Raytheon

Raytheon Marine Company

**Raytheon Pathfinder
Series Radar**

ASLMTX9

User's Manual

Note

This User's Manual for the Raytheon 'Pathfinder' Scanner units includes the 10kW, 48" Open Array Scanner, the 4kW, 48" Open Array, 4kW Radome and 2kW Radome Scanners

Pathfinder Radar Scanners
Owner's Handbook

Pathfinder Radar Scanners
Owners Handbook

February 2000

SAFETY NOTICES

This radar equipment must be installed and operated in accordance with the instructions contained in this manual. Failure to do so can result in personal injury and/or navigational inaccuracies. In particular:

1. HIGH VOLTAGE. The scanner unit contains high voltages. Adjustments require specialised service procedures and tools only available to qualified service technicians – there are no user serviceable parts or adjustments. The operator should never remove the scanner unit internal covers or attempt to service the equipment.

2. ELECTROMAGNETIC ENERGY. The radar scanner transmits electromagnetic energy. It is important that the radar is turned off whenever personnel are required to come close to the scanner to perform work on the scanner assembly or associated equipment.

It is recommended that the radar scanner is mounted out of range of personnel (above head height).

Do not look directly at the antenna at close range as your eyes are the most sensitive part of the body to electromagnetic energy.

When properly installed and operated, the use of this radar will conform to the requirements of ANSI/IEEE C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 Hz to 300 GHz and NRPB, Board Statement on Restrictions on Human Exposure to Static and Time Varying Electromagnetic Fields and Radiation, Doc *NRPB, No. 5 (1993)*.

3. NAVIGATION AID. This radar unit is only an aid to navigation. Its accuracy can be affected by many factors, including equipment failure or defects, environmental conditions, and improper handling or use. It is the user's responsibility to exercise common prudence and navigational judgements. This radar unit should not be relied upon as a substitute for such prudence and judgement.

RAYTHEON MARINE products are supported by a network of Authorized Service Representatives. For information on Raytheon products and services, contact either of the following:

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Preface

This handbook describes the following Pathfinder radar scanners from Raytheon:

2D	18"	2 kW Radome Scanner
4D	24"	4 kW Radome Scanner
5S	48"	4 kW Open Array Scanner
	48"	10 kW Open Array Scanner

2D, 4D and 5S scanner units may be connected to RL70, RL70RC, R70, or R70RC display units. In addition the 2D and 4D scanner units may be connected to SL70, or Autohelm 7" LCD display.

CAUTION
The 5S 48" Open Array Scanner must not be used with the SL70 or Autohelm 7" LCD Display Unit. This may result in damage to the display due to the high power requirements of the open array scanner.

The handbook contains very important information on the installation and operation of your new equipment. In order to obtain the best results in operation and performance, please read this handbook thoroughly.

Raytheon's Product Support representatives or your local dealer will be available to answer any questions you may have.

Display Software Version

For full operation of the open array scanners, the display software version must be 4.xx (or higher) for a R70/R70RC, or 5.xx (or higher) for a RL70/RL70RC. These software versions are normally already installed in the display unit and are also fully compatible with the 2D and 4D radome scanners.

Early display units may not have the correct software for use with open array scanners and will therefore require upgrading.
The software version can be confirmed by switching-on the display and checking the version number during the magnetron warm-up sequence.
Note *that if a scanner unit is not connected then the version number is only displayed for 10 seconds.*

We recommend that where a repeater display is fitted, both the repeater and the master display are upgraded.

Where, necessary Software Upgrade Kits are available from your dealer, distributor or from Raytheon Marine, Part Nos. R55020 (R70/R70RC) and R55019 (RL70/RL70RC).

Warranty

To register your Pathfinder Radar Scanner ownership, please take a few minutes to fill out the warranty registration card found at the end of this handbook. It is very important that you complete the owner information and return the card to the factory in order to receive full warranty benefits.

The radome scanner package includes a barcode label indicating the serial number of the unit. This label should be stuck to the warranty registration card. The open array scanner has two barcode labels indicating the serial numbers of the pedestal and the antenna units. Both labels should be stuck to the warranty registration card.

EMC Conformance

All Raytheon equipment and accessories are designed to the best industry standards for use in the leisure marine environment.

The design and manufacture of Raytheon equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation is required to ensure that performance is not compromised.*

Note: *Then 48" Open Array Scanners have NOT been tested with the SL70 or Autohelm 7" LCD Display Unit for EMC conformance.*

Contents

Chapter 1: Overview

1.1 Introduction

This handbook provides instructions to assist you in the installation and set up of the following radar scanners:

2D	18" 2 kW Radome Scanner
4D	24" 4 k WRadome Scanner
5S	48" 4 kW Open Array Scanner
xS	48" 10 kW Open Array Scanner

2D, 4D, 5S and xS scanner units may be connected to RL70, RL70RC, R70, or R70RC display units. In addition the 2D and 4D scanner units may be connected to SL70, or Autohelm 7" LCD display.

A typical Pathfinder Radar system is illustrated below.
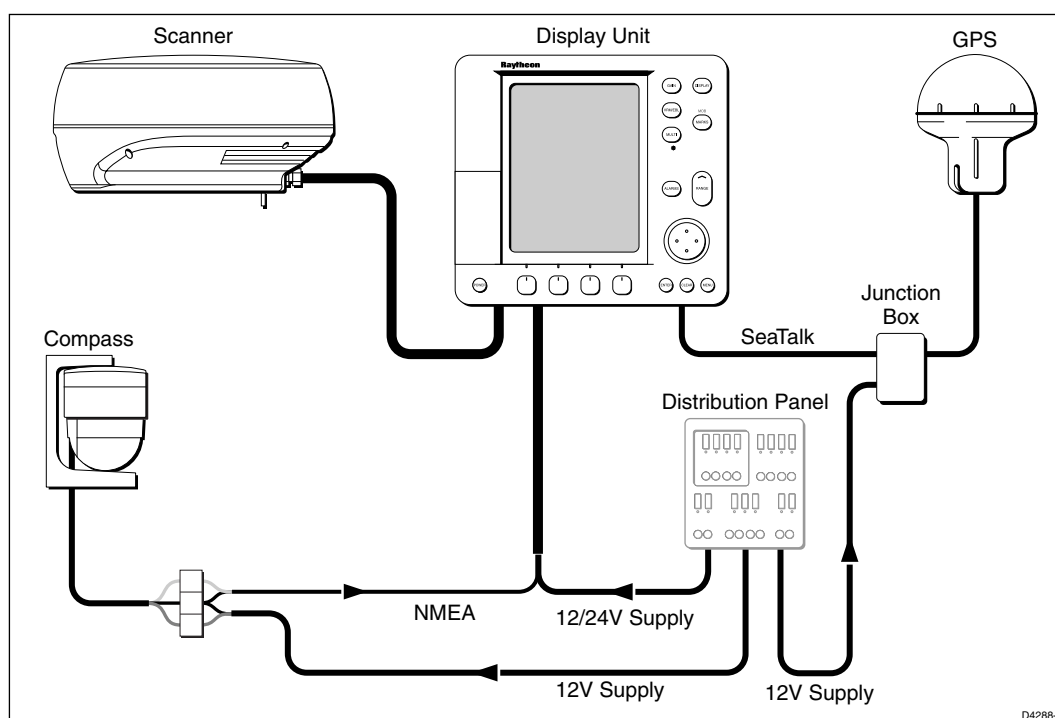
CAUTION
**Do not use the 48" Open Array Scanner with an SL70 or Autohelm 7"
display unit. Failure to observe this may result in permanent damage to
these display units.**

This handbook is divided into three chapters as follows:

Chapter One provides an overview of the scanner installation. It includes sections on Unpacking and Inspecting the Components, Selecting the Scanner

Site and a description of the Cable Runs.

Chapter Two provides detailed instructions on how to mount and connect each type of scanner.

Chapter Three provides instructions on how to perform the system checks, alignment and adjustments. It also provides information on maintenance and what to do if you have problems.

EMC installation guidelines

All Raytheon equipment and accessories are designed to the relevant industry standards for use in the leisure marine environment.

Their design and manufacture conforms to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation configuration is essential to maintain EMC performance and CE compliance. Although every effort has been taken to ensure that they will perform under all conditions, it is important to understand what factors could affect the operation of the product.

The guidelines given here describe the conditions for optimum EMC performance, but it is recognised that it may not be possible to meet all of these conditions in all situations. To ensure the best possible conditions for EMC performance within the constraints imposed by any location, always ensure the maximum separation possible between different items of electrical equipment.

For **optimum** EMC performance, it is recommended that **wherever possible**:

- Raytheon equipment and cables connected to it are:
    - At least 1 m (3 ft) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 2 m (7 ft).
    - More than 2 m (7 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.

- The equipment is supplied from a separate battery from that used for engine start. Voltage drops below 10 V in the power supply to our products, and starter motor transients, can cause the equipment to reset. This will not damage the equipment, but may cause the loss of some information and may change the operating mode.

- Raytheon specified cables are used at all times. Cutting and rejoining these cables can compromise EMC performance and so must be avoided unless doing so is detailed in the installation manual.

- If a suppression ferrite is attached to a cable, this ferrite should not be removed. If the ferrite needs to be removed during installation it must be

reassembled in the same position. *Section 2.1 Installing the Radome Scanner* includes instructions on fitting a ferrite.

The following illustration shows a typical range of suppression ferrites fitted to Raytheon equipment.
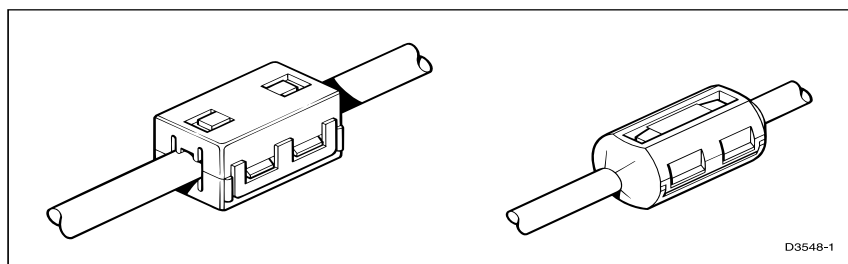
Connections to Other Equipment

If your Raytheon equipment is to be connected to other equipment using a cable not supplied by Raytheon, a suppression ferrite MUST always be fitted to the cable close to the Raytheon unit.

