



Pathfinder Radar Scanners owner's handbook

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Pathfinder Radar Scanners





Pathfinder Radar Scanners

Owners Handbook

December 1998

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 contain 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 cover 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).

Avoid looking directly at the antenna 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, 3Hz to 300 GHz.

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.



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Preface

This handbook describes the following Pathfinder radar scanners from Raytheon:

2D	18" 2kW Radome Scanner
4D	24" 4kW Radome Scanner

It 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.

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.

EMC Conformance

All Raytheon equipment and accessories are designed to the best 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.



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Pathfinder Radar Scanners



Chapter 1: Overview

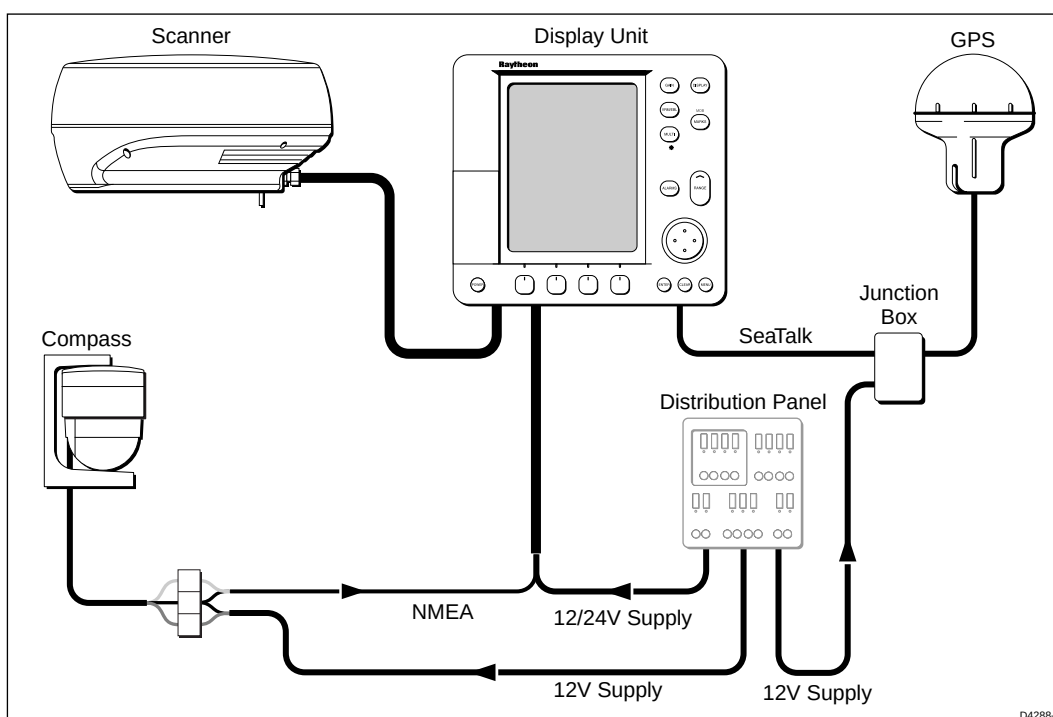
1.1 Introduction

This handbook provides instructions to assist you to install and set up the following radar scanners:

18" Radome Scanner

24" Radome Scanner

A typical Pathfinder Radar system is illustrated below.



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 to mount and connect each type of scanner.

Chapter Three provides instructions to perform the system checks, alignment and adjustments.

EMC Installation Guidelines

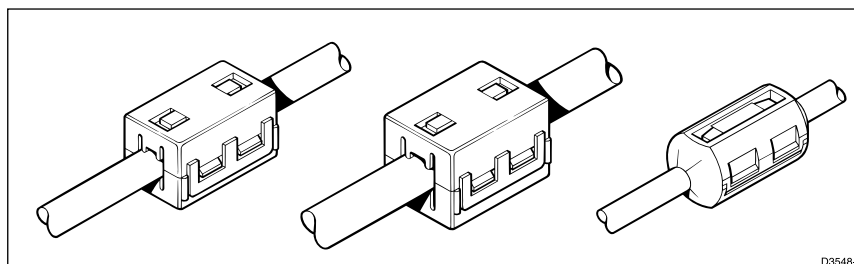
All Raytheon equipment and accessories are designed to the best industry standards for use in the leisure marine environment.

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.

