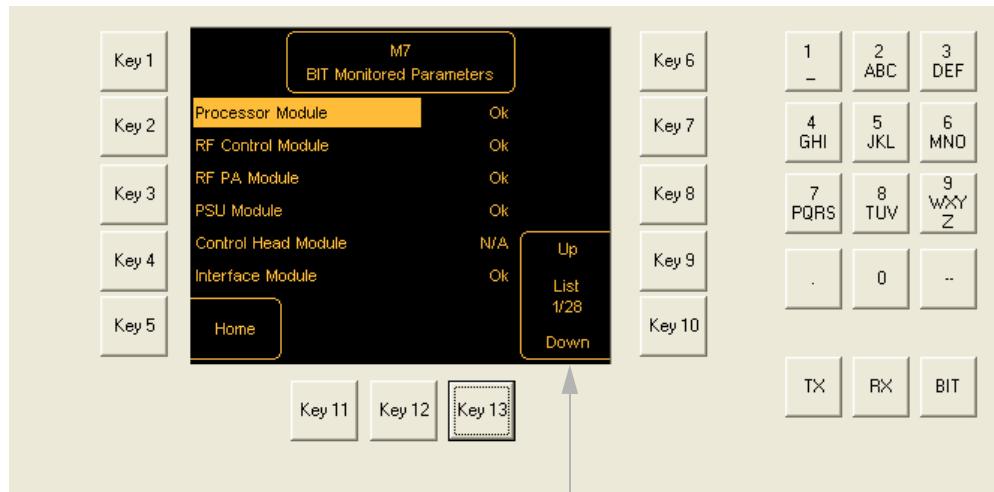


Fig 5-4 Control Head BIT Button Indications

When the BIT system detects a fault, the BIT button lights as detailed in Fig 5-4. The button should then be pressed to display the BIT Monitor screen as shown in [Fig 5-5](#). This screen indicates the faulty module or cable that needs replacing. The BIT also detects external environmental conditions that could lead to degraded performance of the radio; for example, high ambient temperature, high VSWR.

When the BIT Monitor screen is displayed, use Key 9 and Key 10 to scroll through the list. The complete list, with reference to remedial action, is detailed in [Table 5-2](#).



In this figure, Processor Module is highlighted; this is BIT Monitored Parameters 1 of 28 in the List. The Up and Down keys allow scrolling through all BIT Monitored Parameters.

The number of BIT parameters that are monitored depends on the radio type, and the options that are fitted. The number 28 shown in this figure, is an example.

Fig 5-5 BIT Monitor Screen

Table 5-2 BIT Parameters

Parameter	Monitoring Range	Remedial Reference
Processor module	OK or Fault	See Replacing the Processor Module on page 22.
RF control module	OK or Fault	See Replacing the RF Control Module on page 24.
RF PA module	OK or Fault	See Replacing the RF PA on page 27.
PSU module	OK or Fault	See Replacing the PSU Module on page 33.
Control head module	OK or Fault or N/A	See Replacing the Control Head on page 15.
Interface module	OK or Fault	See Replacing the Interface Module on page 26.
Guard receiver module	OK or Fault or N/A	See Replacing the Guard Receiver Module on page 21.
Custom interface module	OK, Fault or N/A	See Replacing the Custom Interface Module on page 20.
Main chassis fan	OK or Fault	See Replacing a Fan on page 13.
Heatsink fan 1	OK or Fault	
Heatsink fan 2	OK or Fault	
Receive RF cable	OK or Fault	See Replacing Faulty Cables on page 38.

Table 5-2 BIT Parameters (Continued)

Parameter	Monitoring Range	Remedial Reference
Linearisation feedback cable	OK or Fault	See Replacing Faulty Cables on page 38.
Rx 90 MHz IF cable	OK or Fault	See Replacing Faulty Cables on page 38.
Tx 90 MHz IF cable	OK or Fault	See Replacing Faulty Cables on page 38.
Transmit drive cable	OK or Fault	See Replacing Faulty Cables on page 38.
10 MHz reference input	OK, Fault or N/A	See Replacing Faulty Cables on page 38.
Guard receiver RF cable	OK, Fault or N/A	See Replacing Faulty Cables on page 38.
DC supply	OK, or Warning when operating from a dc supply that falls below 23 V	
AC supply	OK, or Warning when the ac supply fails and operation switches to dc	
VSWR	OK or Warning (>3:1)	
Ambient temperature	OK or Warning (>55°C)	
E-BIT(A)	OK or Warning	
E-BIT(B)	OK or Warning	

Removing the Top or Bottom Cover

WARNING



Dangerous Voltage

Ensure the input ac and dc supplies are disconnected before removing the top or bottom cover.