1.2 Unpacking and inspecting the components

Unpack your system carefully, to prevent damage to the equipment. It is good practice to save the carton and packing for future use, in case you need to return the unit for service.

Check that you have all the correct system components. These depend on your system package, as detailed in the following tables.

Radome scanners

Item	Part No.	Supplied with:	Option for:
Radome Scanners			
2D 18" 2 kW Radome Scanner	M92650	US Version	-
2DE 18" 2 kW Radome Scanner	M92650E	European Version	-
4D 24" 4 kW Radome Scanner	M92652	-	-
Radome Scanner Accessories (2D & 4D Variants)			
Inter-unit cable 15 m heavy	M92668	4D	-
Inter-unit cable 25 m heavy	M92669	-	Both
Inter-unit cable 10 m light	M92692	2D (US version)	-
Inter-unit cable 15 m light	M92720	2D (Europe version)	-
Extension cable 5 m	M92699	-	Both
Extension cable 10 m	M92700	-	Both
Mast Mount 18" Scanner	M92722	-	2D

Mast Mount 24" Scanner	M92698	-	4D
Radar Interface adapter To fit radome to M88390 type 18" mast mount	M92721	-	2D
Radome mounting interface plate	M92731	-	2D

Supplied with HSB Series Display Unit

Ferrite Clamp	R55007	-	Both

Open array scanners

Item	Part No.	Supplied with:	Option for:
5S 4 kW Scanner Pedestal	M92654	5S	-
xS 10 kW Scanner Pedestal	M	xS	-
48" Open Array	M92693	5S, xS	-
Inter-unit cable 15 m heavy	M92728	-	5S
Inter-unit cable 25 m heavy	M92706	-	5S (24/32V only)
Cable kit: 5 m +10 m extension To fit open array scanner on a radar arch	E55017	-	5S

Open Array Scanner Accessories

Extension cable 5m	M92699	-	5S (24/32V only)
Extension cable 10m	M92700	-	5S
		-	xS
Software Upgrade Kit	R55020	-	R70/R70RC
Software Upgrade Kit	R55019	-	RL70/RL70RC

1.3 Selecting the scanner unit site

This section provides information that affects the possible locations of the scanner, and its position relative to the display unit and to the power supply.

The dimensions of the each scanner unit are shown in the following diagrams.

227mm (8.9in)

Rear

302.5mm (11.9in)

151.25mm (5.95in)   468mm (18.4in) dia.

Rear

Weight: 6.5 kg (14.3lbs)

Compass Safe Distance: 1m (33")

233mm (9.2in)

116.5mm (4.6in)

141.5mm (5.6in)   **18" Radome Scanner**

D3224_3

227mm (8.9in)

Rear

402mm (15.8in)

185.15mm (7.3in)   599mm (23.6in) dia.

Rear

Weight: 7.5 kg (16.5lbs)

Compass Safe Distance: 1m (33")

233mm (9.2in)

116.5mm (4.6in)

141.5mm (5.6in)   **24" Radome Scanner**

D3228_4

48" Open Array Scanner

1306 mm (51.4 in)

Centre of rotation

Centre of rotation

406 mm (16 in)

100 mm
(4 in)

427 mm (16.8 in)

296 mm (11.65 in)

140 mm (5.5 in)

70 mm (2.75 in)

150 mm (6 in)

Weight: Pedestal   24 kg (53.0 lbs)
          Open Array   6 kg (13.2 lbs)
Compass Safe Distance: 1 m (33 in)

Minimum clearance height 510 mm (20.1 in)

Minimum clearance 630 mm (24.8 in)

D4572-1

Selecting the best location for the scanner unit requires careful consideration of the following points, to ensure reliable and trouble free operation:

Note: *In order to minimise potential interference to other systems on board ship (EMC), it is advisable to mount the scanner on a part of the boat that is insulated from the ship's battery negative. If you cannot do this, and encounter problems, you can fit insulating bushes between the scanner and its mounting bracket.*

• **Height:** The scanner unit should normally be mounted as high as practical above the waterline, for three reasons:

  - For safety reasons the scanner should be out of range of personnel, preferably above head height. This avoids mechanical danger and electromagnetic contact, particularly with the eyes.

  - Radar operates at the line-of-sight, so a high mounting position gives better long range performance.

  - Surrounding large objects, in the same horizontal plane, can interfere with the radar signal and cause blind areas or shadow sectors and false targets on the radar screen (see below).

  However, do not mount the scanner so high that it is affected by the pitching and rolling of the vessel. In addition, you may need to lower the scanner to avoid creating a shadow sector.

• **Access:** The scanner unit site should be easily accessible to allow maintenance to be carried out safely.

• **Magnetic compass:** Mount the scannner unit at least 1 m away from a magnetic compass.

• **Cable run:** The maximum length of cable between the display unit and the scanner unit should not normally exceed 20 m (60 ft) for radome scanners, or 15 m (45 ft) for open array scanners. If you need to use a longer cable power cable lengths must be considered, refer to *Section 1.4 Cable Runs* to determine appropriate lengths.

• **Shadow sectors and false echoes:** Mount the scanner away from large structures or equipment, such as the fly bridge, large engine stacks, searchlights, horns, or masts. It is particularly important to avoid shadow sectors near the bow. Raising or even lowering the scanner may help to reduce these effects.

  In shadow areas beyond the obstruction there will be a reduction of the beam intensity, although not necessarily a complete cut-off; there will be a blind sector if the subtended angle is more than a few degrees.

  In some shadow sectors the beam intensity may not be sufficient to obtain an echo from a very small object, even at close range, despite the fact that a large vessel can be detected at a much greater range. For this reason the

angular width and relative bearing of any shadow sector must be determined at installation. Sometimes shadowing can be seen by increasing the radar gain until noise is present. Dark sectors indicate possible shadowed areas. This information should be posted near the display unit and operators must be alert for targets in these blind sectors.

It should also be noted that wet sails create shadow areas and thus sail boat operators should be aware that radar performance may reduce in rain.

If you mount the scanner on a mast, echoes from the mast may appear on the radar display. These can be minimised by placing absorbing material, such as a block of wood, between the scanner and mast.

- **Platform rigidity/stability:** The scanner platform should not twist (causing bearing errors) or be subject to excessive vibration.
- **Heat/fumes:** Mount the scanner away from the top of exhaust stacks, since the scanner and cables can be damaged by excessive heat and the corrosive effects of exhaust gases.

For open array scanners you should also consider the following points:

- **Mounting Platform**: The platform must be mechanically secure and capable of supporting the mass and inertia of the open array scanner. The complete unit weighs 30 kg.
- The site must be clear of ropes and moving rigging.
- Sufficient clearance must be allowed to fully open the open array pedestal for maintenance.

Mounting surface: sailboats

The scanner unit can be installed on a mast platform, an arch, or a bridge structure. Make sure that the platform surface is flat and the scanner unit drain hole (radome scanners) is not obstructed. Raytheon recommends that radome scanner units are best suited for sailboat operation as open array systems are more difficult to protect from ropes and sails.

For sailboat installations, Raytheon offers a universal mast mount kit for each radome scanner type. This optional mount is used to fit a radome scanner to a flat surface on a mast with a minimum diameter of 60 mm (2½ in). When using the mast mount kit, appropriate hardware should be used for the style and structure of the mast aboard the vessel. If there is any doubt concerning the appropriate type of hardware, consult your boat dealer or representative for their recommendations.

Depending on the type of sailboat, a radar scanner guard should be installed if the sails could touch the scanner or platform. Without a proper radar guard the mounting platform and the radar scanner could be severely damaged.

Mounting surface: power boats

On many small vessels the scanner unit can be installed on a mast platform, an arch, or a bridge structure, but take care to follow the scanner site guidelines, particularly regarding height. If necessary, construct a radar mounting platform to obtain a sufficiently high mounting position. Make sure that the platform surface is flat and the scanner unit drain hole (radome scanners) is not obstructed. Ensure the platform is strong enough to support the maximum shock loads likely to occur.

Setting the radiation plane

The scanner unit should be mounted so that the array rotates parallel to the waterline. The radar beam is approximately 25° wide in the vertical direction, providing good target detection during the vessel's pitching and rolling.

12.5°

12.5°

Waterline

IDEAL RADIATION PLANE   D3223-1
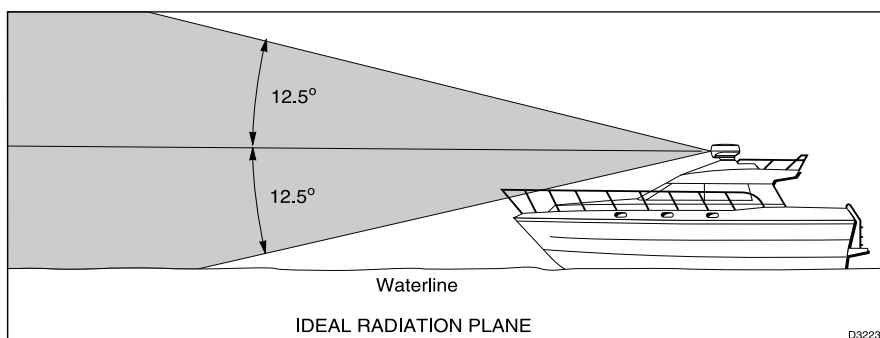
Planing hull vessels, and some displacement hull vessels, adopt a higher bow angle when the vessel is at its cruising speed. In many cases this substantially alters and raises the radar's main radiation plane, and can cause poor detection of nearby targets. It may be helpful to lower the radar beam back towards the parallel, by shimming the rear of the radar, so that the beam points slightly downwards with respect to the waterline when the vessel is at rest.

