

# **Digital Radar**

## Installation

### Manual

Document number: 87087-2  
Date: December 2007



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# Important Information

## Digital Radar Owners Handbook

June 2007

### Intended use

This product is a radar scanner intended for use within a navigational radar system. The intended application is for leisure marine boats and work boats not covered by IMO/SOLAS carriage requirements.

### Safety Notices



**WARNING: Electrical safety**

Ensure you have the power supply switched and locked off before you start installing/servicing this product.



**WARNING: Navigational safety**

Although we have designed this product to be accurate and reliable, many factors can affect its performance. Therefore, it should serve only as an aid to navigation and should never replace commonsense and navigational judgement. Always maintain a permanent watch so you can respond to situations as they develop.

### CAUTION:

**Before installing the Digital radar system, check that individual components are the correct voltage for your boat's supply.**

As correct performance is critical for safety, we **STRONGLY RECOMMEND** that an Authorized Raymarine Service Representative fits this product. You will only receive full warranty benefits if you can show that an Authorized Raymarine Service Representative has installed or commissioned this product.

This radar equipment must be installed, commissioned and operated in accordance with the Raymarine instructions provided. Failure to do so could result in personal injury, damage to your boat and/or poor product performance. In particular

1. **High Voltage.** The scanner unit contains high voltages. Adjustments require specialized service procedures and tools only avail-

able to qualified service technicians – there are no user serviceable parts or adjustments contained in this product. The operator should never remove the digital radar units internal covers, or attempt to service the equipment.

2. **Radio Frequency Radiation Hazard.** The radar antenna emits electromagnetic radio frequency (RF) energy which can be harmful particularly to your eyes. DO NOT look at the antenna at close range. It is important that the radar is turned off whenever personnel are required to come close to the scanner assembly or associated equipment. It is recommended that the radar scanner is mounted out of range of personnel (above head height). Distances from the face of the radar at which RF radiation levels of 100 W/m<sup>2</sup> and 10W/m<sup>2</sup> exist, are given below.

Model	Distance to 100 W/m <sup>2</sup> point	Distance to 10 W/m <sup>2</sup> point
RA1048HD (4 kW)	Nil	Worst case 1.0 M
RA1072HD (4kW)	Nil	Worst case 1.0 M
RA2048SHD (12 kW)	Nil	Worst case 1.0 M
RA3072SHD (12 kW)	Nil	Worst case 1.0 M

When properly installed and operated, the use of this radar will conform to the requirements of:

- ANSI/IEEE C95.1-2005 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 Hz to 300 GHz.
  - ICNIRP Guidelines 1998 - International Commission on Non-Ionising Radiation Protection: Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300Ghz) 1998.
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, improper handling, installation 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.

## Raymarine Support

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

United States	Raymarine Inc. 21 Manchester Street Merrimack NH 03054-4801, USA Telephone +1 603 881 5200 Fax +1 603 864 4756 <a href="http://www.raymarine.com">www.raymarine.com</a>
Europe	Raymarine Ltd. Anchorage Park Portsmouth Hampshire PO3 5TD England Telephone +44 (0)23 9269 3611 Fax +44 (0)23 9269 4642 <a href="http://www.raymarine.com">www.raymarine.com</a>

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The technical and graphical information contained in this handbook, to the best of our knowledge, was correct as it went to press. However, the Raymarine policy of continuous improvement and updating may change product specifications without prior notice. As a result, unavoidable differences between the product and handbook may occur from time to time, for which liability cannot be accepted by Raymarine.

SeaTalk is a registered trademark of Raymarine Ltd.

## Preface

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.

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

This handbook is divided into three chapters as follows:

**Chapter One** provides information to help you plan the digital radar installation.

**Chapter Two** provides detailed instructions on how to mount and electrically connect your digital radar.

**Chapter Three** provides instructions on how to perform the system checks, alignment and adjustments. It also provides information on maintenance and trouble-shooting.

## Warranty

To register your new Raymarine product, please fill out the warranty card included in the box or go to: [www.raymarine.com](http://www.raymarine.com)

It is important that you complete the owner information and return the card to receive full warranty benefits, including notification of software updates if they are required.

## Certified Installation

Raymarine recommends certified installation by a Raymarine approved installer. A certified installation qualifies for enhanced warranty benefits. Contact your Raymarine dealer for further details and refer to the separate warranty card packed with your product.

## Servicing Raymarine equipment

The digital radar contains no user serviceable parts. For any servicing required, see your local authorized Raymarine service agents for information. They will ensure that service procedures and parts will not affect the units performance.



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## Waste Electrical and Electronic Equipment (WEEE) Directive



The European WEEE Directive requires that waste electrical and electronic equipment is recycled.

Products carrying the crossed out wheeled bin symbol (illustrated) must not be disposed of in general waste or landfill, but in accordance with local regulations for such products.

Although the WEEE Directive does not apply to all Raymarine products, we support its policy and ask you to be aware of the correct method for disposing of such products.

Please contact your local dealer, national distributor or Raymarine Technical Services for information on product disposal.

## EMC Conformance

Raymarine equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) regulations for use in the recreational marine environment. Correct installation is required to ensure that EMC performance is not compromised.

### General information

#### FCC and Industry Canada information

The 4kW & 12kW Digital Radars comply with US CFR47 part 80 Rules and with IC Standard RSS138. Operation is subject to the following two conditions: (1) these devices may not cause harmful interference and (2) these devices must accept interference received, including interference that may cause undesired operation.

Changes or modifications to these devices not expressly approved in writing by Raymarine could violate compliance with FCC or IC rules, and void the user's authority to operate the equipment.

#### Declaration of Conformity

Raymarine UK Ltd. hereby declares that the 4kW & 12kW Digital Radars are in compliance with the essential requirements and other relevant provisions of the R&TTE Directive 1999/5/EC.

The original Declarations of Conformity may be viewed on the relevant product pages at [www.raymarine.com](http://www.raymarine.com).

#### Approvals

EU	R&TTE Directive 1999/5/EC		
USA	FCC Part 80	FCC ID: PJ5-DP4KW (4kW)	PJ5-DP12KW (12kW)
Industry Canada	RSS138	ID IC:4069B-DP4KW (4kW)	IC:4069B-DP12KW (12kW)

# Chapter 1: System Overview

## 1.1 Introduction

This handbook provides instructions to assist you in the installation of the following digital radars:

- **4 kW High definition open array digital radar**
- **4kW Super high definition open array digital radar**
- **12kW Super high definition open array digital radar**

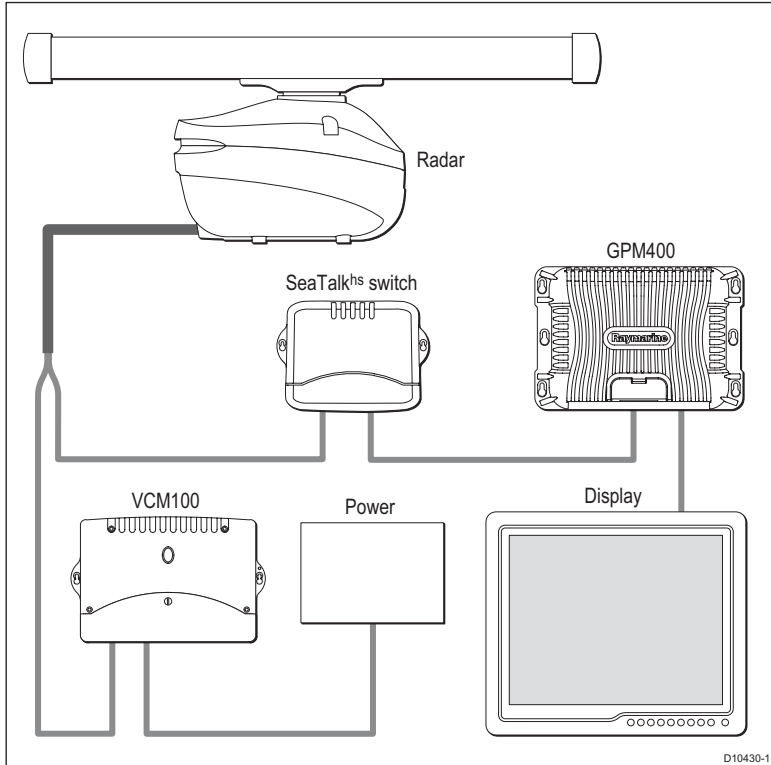
Each of the above radars is available with either:

