

## 3 Installation and Commissioning

### 3.1 General information

The Scanner Unit comprises the following main elements, each of which is supplied in its own packing, together with relevant Installation Drawings:

**Turning Unit** with/without Masthead Transceiver ( 10 or 25kW )  
Despatch Kit 65801660  
(Installation Drawing 65801050 )

**Transceiver Unit** Bulkhead Transceiver only ( 10 or 25kW )  
Despatch Kit 65825660  
(Installation Drawing 65825050 )

**Note** that a Bulkhead system would be supplied with both Despatch Kits.

**Antenna** 4ft, 6ft or 8ft  
Despatch Kit is supplied in Antenna carton.  
(Installation Drawing 65601275 )

Installation of the Scanner Unit entails carrying out the following operations, preferably in the sequence outlined below:

1. Preparation of the site.
2. Bolting the Turning Unit to the mounting platform (ship's structure) as detailed in Installation Drawing 65801050 supplied with the Turning Unit.
3. Bolting the Antenna to the Support Casting as detailed in Installation Drawing 65601275 supplied with the Antenna.
4. Laying in and installing the cables for the Turning Unit in accordance with the appropriate Cabling Schedules (Including X-Band co-axial feeder or waveguide in Bulkhead systems).
5. Ensuring that in the Turning Unit, the Motor Drive Board and the Pulse Bearing Board are correctly set for the required High or Low Speed operation set via their relevant jumper links.

Figures 2.1 to 2.4 also show installation details which are intended to duplicate those provided with the equipment. However, as it is possible that changes may occur to the details which may not be reflected in this manual, the installation drawings supplied with the equipment take precedence in the event of differences arising.