WARNING

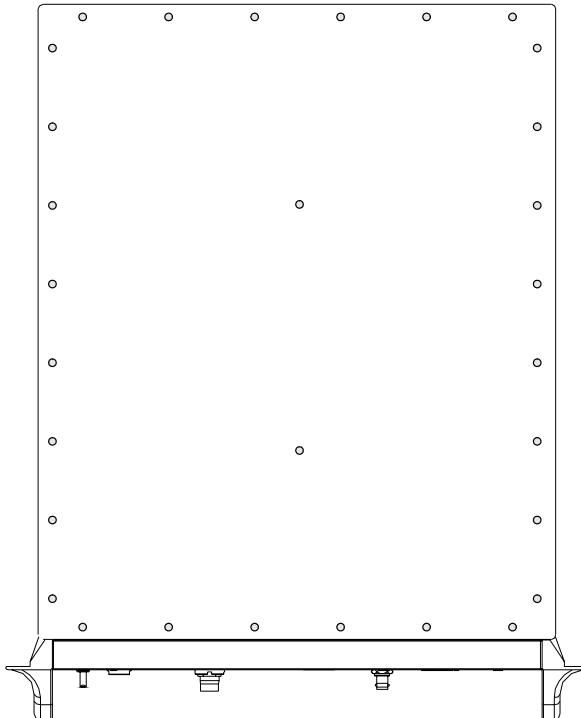


Dangerous Voltage

Do not remove the top or bottom cover for at least one minute after switching off the radio.

To remove the radio's top or bottom cover:

- (1) Ensure that the input ac and dc supplies are disconnected from the radio.
- (2) Using a Torx T20 screwdriver, remove and retain the 30 screws that secure the cover to the chassis; see Fig 5-6.



The radio's top and bottom covers are each secured to the chassis using thirty M4 x 6 mm Torx head screws.

Use only a Torx T20 screwdriver to remove and refit the top cover's securing screws.

When removing the top cover, retain the M4 x 6 mm screws and re-use when refitting.

Fig 5-6 Top/Bottom Cover Securing Screws

Replacing a Fan

Three fans are fitted on a transceiver's rear panel as shown in Fig 5-7. The serviceability of each fan is reported through the BIT system as shown in Fig 5-8.

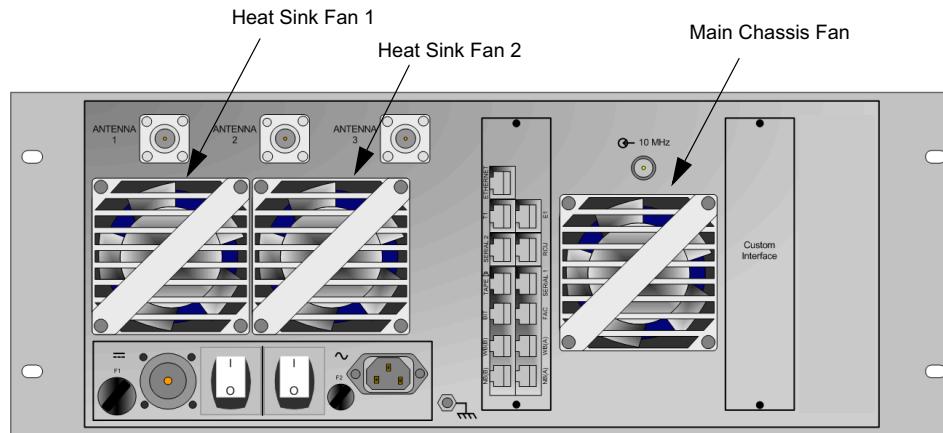


Fig 5-7 Fan Identification



Note that Heat Sink Fan 1 and Heat Sink Fan 2 differ in type from the Main Chassis Fan. See [Table 5-1](#) for part numbers.