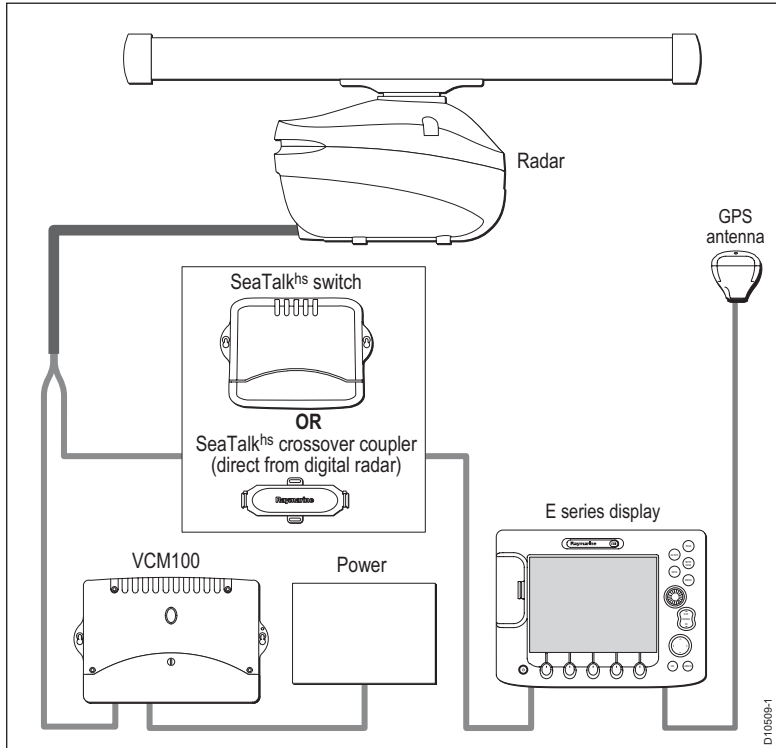
- 48" array scanner
- 72" array scanner

*Note: Digital radars work with G and E-Series systems (for E-Series systems to be compatible with digital radar, software version 4.0 or above is required). For advanced operating procedures please refer to G and E-Series handbooks or contact technical support.*

## System configuration

Examples of digital radar systems as illustrated below. For more detailed systems please see your individual display Owner's Handbook.





## 1.2 EMC installation guidelines

Raymarine equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) regulations. This minimises electromagnetic interference between equipment, which could otherwise affect the performance of your system.

Correct installation is required to ensure that EMC performance is not compromised.

For optimum EMC performance, we recommend that:

- Raymarine equipment and the cables connected to it are:
  - At least 3 ft (1 m) 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 7 ft (2 m).

- More than 7 ft (2 m) 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 product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss, which can occur if the engine start does not have a separate battery.
- Raymarine specified cables are used.
- Cables are not cut or extended unless doing so is detailed in the installation manual.

## Remember

Where constraints on the installation prevent any of the above recommendations:

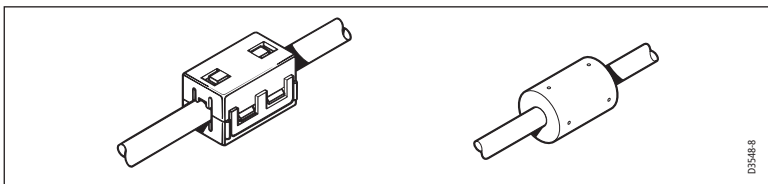
- Always allow the maximum separation possible between different items of electrical equipment. This will provide the best conditions for EMC performance for the installation.

## Suppression ferrites

Raymarine cables may be fitted with suppression ferrites. These are important for correct EMC performance. Any ferrite removed to facilitate installation must be replaced in the original position immediately when installation is complete.

Use only ferrites of the correct type, supplied by Raymarine authorised dealers.

The following illustration shows a typical range of suppression ferrites fitted to Raymarine equipment.



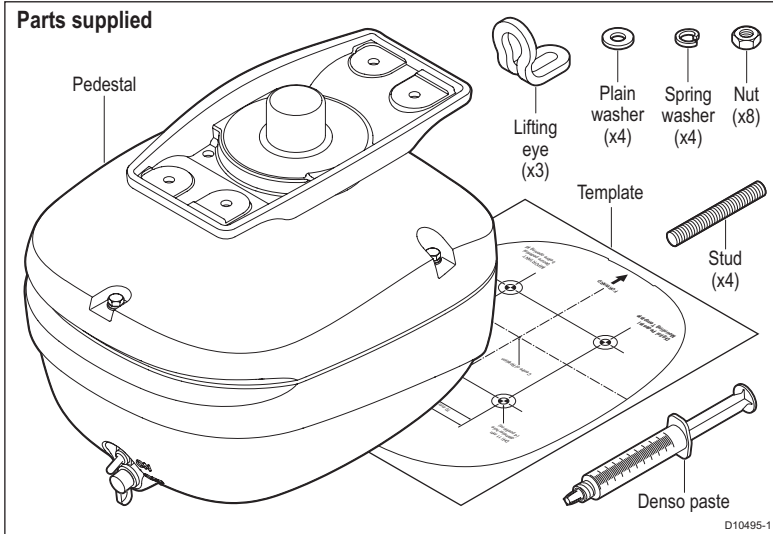
## Connections to other equipment

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

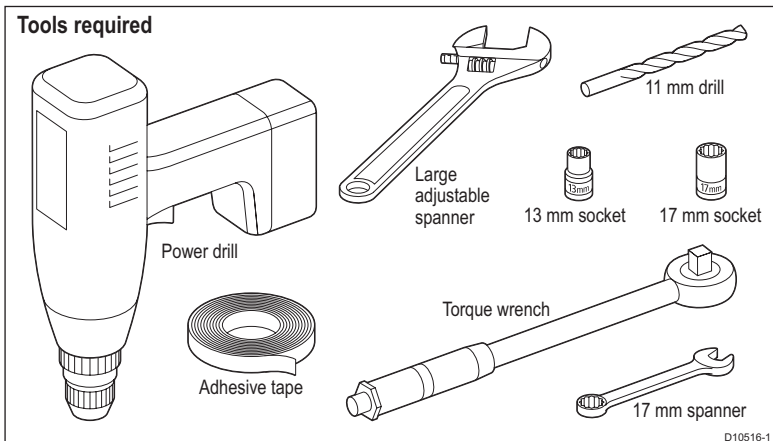
## 1.3 Unpacking and inspecting the components

Unpack your system carefully, to prevent damage to the equipment.  
Check that you have all the correct system components.