Wedge or washers

Forward

Using shims to lower the main beam

D3229-2
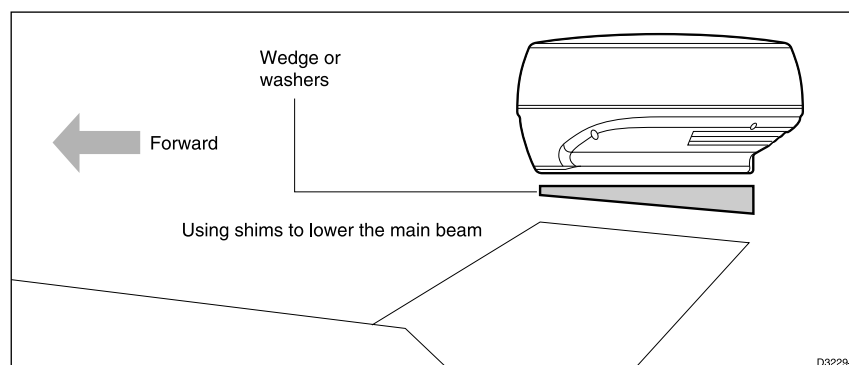
The shims may be made from aluminium plate wedges, simple flat washers, or an angled wooden block. For thick shims, you may need longer securing bolts than the M8x40 bolts supplied with the radome scanner, or the M10 studding supplied with the open array scanners.

1.4 Cable runs

You need to consider the following before installing the system cables:

– You need to fit the inter-unit cable and the power cable.

– All cables should be adequately clamped and protected from physical damage and exposure to heat - avoid running cables through bilges or doorways, or close to moving or hot objects.

– Acute bends must be avoided

– Where a cable passes through an exposed bulkhead or deckhead, a watertight gland or *swan neck* tube should be used.

– Avoid cutting and re-joining cables (if necessary, refer to the notes below)

You need to run the following cables:

CAUTION
Do not pull the cable through bulkheads using a cord attached to the connector. This could damage the connections.

• **Inter-unit cable** . A vinyl-covered and shielded cable is supplied with the radome scanner unit. The cable has a connector plug at one end for connecting to the display unit or extension cable; the other end of the radome scanner cable is fitted with an 8-way plug and power cores (covered by a clear protective sleeve) for connecting to the scanner.
For open array scanners, various length cables are available. These cables have a connector plug at one end for connecting to the display unit or extension cable; the other end is prepared ready to fit to the power and signal connectors (see *Section 2.2*)

• **Power cable,** the scanner receives power via the display unit. The power cable is supplied with the display unit. However, cable details are provided in this section.

Rejoining Cables

You should avoid cutting and re-joining cables. If this is necessary you must:

• Fit a ferrite on each side of the join. The specific ferrite to use depends on the cable type - contact Raytheom Marine for details.

• Take care not to damage any of the wires. Make sure that all the wires and, in particular, the screen are reconnected correctly.

If you are mounting the scanner on the mast of a sailboat, and will need to unstep the mast, you should install a suitable junction box inside the boat. On a radome scanner, the junction box should provide an 11- or 13-way terminal strip, depending on the number of power cores in your cable, with a 10 A rating. Also, you should keep the length of the un-screened coaxial cores to less than 30 mm to maintain EMC conformance.

On an open array scanner, the junction box should provide a 13-way terminal strip with a 20 A rating for power cores. It is essential that all 4 power cores are connected and that the connection is of very low resistance as considerable power passes through this connection. Also, you should keep the length of the un-screened coaxial cores to less than 30 mm to maintain EMC conformance.

Inter-unit cable

The inter-unit cable entrance is at the rear of the scanner unit. If the unit is mounted on a hollow mast the cable may be run inside the mast and then fed through the radar's cable entrance. Make sure that the cable does not chafe where it enters and exits the mast.

Note: *Route the cable from the display up to the scanner, since this will require the smallest clearance hole.*

CAUTION
The display connector on the inter-unit cable is a moulded plug that cannot be replaced. DO NOT remove this moulded plug.

The inter-unit cable, for connecting the scanner to the display unit, depends on your scanner package as follows:

Scanner Package	Inter-Unit Cable
2D (US)	10 m light (2 power cores)
2DE (European)	15 m light (2 power cores)
4D	15 m heavy (4 power cores)
5S, 4 kW	15 m or radar arch kit (5 m + 10 m extension) 25 m heavy (24/32 V systems only)
xS, 10 kW	

The minimum bends permitted are:

Minimum bend, light cable	60 mm (~2.5 in) radius
Minimum bend, heavy cable	82 mm (~3.75 in) radius

Radome scanner cable

The length of the supplied cable should be sufficient to complete the cable run required on most small vessels. For longer runs, additional or replacement cables are available, which have 4 power cores to minimise voltage drops over the longer cable run: these optional cables include 5 m and 10 m extension cables, and a 25 m replacement cable.

The maximum inter-unit cable length is limited by the minimum supply voltage, the scanner type (18" radome or 24" radome), and the cable type (2 or 4

power cores): if a mix of light and heavy cables is used, only 2 power cores are connected through.

Note: *For vessels with 24 V power systems, any combination of inter-unit cables can be used.*
For vessels with 12 V power systems, the recommended cable(s) for different run lengths are given in the following table, which assumes a minimum supply voltage of 10.7 V (the lowest voltage likely to be reached by a 12 V battery in normal marine use). **Do not use cable combinations that are not included in the table.**

Recommended Radome Inter-Unit Cable(s) for Vessels with 12 V Power Systems

Inter-Unit Cable Length Required (m)	2D (US)	Scanner Package 2DE (Eur)	4D
10	Std 10 m light	N/A	N/A
15	Std + 5 m ext	Std 15 m light	Std 15 m heavy
20	Std + 10 m ext	25 m assembly	Std + 5 m ext
25	25 m assembly	25 m assembly	Std + 10 m ext
30	25 m + 5 m ext	25 m + 5 m ext	25 m + 5 m ext
35	25 m + 10 m ext	25 m + 10 m ext	25 m + 10 m ext

Refer to the packing list in *Section 1.2* for cable part numbers

Note: *This table applies to systems using the standard 1.5 m power cable. If you extend the power cable you may need to select different inter-unit cable(s), as discussed in the following section Power Cable.*

Open array scanner cable

Heavy duty cables are available in 15 m and 25 m lengths which should be sufficient to complete the cable run required on most small vessels. For longer runs, 5 m and 10 m extension cables are available, both have 4 power cores to minimise voltage drops over the cable run and incorporate in-line moulded plugs .

The maximum inter-unit cable length is limited by the minimum supply voltage and the scanner type.

12 V Systems

For vessels with 12 V power systems, the recommended cable(s) for different run lengths are given in the following table, which assumes a minimum supply voltage of 10.7 V (the lowest voltage likely to be reached by a 12 V battery in normal marine use). **Do not use cable combinations that are not included in the table.**

Recommended Open Array Inter-Unit Cable(s) for Vessels with 12 V Power Systems

Inter-Unit Cable Length Required (m)	4 kW Scanners	10kW Scanners
5	5m heavy	
15	15 m heavy	
15	5 m heavy + 10 m extension	

Refer to the packing list in *Section 1.2* for cable part numbers

24 V and 32 V Systems

For vessels with 24 V and 32 V power systems, any combination of inter-unit cable up to a maximum length of 35 m can be used.

Power cable - radome scanners

The radome radar systems are intended for use on ships' DC power systems operating in the 10.7 to 32 V DC range (that is, 12 V and 24 V systems, not 32 V systems). A 1.5 m (5 ft) power cable is supplied (with the display unit) for connecting the ship's DC power to the radar scanner via the display unit. Refer to the HSB Series Display Owner's Handbook for details on connecting this cable. This section provides details for extending the length of the power cable.

If a longer power cable run is required, use the supplied power cable to connect to the display unit. Then use a suitable connector block to connect the free end to the extension cable. The supplied power cable has a cross-section of 2.0 mm^2.

Note: *For vessels with 24 V power systems, the power cable may be extended by up to 20 m using a wire gauge of 1.5 mm² (AWG 16) or greater, irrespective of the inter-unit cable length.*

For vessels with *12 V power systems*, longer power cable runs may require larger wire gauges to minimise any voltage drop in the cable. The scanner type and the length and type of the inter-unit cable (see tables) also affect the wire gauge required for the extension power cable. In order to determine the correct

supply cable size if the power cable must be extended, estimate the length of cable between the ship's main power source and the connector block, and then select the wire size indicated by the distance and inter-unit cable in the appropriate table following.

For example, you might have a 24" scanner, with 20 m between the scanner and display unit, that you plan to connect by extending the supplied 15 m heavy inter-unit cable with a 5 m extension cable. In addition, your 12 V power supply might be 10 m from the display unit, requiring an extension of 8.5 m. To determine the wire gauge required for the power cable extension, refer to the table for the 24" scanner, go to the row labelled *15 m Heavy + 5 m ext*, and read across until you come to a maximum cable length greater than 8.5 m. This is the 10 m entry, in the column for 4.0 mm^2 wire gauge.

Maximum Extension Power Cable Lengths (m), 12 V Systems with 18" Radome Scanner

Inter-Unit Cable(s)		Power Cable Core					
	mm^2:	1.5	2.0	2.5	4.0	6.0	10.0
	AWG:	16	15	14	11	10	7
10 m Light		5.0	7.0	9.0	14.0	20.0	35.0
10 m Light + 5 m ext		1.0	2.0	3.0	4.5	7.0	12.0
10 m Light + 10 m ext		Do NOT extend the power cable					
15 m Light		1.0	2.0	3.0	4.5	7.0	12.0
15 m Heavy		7.0	10.0	13.0	20.0	30.0	50.0
15 m Heavy + 5 m ext		5.0	7.0	10.0	15.0	25.0	40.0
25 m Heavy		4.5	6.0	8.0	12.0	20.0	35.0
25 m Heavy + 5 m ext		3.5	4.5	6.0	9.0	15.0	25.0
25 m Heavy + 10 m ext		2.0	3.0	4.0	6.0	9.0	15.0

Note: *If you have an 18" radome scanner, and the wire gauge required for your extended power cable is unacceptably large, you should replace the supplied light (2 power core) inter-unit cable with the 25 m heavy (4 power core) inter-unit cable assembly (see table).*

**Maximum Extension Power Cable Lengths (m), 12 V Systems with 24"
Radome Scanner**

Inter-Unit Cable(s)		Power Cable Core					
mm²:	1.5	2.0	2.5	4.0	6.0	10.0
AWG:	16	15	14	11	10	7
15 m Heavy	5.0	7.0	9.0	14.0	20.0	35.0
15 m Heavy + 5 m ext	4.0	5.0	6.0	10.0	15.0	25.0
15 m Heavy + 10 m ext	2.0	3.0	4.0	7.0	10.0	17.0
25 m Heavy	2.0	3.0	4.0	7.0	10.0	17.0
25 m Heavy + 5 m ext	1.0	1.5	2.0	3.0	4.0	8.0
25 m Heavy + 10 m ext	Do NOT extend the power cable					

Power cable - open array scanners

The 48" 4 kW and 10 kW open array scanners are intended for use on ships' DC
power systems operating in the 10.7 to 44 V DC range (that is, 12 V, 24 V and
32 V systems). Open array scanners draw considerable power from the vessels
power source, especially in high wind speeds. It is essential for reliable
operation that the unit is supplied with a low resistance power cable system,
especially when operated from a 12 V power system.