To avoid the risk of operating problems, all Raytheon equipment, and cables connected to it, should be installed as follows:

- Ensuring you follow the installation instructions in *Chapter 2*, particular with reference to earthing details.
- With at least 1m (3ft) 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 2m (7ft).
- Avoiding the beam from another radar scanner. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The equipment should be supplied from a different battery than the one used for engine start. Voltage drops below 10.7V in the power supply to our products can cause the equipment to reset. This will not damage the equipment, but will cause the loss of some information and can change the mode of operation.
- Genuine Raytheon cables must be used at all times. Cutting and rejoining these cables can compromise EMC performance and must therefore be avoided unless specifically detailed in this handbook.
- If a suppression ferrite is attached to a cable, this ferrite must not be removed. If the ferrite has 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.



If your Raytheon equipment is going 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 follows:

Item	Part No.	Supplied with:	Option for:
Radome Scanners			
2D 18" 2kW Radome Scanner	M92650	US Version	-
2DE18" 2kW Radome Scanner	M92650E	European Version	-
4D 24" 4kW 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 15m light	M92720	2D (Europe version)	-
Extension cable 5m	M92699	-	Both
Extension cable 10m	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 To mast mount the radome	M92731	-	2D
Supplied with HSB Series Display Unit			
Ferrite Clamp	R55007	-	Both



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.

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 two reasons:
 - 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 (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.
- **Safety:** The scanner should be out of range of personnel (above head height).
- **Magnetic compass:** Mount the display unit at least 1m away from a magnetic compass.
- **Cable run:** The maximum length of cable between the display unit and the scanner unit should not normally exceed 20m (60ft) for radome scanners. If you need to use a longer cable, refer to *Section 1.4 Cable Runs*.
- **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 objects 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 stack gases.

Mounting Surface: Sailboats

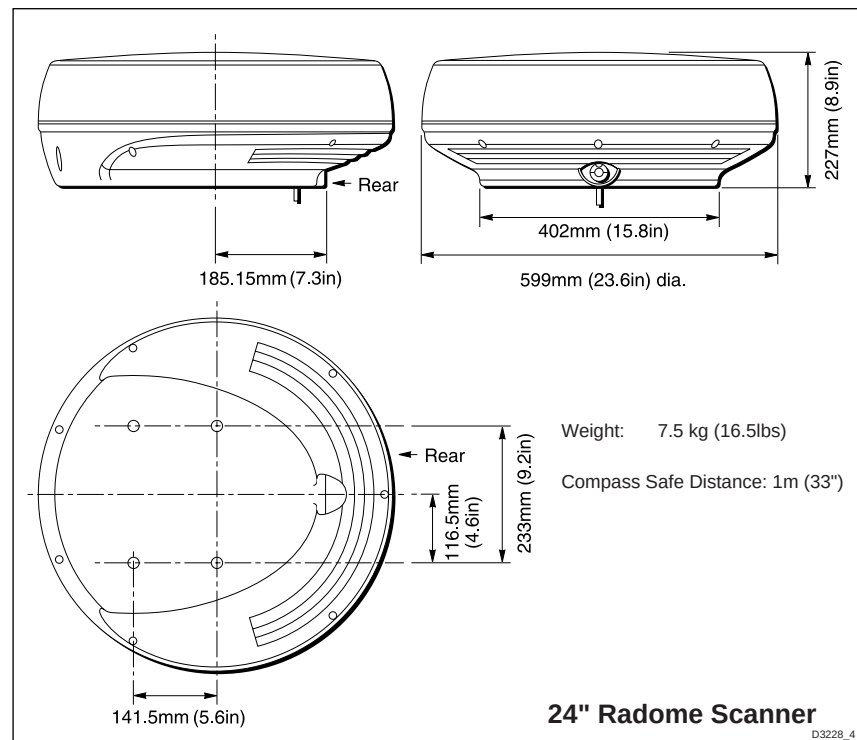
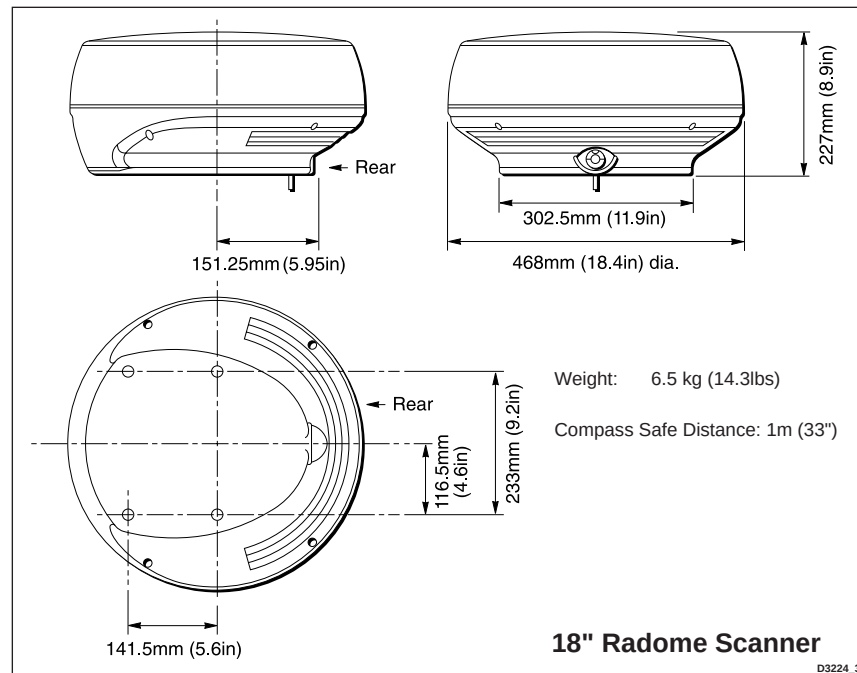
The scanner unit can be installed on a mast platform, an arch, or a bridge structure. Make sure that the platform surface is flat and the scanner unit drain hole is not obstructed. Raytheon recommends that radome scanner units are best suited for sailboat operation as open array systems are more difficult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