### What's in the box?

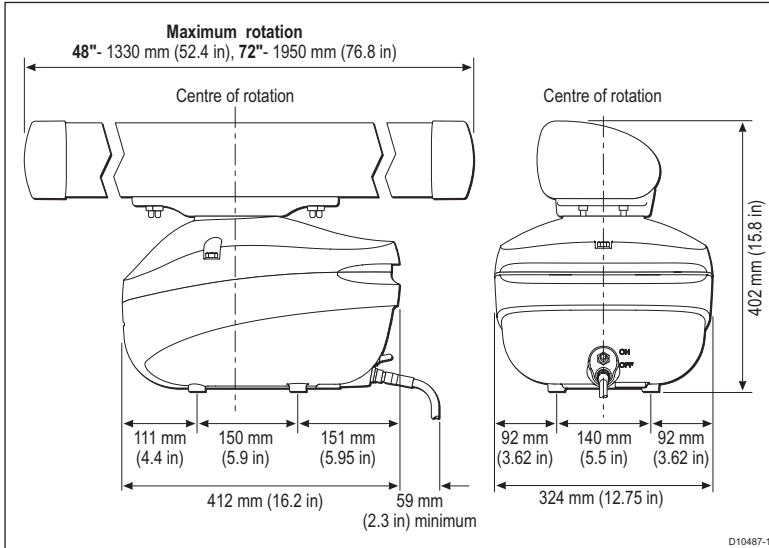


### What tools do I need?



## 1.4 Selecting the digital radar unit site

### Digital radar dimensions



#### CAUTION:

If two digital radars are installed at different locations in a dual radar system, care should be taken to allow for the difference in position of the radars when switching between the two on your display, this is especially noticeable at short ranges on larger vessels.

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

- **Height:** The digital radar unit should normally be mounted as high as practical above the waterline, for three reasons:
  - For safety reasons the digital radar 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 in 'mounting surfaces').

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

- **Access:** The digital radar unit site should be easily accessible to allow maintenance to be carried out safely. Particular attention should be paid to space above the install site to ensure you can open the radar lid fully.
- **Magnetic compass:** Mount the digital radar unit at least 1 m away from a magnetic compass.
- **Cable run:** The maximum length of cable between the battery and the Voltage Converter Module unit (VCM100) should not normally exceed 19.6 ft. (6 M). All power cable lengths should be kept as short as possible. If you need to use a longer cable, power and data cable lengths must be considered, (see 1.8, *Power requirements p.20* and *Table 1-1 p.18*).
- **Shadow sectors and false echoes:** Mount the digital radar away from large structures or equipment, such as large engine stacks, searchlights, horns, or masts. It is particularly important to avoid shadow sectors near the bow. Raising or even lowering the digital radar 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 digital radar on a mast, echoes from the mast may appear on the radar display. These can be minimized by placing absorbing material, such as a block of wood, between the digital radar and mast.

- **Platform rigidity/stability:** The radar platform should not twist (causing bearing errors) or be subject to excessive vibration.
- **Heat/fumes:** Mount the digital radar away from the top of exhaust stacks, since the array and cables can be damaged by excessive heat and the corrosive effects of exhaust gases.
- **Mounting Platform:** The platform must be mechanically secure and capable of supporting the mass and inertia of the open array scanner. The complete digital radar unit (Open array and Pedestal) weighs: 48" scanner - 25 kg (55.1 lb); 72" scanner - 29 kg (63.9 lb).
- The site must be clear of ropes and moving rigging.
- Sufficient clearance must be allowed to fully open the open array pedestal for maintenance/service (*see Digital radar dimensions on page* ).

## 1.5 Mounting Surfaces

The digital radar unit can be installed on a mast platform, an arch, or a bridge structure. Make sure that the platform surface is flat and the units drain hole is not obstructed.

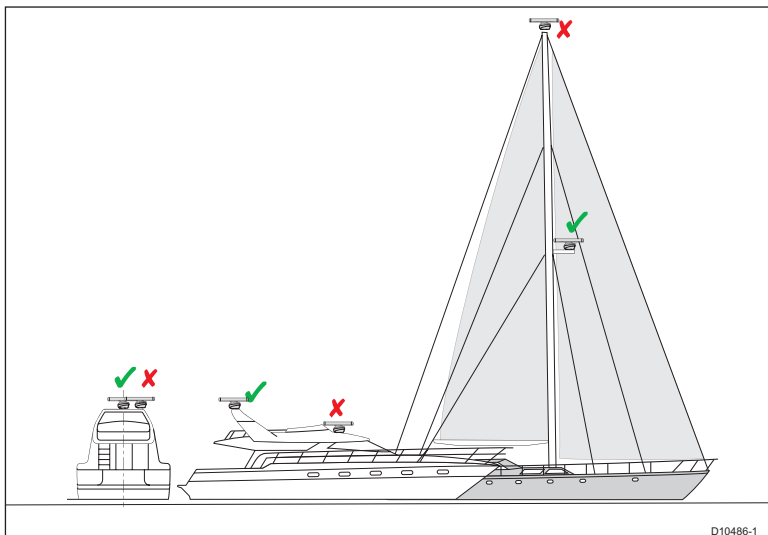
If there is any doubt concerning the appropriate type of hardware, consult your boat dealer or representative for their recommendations.

### Sailboats

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

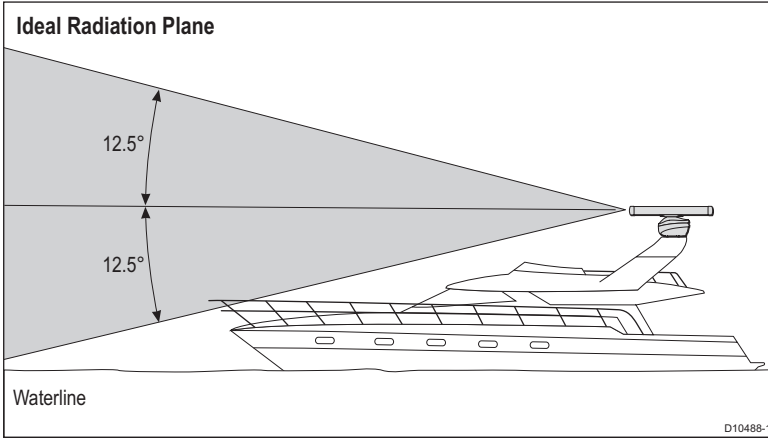
### Power Boats

On many small vessels the digital radar unit can be installed on an arch, or a bridge structure, but take care to follow the site guidelines, particularly regarding height. If necessary, construct a suitable mounting platform to obtain a sufficiently high mounting position. Make sure that the platform surface is flat. Ensure the platform is strong enough to support the maximum likely shock loads of the radar whilst at sea.

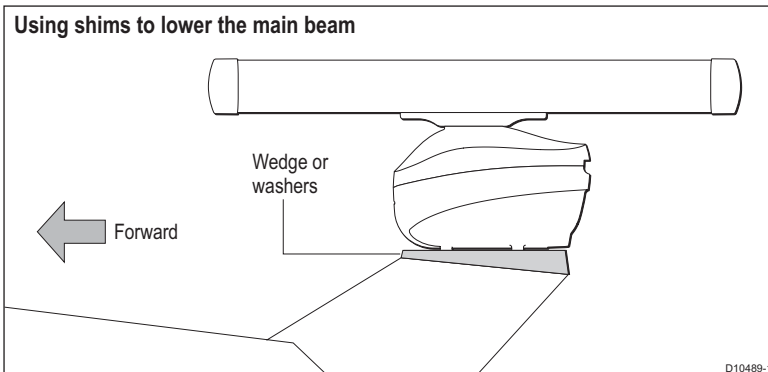


## 1.6 Setting the radiation plane

The digital radar unit should be mounted so that the array rotates parallel to the waterline. The radar beam is approximately  $25^\circ$  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 digital radar, so that the beam points slightly downwards with respect to the waterline when the vessel is at rest.



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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 M10 studding supplied, (see *note in Installing the Digital Radar Components on p.26*).

## 1.7 Cable requirements

This section provides details on selecting the appropriate cables for your system. Permissible cable lengths depend on the digital radar type and the boat's power system. Information on the combined inter-unit and power cables is provided in the following sections.