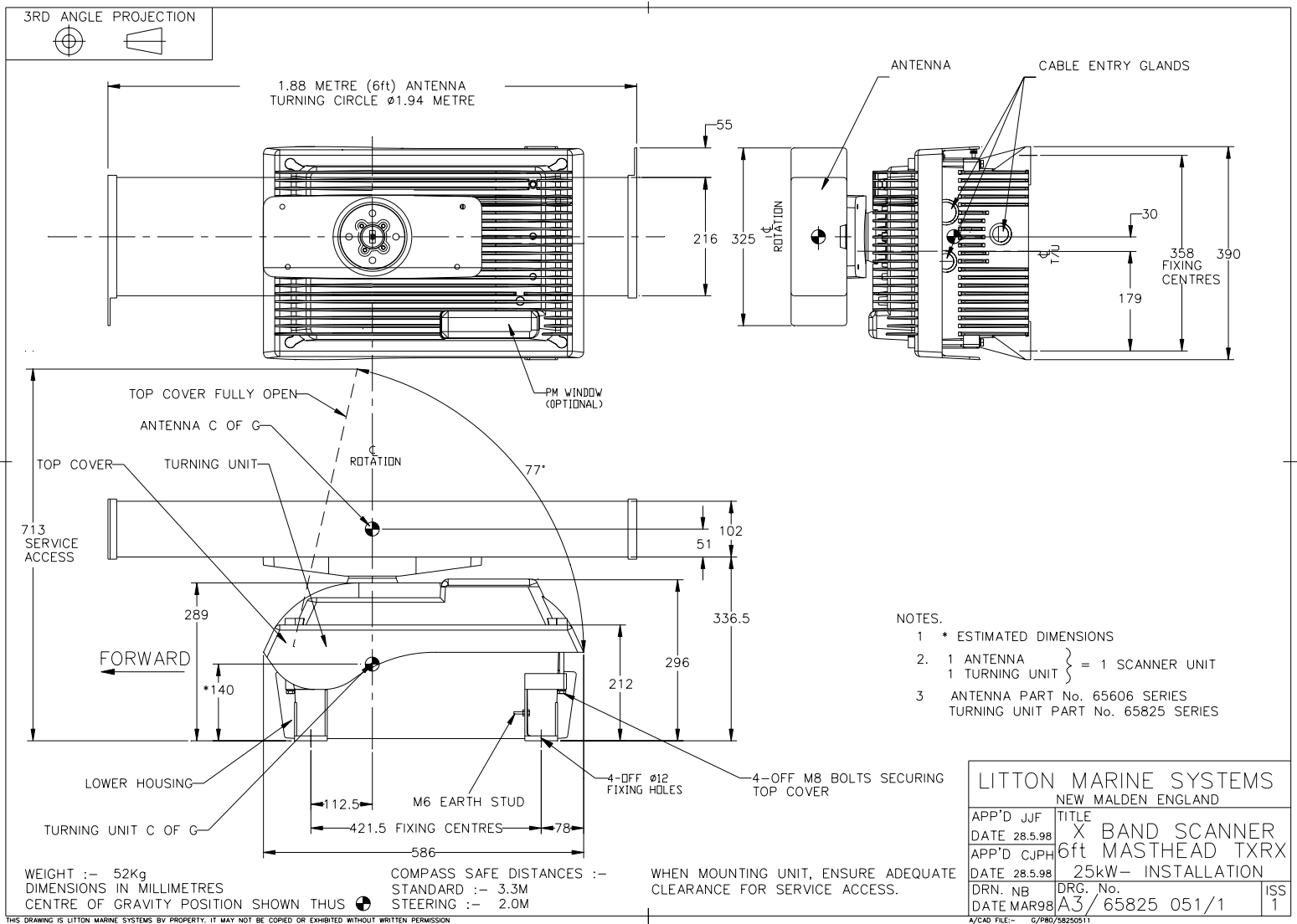


Figure 2.1 - X-Band Scanner 6ft Masthead Tx/Rx 25kW Installation

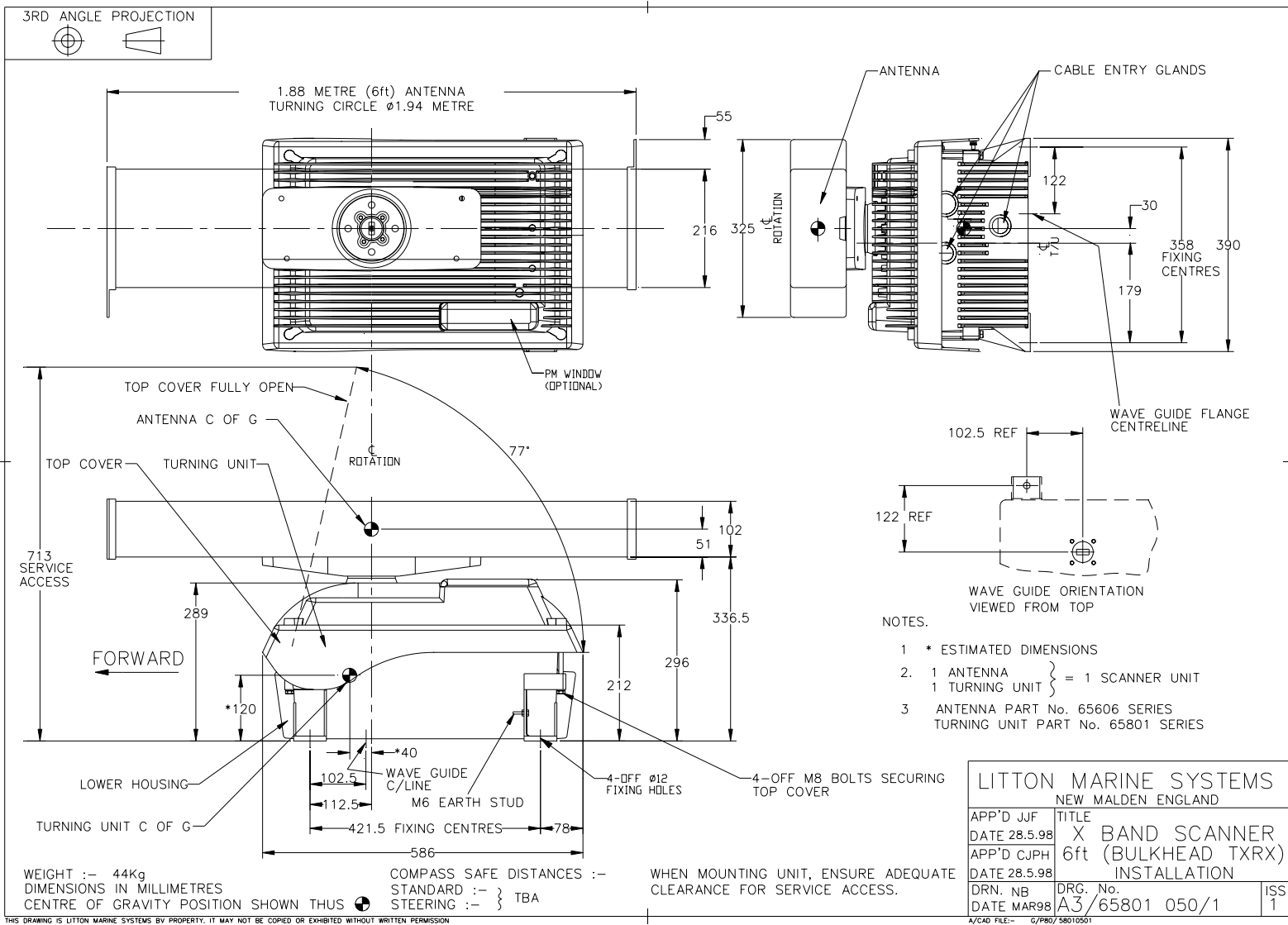


Figure 2.2 - X-Band Scanner 6ft (Bulkhead Tx/Rx) Installation

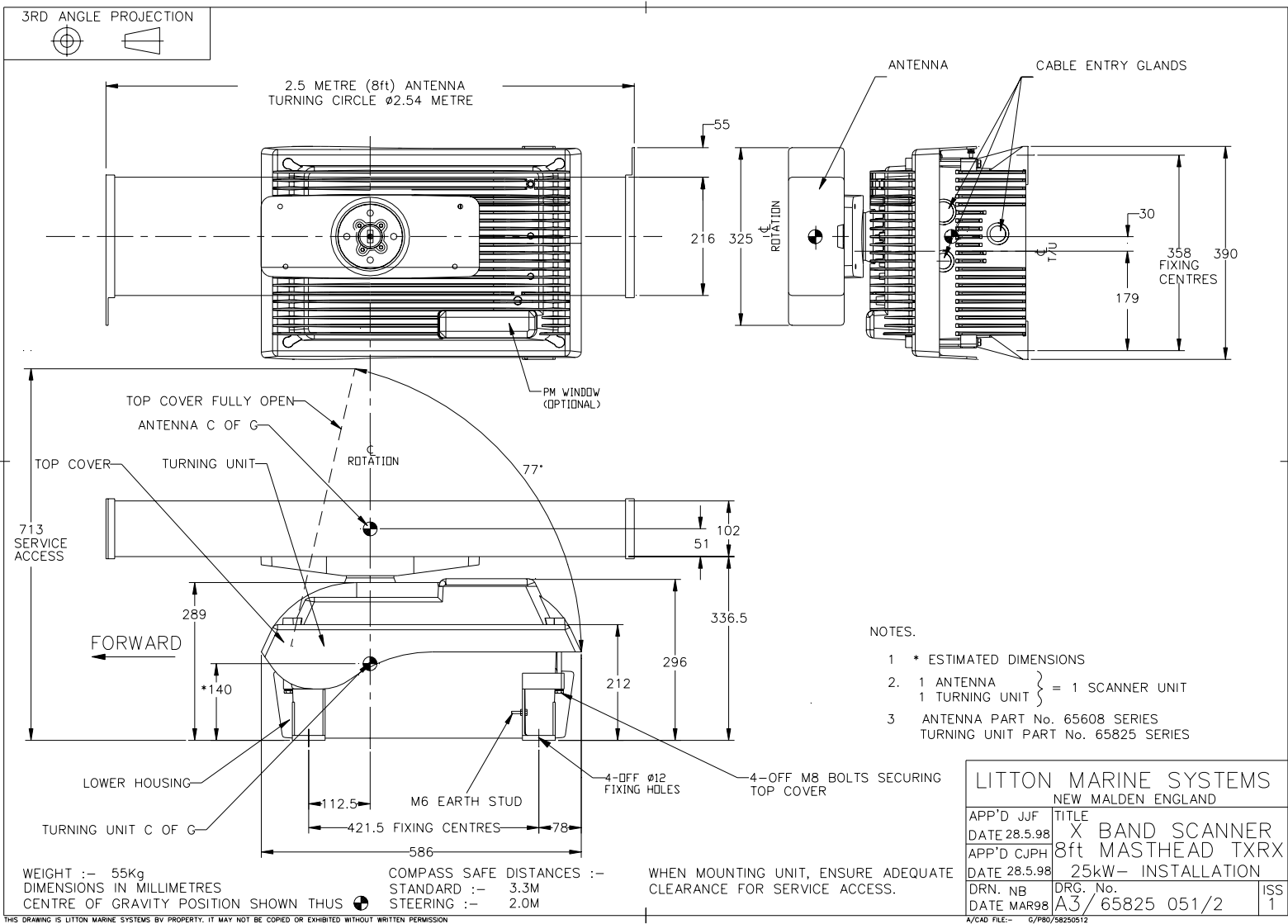


Figure 2.5 - X-Band Scanner 8ft Masthead Tx/Rx 25kW Installation

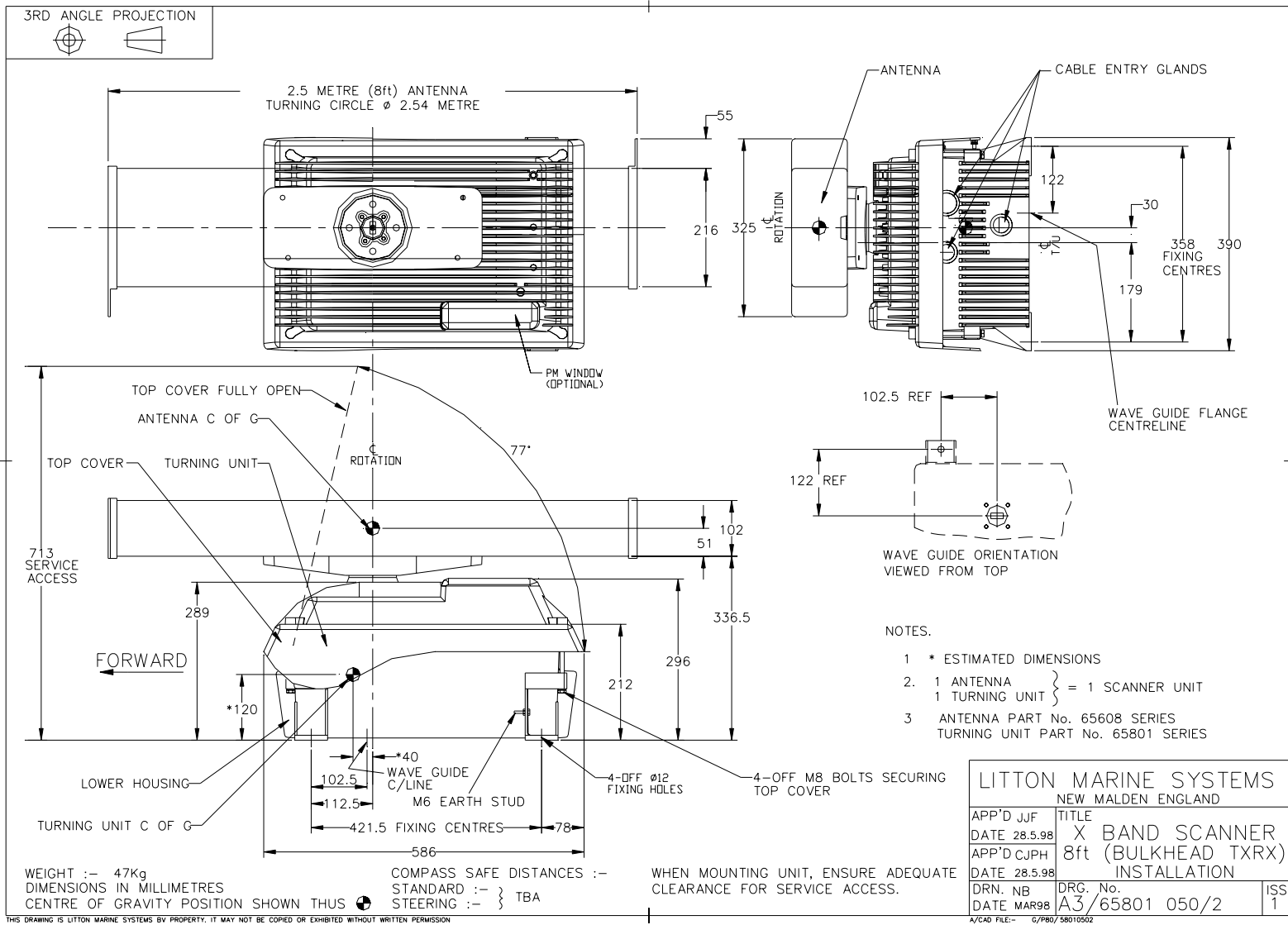
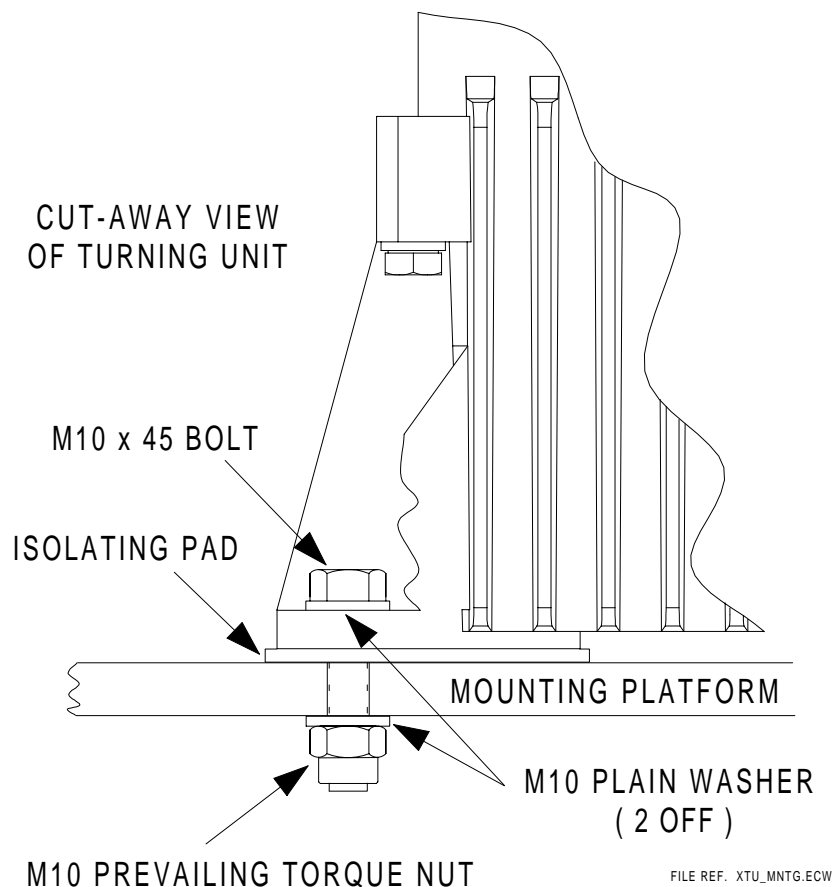


Figure 2.4 - X-Band Scanner 8ft (Bulkhead Tx/Rx) Installation

## 3.2 Turning Unit

**CAUTION** The Turning Unit should only be lifted using the four fixing holes at the base of the unit. The weight and spread of the Antenna can cause a free-standing Turning Unit to topple over. The Turning Unit should therefore be bolted down onto its mounting platform before attaching the Antenna and Support Casting to the Turning Unit. When working on the Turning Unit with the top casting raised, always ensure that the locking bolt on the stay is in the locked position. **DO NOT** lift the Scanner Unit by the Antenna, this is dangerous and will seriously damage the Antenna.