For sailboat installations, Raytheon offers a universal mast mount kit for each scanner type. These optional mounts are used to fit masts, with a minimum diameter of 60 mm (2½in), to a flat surface. 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.

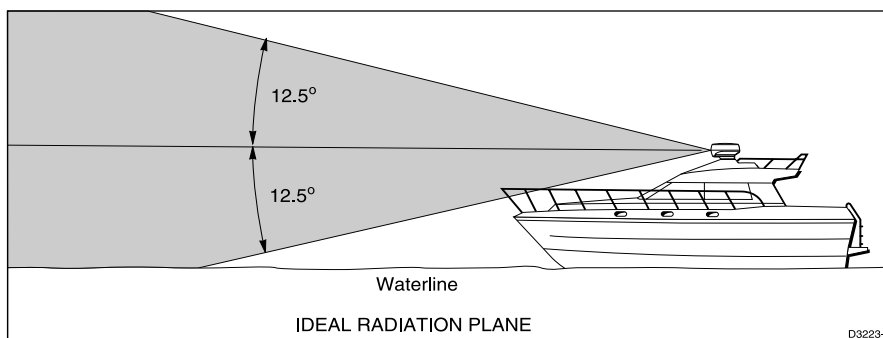
Mounting Surface: Power Boats

On many small vessels the scanner unit can be installed on a mast platform, an arch, or a bridge structure. If necessary, construct a radar mounting pedestal to obtain a sufficiently high mounting position. Make sure that the platform surface is flat and the scanner unit drain hole is not obstructed. Ensure the platform is strong enough to support the maximum shock loads likely to occur.

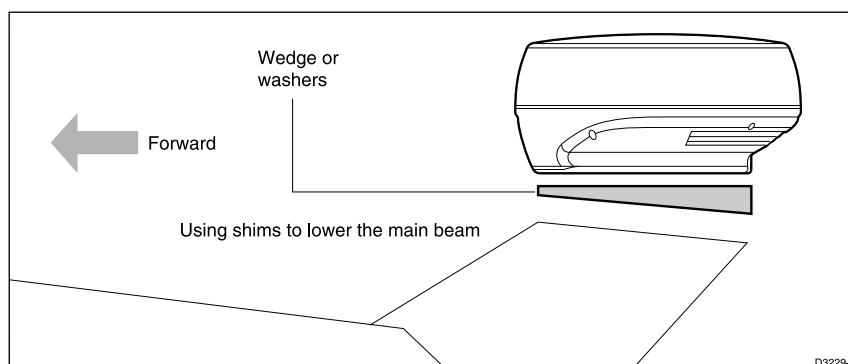


Setting the Radiation Plane

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.



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.



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 scanner.

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 cleated 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 provided.

You need to run the following cables:

CAUTION

Do not pull the cable through bulkheads using a cord attached to the 8-way connector. This could damage the connections.