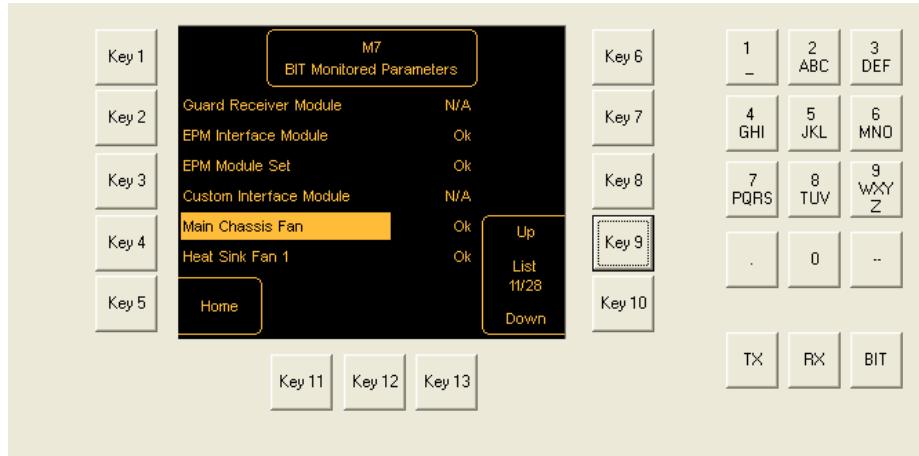


Fig 5-8 Fans – BIT Reporting

To replace a fan:

- (1) Using a thin blade, gently prise the finger guard away from the fan's body (Fig 5-9).
- (2) Release the four screws that secure the fan to the radio's chassis.
- (3) Unplug the fan from the chassis mounted Molex 4-way connector; remove the fan from the radio.
- (4) Secure the replacement fan to the chassis using the four screws removed in step (2).
- (5) Plug the fan into the chassis mounted 4-way Molex connector.

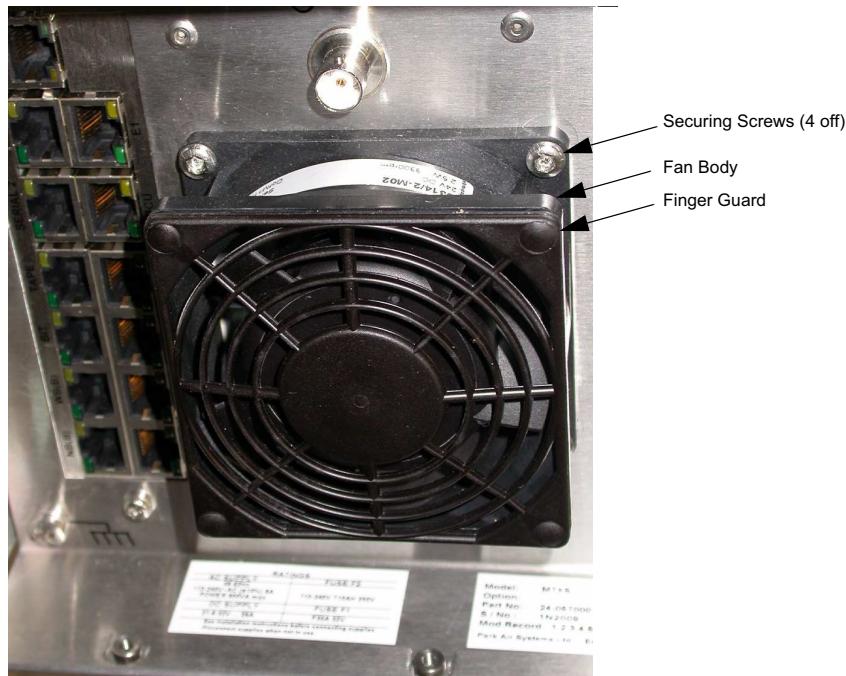


Fig 5-9 Fan with Finger Guard Fitted

- (6) Push the finger guard onto the fan's body.
- (7) Reapply power to the radio. Ensure that the fan is operating and that the appropriate BIT parameter (Fig 5-8) reads **OK**.