**Note** -The Turning Unit is bolted to the mounting platform with Neoprene isolating pads (4 off - 65601251) between the Turning Unit casting and the mounting platform, to prevent Galvanic corrosion. Additional washers or pads, may be added for the purpose of levelling the mounting so that the Turning Unit casting is not subject to twist when the bolts are tightened. M10 washers may be used as shims, or purpose made parts produced locally may be used.



**Figure 2.5** - Fixing the Turning Unit to the Mounting Platform

### 3.2.1 Support Casting

The Support Casting is factory fitted to the Turning Unit and requires no further assembly during installation.

### 3.2.2 Performance Monitor

The Performance Monitor comprises the Performance Monitor module, and an associated control cable. The equipment is normally factory fitted.

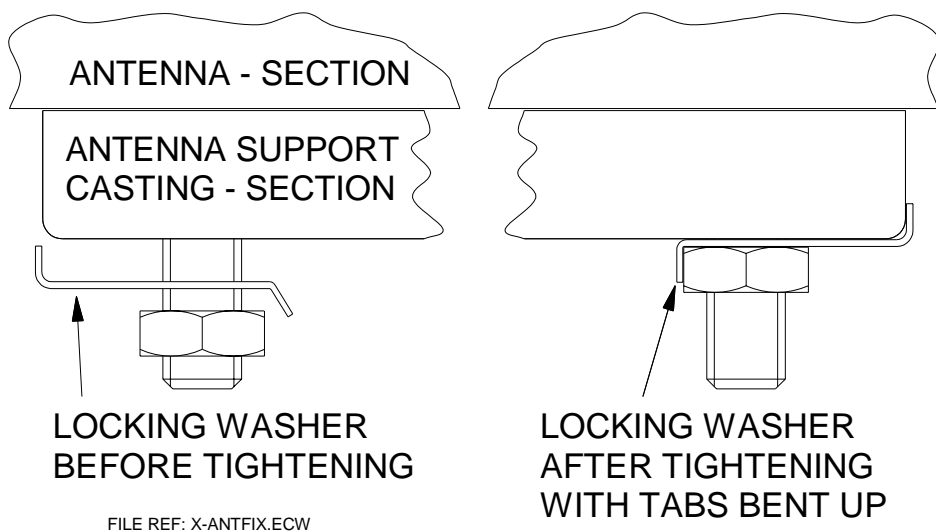
### 3.3 Antenna

The Antenna is fitted to the Support Casting using the parts listed below which are supplied with the antenna. Note that the holes in the support casting are assymmetrically placed to prevent the antenna being fitted backwards. The support casting has the letters 'FRONT' visible from above to aid initial antenna location.

- 4 off - M8 Stainless Steel Plain Nut                    4411544
- 4 off - Washer with locking tab                        65602116

Figure 2.6 shows how these are fitted.  
Ensure that all threads and bushes are coated with Densopaste.

**Note - The lock tab ends must be bent as shown to prevent rotation of the nuts.**



**Figure 2.6** - Fixing the Antenna to the Support Casting

### 3.3.1 Scanner Speed Settings

Two scanner speed settings, 'LOW' and 'HIGH', are available, depending on the following settings of the Motor Drive Board and the Pulse Bearing PCB Assembly.

#### Motor Drive Board

The position of the link LK1 fitted to the Motor Drive Board 65801811.

The link is set during installation and commissioning, and requires no tools to change.

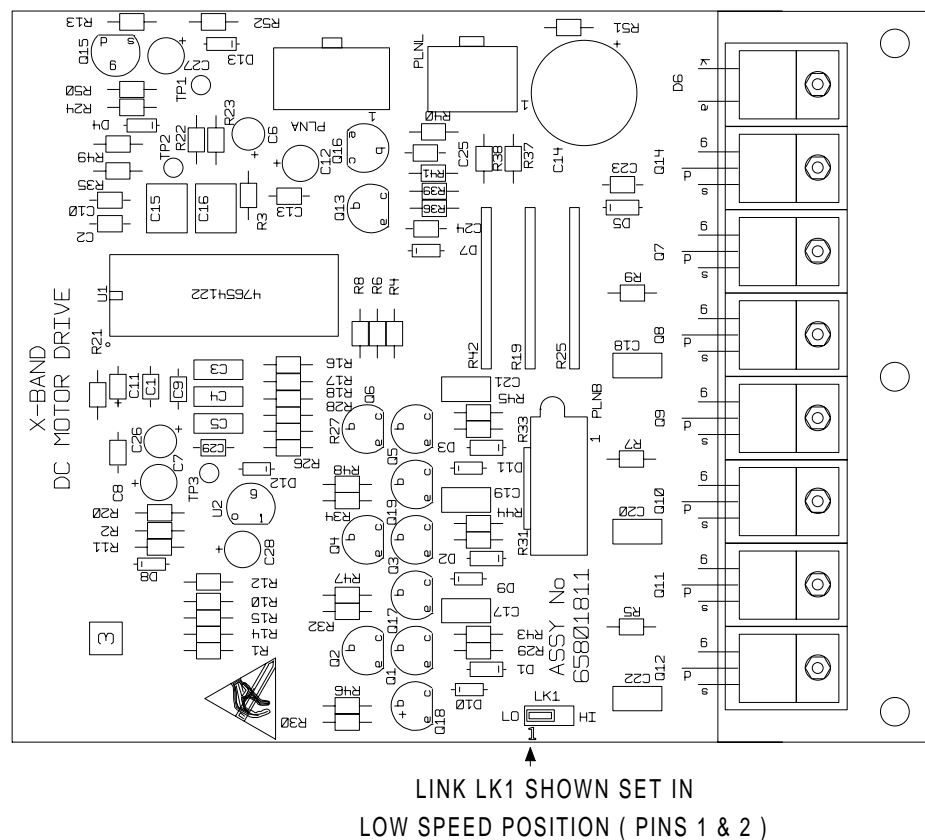
The factory default setting is 'LOW' speed ( 28 RPM nominal ).