You need to consider the following before installing the cables:

- You need to connect the digital radar to the SeaTalk<sup>hs</sup> switch, or SeaTalk<sup>hs</sup> crossover coupler for data, and the Voltage Converter Module (VCM100) unit for power. The cable required depends on the distance between the digital radar, VCM100 and data connections.
- 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 in any cable must be avoided. Minimum bend radius = 2.5 inch (60mm).
- Where a cable passes through an exposed bulkhead or deckhead, a watertight gland or *swan neck* tube should be used.
- Do not cut and re-join cables.

### Digital Radar cable

The digital radar cable combines inter-unit data (SeaTalk<sup>hs</sup>) and power cores. One has a plug for connecting in to the SeaTalk<sup>hs</sup> network, the other is for connecting to the power output of the VCM100 (see *Voltage Converter Module (VCM100) on page* ). The digital radar cable connector plug is situated at the rear of the digital radar unit.

4 cable lengths and 2 extension cable length's are available (see *Table 1-1 p.18*).

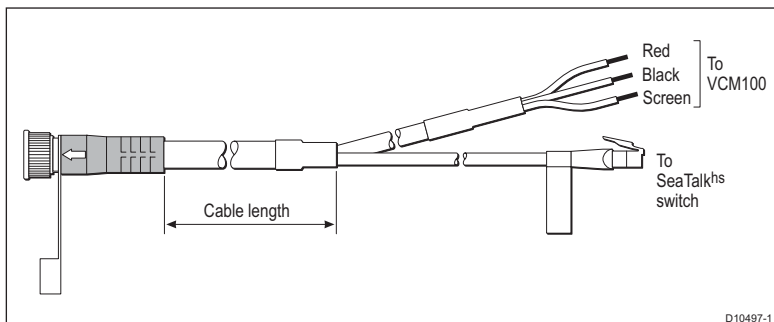
All figures are for cable lengths between digital radar to VCM100 and SeaTalk<sup>hs</sup> connections.

These cable lengths should be sufficient to complete the cable run required on most vessels, part numbers for cables are shown in the table below.

Table 1-1:

Item	Part No.	Option for:
4 kW digital radar Pedestal	E52069	High definition
4 kW digital radar Pedestal	E52081	Super high definition
12 kW digital radar Pedestal	E52082	Super high definition
48" Open Array	E52083	High definition
72" Open Array	E52084	High definition
48" Open Array	E52092	Super high definition
72" Open Array	E52093	Super high definition
<b>Digital cables</b>		
16.4 ft. (5 M) Digital cable	A55076	Cable options for all digital radar configurations.
32.8 ft. (10 M) Digital cable	A55077	
49.2 ft. (15 M) Digital cable	A55078	
82.0 ft. (25 M) Digital cable	A55079	
<b>Digital extension cables</b>		
16.4 ft. (5 M) Digital extension cable	A55080	
32.8 ft. (10 M) Digital extension cable	A55081	

The radar cables power and data connectors described above are illustrated in the following diagram.



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## Running the cable to the digital radar

### CAUTION:

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

The digital connector plug is at the rear of the digital radar unit. If the unit is mounted on a hollow structure the cable may be run up on the inside and then fed through to the digital radars cable connector. Make sure that the cable does not chafe where it enters and exits the mounting structure.

### Cable bend requirements

The minimum bends permitted are:

Minimum bend, 2.5 in (60 mm) radius

### Extending cables

#### Data

You should NOT cut and re-join any of the supplied cables. If it is necessary to extend the SeaTalk<sup>hs</sup> data cable you should use a Raymarine supplied extension cable (see *Table 1-1*; p.18).

For the SeaTalk<sup>hs</sup> data cable extensions you must:

- **G-series:** Connect the digital radar cable's SeaTalk<sup>hs</sup> data plug to the SeaTalk<sup>hs</sup> switch. The output of the SeaTalk<sup>hs</sup> switch should then be connected to the G-series GPM's SeaTalk<sup>hs</sup> port for a networked system (see *System configuration on page 8*).
- **E-series:** If you have a single SeaTalk<sup>hs</sup> device to connect into your E-series, use a SeaTalk<sup>hs</sup> cross-over coupler to route to the display as a direct connection of the digital radars data output is not possible (ensure you have 2 SeaTalk<sup>hs</sup> data cables for either side of the cross-over coupler). If you have multiple SeaTalk<sup>hs</sup> devices, you should route to your display via a SeaTalk<sup>hs</sup> switch. Connect the output of the switch to the E-series display for a networked system, (see *System configuration on page 9*).

*Note: Please ensure you have the correct software version in your E-series display for use with the digital radar. For upgrade procedure information and correct software levels, see your E-series*

*documentation, display upgrade procedure booklet 81299, or go online at [www.raymarine.com](http://www.raymarine.com).*

## **Power**

To extend the power cable (see *Table 1-2*; p.21 for maximum extension lengths), use a splash proof junction box. The junction box should provide a terminal strip with sufficient space for power connections. The terminal strip should be a minimum of 20 Amp rating for power cores. It is essential that both power cores and the screen are connected and that the connection is of very low resistance as considerable power passes through this connection.

### **CAUTION:**

**The digital radar connector at one end of the cable is a moulded plug that should not be removed. DO NOT remove this moulded plug.**

## **1.8 Power requirements**

The digital radar system is intended for use on ships' DC power systems operating from 12 to 24 Volts DC.

### **12 V and 24 V systems**

Extensions to the supplied power cable should be kept to the minimum length possible. Raymarine recommends that the power should be fed directly from the output of the battery isolator switch or DC distribution panel via its own dedicated cable system to the VCM100. It is also recommended that no additional power switch is included in this power cable.

All power connections must be of high quality to minimize their resistance and to remove the risk of accidental shorts. Recommended total power cable lengths and gauges are given in the table below. These figures relate to the maximum distance of cables from the



battery isolator switch/DC distribution panel to the VCM100. Do not exceed these lengths as unreliable operation may result.

Table 1-2:

*Max total distance from power supply to Voltage Converter Module (VCM100)				
AWG ( <i>American Wire Gauge</i> )	11	10	8	7
Maximum distance (12 V supply)	6.0 M (19.6 ft.)	8.0 M (26.2 ft.)	10.0 M (32.8 ft.)	15.0 M (49.2 ft.)
Maximum distance (24V supply)	24.0 M (78.7 ft.)	32.0 M (104.9 ft.)	40.0 M (131.2 ft.)	55.0 M (180.4 ft.)

*Note: If the required extensions result 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<sup>2</sup> is equivalent to using two single 4.0 mm<sup>2</sup> cables.*

## Voltage Converter Module (VCM100)

The VCM100 is exclusively used to convert the ships supply, nominally operating at ranges from 12 to 24 V with a higher voltage output of 42 V to the digital radar. The unit is a below decks unit only and is designed to be splash-proof only!

Notes:

- Only one digital radar can be powered per VCM100.
- For dual digital radar systems, use one digital radar per VCM100.

### Power in

Power from the battery isolator/DC distribution panel goes to the 'POWER IN' port, making sure to use the screen port to effectively ground the radar (*see Grounding the digital radar system on page 23*).