CAUTION
**Do not use the 48" Open Array Scanner with an SL70 or Autohelm 7"
LCD display unit. Failure to observe this may result in permanent damage
to the display unit.**

12 V systems

Extensions to the supplied power cable must be kept to a minimum and the
power should be fed directly from the output of the battery isolator switch via
its own dedicated cable system. It is recommended that no additional power
switch is included in this power cable.

CAUTION
**The display unit does not include a fuse for scanner power, so an in-line
fuse or circuit breaker MUST be included in the power cable.**

All power connections must be of high quality to minimise their resistance and
to remove the risk of accidental shorts. Recommended maximum power cable
extensions are given in the table below. These figures relate to the total cable
extension, from the end of the supplied 1.5 m power cable to the system battery
terminals. Do not exceed these lengths as unreliable operation may result.

Maximum Extension Power Cable Lengths (m), 12 V Systems

	Power Cable Core Size (each core)			
mm^2:	4.0	6.0	8.0	10.0
AWG:	11	10	8	7
48" 4 kW Scanners	<3.0	4.5	6.0	7.5
48" 10 kW Scanners				

Note: *If the required extension results in unacceptably large diameter cables, use two or more smaller gauge wires to achieve the required copper wire cross-section. For example, using two pairs of 2 mm^2 is equivalent to using two single 4.0 mm^2 cables.*

24 V and 32 V systems

These systems are less sensitive than 12 V systems to voltage loss in the power cables. However, it is still necessary to use adequate cables to prevent excessive power loss. The table below gives the recommended wire gauge for different power cable extension lengths. Raytheon recommends that power is fed directly from the output of the battery isolator switch via its own dedicated cable system.

CAUTION
The display unit does not include a fuse for scanner power, so an in-line fuse or circuit breaker MUST be included in the power cable.

Maximum Extension Power Cable Lengths (m), 24/32 V Systems

	Power Cable Core Size (each core)				
mm^2:	2.0	4.0	6.0	8.0	10.0
AWG:	14	11	10	8	7
48" 4 kW Scanners	<8.0	16.0	24	32	35
48" 10 kW Scanners					

Note: *If the required extension results in unacceptably large diameter cables, use two or more smaller gauge wires to achieve the required copper wire cross-section. For example, using two pairs of 2 mm^2 is equivalent to using two single 4.0 mm^2 cables.*

Chapter 2: Installing the Scanner

2.1 Radome scanner

Securing the radome scanner to the mounting surface

CAUTION

The drain tube must always be used, but may be shortened if necessary

1. Using the paper template supplied with the scanner mounting kit, mark the flat mounting surface with the mounting holes and drain tube hole, and drill the holes as indicated on the template.

    If it is impractical to drill a hole for the drain tube, then the scanner unit should be mounted on 4 suitable spacers 10 mm high and the drain tube length reduced by 10 mm. It will then be clear of the flat surface and can still perform its function.

    Note: *If you are using a Raytheon mast mount bracket, the surface is pre-prepared.*

    Note: *If you are mounting the scanner on a flat surface, you may find it easier to fit the drain tube, as described in the following section, before securing the scanner.*

2. Position the scanner on the mounting surface, ensuring that the cable inlet is pointing aft.

3. Locate the bolts and washers supplied with the scanner, grease the bolts, and secure the scanner to the mounting surface as shown in the following diagram.
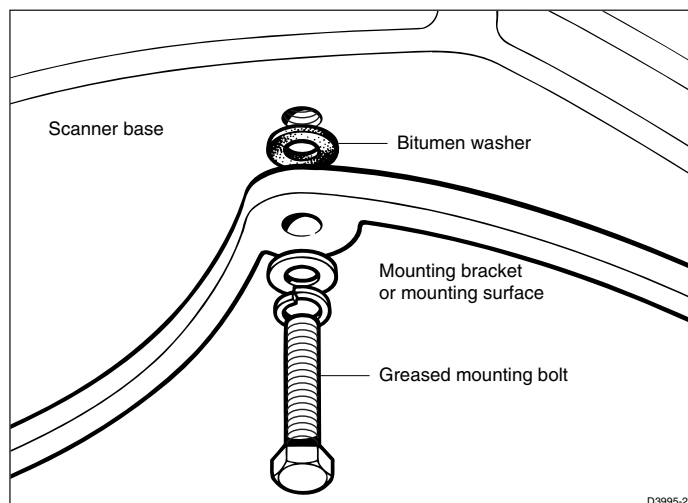
You may need to use longer M8 mounting bolts to secure the scanner if you have used shims to lower the radar beam.

## Connecting the radome scanner inter-unit cable

CAUTION:

Before wiring the scanner unit, make sure that the inter-unit cable is not connected and power is not applied to the display unit.

When you have run the inter-unit cable to the scanner location, connect the cable as follows:

1. Loosen the 4 (18") or 7 (24") screws securing the scanner cover. These screws are captive and should remain assembled to the lower flange assembly. Press the radome inwards to release the top. This breaks the seal and makes removal easier.

2. To avoid losing the scanner cover, tie the cord, attached to the inside of the base of the scanner, to the eye provided in the cover.

3. If you have a 24" scanner, unscrew and remove the inner cover:
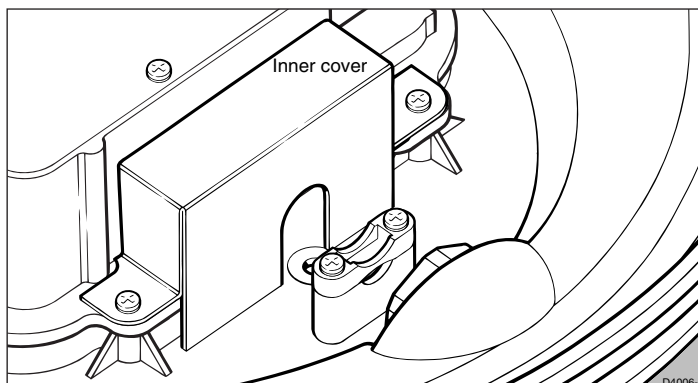
4. Remove the drain tube from inside the base of the scanner, and insert it into the drain hole as shown in the following diagram. Pull the tube gently from outside the scanner so that it clips into place.
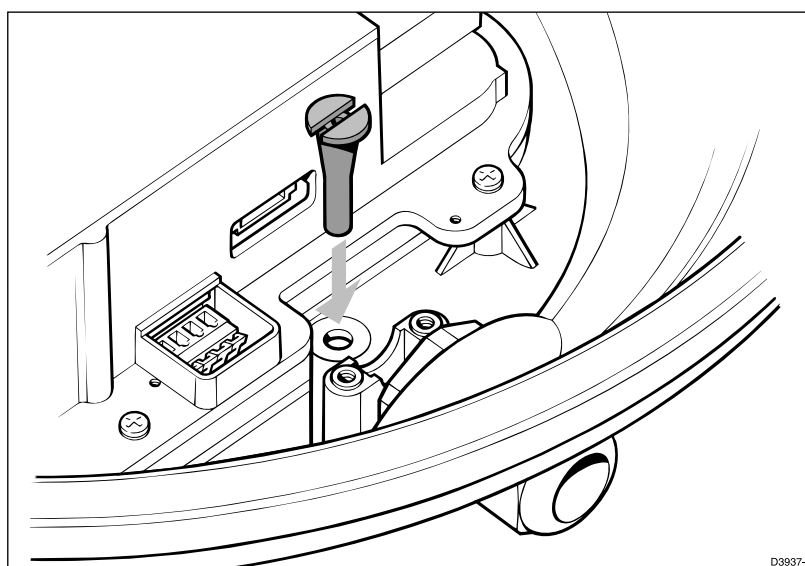
5. Referring to the following illustration, remove the securing nut (1) from the watertight gland and grommet (2), where the inter-unit cable (3) will enter the base.
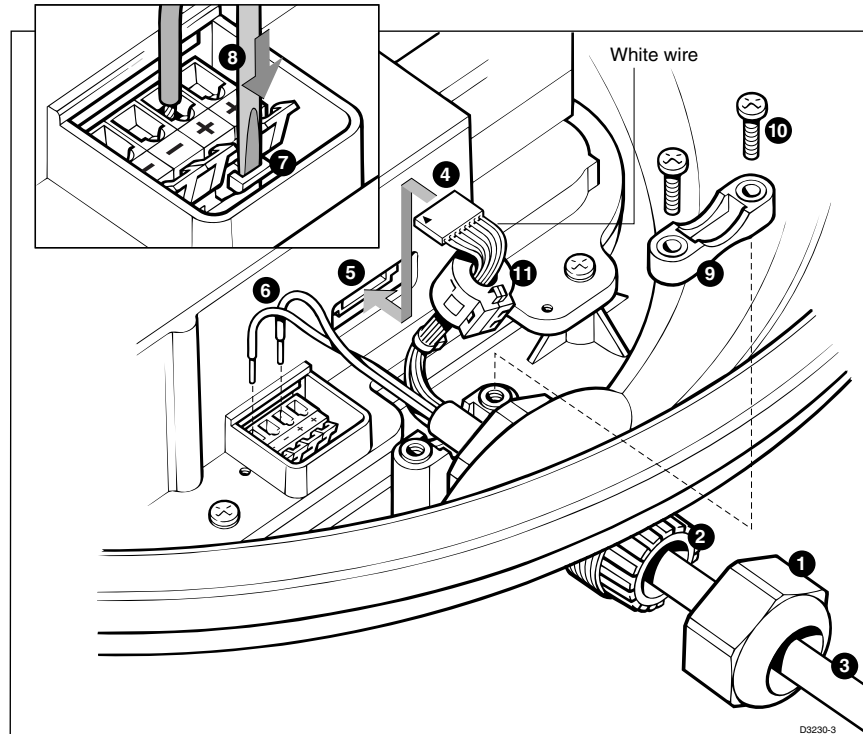
1 Securing nut **2** Gland **3** Inter-unit cable **4** Eight-way plug **5** Eight-way socket **6** Power cores (2 or 4) **7** Terminal clamp **8** Screwdriver **9** Cable clamp **10** Cable clamp screws **11** Ferrite clamp

6. Slide the gland nut onto the inter-unit cable (3), and insert the cable, still covered by its protective sleeve, through the gland into the base.