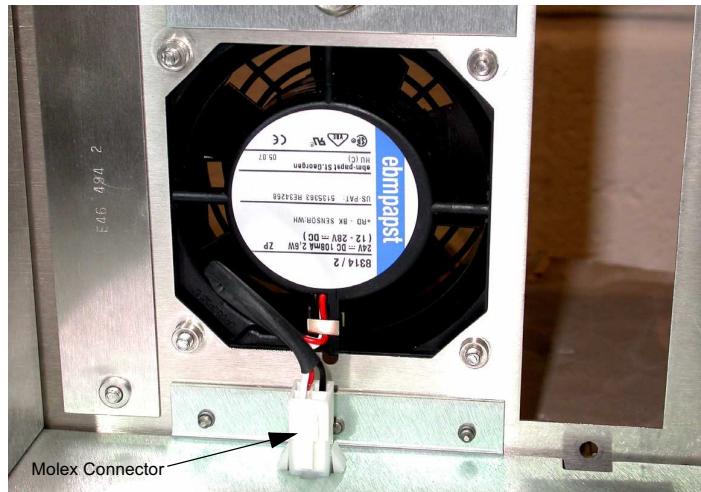


Fig 5-10 Molex Fan Connector

Replacing the Control Head

WARNING**Dangerous Voltage**

Ensure the input ac and dc supplies are disconnected before removing the Control Head.

Caution**ESDs**

This equipment contains devices sensitive to electrostatic discharge. Precautions applicable to handling such equipment, including wearing a static protection wrist strap connected to earth, should always be taken.

To remove the radio's Control Head:

- (1) Using a Torx T20 screwdriver, remove and retain the four M4 x 6 mm screws that secure the Control Head to the chassis; see Fig 5-11.



Fig 5-11 Replacing the Control Head (1)

- (2) Pull the Control Head forward to access the three cables that connect to the control head's rear plate (Fig 5-12).

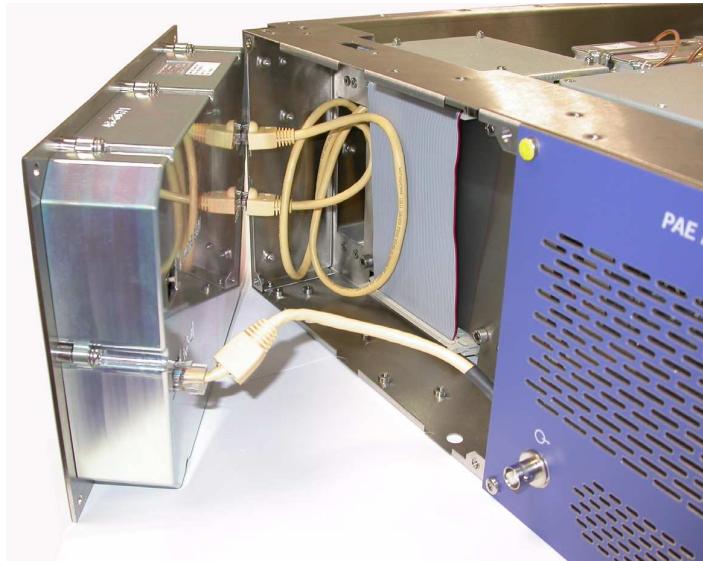


Fig 5-12 Replacing the Control Head (2)

- (3) From the Control Head, disconnect the three cables listed below and then remove the control head from the radio.
 - The cable from the loudspeaker box connects to the Control Head's  connector
 - The cable from the E1 connector shown in [Fig 5-13](#) connects to the Control Head's E1 connector
 - The cable from the Supply connector shown in [Fig 5-13](#) connects to the Control Head's  connector.

To fit the Control Head to the radios front panel:

- (1) Connect the cables disconnected during control head removal. Should both ends of the DC or E1 cables become inadvertently disconnected during removal, [Fig 5-13](#) shows how they connect.
- (2) Place the Control Head in position and secure using a Torx T20 screwdriver and four M4 x 6 mm screws; see [Fig 5-11](#).
- (3) Connect the radio to a PC using the Control Head to PC USB cable (see [Table 5-1](#)).
- (4) Reapply input power to the radio.
- (5) Download the Interface module software from the Park Air radio software CD. Instructions for downloading software are given under the heading 'Data Loader Application' starting on [page 5-39](#).