### Power out

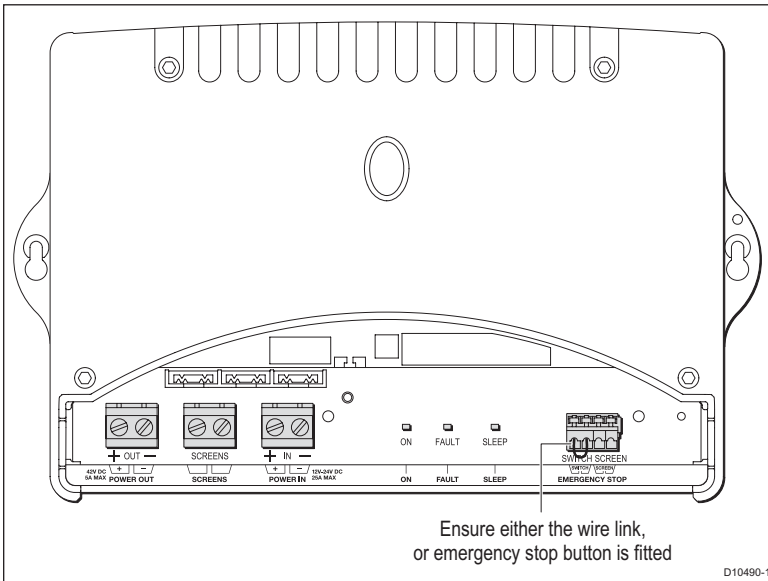
The 'POWER OUT' port is used to connect the digital radar power cable to supply the 42 V required, also ensure that the screen port is used.

## VCM100 Status LED's

The VCM100 has status LED's fitted (see Table 3-2; p.43 for trouble-shooting advice).

## Emergency stop button

The VCM100 unit has an option for an emergency stop button. If this is used, the factory fitted wire link (bridge) should be removed and replaced with the emergency stop button's connector wires.



### CAUTION:

The digital radar has been designed to be used in conjunction with a VCM100 and is NOT compatible with a direct battery connection

---

## 1.9 Grounding the digital 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/screen wire (green) of the power cable to the ground point (screen) of the VCM100, the ship's RF ground system should be connected to the other screen point on the VCM100 when running the power cables. Refer to your display unit *Owner's Handbook* for details.

If you need to extend the drain (screen) wire, the extension wire should be an 8 mm braid or AWG 10 (6.0 mm<sup>2</sup>) multi-stranded cable.

If your vessel does not have an RF system, connect the drain wire to the negative battery terminal.

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.**

## 1.10 Circuit breaker and fuse ratings

It is recommended that power is fed directly to the VCM100 via its own dedicated cable system and **MUST** be protected by a thermal circuit breaker or fuse, fitted close to the power connection, then run power from the output of the VCM100 to the digital radar, (*the connection from the output of the VCM100 to the digital radar does not need any fuse or circuit breakers connecting*). Refer to the table below for isolator switch, circuit breaker or fuse value ratings. Check and ensure 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 lead of the power cable.**

Table 1-3:

Vessels Supply	Device	Open Array Systems	
		4 kW	12 kW
12 V	Isolator Switch min. rating	30 A	30 A
	Thermal Breaker rating	15 A	15 A
	Fuse value	20 A	20 A
24 V	Isolator Switch min. rating	15 A	15 A
	Thermal Breaker rating	8 A	10 A
	Fuse value	10 A	15 A

Digital radars cannot be directly connected to the battery. Power connections are made from the VCM100 POWER OUT port.

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# Chapter 2: Installing the Digital Radar Components

## 2.1 Digital radar

### CAUTION:

**Correct performance of the boat's navigation equipment is critical for safety, we STRONGLY RECOMMEND that an Authorized Raymarine Service Representative fits this product.**

You will only receive full warranty benefits if you can show that an authorized Raymarine service representative has installed or commissioned this product.

Installation of the digital radar should only be undertaken by a competent installer. If you have any difficulty with the installation, please contact your local Raymarine dealer or distributor.

The digital radar system is supplied in three sections; the pedestal unit, the antenna and the Voltage Converter Module (VCM100). The pedestal unit is secured from below the mounting platform. The open array is then secured to the pedestal, and the VCM100 is fitted where it is accessible. Full details for mounting the digital radar are given below.

### CAUTION:

**The pedestal unit has a cap fitted over the open array mounting shaft to protect the delicate protruding co-axial pin. This cap must be left in place until the open array antenna is ready to be fitted and fixed.**



### WARNING:

**The digital radar weighs in total (with antenna fitted): 48" Radar - 25 kg (55.1 lb); 72" Radar - 29kg (63.9 lb). For safety reasons it is recommended that the unit is not lifted by one person.**

The unit is supplied 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 a minimum of 150 kg. Suitable lifting equipment could include a crane, hoist, or an appropriate rigid, overhead structure. You should not attach the antenna to the digital radar prior to lifting,

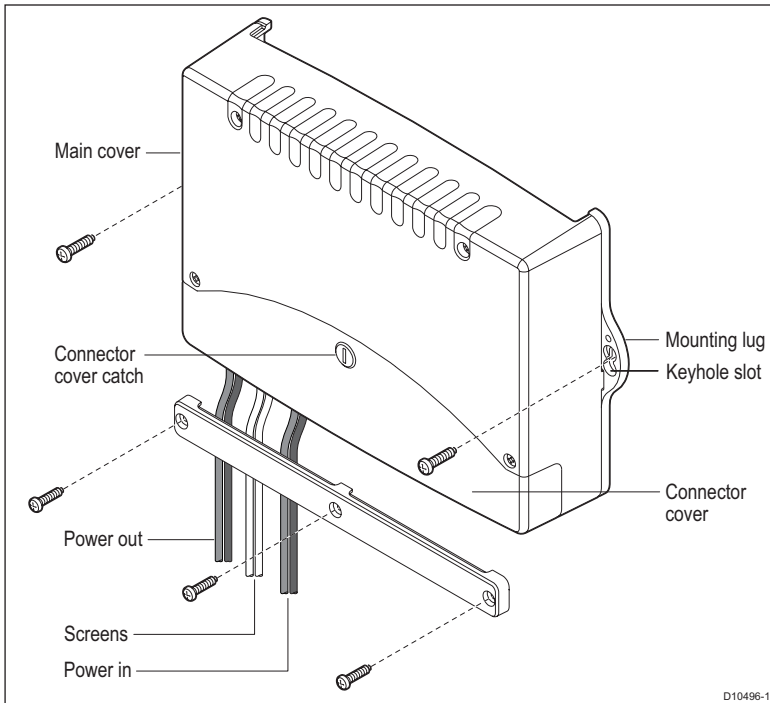
lift and fix the digital radar in place before fixing the antenna. You should never lift the unit by the attached open array antenna.

Please read and understand chapter 1 before you start to install any of the components of the digital radar system.

## 2.2 Installing the VCM 100

### CAUTION:

**It is important to keep the cable run from the DC distribution panel/circuit breaker to the VCM100 as short as possible. (see Table 1-2, p.21).**