Note that with no jumper fitted, the rotational speed defaults to HIGH speed.

Under no circumstances should the link position be moved whilst the motor is running.

With the jumper in the position marked 'LO' ( pins 1 & 2 - left hand pair ), the nominal scanner speed is 28 RPM.

With the jumper in the position marked 'HI' ( pins 2 & 3 - right hand pair ), the nominal scanner speed is 45 RPM.



**Figure 2.7** - Motor Drive Board 65801811 - Showing Link Position



### Pulse Bearing PCB Assembly

The position of the link LK1 fitted to the Pulse Bearing PCB Assembly 65801805.

**Note** - This link does not physically affect the rotational speed of the scanner, but does affect the ability of the phase-locked loop within the board to track the scanner rotational speed.

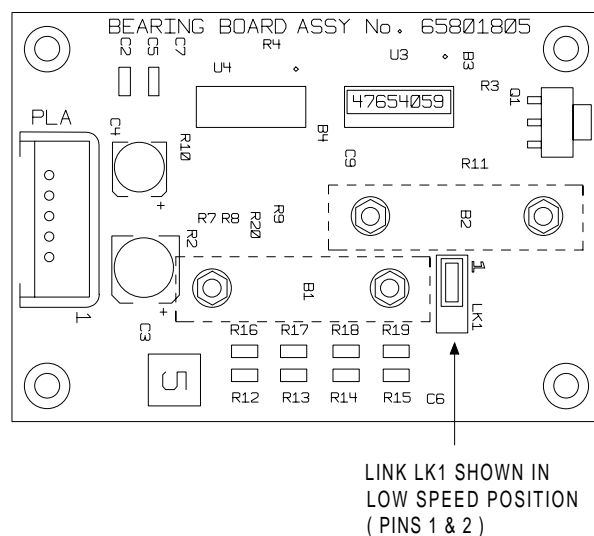
The factory default setting is 'LOW' speed.

**Note** - With no jumper fitted, the PCB defaults defaults to HIGH speed configuration.

With the jumper in the position marked '1' ( pins 1 & 2 - the lower pair ), the PCB is configured for LOW speed operation.

With the jumper in the upper pair position ( pins 2 & 3 ), the PCB is configured for HIGH speed operation.

The link is set during installation and commissioning. The link can be moved with the PCB in place using long nose pliers but the operation is not easy due to the PCB mounting bracket which tends to obscure the position of the link. The recommended method is to loosen the 2 Pozidrive screws that retain the mounting bracket and slide the whole assembly to the right using the slotted screw holes in the mounting bracket. The assembly can then be brought forward into a more accessible position for the link to be moved. Take care during removal and refitting of the mounting bracket not to damage the teeth on the pulse disc assembly which run between opto-couplers mounted on the rear of the Pulse Bearing PCB. Before re-tightening the 2 Pozidrive screws, check that both pairs of plain and single coil washers are above the top surface of the mounting bracket and not trapped beneath it. For ease of installation, it is recommended that this operation be carried out, if required, before mounting the Turning Unit aloft.



**Figure 2.8** - Pulse Bearing Board 65801805 - Showing Link Position

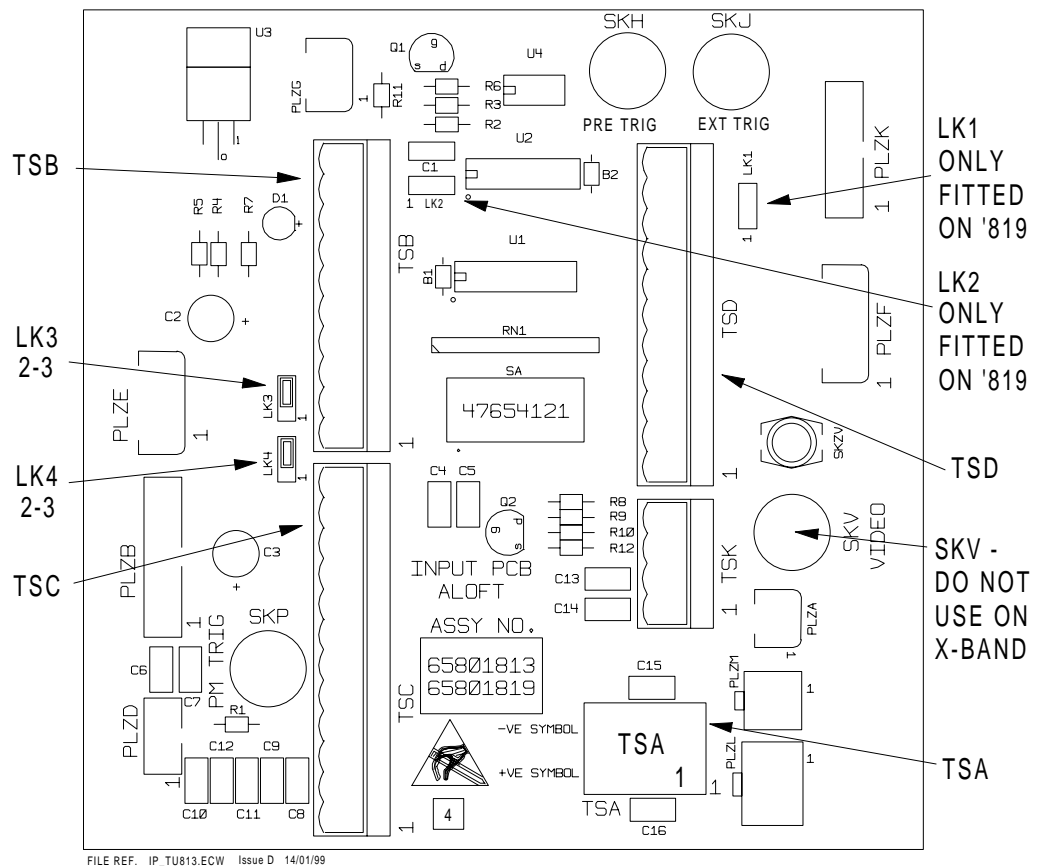
### Turning Unit Input Board 65801813

The diagram below shows details of the Turning Unit Input Board 65801813. This is revealed by lifting up the upper casting cover on its hinges after releasing the four retaining bolts, see Figures 2.1 to 2.4. The screening cover is then removed by releasing four securing screws

Normal configuration of the PCB links is as follows:

- Link 1 Not Normally Fitted
- Link 2 Not Normally Fitted
- Link 3 Link Pins 2 & 3
- Link 4 Link Pins 2 & 3

**Note** - The Video cable does not plug into the Input Board, but goes directly to the Receiver. Refer to Section 3.4.2 'Fitting the Cable Glands' for further details.