7. Cut and remove the protective sleeve to expose the 8-way plug (4) and power cores (6).

8. If the scanner is connected to an HSB Series Pathfinder Radar display, fit the ferrite clamp (11), supplied loose with the display unit, as follows:

   CAUTION
   If any wires are damaged when the clamp is fitted, the scanner unit will not function correctly.

   - the ferrite clamp is supplied open. If the clamp has been closed, insert a small, flat-blade screwdriver into the slots at the end of the clamp opposite the hinge and twist gently.

   - Position one-half of the clamp around the eight cores of the inter-unit cable between the 8-way plug (4) and the cable clamp, as close to the 8-way plug as possible. (It may be necessary to fit the clamp over the cable tie closest to the 8-way plug – this will not affect the ferrite clamp's function).

> **Note**: *on the 24" scanner, the clamp must be contained inside the inner cover.*

- With the clamp positioned correctly, close the clamp ensuring none of the cores are trapped by the hinge, latch or the ferrite itself.

9. Connect the 8-way plug (4) to the connector (5). The correct fitting is with the small arrow marked on the body of the plug facing upwards and to the left hand side. The grey wire will then be at the left hand side and the white wire will be at the right hand side.

10. Connect the red and black power cores (6).

   If you have a 10 m or light 15 m inter-unit cable, there is one pair of cores. Connect the red cable lead to one of the terminal sockets marked "+", and the black cable lead to one of the sockets marked "-".

   If you have a heavy 15 m inter-unit cable, there are two pairs of cores. Connect the red cable leads to the terminal sockets marked "+", and the black cable leads to the terminal sockets marked "-", with one lead in each socket.

   The terminal clamps (7) are operated using a screwdriver (8), as shown in the inset diagram on the previous page.

CAUTION:
Do not earth the cable screen to the scanner. The radar system is earthed via the display unit.

11. Secure the nut (1) on the watertight gland, making sure that it grips the cable's outer sheath.

12. Secure the cable with the cable clamp (9), using the two screws (10) provided. The clamp can be installed either way up, depending on the thickness of the cable: use the position that matches the profile of the cable.

CAUTION
It is essential that the drain tube is fitted and that the nut on the watertight gland is adequately tightened. If this is not done, water could become trapped in the scanner and cause irreparable damage.

13. Tighten the securing nut (1) again to ensure a waterproof seal.

14. If you have a 4D scanner, replace the inner cover over the connectors.

15. **Untie the cord from the scanner cover, and coil it up in the base of the scanner unit so that it cannot foul the rotating antenna.**

16. Replace the scanner cover, aligning the mark on the cover with the mark on the scanner base above the cable gland, and tighten the 4 or 7 captive screws. **Do not over-tighten these screws.**

2.2 Open array scanner

Installation of the open array scanner should only be undertaken by a competent installer. If you have any difficulty with the installation, please contact your local Raytheon Marine dealer.

The open array scanner is supplied in two sections; the pedestal unit and the antenna. The pedestal unit is secured from below the mounting platform. The open array is then secured to the pedestal. Full details for mounting the scanner are given below.

CAUTION

The pedestal unit has a cap fitted over the open array mounting shaft to protect the protuding co-axial pin. This cap must be left in place until the open array is fitted.

WARNING

The open array scanner weighs 30 kg. For safety reasons it is recommended that the unit is not lifted by one person.

The unit is fitted with lifting eyes (maximum SWL 40 kg) to facilitate the use of standard lifting accessories, e.g. rope, chain or strop. The safe working load (SWL) of the lifting accessories should be 150 kg. Suitable lifting equipment could include a crane, hoist, or an appropriate rigid, overhead structure.

Alternatively, the unit is suitable for a two person lift. Care should be taken to ensure that each person is standing on a stable surface, and that the pedestal is held carefully to ensure it cannot slip.

The T-bar beneath the open array antenna can be used to aid lifting.

You should never lift the scanner by holding onto the open array antenna.

Securing the pedestal to the mounting platform

1. Using the paper template supplied with the scanner mounting kit, mark the flat mounting surface with the holes and drill as indicated on the template. Refer to *Section 1.2* when selecting the scanner unit site.

2. Stick the four self-adhesive bitumen washers over the mounting holes.

3. Ensure the lifting eyes are securely fitted to the top of the pedestal, and the yellow protective cap is in place.

CAUTION

To prevent damage to the internal mounting bar, ensure the stud penetration is no more than 32 mm into the pedestal base. We recommend you mark each stud with tape, 32 mm from one end, to act as a guage.

4. Grease the studs. Using two nuts locked together on the stud, screw each stud into the pedestal until they bottom out. Remove these two nuts.

Note: *If the studding supplied is not long enough, use M10 stainless steel, grade*

A4 studding of a suitable length. Refer to the following illustration for details.

5.   Using suitable lifting equipment, raise the pedestal over the mounting surface. Carefully lower into position, taking care that the studs pass through the holes without damaging the threads. Ensure that the cable inlet is pointing aft.

WARNING

Support the pedestal unit until it has been secured to the mounting platform. It is important that all four sets of nuts and washers are used to secure the pedestal to the mounting platform.

6.   Referring to the following illustration, use the four nuts and associated washers supplied to secure the pedestal.
     Grease the nuts.
     If required, cut-off any excess stud.
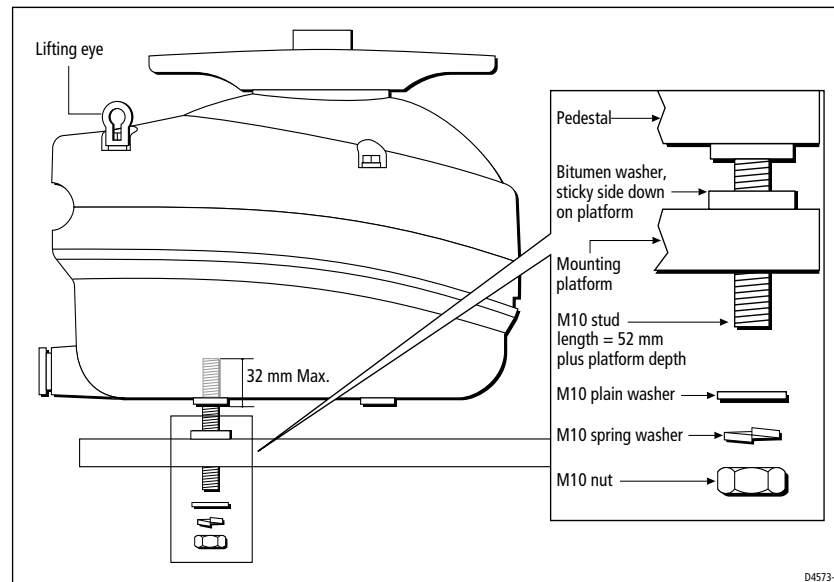
Connecting the open array scanner inter-unit cable

CAUTION:

Before wiring the scanner unit check that it is securely mounted to the platform, then make sure that the inter-unit cable is not connected and power is not applied to the display unit. The scanner switch must be in the OFF position.

1. Loosen the four self-retaining bolts securing the pedestal lid to the base. Pull-up and turn the bolts anti-clockwise to lock them in the upright position. Remove the lifting eyes.

Note: *It is important to remove lifting eyes to avoid corrosion. Retain the lifting eyes: they will be required if the scanner is removed from its platform.*

2. Open the pedestal lid. Ensure the securing stay has automatically locked into position.

3. Referring to the following illustration, remove the cable gland nut, washer and grommet from the watertight gland, where the inter-unit cable will enter the base.

4. Slide the cable through the gland nut, washer and grommet, then into the base. Clamp into position, ensuring the section of main cable covered in yellow heatshrink is clamped.
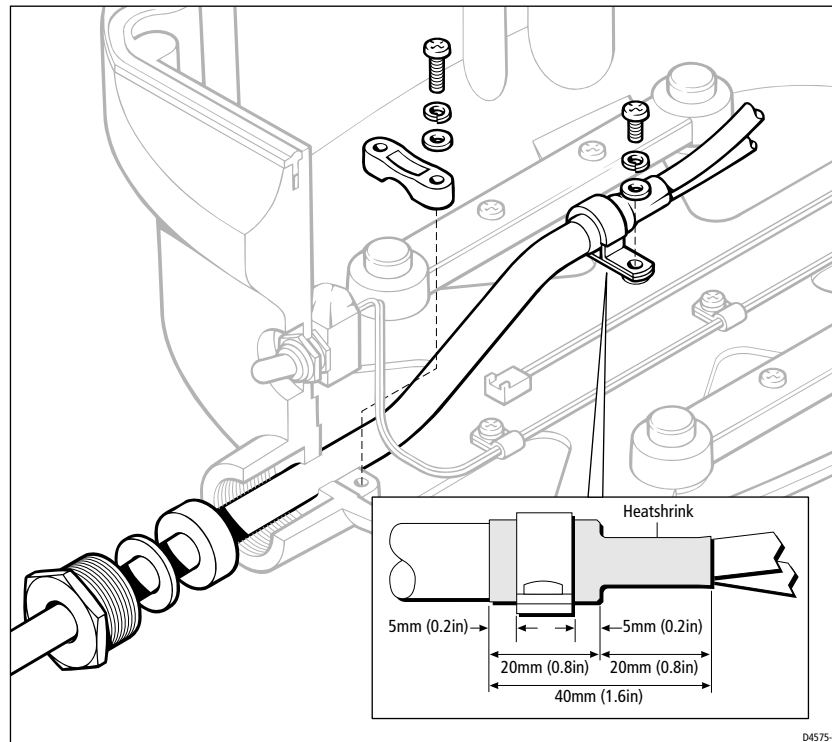
4. The cable is supplied prepared and ready to fit to the signal and power connectors. If you need to cut the cable to length, strip off the protective outer sleeve then use the supplied kit to prepare the cable as detailed in the illustration below.