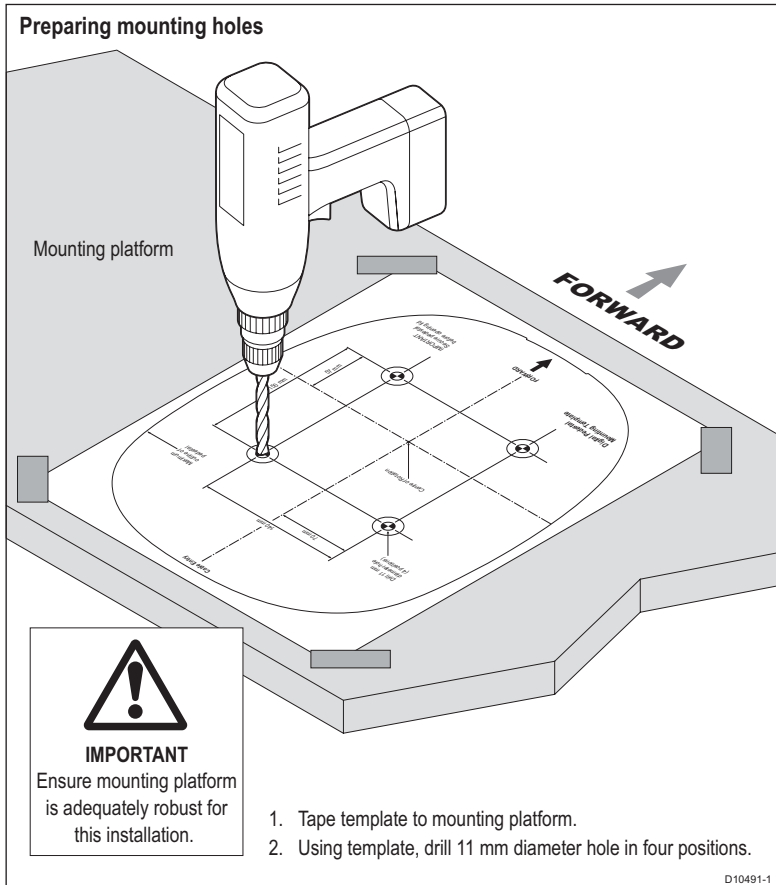
Ensure the VCM100 unit is level on it's horizontal plane. Once situated, fit in position with the 2 mounting screws provided

### CAUTION:

**The VCM100 is a 'below decks' piece of equipment. It is designed to be splash-proof only!**

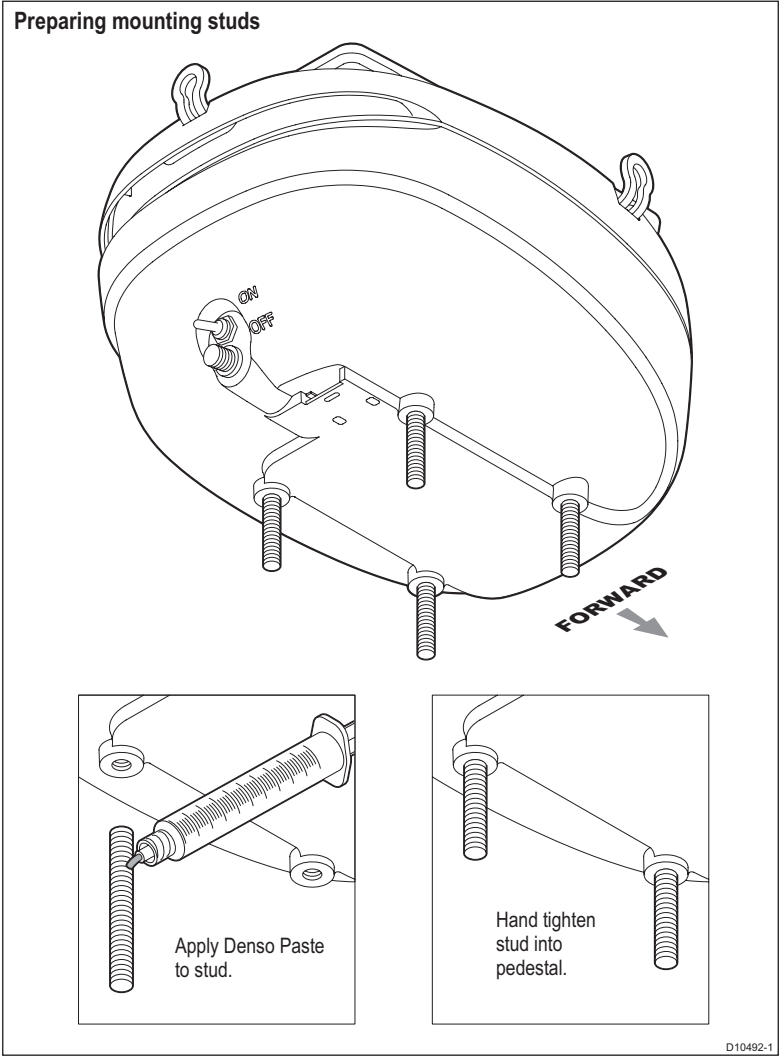
## 2.3 Securing the pedestal to the mounting platform

1. Using the paper template supplied with the mounting kit, mark the flat mounting surface in-line with the holes, and drill as indicated on the template.



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

- Grease the studs with Denso paste (supplied) then in turn, hand tighten the 4 studs into the pedestal.



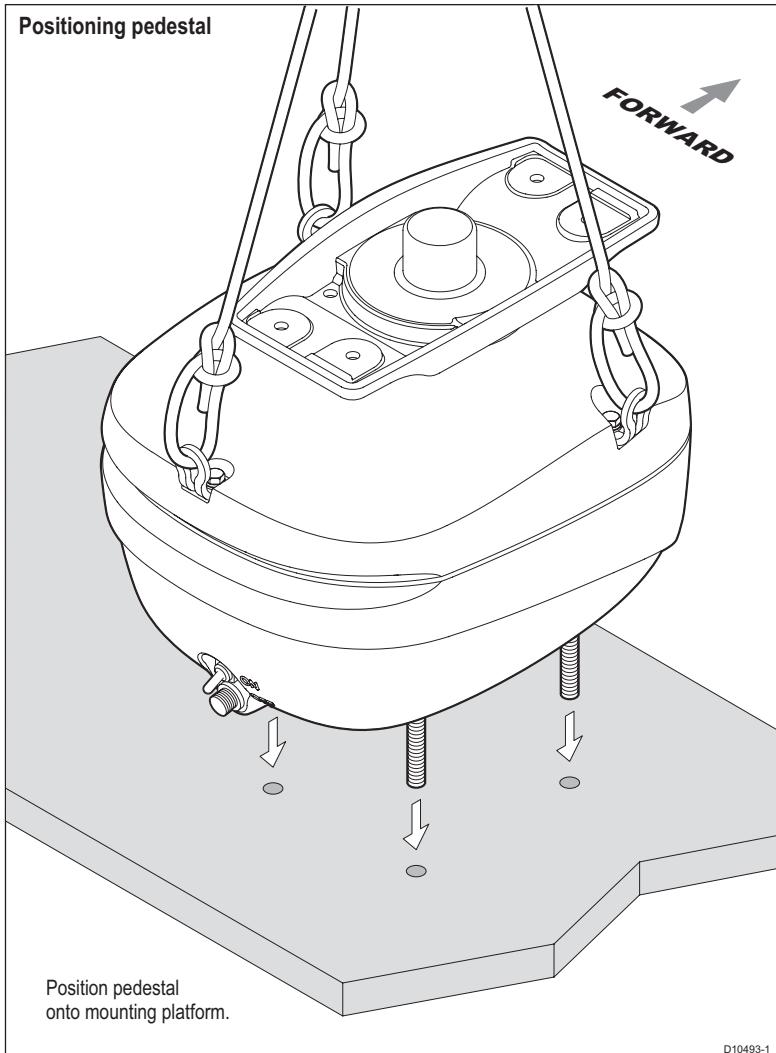
*Note: If the studding supplied is not long enough for the mounting surface thickness, use M10 stainless steel, grade A4-70 studding of a suitable length. Refer to the following illustrations for details.*