- **Inter-unit cable**, supplied with the scanner unit. This is vinyl-covered and shielded, with 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.
- **Power cable**, the scanner receives power via the display unit. The power cable is supplied with the display unit. However, connection details are provided in this section.

Inter-Unit Cable - Radome Systems

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 molded 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)	10m light (2 power cores)
2DE (European)	15m light (2 power cores)
4D	15m heavy (4 power cores)

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

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 5m and 10m extension cables, and a 25m 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 24V power systems, any combination of inter-unit cables can be used.

For vessels with 12V power systems, the recommended cable(s) for different run lengths are given in the following table, which assumes a minimum supply voltage of 10.7V (the lowest voltage likely to be reached by a 12V 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 12V Power Systems

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

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

Note: This table applies to systems using the standard 1.5m 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*.

Note: If you are mounting the scanner on a sailboat, and will need to unstep the mast, you should install a suitable junction box inside the boat. The junction box should provide an 11- or 13-way terminal strip, depending on the number of power cores in your cable, with a 10A rating. If cutting and joining the cable, be careful not to damage any of the wires, and make sure that all the wires and, in particular, the screen are re-connected correctly. Also, you should keep the length of the un-screened coaxial cores to less than 50mm to maintain EMC conformance.

Power Cable - Radome

The radome radar systems are intended for use on ships' DC power systems operating in the 10.7 to 32V DC range (that is, 12V and 24V systems, not 32V systems). A 1.5m (5ft) power cable is supplied (with the display unit) for connecting the ship's DC power to the radar scanner via the display unit.

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 2.0mm².

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

For vessels with 12V 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 20m between the scanner and display unit, that you plan to connect by extending the supplied 15m heavy inter-unit cable with a 5m extension cable. In addition, your 12V power supply might be 10m from the display unit, requiring an extension of 8.5m. To determine the wire gauge required for the power cable extension, refer to the table for the 24" scanner, go to the row labelled "15m Heavy + 5m ext", and read across until you come to a maximum cable length greater than 8.5m. This is the 10m entry, in the column for 4.0mm² wire gauge.

Maximum Extension Power Cable Lengths (m), 12V Systems with 18" 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	12	10	8
10m Light		5.0	7.0	9.0	14.0	20.0	35.0
10m Light + 5m ext		1.0	2.0	3.0	4.5	7.0	12.0
10m Light + 10m ext		Do NOT extend the power cable					
15m Light		1.0	2.0	3.0	4.5	7.0	12.0
15m Heavy		7.0	10.0	13.0	20.0	30.0	50.0
15m Heavy + 5m ext		5.0	7.0	10.0	15.0	25.0	40.0
25m Heavy		4.5	6.0	8.0	12.0	20.0	35.0
25m Heavy + 5m ext		3.5	4.5	6.0	9.0	15.0	25.0
25m Heavy + 10m 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 25m heavy (4 power core) inter-unit cable assembly (see table).

Maximum Extension Power Cable Lengths (m), 12V 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	12	10	8
15m Heavy		5.0	7.0	9.0	14.0	20.0	35.0
15m Heavy + 5m ext		4.0	5.0	6.0	10.0	15.0	25.0
15m Heavy + 10m ext		2.0	3.0	4.0	7.0	10.0	17.0
25m Heavy		2.0	3.0	4.0	7.0	10.0	17.0
25m Heavy + 5m ext		1.0	1.5	2.0	3.0	4.0	8.0
25m Heavy + 10m ext		Do NOT extend the power cable					



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

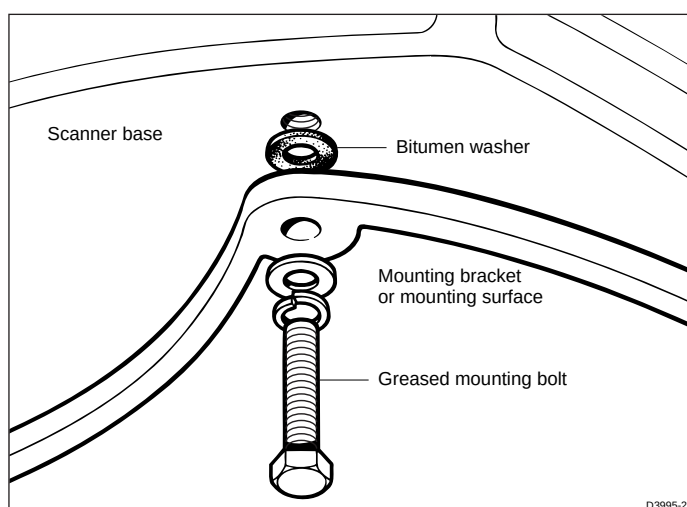
1. Using the paper template supplied with the scanner mounting kit, mark the flat mounting surface with the mounting holes and drain tube hole, and drill the holes as indicated on the template.