1. Preparation of Wires
500mm ± 10mm
5-6mm strip length
Black power wires
Red power wires
See Note A
Data wires (6 off)
Coaxial signal
Coaxial screen
See Note B
25mm
10mm
500mm ± 10mm
5-6mm strip length

2. Heat Shrinking of Wires
5mm maximum
35mm
25mm
See Note D   See Note C

3. Heat Shrinking of Cable/Wires
40mm
20mm

Notes
A. Aluminium screen/polyester tape screen to remain.
B. Heat shrink sleeving fitted to keep the aluminium/polyester tape screen from unwinding from the coaxial signal insulation.
C. The wires must be formed into two bundles with heat-shrink tubing (one containing the four power wires and the other containing the eight signal wires).
D. The heatshrink shown in step 3 must be fitted to prevent the 'overall screen' from shorting to base.

D4579-1

CAUTION:

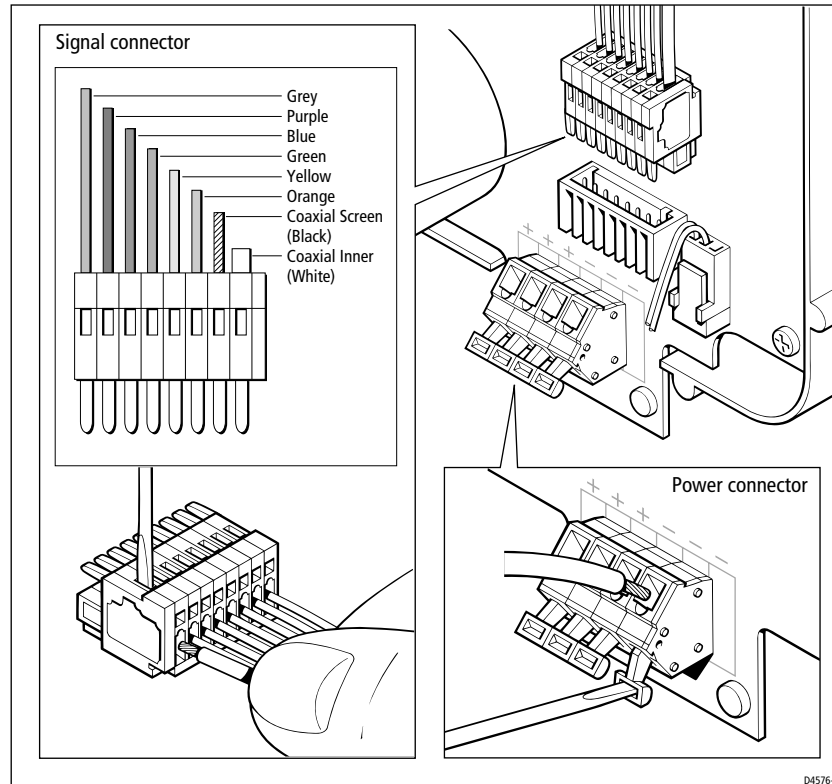**If any of the wires are incorrectly fitted, the scanner will not function correctly.**

Remove the 8-way plug from the signal connector and fit to the cable as shown in the following diagram. The terminal clamps are operated using a screwdriver as shown. Alternatively, you can leave the connector in position whilst connecting the cable, you should then remove the connector and visually check each wire connection.

Re-connect to the plug. When correctly fitted the white wire (co-axial) will be at the outer edge of the unit.

Signal connector

Grey
Purple
Blue
Green
Yellow
Orange
Coaxial Screen (Black)
Coaxial Inner (White)

Power connector

D4576-1

5. Connect the red and black power cores. Connect the red cable leads to the terminal sockets marked "+", and the black cable leads to the terminal socket marked "-", with one lead in each socket. The terminal clamps are operated using a screwdriver as shown in the inset diagram.

CAUTION:

Do not earth the cable screen to the scanner. The radar system is earthed via the display unit.

6. Using the tie-wrap fitting on the pedestal lid, secure the cable.

7. Close the pedestal lid, ensuring that the cable does not become trapped. Tighten the four self-retaining bolts.

Fitting the open array to the pedestal

CAUTION

The pedestal unit has a cap fitted over the open array mounting shaft to protect the protuding co-axial pin. This cap must be left in place until the open array is fitted to the pedestal.

1. Remove the cap from the open array shaft. Retain the cap, it will be required if the open array is removed from the pedestal.

2. Grease the four securing studs.

CAUTION

If the pin is damaged during the following operation you should contact your service dealer.

3. Lift the open array into position. Carefully lower the array - to prevent damage to the mounting pin, ensure the array remains parallel to the pedestal so that the studs slot into the holes on the pedestal mounting bracket.

Note: *The open array mounting bracket is designed so that the array can only be fitted to the pedestal in the correct orientation.*

4. Use the four nuts and associated washers supplied to secure the array to the pedestal as shown in the diagram below.

Array

Pedestal

M8 plain washer

M8 spring washer

M8 nut

D4580-1
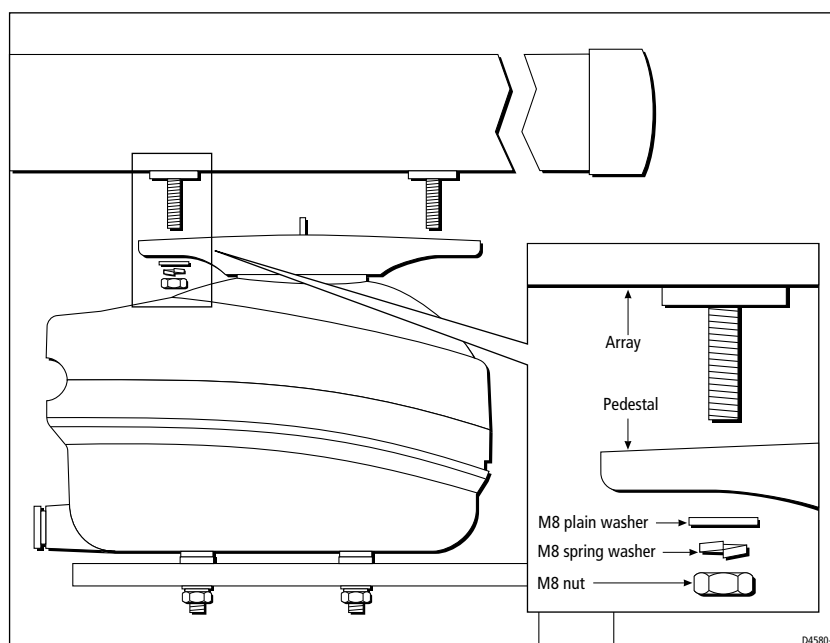
2.3 System connections

DC power connection

Power is supplied to the scanner via the display unit; the power cable is supplied with the display unit, refer to your display unit *Owner's Handbook* for details on connecting power. However, you should be aware of the following.
The DC system should be either:

- Negative grounded, with the negative battery terminal connected to the ship's ground.

- Floating, with neither battery terminal connected to the ship's ground.

CAUTION:
This radar is not intended for use on "positive" ground vessels.
The power cable Earth screen connections must be connected to the ship's ground.

Grounding the radar system

It is important that an effective RF ground is connected to the radar system. You must ground the radar by connecting the drain wire (screen) of the Power/NMEA Input cable to the nearest ground point of the ship's RF ground system. Refer to your display unit *Owner's Handbook* for details.
Note: *Use only this ground connection.*

Power Connections

The power connection to the radar should be made at either the output of the battery isolator switch, or at a DC power distribution panel. Raytheon recommends that power is fed directly to the radar via its own dedicated cable system and MUST be protected by a thermal circuit breaker or fuse, fitted close to the power connection. Refer to the table below for isolator switch, circuit breaker or fuse value ratings. Check all terminal connections are clean.

CAUTION:
If you do not have a thermal circuit breaker or fuse in your power circuit, e.g. fitted to the DC distribution panel, you MUST fit an in-line breaker or fuse to the positive (red) lead of the power cable.