These connectors do not have to be disconnected when removing the Control Head. This figure is included only to identify the cables should one of them become inadvertently disconnected.

Supply. To Control Head == Connector

E1. To Control Head E1 Connector

These two connectors are located behind the Control Head (looking from the radio's front) on the left-hand side.

Fig 5-13 Replacing the Control Head (3)

Plug-In Modules

The radio contains a number plug-in modules. These are listed below and are located as shown in Fig 5-14. Note that after replacing any module, the build status requires amendment – see Data Loader Application starting on [page 5-39](#).

- Module position A – Not used
- Module position B – Custom Interface module. This is an optional module used to accommodate a user's special interfacing requirement.
- Module position C – Guard Receiver module. Optional VHF and UHF guard receiver
- Module position D – Processor module
- Module position E – RF Control module
- Module position F – Interface module
- Module position G – RF PA
- Control head – fitted at radio's front panel (see [page 5-15](#))
- PSU module – located on underside of radio below the RF PA position

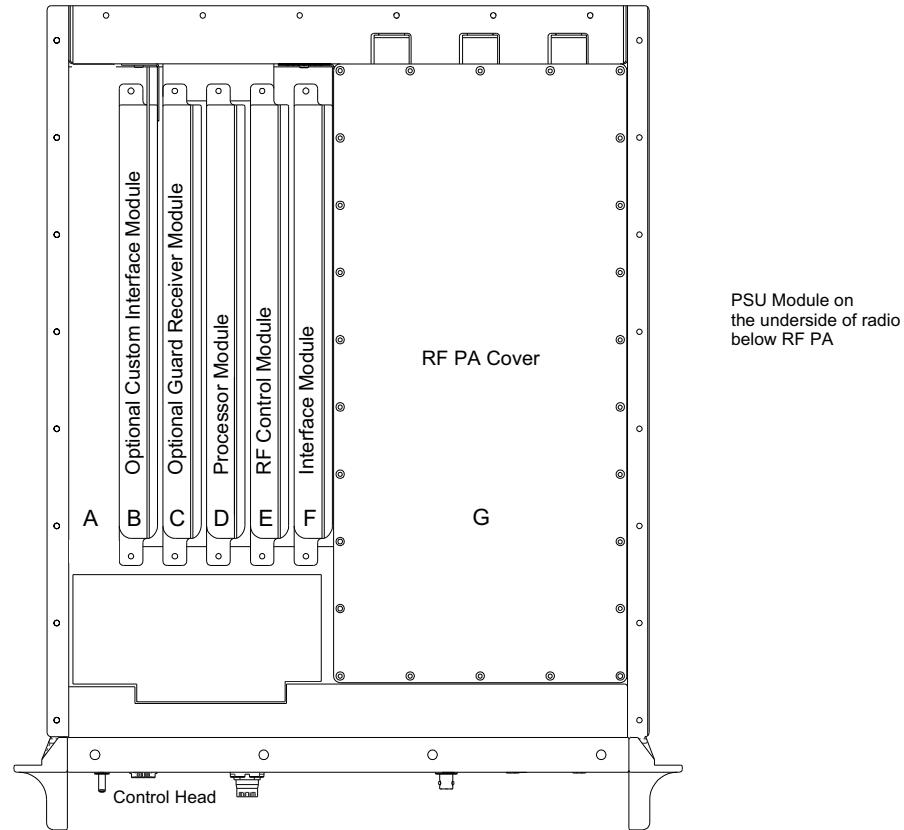


Fig 5-14 Module Layout

Modules B to F

Modules B to F each mate with a multi-way socket fitted on the chassis base. The module connection sockets are shown in [Fig 5-15](#).