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 main beam.

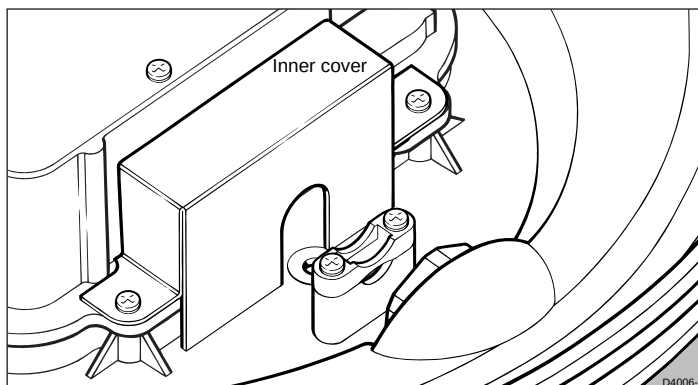
Connecting the Radome Scanner

CAUTION:

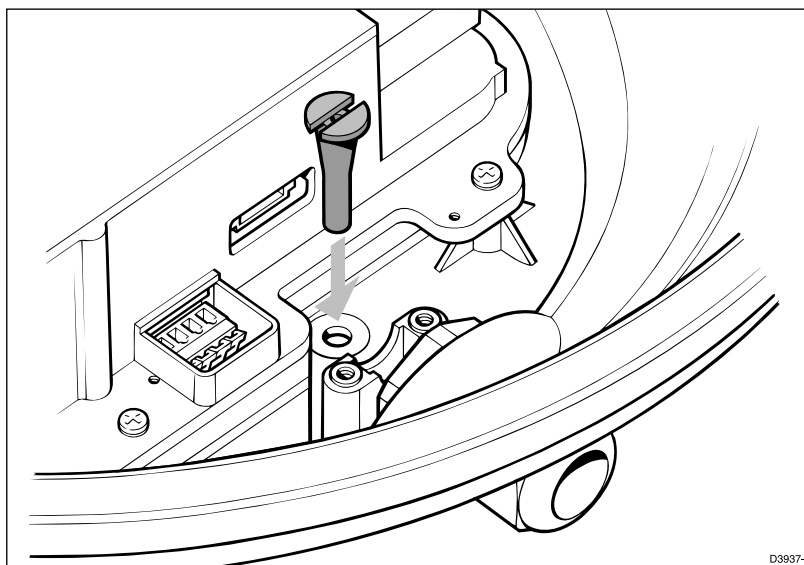
Before wiring the scanner unit, make sure that the inter-unit cable is not connected and power is not applied to the display unit.

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

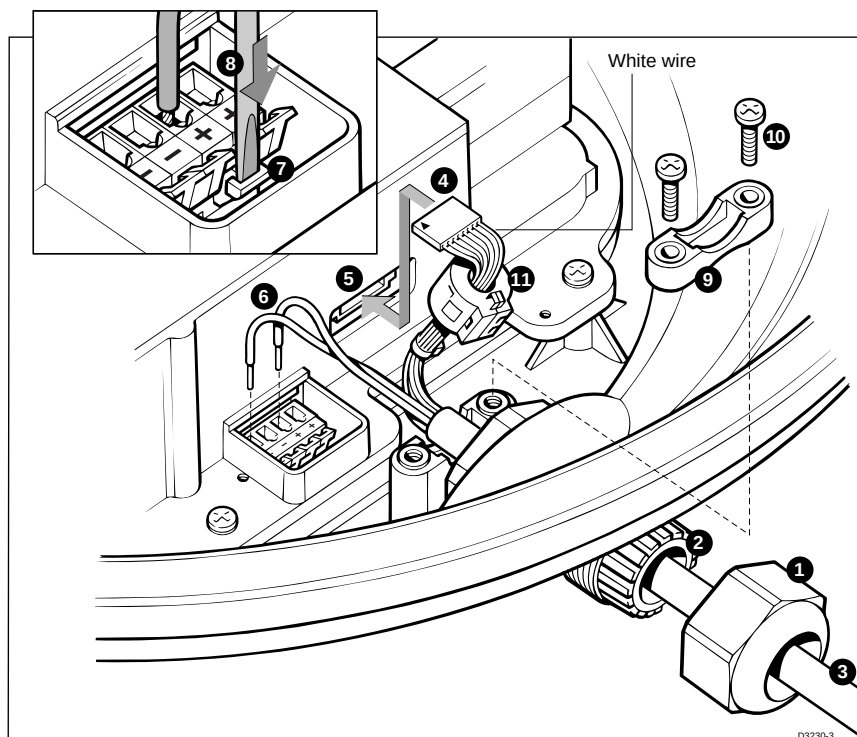
1. Loosen the 4 (18") or 7 (24") screws securing the scanner cover. These screws are captive and should remain assembled to the lower flange assembly. Press the radome inwards to release the top. This breaks the seal and makes removal easier.
2. To avoid losing the scanner cover, tie the cord, attached 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:
 - the ferrite clamp is supplied open. If the clamp has been closed, insert a small, flat-bladed 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).