**CAUTION:**

**DO NOT** lift the unit with the open array antennae attached.

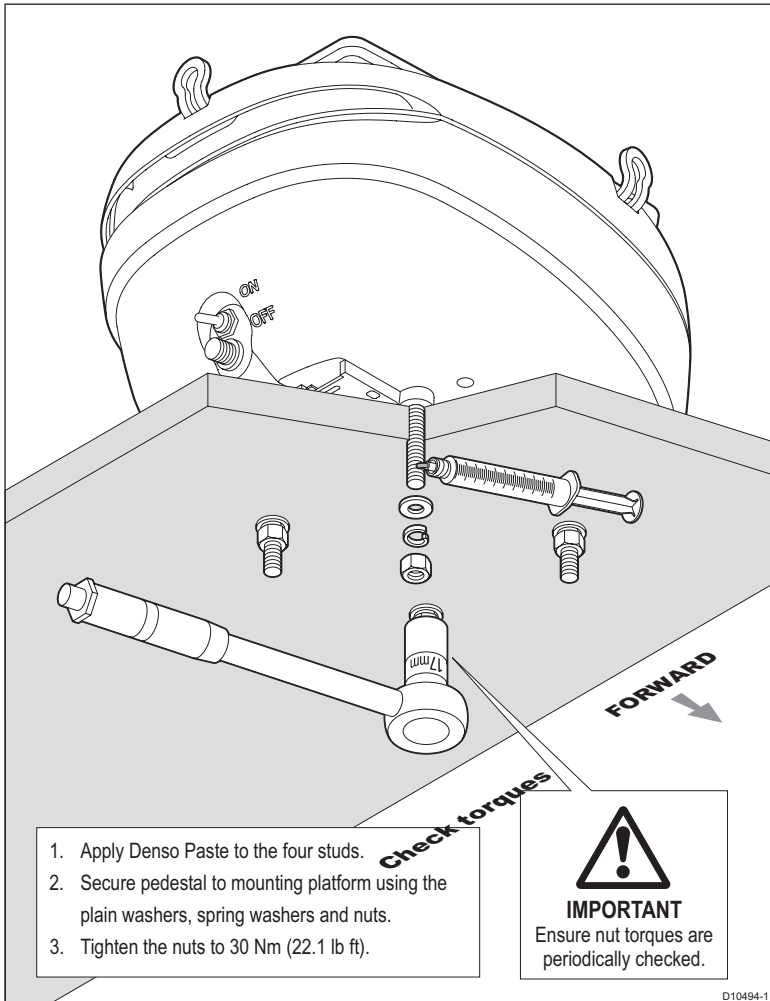
- Using suitable lifting equipment (see warning on *page -25*), raise the pedestal over the mounting surface. Carefully lower into position, taking care that the studs pass through the holes without damaging the threads. Ensure that the digital connector plug is pointing aft.



**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.

5. Referring to the following illustration, use the four nuts and associated washers to secure the pedestal. Grease the studs with Denso paste (supplied). Tighten to 22.1 lb ft. (30NM) torque; ensure the radar is tightly fitted. If required, cut-off any excess stud.



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## 2.4 Removing the lifting eyes

*Note: Complete this step on each bolt, one by one.*

1. Loosen the first self retaining bolt securing the lifting eye to the pedestal lid, do this enough to remove the lifting eye.
2. Once the lifting eye is removed, re-tighten the bolt to 5.2 lb ft. (7 NM) torque. Move to the next bolt, repeat the steps until all three lifting eyes are removed.

## 2.5 Fitting the open array to the pedestal

### CAUTION:

**Before attaching the open array antenna to the digital radar unit ensure that the pedestal base is securely fixed to the platform. Also ensure the cable is not attached and no power is applied to the display unit or it's attached system. The digital radars power switch should be in the OFF position.**

The pedestal unit has a cap fitted over the open array mounting shaft to protect the protruding co-axial pin. This cap must be left in place until you're ready to fit the open array to the pedestal unit.

### Important Information:

#### CAUTION:

**Extreme caution is required to ensure that the open array antennae does not come into contact with the delicate protruding coaxial pin. This is a critical component and should be treated with caution. Ensure that the alignment guides are used and all instructions below are adhered to!**

1. Fit the 4 threaded alignment guides to the studs on the underside of the antenna until they bottom out. The alignment guides are essential to help prevent damage to the coaxial pin.
2. Remove and retain the protective cap from the open array shaft.

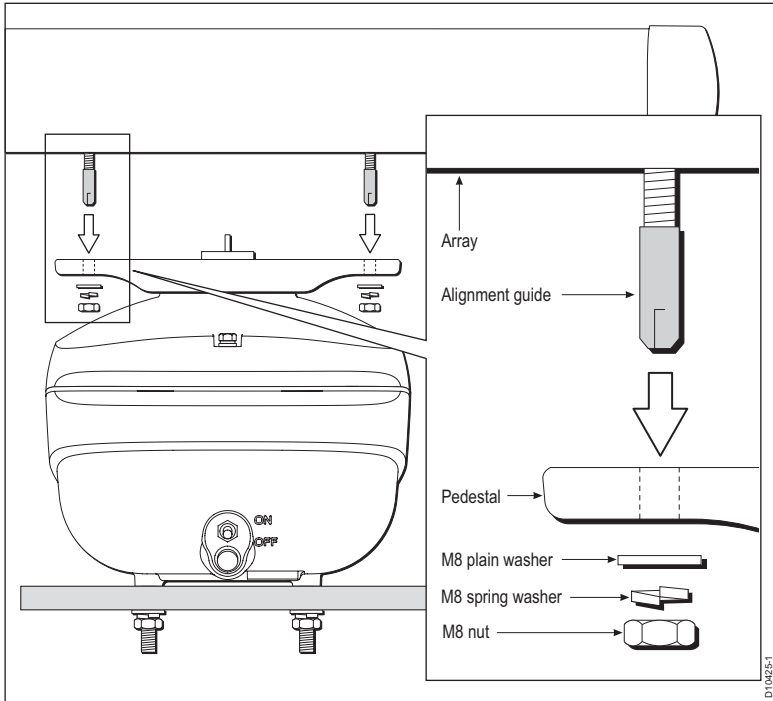
*Note: Retain the protective cap, for use if the open array is removed from the pedestal in the future. If the pin is damaged during the following operation you should contact your service dealer.*

3. Move the antenna mounting bracket so it sits on the Port to Starboard axis of the digital radar. Lift the open array into position, taking care it is in the correct orientation and that the threaded alignment guides are fitted. Carefully align, then slowly lower the array.

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

4. Once the antenna is seated, remove the alignment guides.
5. Grease the four securing studs with Denso paste (supplied).

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



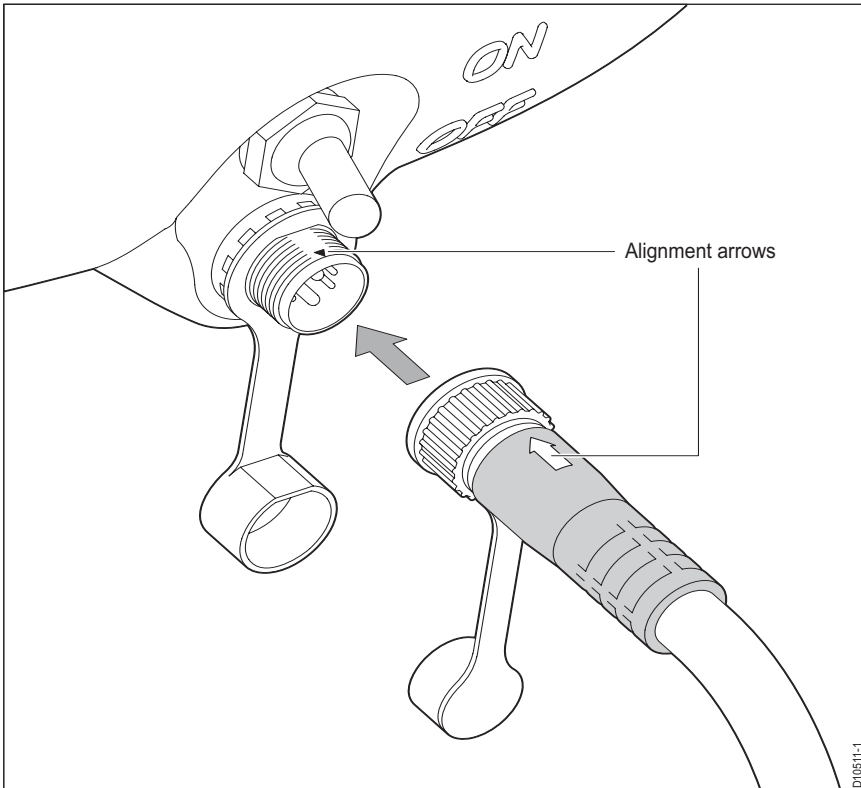
## 2.6 System Connections

### CAUTION:

The digital radar connector (situated at one end of the cable) is a moulded plug that should not be removed. **DO NOT** remove this moulded plug.