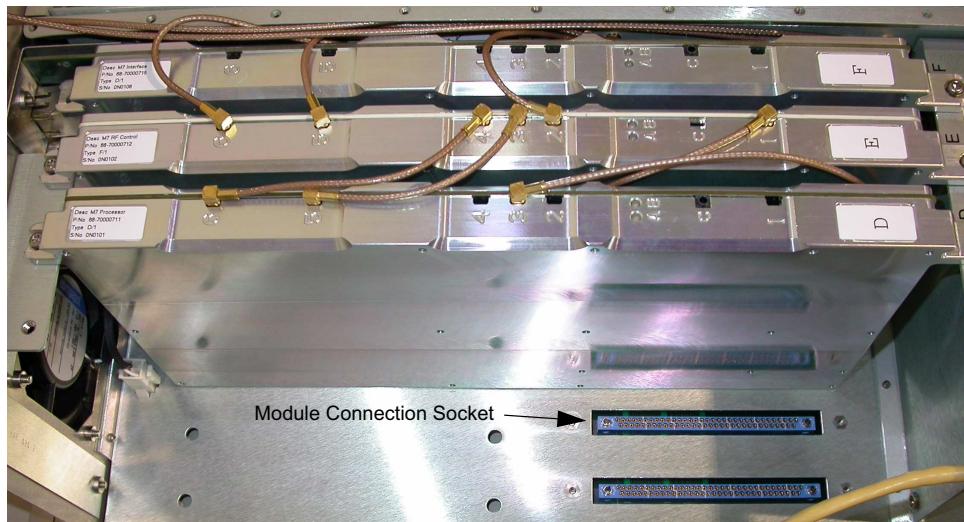


Fig 5-15 Module Connection Socket

Modules B to F are secured in position using two screws as shown in Fig 5-16.

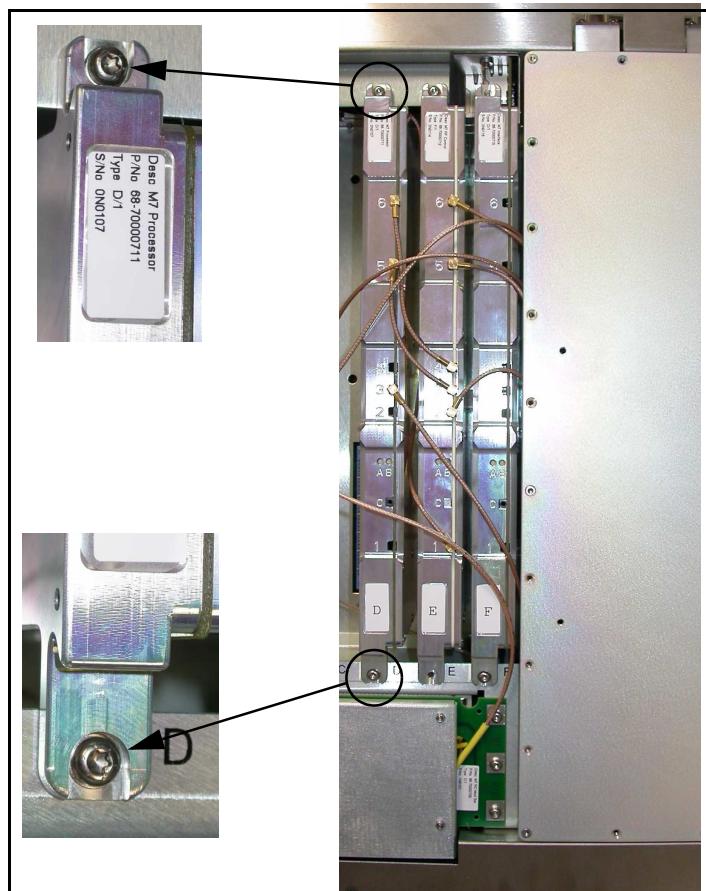


Fig 5-16 Module B to F Securing Screws

Replacing the Custom Interface Module

WARNING



Dangerous Voltage

Ensure the input ac and dc supplies to the radio are disconnected before removing the top cover.

WARNING



Dangerous Voltage

Do not remove the radio's top cover for at least one minute after switching off the radio.

Caution



ESDs

This equipment contains devices sensitive to electrostatic discharge. Precautions applicable to handling such equipment, including wearing a static protection wrist strap connected to earth, should always be taken.