Ensure that the flat, ferrite side of the clamp does not trap or pinch any of the cables.

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 or latch.
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 10m or light 15m 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 15m 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 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.
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 System Connections

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.

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.*

DC Power Connection - Radome Systems

The Radome radar system is intended for use on ships' DC power systems operating in the 10.7 to 32VDC range (12V and 24V systems, not 32V systems). The connections should be made at a DC power distribution panel, through an isolation switch or circuit breaker that is fused or trips at not greater than 10A. Check that all connection terminals are clean.

CAUTION:

If you do not have a breaker in your power circuit, you must fit an in-line 6.3A quick-blow fuse to the positive (red) lead of the power cable.

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.

The DC system should be either:

- Negative grounded, with the negative battery terminal connected to the ships ground.
- Floating, with neither battery terminal connected to the ships ground.

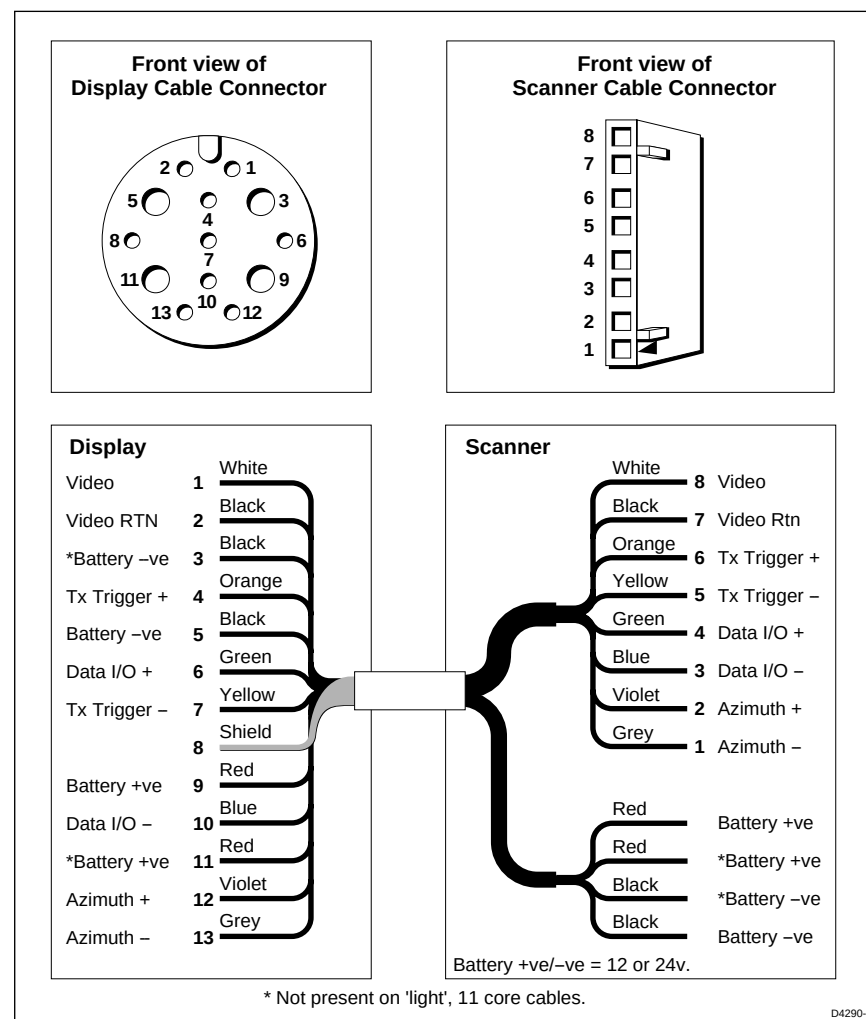
Scanner Connection

The inter-unit cable is connected to the scanner as described in *Section 2.1*. 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