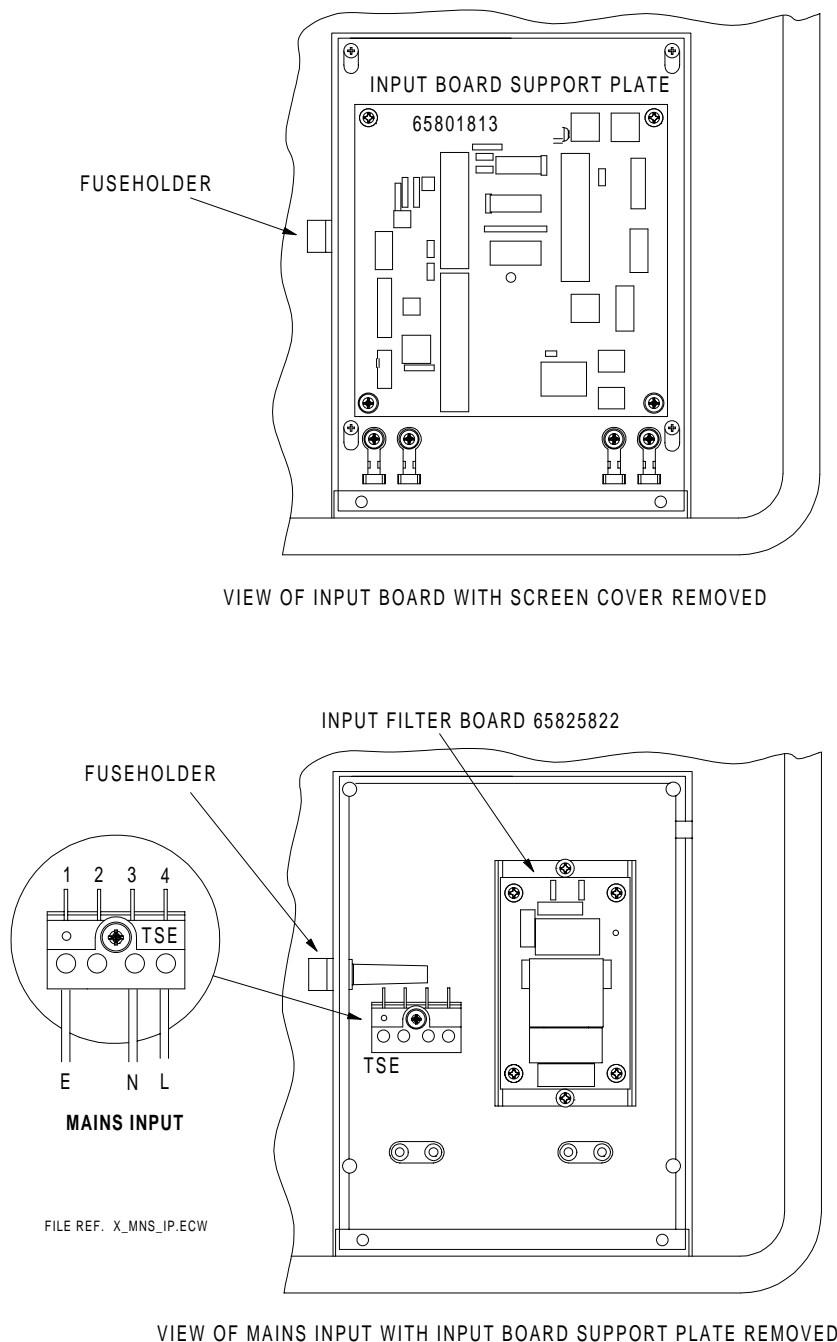


INPUT BOARD 65801813 ( & 65801819 ) - TURNING UNIT

**Figure 2.9** - Turning Unit - Input Board Details

### 3.4 Turning Unit Mains Input Connector (Aloft Transceiver)

The diagram below shows details of the Mains Input connector TSE (Integral Transceiver only). These are revealed on removal of the screenig cover and the support plate, which is retained by 4 fixing screws (see below). Note that the screws need only be partially undone to allow the plate to be slid out.



**Figure 2.10** - Turning Unit - Mains Input Details

### 3.4.1 Cabling Information

The Table below shows the route by which each cable enters the Turning Unit (with or without an Integral Transceiver). Figures 2.11 and 12 show the cable entry points. Three of these are via cable glands labelled 1, 2, & 3.

The RF Feeder ( waveguide ) input is only required when the Transceiver is mounted below decks (Bulkhead). The Bulkhead lower casting is different from the Masthead variant in the respect that an X-Band waveguide flange is mounted on the underside face. See Figure 2.1 or 2.4 for details.

A hole is provided for a 6mm bolt to enable bonding the unit to the Ship's structure. This is an important safety feature and must not be used for any other connection.

For details of how to terminate the cables into their connector blocks, see the Interconnection Diagrams and Cabling Schedules in Section 3. The numbers in parentheses e.g. (203) refers to the cable schedule number.

Each of the Cable Glands has a waterproof seal and a separate EMC seal, both of which must be installed as shown in Figure 2.14.

Details for terminating the R.F. Feeder (waveguide) are given in Section 3.6.3.

Cable Gland	TURNING UNIT without Integral Transceiver		TURNING UNIT with Integral Transceiver	
	Description	Cable Type	Description	Cable Type
Cable Gland 1	Blanking Plug	-	Mains Input (204)	TP3   49
Cable Gland 2	PM/Bearing (206)	TP3   45	Blanking Plug	-
Cable Gland 2	PM Trigger (207)	75 $\Omega$ Co-ax	-	-
Cable Gland 2	TU Enable (209)	TP3   41		
Cable Gland 3	Motor 50V (208)-	TP3   49	Radar Video (175)	75 $\Omega$ Co-ax
Cable Gland 3	-	-	Data (245)	T/Pairs
RF Connector	RF Feed	X-Band Waveguide	-	-