To replace the Custom Interface module:

- (1) Remove the radio's top cover as detailed on [page 5-12](#).
- (2) Refer to [Fig 5-14](#) on [page 5-18](#) and identify the Custom Interface module's position (Module B).
- (3) Using a Torx T15 screwdriver, remove and retain the front and rear module securing screws ([Fig 5-16](#) on [page 5-19](#)).
- (4) Carefully lift the module disconnecting it from its socket ([Fig 5-15](#) on [page 5-19](#)).
- (5) Place the replacement module in position and press down to ensure it is fully located in the chassis socket.
- (6) Fit and tighten the front and rear module securing screws ([Fig 5-16](#) on [page 5-19](#)).
- (7) Refit the radio's top cover (see [page 5-12](#)).
- (8) Connect the radio to a PC using the Lemo to USB cable.
- (9) Reapply input power to the radio.
- (10) Download the Custom Interface module software from the Park Air radio software CD. Instructions for downloading software are given under the heading 'Data Loader Application' starting on [page 5-39](#).

Replacing the Guard Receiver Module

WARNING



Dangerous Voltage

Ensure the input ac and dc supplies to the radio are disconnected before removing the top cover.

WARNING



Dangerous Voltage

Do not remove the radio's top cover for at least one minute after switching off the radio.

Caution



ESDs

This equipment contains devices sensitive to electrostatic discharge. Precautions applicable to handling such equipment, including wearing a static protection wrist strap connected to earth, should always be taken.

To replace the Guard Receiver module:

- (1) Remove the radio's top cover as detailed on [page 5-12](#).
- (2) Refer to [Fig 5-14 on page 5-18](#) and identify the Guard Receiver module's position (Module C).
- (3) At the Guard Receiver module, disconnect CN6; this cable connects the module to the RF PA connector CN7.
- (4) Using a Torx T15 screwdriver, remove and retain the front and rear module securing screws ([Fig 5-16 on page 5-19](#)).
- (5) Carefully lift the module disconnecting it from its socket ([Fig 5-15 on page 5-19](#)).
- (6) Place the replacement module in position and press down to ensure it is fully located in the chassis socket.
- (7) Fit and tighten the front and rear module securing screws ([Fig 5-16 on page 5-19](#)).
- (8) At the Guard Receiver, reconnect the cable at CN6.
- (9) Refit the radio's top cover (see [page 5-12](#)).
- (10) Connect the radio to a PC using the Lemo to USB cable.
- (11) Re-apply input power to the radio.
- (12) Download the Guard Receiver module software from the Park Air radio software CD. Instructions for downloading software are given under the heading 'Data Loader Application' starting on [page 5-39](#).

Replacing the Processor Module

WARNING



Dangerous Voltage

Ensure the input ac and dc supplies to the radio are disconnected before removing the top cover.

WARNING



Dangerous Voltage

Do not remove the radio's top cover for at least one minute after switching off the radio.

Caution



ESDs

This equipment contains devices sensitive to electrostatic discharge. Precautions applicable to handling such equipment, including wearing a static protection wrist strap connected to earth, should always be taken.

To replace the Processor module:

- (1) Remove the radio's top cover as detailed on [page 5-12](#).
- (2) Refer to [Fig 5-14](#) on [page 5-18](#) and identify the Processor module's position (Module D).
- (3) At the Processor module, disconnect the three cables listed in Table 5-3.

Table 5-3 Processor Module Cables

Processor Module Connection	Cable Part Number	Destination
CN3, 10 MHz Reference output	17T11700028	Rear Panel, 10 MHz Reference output
CN5, Rx 90 MHz IF/Linearisation feedback	17T11700023	RF Control module, CN3
CN6, Tx 90 MHz IF	17T11700019	RF Control module, CN4

- (4) Using a Torx T15 screwdriver, remove and retain the front and rear module securing screws ([Fig 5-16](#)).
- (5) Carefully lift the module disconnecting it from its socket ([Fig 5-15](#) on [page 5-19](#)).
- (6) Place the replacement module in position and press down to ensure it is fully located in the chassis socket.
- (7) Fit and tighten the front and rear module securing screws ([Fig 5-16](#) on [page 5-19](#)).
- (8) At the Processor module, reconnect the three cables listed in Table 5-3.
- (9) Refit the radio's top cover (see [page 5-12](#)).
- (10) Connect the radio to a PC using the Lemo to USB cable.
- (11) Reapply input power to the radio.
- (12) Download the Processor module software from the Park Air radio software CD. Instructions for downloading software are given under the heading 'Data Loader Application' starting on [page 5-39](#).