### Connecting the digital radar cable

Line up the two arrows (one on the radar cable, one on the radar connector, on the base). With the two arrows aligned, push the connector in, once the connector is sited turn the threaded collar clockwise to lock the cable into position. **Ensure the connector is fully home and tightened.**

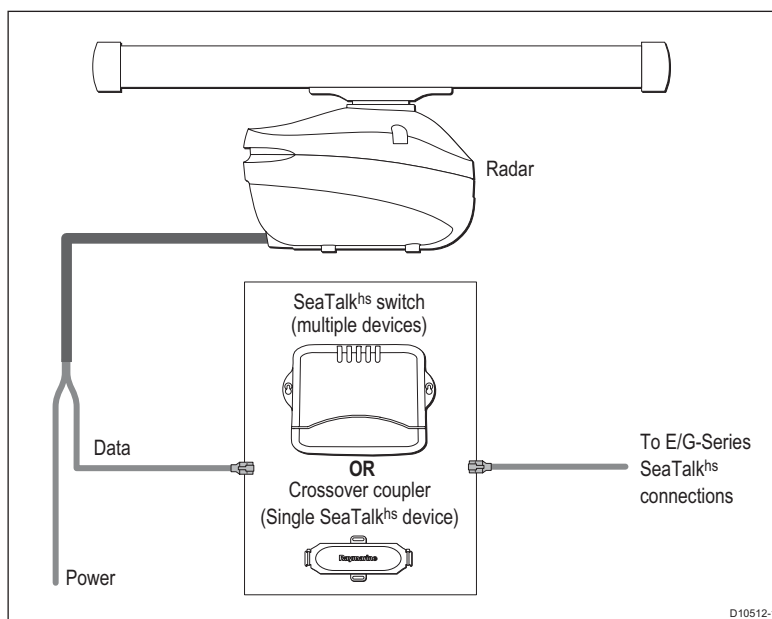


## Digital Radar Connections

The digital radar cable consists of 2 parts, power and data. The moulded connector plugs in to the digital radar. The cable's power cores are routed to the VCM100. The RJ45 data connector goes to the SeaTalk<sup>hs</sup> connection as described in *Installing the Digital Radar Components on p.35*.

## Data Connections

The digital radar data connection should go into the SeaTalk<sup>hs</sup> data bus via the SeaTalk<sup>hs</sup> switch/crossover coupler. Connect the display system into the SeaTalk<sup>hs</sup> data bus from the switch/cross-over coupler so data can be shared throughout the system.



## Power Connections

DC power requirements are described in *Power requirements on page 20*).

Power for a digital radar is supplied via the VCM100. The digital radar has a power switch fitted to it. This switch can normally be left ON. However, if the scanner is being serviced, or if anyone needs to

work in the vicinity of the open array, the switch should be set to OFF.

The following cable connections to the VCM100 are required.

Table 2-1:

Red	VCM100 Out +ve
Black	VCM100 Out -ve
Green	VCM100 Screen

(See *Voltage Converter Module (VCM100)* on page 21 for power connection details).



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# Chapter 3: Maintenance and Troubleshooting

Once you have installed your digital radar 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. In addition, for a 72" open array scanner you need to set the antenna size to ensure the scanner rests in the correct position when rotation stops.

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/system *Owner's Handbook*. Reading the relevant Multifunctional display/system *Owner's Handbook* will help you to familiarize yourself with the operation of the radar.

## 3.1 EMC Conformance

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

To do this:

- Turn on all transmitting equipment (radar, VHF radio etc.).
- Check that all electronic systems are operating correctly without undue interference or noise.

## 3.2 System Checks

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:* We recommend that an certified and authorized Raymarine agent checks the installation before going to sea.

## 3.3 Set up, alignment and timing checks

### Switch on and initial set up

On the digital radar, ensure the power switch is set to ON. Switch on the display unit. 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, 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, (see display unit *Owner's Handbook* for information on bearing alignment).

### Display timing adjustment

The display timing setting can be used to set/change the range accuracy shown on the display, if required. It is possible to check the display timing before using the system for navigation. To fine tune the radar for accuracy if required see your display unit *Owner's Handbook*.

## Parking alignment

When the radar is in standby or powered down, the antenna should park (rest) facing forward, (so you can see the Raymarine logo when looking towards the scanner from the front of the boat). A parking offset angle determines where the scanner parks, and you can set this, so the scanner parks correctly.

To set the correct offset angle ensure that:

- The display is switched on with the radar page selected.
- The radar is powered up.
- The radar is in standby mode.

1. Press **MENU**.
2. Select **Radar Setup**.
3. Select **Scanner Setup**.
4. Select the **Parking Offset** option, then set the correct offset angle so the antenna parks facing forward.
5. Select **OK** until you return to the radar display page.
6. Visually check that the radar is suitably parked.

## 3.4 Maintenance



### **WARNING: HIGH VOLTAGE**

The display and digital radar units contain *high voltage*. Do not remove the rear cover from the display or any covers from the scanner.

Adjustments require specialized 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.

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.

### **Suppression ferrites**

Raymarine cables may be fitted with suppression ferrites. These are important for correct EMC performance. Any ferrite removed for maintenance purposes must be replaced in the original position once the maintenance is complete.

Use only ferrites of the correct type, supplied by Raymarine authorized dealers.

### **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 securely to the mounting.
- Once a year, remove, grease and re-attach the mounting bolts securing the scanner and pedestal.

## **Servicing and Safety**

- Raymarine equipment should only be serviced only by authorized Raymarine service technicians. They will ensure that service procedures and replacement parts used will not affect performance. There are no user serviceable parts in any Raymarine product.
- Some products generate high voltages, so never handle the cables/connectors when power is being supplied to the equipment.
- Undue noise and interference may be a symptom of an EMC related problem, Always report any EMC-related problem to your nearest Raymarine dealer. We use such information to improve our quality standards.
- To minimise any EMC related problems and ensure the best possible performance from your Raymarine equipment, follow the guidelines given in the installation instructions.
- 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.

## 3.5 Problem Solving

All Raymarine products are subjected to comprehensive test and quality assurance programmes prior to packing and shipping. However, if this radar unit or VCM100 should develop a fault, please refer to the following table's 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 Raymarine 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 digital radar serial number is on the rear of the scanner near the connector socket.

Table 3-1:

Problem	Correction
"No Data Source" message	Check that all the SeaTalk <sup>hs</sup> cable connections from the digital radar to the SeaTalk <sup>hs</sup> hub/crossover coupler and from the SeaTalk <sup>hs</sup> hub/crossover coupler to the display system is firmly attached, and undamaged. Check that the polarity of the cables is correct. Check the
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
The 72" antenna stops in the wrong position when I power down or go to standby.	Refer to <i>Parking alignment</i> on page 39.

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## VCM100 status LED sequence's

Table 3-2:

LED name	Operating color	Working condition
On	Green (solid)	Radar operating normally
Fault	Red (solid)	Fault condition
Sleep	Yellow (flashing)	(Radar in Standby)
	Yellow (solid)	Fault condition, self recovers after 20 seconds