**Turning Unit** - Cable Entry Details

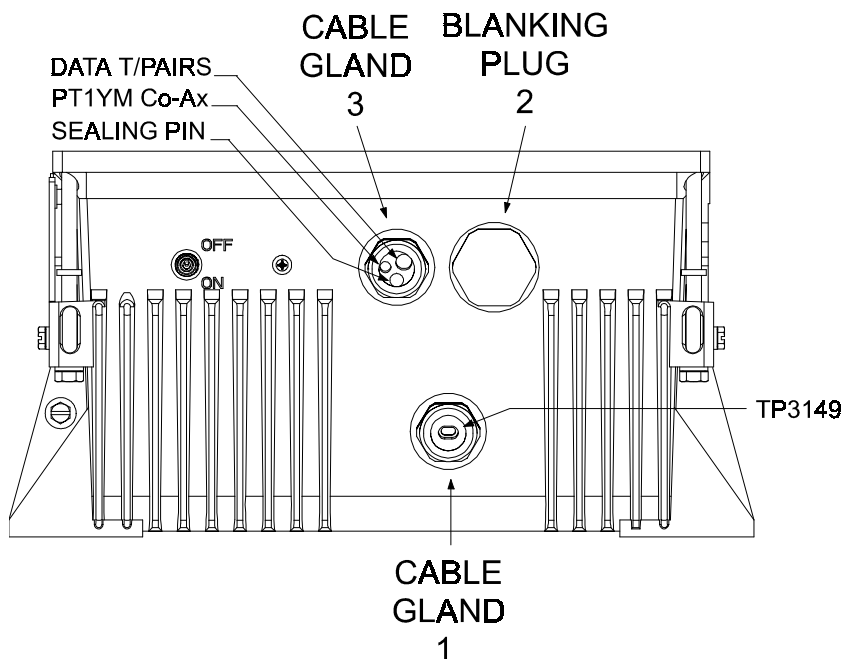


Figure 2.11 - Turning Unit (Aloft Transceiver) - Cable Entry Positions

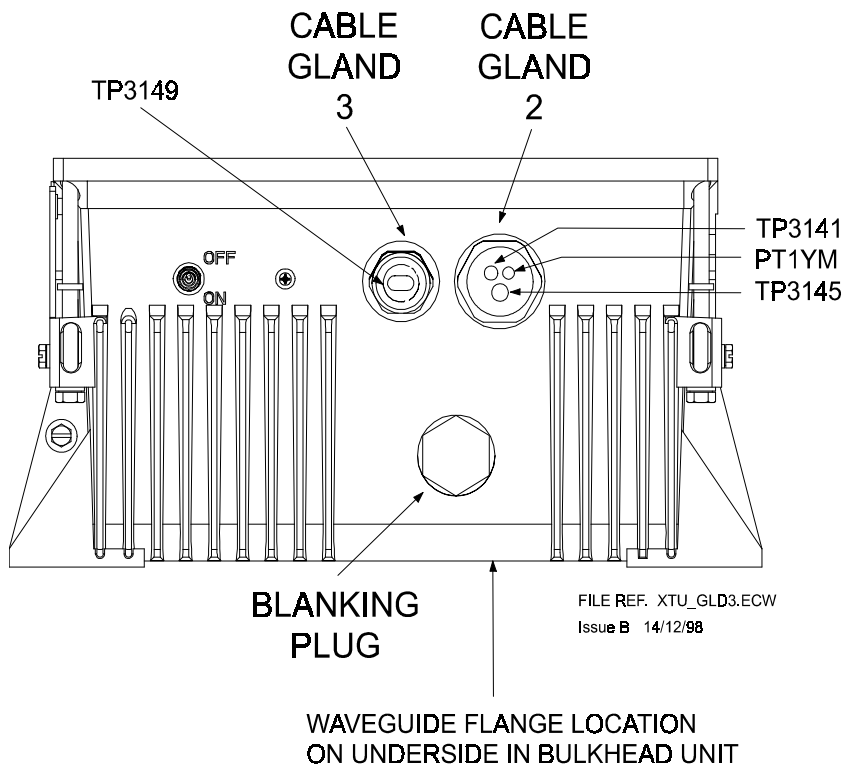
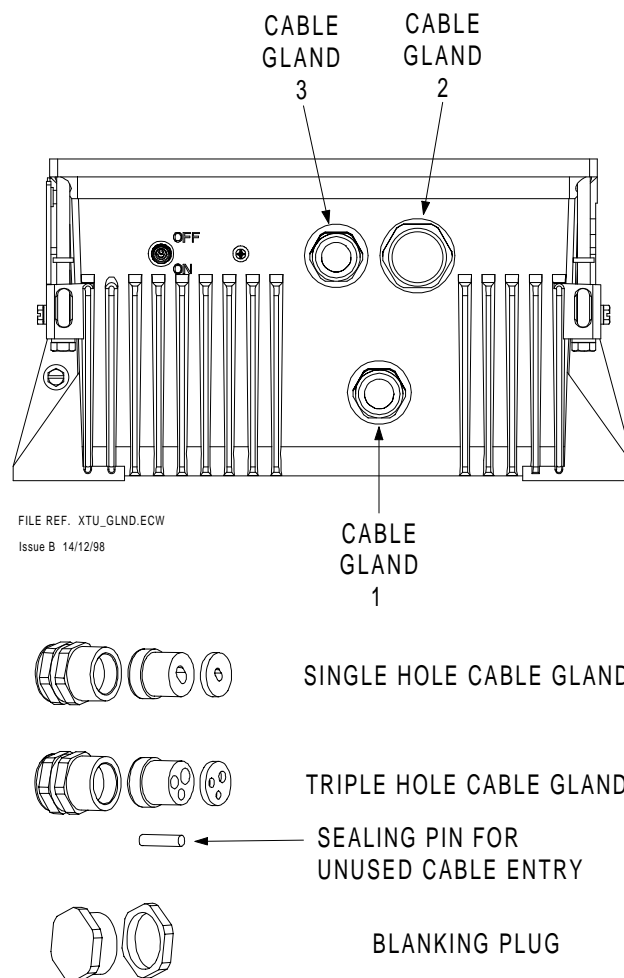


Figure 2.12 - Turning Unit (Bulkhead Transceiver) - Cable Entry Positions

### 3.4.2 Fitting the Cable Glands

The installation cables are connected into the Turning Unit via the appropriate cable glands (see earlier table). The body of the gland fits through a hole in the casting and is held in position by the Top Nut. Note the 'O' ring seal, which is fitted below the casting surface (input side). Two seals are provided with each gland as shown in Figure 2.13 below. The lower seal provides for waterproofing, and the upper for EMC. Some glands are designed to take a single cable whilst others are intended for several cables. Unused glands are fitted with a blanking plug, and unused cable entries are fitted with a sealing pin to maintain the seal.