- (13) Refer to [page 5-47](#) and complete the procedure 'Setting the Carrier Power Trim'
- (14) Refer to [page 5-4](#) and check, resetting as necessary, the radio's internal frequency reference.
- (15) Disconnect the Lemo to USB cable and restore the radio ready for operational use.

Replacing the RF Control Module

WARNING



Dangerous Voltage

Ensure the input ac and dc supplies to the radio are disconnected before removing the top cover.

WARNING



Dangerous Voltage

Do not remove the radio's top cover for at least one minute after switching off the radio.

Caution



ESDs

This equipment contains devices sensitive to electrostatic discharge. Precautions applicable to handling such equipment, including wearing a static protection wrist strap connected to earth, should always be taken.

To replace the RF Control module:

- (1) Remove the radio's top cover as detailed on [page 5-12](#).
- (2) Refer to [Fig 5-14 on page 5-18](#) and identify the RF Control module's position (Module E).
- (3) At the RF Control module, disconnect the six cables listed in Table 5-4.

Table 5-4 RF Control Module Cables

RF Control Module Connection	Cable Part Number	Destination
CN1, 10 MHz reference input	17T11700027	Rear panel, 10 MHz Reference input
CN2, Linearisation feedback	17T11700021	RF PA, CN5
CN3, Rx 90 MHz IF/linearisation feedback	17T11700023	Processor module, CN5
CN4, Tx 90 MHz IF	17T11700019	Processor module, CN6
CN5, transmit drive	17T11700020	RF PA, CN4
CN6, receive signal	17T11700022	RF PA, CN6

- (4) Using a Torx T15 screwdriver, remove and retain the front and rear module securing screws ([Fig 5-16 on page 5-19](#)).
- (5) Carefully lift the module disconnecting it from its socket ([Fig 5-15 on page 5-19](#)).
- (6) Place the replacement module in position and press down to ensure it is fully located in the chassis socket.
- (7) Fit and tighten the front and rear module securing screws ([Fig 5-16 on page 5-19](#)).
- (8) At the RF Control module, reconnect the six cables listed in Table 5-4.
- (9) Refit the radio's top cover (see [page 5-12](#)).

- (10) Connect the radio to a PC using the Lemo to USB cable.
- (11) Reapply input power to the radio.
- (12) Download the RF Control module software from the Park Air radio software CD. Instructions for downloading software are given under the heading 'Data Loader Application' starting on [page 5-39](#).
- (13) Refer to page 47 and complete the procedure 'Setting the Carrier Power Trim'
- (14) Disconnect the Lemo to USB cable and restore the radio ready for operational use.

Replacing the Interface Module

WARNING



Dangerous Voltage

Ensure the input ac and dc supplies to the radio are disconnected before removing the top cover.

WARNING



Dangerous Voltage

Do not remove the radio's top cover for at least one minute after switching off the radio.

Caution



ESDs

This equipment contains devices sensitive to electrostatic discharge. Precautions applicable to handling such equipment, including wearing a static protection wrist strap connected to earth, should always be taken.

To replace the Interface module:

- (1) Remove the radio's top cover as detailed on [page 5-12](#).
- (2) Refer to [Fig 5-14](#) on [page 5-18](#) and identify the Interface module's position (Module F).
- (3) Using a Torx T15 screwdriver, remove and retain the front and rear module securing screws ([Fig 5-16](#) on [page 5-19](#)).
- (4) Carefully lift the module disconnecting it from its socket ([Fig 5-15](#) on [page 5-19](#)).
- (5) Place the replacement module in position and press down to ensure it is fully located in the chassis socket.
- (6) Fit and tighten the front and rear module securing screws ([Fig 5-16](#) on [page 5-19](#)).
- (7) Refit the radio's top cover (see [page 5-12](#)).
- (8) Connect the radio to a PC using the Lemo to USB cable.
- (9) Reapply input power to the radio.
- (10) Download the Interface module software from the Park Air radio software CD. Instructions for downloading software are given under the heading 'Data Loader Application' starting on [page 5-39](#).
- (11) The radio's build state is stored in the Interface module. To restore this information, use the DLA Build State procedure given on [page 5-43](#).