Vessels Supply	Device	Open Array Systems	Radome Systems
12 V	Isolator Switch min. rating Thermal Breaker Rating Fuse value	30 A 12 A 15 A	20A 10A 15 A
24/32 V*	Isolator Switch min. rating Thermal Breaker Rating Fuse value	15 A 7 A 8 A	15 A 5 A 8 A

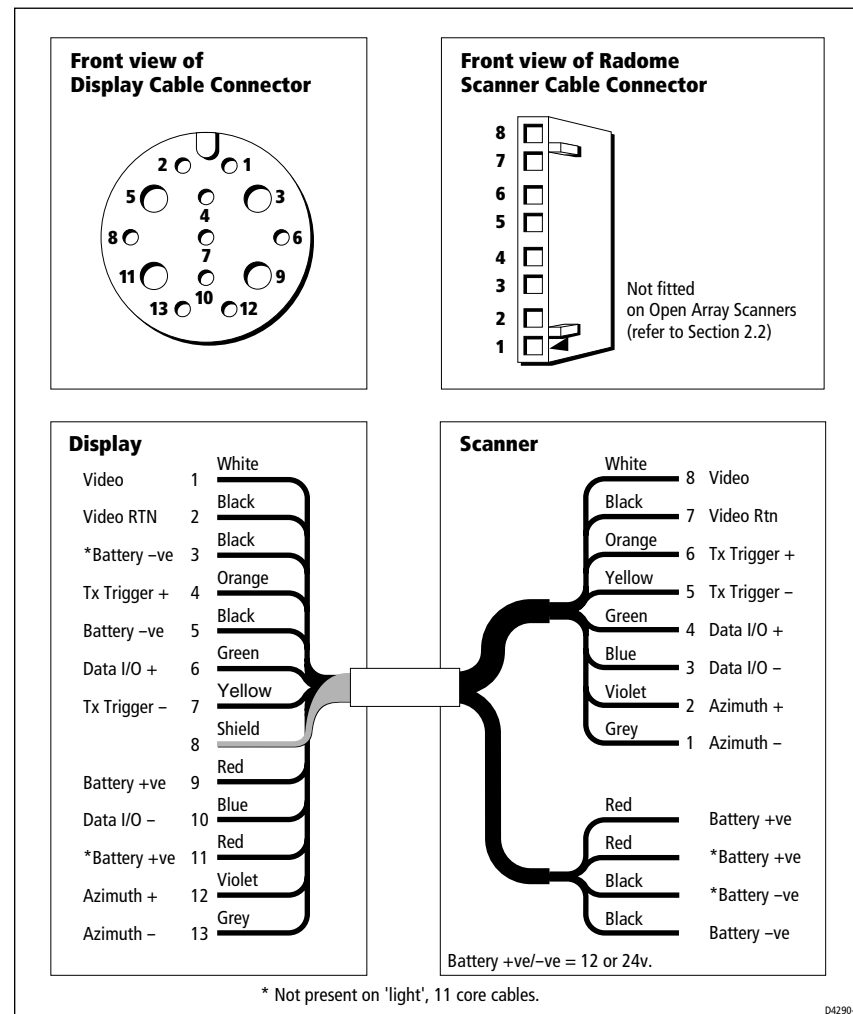******Radome systems cannot use 32V.*

The open arrray scanner has a power switch fitted to the pedestal. This switch can normally be left ON. However, if the scanner is being serviced or if any personnel are in the vicinity of the open array, the switch should be set to OFF.

Scanner connection

The inter-unit cable is connected to the scanner as described in *Sections 2.1 and 2.2*. If you are using an inter-unit extension cable, connect this to the display unit, and connect the supplied cable to the extension cable. The scanner connector pins are shown in the following diagram, together with the connections and core colours.

CAUTION
The display connector on the inter-unit cable is a moulded plug that cannot be replaced. DO NOT remove this moulded plug.

**Front view of
Display Cable Connector**

**Front view of Radome
Scanner Cable Connector**

Not fitted
on Open Array Scanners
(refer to Section 2.2)

Display

Video	1	White
Video RTN	2	Black
*Battery –ve	3	Black
Tx Trigger +	4	Orange
Battery –ve	5	Black
Data I/O +	6	Green
Tx Trigger –	7	Yellow
	8	Shield
Battery +ve	9	Red
Data I/O –	10	Blue
*Battery +ve	11	Red
Azimuth +	12	Violet
Azimuth –	13	Grey

Scanner

White	8	Video
Black	7	Video Rtn
Orange	6	Tx Trigger +
Yellow	5	Tx Trigger –
Green	4	Data I/O +
Blue	3	Data I/O –
Violet	2	Azimuth +
Grey	1	Azimuth –
Red		Battery +ve
Red		*Battery +ve
Black		*Battery –ve
Black		Battery –ve

Battery +ve/–ve = 12 or 24v.

* Not present on 'light', 11 core cables.

D4290-2
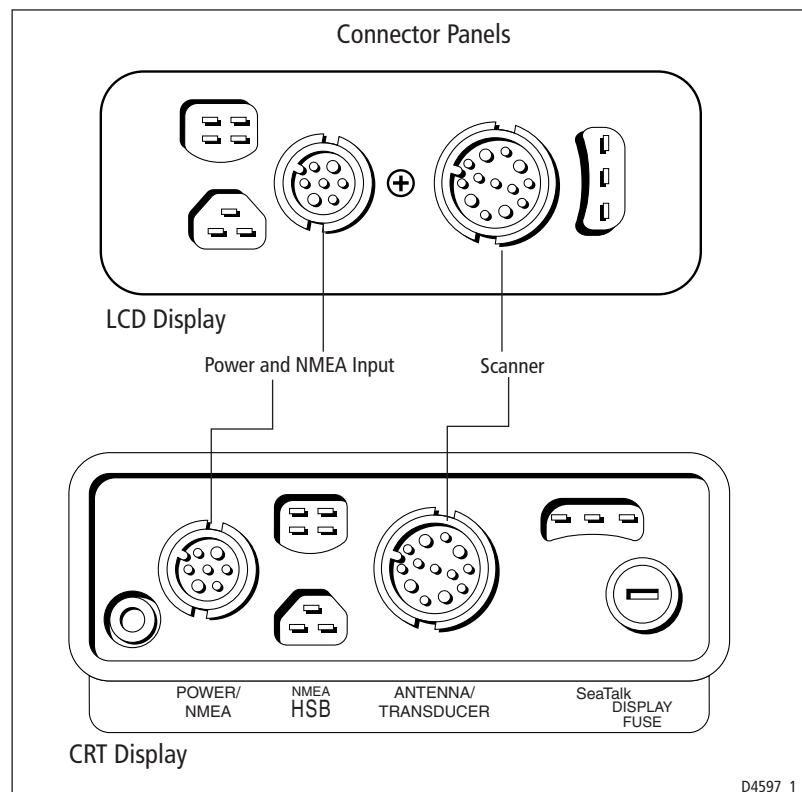
Display unit connection

CAUTION

Do not use the 48" open array scanner with an SL70 or Autohelm 7" LCD display unit. Failure to observe this may result in permanent damage to the display unit.

The rear of the Pathfinder display includes the following connection sockets:

- **Scanner** connection

- **Power/NMEA Input**, for 12 V, 24 V or 32 V (open array) DC power connection, two NMEA 0183 inputs and one RF ground (screen) connection.

Connect the scanner cable to the scanner connector and power to the power/ NMEA input connector .

Power and all other connector details are supplied in the display unit *Owner's Handbook.*

Connector Panels

LCD Display

Power and NMEA Input   Scanner

POWER/NMEA   NMEA HSB   ANTENNA/TRANSDUCER   SeaTalk DISPLAY FUSE

CRT Display

D4597_1

Chapter 3:
Post Installation Checks and Maintenance

Once you have installed your radar scanner and display unit, and made all the connections, you need to check your installation. You can then set up the radar system, align the scanner and check the display timing.

Set up, alignment and timing checks are performed from the radar system display unit. The procedures are outlined below; full details are provided in the display unit *Owner's Handbook*. You should read the Pathfinder radar display unit *Owner's Handbook* and familiarise yourself with the operation of the radar.

EMC Conformance

Always check the installation before going to sea to make sure that it is not affected by radio transmissions, engine starting etc.

3.1 System Checks and Alignment

System check

Before performing the functional test, check the following:

• All securing bolts are fully tightened and mechanical locking arrangements as specified are in place

• All connections have been made

• All connecting wires are secured and protected as necessary

Note: *If you are the boat owner and have performed the installation yourself, ask your authorised installation dealer to check the installation before going to sea.*

Set up, alignment and timing checks

Switch on and initial set up

On the 48" open array scanner, ensure the power switch on the pedestal is set to ON.

To switch on the display unit, press and hold the **POWER** key until the unit beeps. The magnetron warm-up sequence should start, after which the unit should enter Standby mode.
If necessary, adjust the lighting and contrast.
If required, change the default language settings.

Checking transmission
WARNING:
The radar scanner transmits electromagnetic energy. Ensure that the scanner has been installed according to the recommendations given in *Chapter 1*, and that all personnel are clear of the scanner, before switching to transmit mode.

Run through the radar operations described in the display unit *Owner's Handbook* and check that all the expected data is displayed.

Bearing alignment

When the system is correctly installed, you must check the bearing alignment to ensure that targets appear at their correct bearing relative to the ship's bow, and adjust the alignment if necessary.

Display timing adjustment

The display timing can be affected by the length of the cable used to connect the scanner to the display unit. This in turn affects the short range accuracy shown on the display.
It is advisable to check the display timing before using the system for navigation.

3.2 Maintenance

Warnings

The display unit and scanner unit contain *high voltage*. Adjustments require specialised service procedures and tools only available to qualified service technicians - there are no user serviceable parts or adjustments and the operator should not attempt to service the equipment. *The operator should not remove the rear cover of the display or any internal covers in the scanner.*

Always turn the radar system off before carrying out any routine maintenance on the scanner or nearby equipment. Switch off the display unit before removing the power cord.

Routine Checks

The radar scanners are sealed units. Maintenance procedures are therefore limited to the following periodical checks:

- Examine the cables for signs of damage, such as chafing, cuts or nicks.
- Check that the cable connectors are firmly attached.
- Make sure the scanner and pedestal are still attached securing to the mounting.
- Once a year, remove, grease and re-attach the mounting bolts securing the scanner and pedestal.

Servicing and Safety

- Raytheon equipment should be serviced only by authorised Raytheon service technicians. They will ensure that service procedures and replacement parts used will not affect performance. There are no user serviceable parts in any Raytheon product.
- High voltages are generated in both the scanner and the display unit. Never handle the cables/connectors when power is being supplied to the equipment.
- When powered up, all electrical equipment produces electromagnetic fields. These can cause adjacent pieces of electrical equipment to interact with one another, with a consequent adverse effect on operation. In order to minimise these effects and enable you to get the best possible performance from your Raytheon equipment, guidelines are given in the installation instructions, to enable you to ensure minimum interaction between different items of equipment, i.e. ensure optimum Electromagnetic Compatibility (EMC).
- Always report any EMC-related problem to your nearest Raytheon dealer. We use such information to improve our quality standards.

- In some installations, it may not be possible to prevent the equipment from being affected by external influences. In general this will not damage the equipment but it can lead to spurious resetting action, or momentarily may result in faulty operation.

3.3 Problem Solving

All Raytheon products are, prior to packing and shipping, subjected to comprehensive test and quality assurance programmes. However, if this unit should develop a fault, please refer to the following table to identify the most likely cause and the corrective action required to restore normal operation.