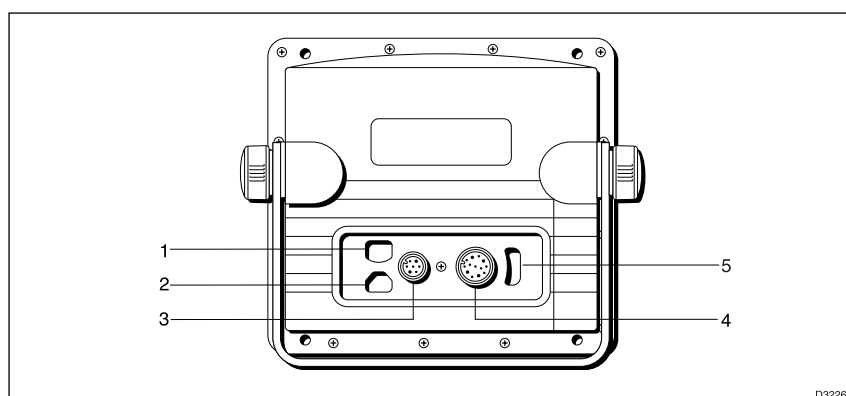
The display connector on the inter-unit cable is a moulded plug that cannot be replaced. DO NOT remove this molded plug.



Display Unit Connection

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

- **Scanner** connection
- **HSB**, for connecting to another HSB Series display (such as a chartplotter or second radar display) – not available on SL70 display
- **SeaTalk**, for SeaTalk data input and output and connecting to another HSB Series display (such as a chartplotter or second radar display)
- **NMEA Output** – not available on SL70 display
- **Power/NMEA Input**, for 12V or 24V DC power connection and two NMEA 0183 inputs



1 NMEA Output 2 HSB 3 Power and NMEA Input 4 Scanner 5 SeaTalk

Connect the scanner cable to the scanner connection (4) and power to the power/NMEA input connector (3).

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



Chapter 3: System Tests and Post Installation Alignment

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.

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 Setup

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. If you have extended your inter-unit cable, you will need to check the display timing before using the system for navigation.



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 227mm (18.4 x 8.9in)
Weight	6.5kg (14.3lbs)
Input Voltage	8.7 - 32V DC (from display unit)
Power Consumption	28W (9W 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: 100Kts
Maximum Range Scale	24nm

Transmitter

Transmitter Frequency	9410 +/- 30 MHz
Peak Power Output	2.0kW (nominal)
Transmitter	Solid-state modulator driving Magnetron
Pulse Length/PRF	0.08ms/2250Hz (0.75nm or less) 0.25ms/1500Hz (above 0.75nm and less than 6nm) 0.70ms/750Hz (6nm 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 Sidelobes	Less than -22dB
Rotation Rate	24 rpm (nominal)

Receiver

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

4D 24" 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	Φ599 x 227mm (23.6 x 8.9in)
Weight	7.5kg (16.5lbs)
Input Voltage	8.7 - 32V DC (from display unit)
Power Consumption	34W (10W 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: 100Kts
Maximum Range Scale	48nm

Transmitter

Transmitter Frequency	9410 +/- 30 MHz
Peak Power Output	4.0kW (nominal)
Transmitter	Solid-state modulator driving Magnetron
Pulse Length/PRF	0.08ms/2250Hz (0.75nm or less) 0.25ms/1500Hz (above 0.75nm and less than 6nm) 0.70ms/750Hz (6nm 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 Sidelobes	Less than -22dB
Rotation Rate	24 rpm (nominal)

Receiver

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





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Warranty iii



Limited Warranty Certificate

Raytheon Marine Company warrants each new Light Marine/Dealer Distributor Product to be of good materials and workmanship, and will repair or exchange any parts proven to be defective in material and workmanship under normal use for a period of 2 years/24 months from date of sale to end user, except as provided below.

Defects will be corrected by Raytheon Marine Company or an authorized Raytheon dealer. Raytheon Marine Company will, except as provided below, accept labor cost for a period of 2 years/24 months from the date of sale to end user. During this period, except for certain products, travel costs (auto mileage and tolls) up to 100 round trip highway miles and travel time of 2 hours, will be assumed by Raytheon Marine Company only on products where proof of installation or commission by authorised service agents, can be shown.

Warranty Limitations

Raytheon Marine Company Warranty policy does not apply to equipment which has been subjected to accident, abuse or misuse, shipping damage, alterations, corrosion, incorrect and/or non-authorized service, or equipment on which the serial number has been altered, mutilated or removed.

Except where Raytheon Marine Company or its authorized dealer has performed the installation, it assumes no responsibility for damage incurred during installation.

This Warranty does not cover routine system checkouts or alignment/calibration, unless required by replacement of part(s) in the area being aligned.

A suitable proof of purchase, showing date, place, and serial number must be made available to Raytheon Marine Company or authorized service agent at the time of request for Warranty service.

Consumable items, (such as: Chart paper, lamps, fuses, batteries, styli, stylus/drive belts, radar mixer crystals/diodes, snap-in impeller carriers, impellers, impeller bearings, and impeller shaft) are specifically excluded from this Warranty.

Magnetrons, Cathode Ray Tubes (CRT), hailer horns and transducers are warranted for 1 year/12 months from date of sale. These items must be returned to a Raytheon Marine Company facility.

All costs associated with transducer replacement, other than the cost of the transducer itself, are specifically excluded from this Warranty.

Overtime premium labor portion of services outside of normal working hours is not covered by this Warranty.

Travel cost allowance on certain products with a suggested retail price below \$2500.00 is not authorized. When/ or if repairs are necessary, these products must be forwarded to a Raytheon Marine Company facility or an authorized dealer at owner's expense will be returned via surface carrier at no cost to the owner.

Travel costs other than auto mileage, tolls and two (2) hours travel time, are specifically excluded on all products. Travel costs which are excluded from the coverage of this Warranty include but are not limited to: taxi, launch fees, aircraft rental, subsistence, customs, shipping and communication charges etc..

Travel costs, mileage and time, in excess to that allowed must have prior approval in writing.

TO THE EXTENT CONSISTENT WITH STATE AND FEDERAL LAW:

(1) THIS WARRANTY IS STRICTLY LIMITED TO THE TERMS INDICATED HEREIN, AND NO OTHER WARRANTIES OR REMEDIES SHALL BE BINDING ON RAYTHEON MARINE COMPANY INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

(2) Raytheon Marine Company shall not be liable for any incidental, consequential or special (including punitive or multiple) damages.

All Raytheon Marine Company products sold or provided hereunder are merely aids to navigation. It is the responsibility of the user to exercise discretion and proper navigational skill independent of any Raytheon equipment.

44592-4
9th November 1998

**United States of America**

Raytheon Marine Company
Recreational Products
676 Island Pond Road
Manchester, NH 03109-5420
U.S.A.

Tel 603-647-7530
Fax 603-634-4756

UK, Europe, Middle East, Far East

Raytheon Marine Company
Recreational Products
Anchorage Park, Portsmouth
PO3 5TD, England

Tel (44) 1705 693611
Fax (44) 1705 694642
Fax Customer support (44) 1705 661228

Raytheon

Factory Service Centers

United States of America

Raytheon Marine Company
address as above

UK, Europe, Middle East, Far East

Raytheon Marine Company
address as above

Stick barcode label here

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Purchase date

Dealer Address

Installed by

Installation date

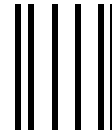
Commissioned by

Commissioning date

Owner's name

Mailing address

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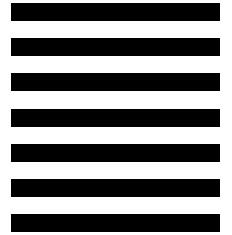
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Recreational Products
676 Island Pond Road
Manchester NH 03109-9953
USA



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Portsmouth
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England



North and South America

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To validate the warranty, the customer or dealer must fill in the requested information below and mail to address shown on front.

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Purchase date

Dealer address

Installed by

Installation date

Commissioned by

Commissioning date

Owner's name

Boat's name/Boat type/Location

Mailing address

Owner's occupation

UK, Europe, Middle East and Far East

Detach and mail this portion within **48 hours**.

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Purchased from

Purchase date

Dealer address

Installed by

Installation date

Commissioned by

Commissioning date

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Boat's name/Boat type/Location

Mailing address

Owner's occupation