If you still have a problem after referring to the table below, contact your local dealer, national distributor or Raytheon Product Support Department for further advice.

Always quote the product serial numbers. The display unit serial number is printed on the back of the unit, and the scanner serial number is on the back of the scanner near the gland.

Common Problems and Their Solutions

Problem	Correction
"Scanner not responding" message.	Check that the cable connecting the scanner to the radar display unit is firmly attached and undamaged.
The bearing displayed on the radar display is not the same as the actual *bearing*.	Perform the bearing alignment procedure described in the display unit *Owner's Handbook Section 8.7*.

How to Contact Raytheon (US)

For Marine Product and Services Information

Visit the Raytheon World Wide Web site for the latest information on the newest Raytheon Marine electronic equipment and systems at:

www.raymarine.com

For Accessories and Parts

Many Raytheon accessory items and parts can be obtained directly from your authorized Raytheon dealer. However, if you are in need of an item not available from the retailer, please contact Sales & Order Services at:

1-800-539-5539 extension 2333 or (603) 881-5200 extension 2333.

Sales & Order Services are available Monday through Friday 8:15 AM to 5:00 PM Eastern Standard Time.

Please have the Raytheon item or part number ready when calling if placing an order. If you are not sure which item is appropriate for your unit, you should first contact the Technical Support Department at:

1-800-539-5539 ext. 2444 or (603) 881-5200 extension 2444

to verify your requirements.

For Technical Support:

For technical support, call:

1-800-539-5539 extension 2444 or (603) 881-5200 extension 2444.

The Raytheon Fax number is 1-603-634-4756.

Our Technical Support Specialists are available to answer questions about installing, operating and trouble-shooting all Raytheon products. Questions may be addressed directly to our Technical Support Department via e-mail at:

rmc_tech_raytheon@raymarine.com.

For Product Repair and Service

In the unlikely event your Raytheon unit should develop a problem, please contact your authorized Raytheon dealer for assistance. The dealer is best equipped to handle your service requirements and can offer timesaving help in getting the equipment back into normal operation.

In the event that repairs can not be obtained conveniently, product service may also be obtained by returning the unit to :

Raytheon Product Repair Center
22 Cotton Road, Suite 280
Nashua, NH03063-4219

The Product Repair Center is open Monday through Friday 8:15 a.m. to 5:00 p.m. Eastern Standard Time or Eastern Daylight Savings Time. All products returned to the Repair Center are registered upon receipt. A confirmation letter will be sent to you acknowledging the repair status and the product's reference number. Should you wish to inquire about the repair status of your unit, contact the Product Repair Center at:

1-800-539-5539 extension 2118.

Please have the product reference number, or unit serial number, ready when you call. We will do everything possible to make the repair and return your unit as quickly as possible

How to Contact Raytheon (Europe)

In Europe, Raytheon support, service and accessories may be obtained from your authorised dealer, or contact:

> Raytheon Marine Company
> Anchorage Park, Portsmouth
> PO3 5TD, England
> Tel : (+44) 23 9269 3611
> Fax: (+44) 23 9269 4642

Technical Support

The Customer Services Department handles enquiries concerning installation, operation, fault diagnosis and repair. For technical helpdesk:

> Tel: (+44) 23 9271 4713
> Fax: (+44) 23 9266 1228

Our technical support staff may also be reached via e-mail. Questions may be addressed directly to:

techsupra@raytheon.com.

Or visit the Raytheon Marine World Wide Web site:

www.raymarine.com

Accessories and Parts

Raytheon accessory items and parts are available through your authorised Raytheon dealer. Please refer to the lists of component part numbers and optional accessories in the Installation chapter of this manual, and have the Raytheon part number ready when speaking with your dealer.

If you are uncertain about what item to choose for your Raytheon unit, please contact our Customer Services Department prior to placing your order.

Worldwide Support

Please contact the authorised distributor in the country. A list of worldwide distributors is supplied with your system.

Appendix A: Specification

2D 18" Radome Scanner Unit

General

Approvals	
CE - conforms to	89/336/EEC (EMC), EN60945:1997
FCC - conforms to	Part 80 (47CFR) and Part 2 (47CFR)
Dimensions	Φ468 x 227 mm (18.4 x 8.9 in)
Weight	6.5 kg (14.3 lbs)
Input Voltage	8.7 - 32 V DC (from display unit)
Power Consumption	28 W (9 W Standby)
Environmental	Waterproof to CFR46
	Temperature range: -10° to +55°C
	Humidity limit: up to 95% at 35°C
	Maximum wind speed for satisfactory operation: 100 Kts
Maximum Range Scale	24 nm

Transmitter

Transmitter Frequency	9410 +/– 30 MHz
Peak Power Output	2.0 kW (nominal)
Transmitter	Solid-state modulator driving Magnetron
Pulse Length/PRF	0.08μs/2250Hz (0.75 nm or less)
	0.25 μs/1500 Hz (above 0.75 nm and less than 6 nm)
	0.70 μs/750 Hz (6 nm or greater)
Standby Mode	Magnetron heater and control left on, all other services off
Duplexer	Circulator

Antenna

Antenna Type	Patch array
Beam Width (nominal)	5.2° horizontal, 25° vertical
Polarisation	Horizontal
Antenna Side lobes	Less than -22 dB
Rotation Rate	24 rpm (nominal)

Receiver

IF Frequency	60 MHz (nominal)
Receiver Characteristic	Semi-log
Receiver Noise Figure	Less than 5 dB (including Low Noise Converter/Limiter & IF Receiver)
Receiver Bandwidth	12/3/1 MHz

4D 24" Radome Scanner Unit

General

Approvals CE - conforms to FCC - conforms to	 89/336/EEC (EMC), EN60945:1997 Part 80 (47CFR) and Part 2 (47CFR)
Dimensions	Φ599 x 227 mm (23.6 x 8.9 in)
Weight	7.5 kg (16.5 lbs)
Input Voltage	8.7 - 32 V DC (from display unit)
Power Consumption	34 W (10 W Standby)
Environmental	Waterproof to CFR46 Temperature range: -10° to +55°C Humidity limit: up to 95% at 35°C Maximum wind speed for satisfactory operation: 100 Kts
Maximum Range Scale	48 nm

Transmitter

Transmitter Frequency	9410 +/– 30 MHz
Peak Power Output	4.0 kW (nominal)
Transmitter	Solid-state modulator driving Magnetron
Pulse Length/PRF	0.08μs/2250Hz (0.75 nm or less) 0.25 μs/1500 Hz (above 0.75 nm and less than 6 nm) 0.70 μs/750 Hz (6 nm or greater)
Standby Mode	Magnetron heater and control left on, all other services off
Duplexer	Circulator

Antenna

Antenna Type	Patch array
Beam Width (nominal)	3.9° horizontal, 25° vertical
Polarisation	Horizontal
Antenna Side lobes	Less than -22dB
Rotation Rate	24 rpm (nominal)

Receiver

IF Frequency	60 MHz (nominal)
Receiver Characteristic	Semi-log
Receiver Noise Figure	Less than 5 dB (including Low Noise Converter/Limiter & IF Receiver)
Receiver Bandwidth	12/3/1 MHz

5S and xS 8" Open Array Scanner Unit

General

Approvals CE - conforms to FCC - conforms to	89/336/EEC (EMC), EN60945:1997 Part 80 (47CFR) and Part 2 (47CFR)	
Dimensions	Pedestal: Array:	427 x 296 x 406 mm (16.8 x 10.5 x 16 in) 1306 mm (51.4 in) length
Weight	Pedestal: Array:	24 kg 6 kg
Input Voltage	7 - 44 V DC (from display unit)	
Power Consumption	9.2 W Standby 46 W Typical operation in light winds 61 W Max. operation in 50 Kt winds 96 W Max. operation in 100 Kt winds	
Environmental	Waterproof to CFR46 Temperature range: -10° to +55°C Humidity limit: up to 95% at 35°C Maximum wind speed for satisfactory operation: 100 Kts	
Maximum Range Scale	72 nm	

Transmitter - 4 kW

Transmitter Frequency	9410 +/– 30 MHz
Peak Power Output	4 kW (nominal)
Transmitter	Solid state modulator driving magnetron

Pulse Length/PRF

Range (nm)	Normal Pulse Length (µS)	Normal PRF (Hz)	Normal Bandwidth (MHz)	Expanded Pulse Length (µS)	Expanded PRF (Hz)	Expanded Bandwidth (MHz)
0.125	0.06	3000	12	0.09	3000	12
0.25	0.06	3000	12	0.09	3000	12
0.50	0.09	3000	12	0.15	3000	12
0.75	0.15	3000	12	0.25	3000	12
1.50	0.35	2000	3	0.45	1600	3
3.00	0.45	1600	3	0.60	1200	0.7
6.0 - 72	1.00	740	0.5	-	-	-

Standby Mode	Magnetron heater and control left on, all other services off
Duplexer	Circulator

Transmitter - 10 kW

Transmitter Frequency	
Peak Power Output	10 kW (nominal)
Transmitter	Solid state modulator driving magnetron

Pulse Length/PRF

Range (nm)	Normal Pulse Length (µS)	Normal PRF (Hz)	Normal Bandwidth (MHz)	Expanded Pulse Length (µS)	Expanded PRF (Hz)	Expanded Bandwidth (MHz)
0.125						
0.25						
0.50						
0.75						
1.50						
3.00						
6.0 - 72						

Standby Mode	Magnetron heater and control left on, all other services off
Duplexer	Circulator

Antenna

Antenna Type	Slotted waveguide array
Beam Width (nominal)	1.85°
Polarisation	Horizontal
Antenna Side lobes	Less than -22 dB
Rotation Rate	24 rpm (nominal)

Receiver

IF Frequency	60 MHz (nominal)
Receiver Characteristic	Semi-log
Receiver Noise Figure	Less than 5 dB (including Low Noise Converter/Inverter & IF Receiver)
Receiver Bandwidth	12/3/0.7/0.5 MHz

Note:

If the scanner is bought for use with an existing display, contact your dealer/ service agent for the latest display software to ensure you can use all the open array scanner features.

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