**Note** - Cable Glands and Blanking Plugs are normally Factory fitted to the Turning Unit.

**Figure 2.13** - General view of Cable Glands

### CABLE INSTALLATION “X” BAND SCANNER UNIT

Included within the cable gland is a waterproof seal, and an EMC gasket. The waterproofing seal works by clamping onto the cable PVC sheath whereas the EMC seal clamps onto the cable braid. **It is important not to force the outer sheath through the EMC seal, as the seal is liable to split.** The braid is also formed into a tail which is grounded by means of an adjacent earth tag. The fitting procedure is detailed in Figure 3.14.

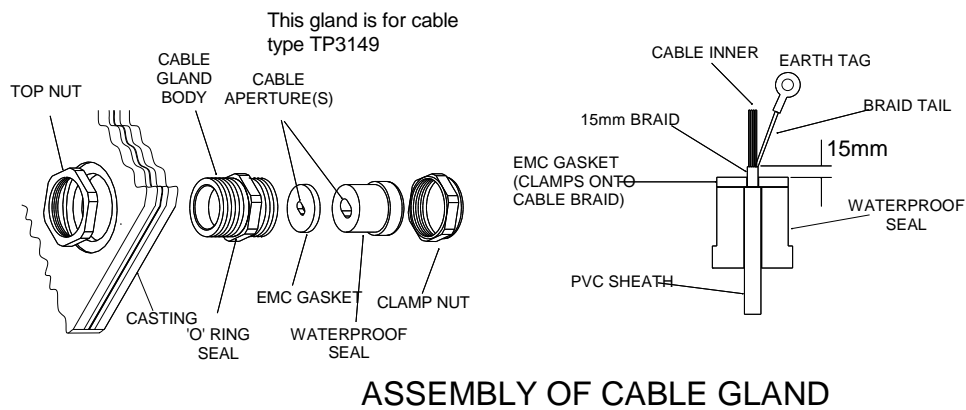


Figure 3.14 - Detailed view of Cable Gland Assembly

#### To Install the Cables:

Unscrew the gland nut and remove the waterproof seal and the EMC gasket. Feed the cables through the gland nut and the water proof seal.

For the multicore cables strip the outer sheath to expose approximately 300mm of braid, and for the Video coaxial cable to expose about 1200mm of braid.

Push the braid back to expose approximately 50mm of the inner cores.

Trim 50mm off the cores, and pull the braid back and twist into a point.

Feed the cable through EMC gasket until it positioned as shown above.

#### For the Multicore Cable:

Flare the braid out to within approximately 15mm of the EMC gasket and form a tail.

#### For the Coaxial Cable:

Do not fit the connector at this time.

**Assembly Into the Scanner Unit:**

Feed the assembled cables and seals into the gland body, and tighten the gland nut to compress the waterproof seal.

Crimp the earth tags provided to the braids of the multicore cables, keeping them as short as possible attach them with the screws provided. Trim and make off the cable inners to the appropriate connectors.

The Video coaxial cable does not plug into SKV on the Input PCB, but is connected to SKV on the Receiver Assy.

Sleeve the braid of the coaxial cable with the 6mm sleeving provided.

Route the cable through the slot at the end of the filter box cover, along the cable loom on the right hand side of the scanner unit. Use cable ties to clip it to the loom.

Trim to length and fit the coaxial plug.

For systems using below decks transceivers, the Performance Monitor Trigger coaxial cable is terminated in the same manner but only needs to be stripped back 200mm as it is plugged into SKP on the input Pcb.



### 3.5 X-Band Bulkhead Transceiver

The Bulkhead Transceiver 65810A (10kW) or 65825A (25kW) is installed below decks in a suitable location such as the ship's equipment room. The installation should pay due regard to ventilation, accessibility for maintenance and servicing, and the distance between the Transceiver and the Scanner Unit. For maximum performance, this should be kept as short as practicable, as the loss per metre of the X-Band waveguide is typically 10dB per 100 metres, i.e. 2dB for 20 metres. This loss applies to both the transmitted RF pulse and the received signals.

The maximum permissible separation between the Turning Unit and the Transceiver Unit is 30 metres, and that between the Transceiver (or Turning Unit) and Display is 67 metres. Separation up to 300m is possible if a suitable low-loss co-axial cable is used for the video. When choosing the installation location for the Transceiver, due regard must be made for the routing of the RF Feeder (waveguide).

The Transceiver may be attached to the bulkhead by several methods. The actual method chosen will depend on individual circumstances, but due regard must be given to the likely vibration and shock loading which may be experienced. The available methods include through bolting to the bulkhead, or mounting on studs provided by the shipyard. Note that slotted mounts are provided at the bottom for ease of installation.

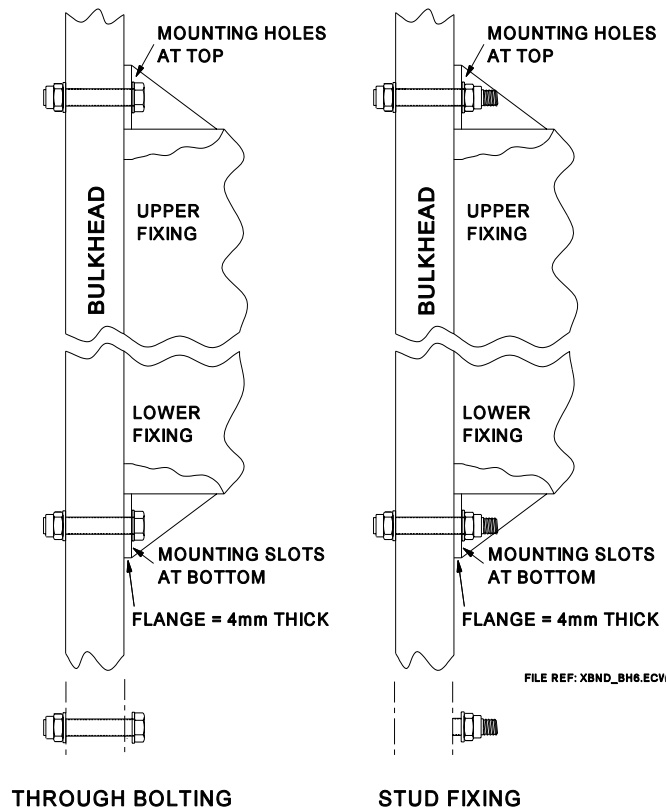


Figure 2.15 - X-Band Bulkhead Transceiver - Mounting Alternatives

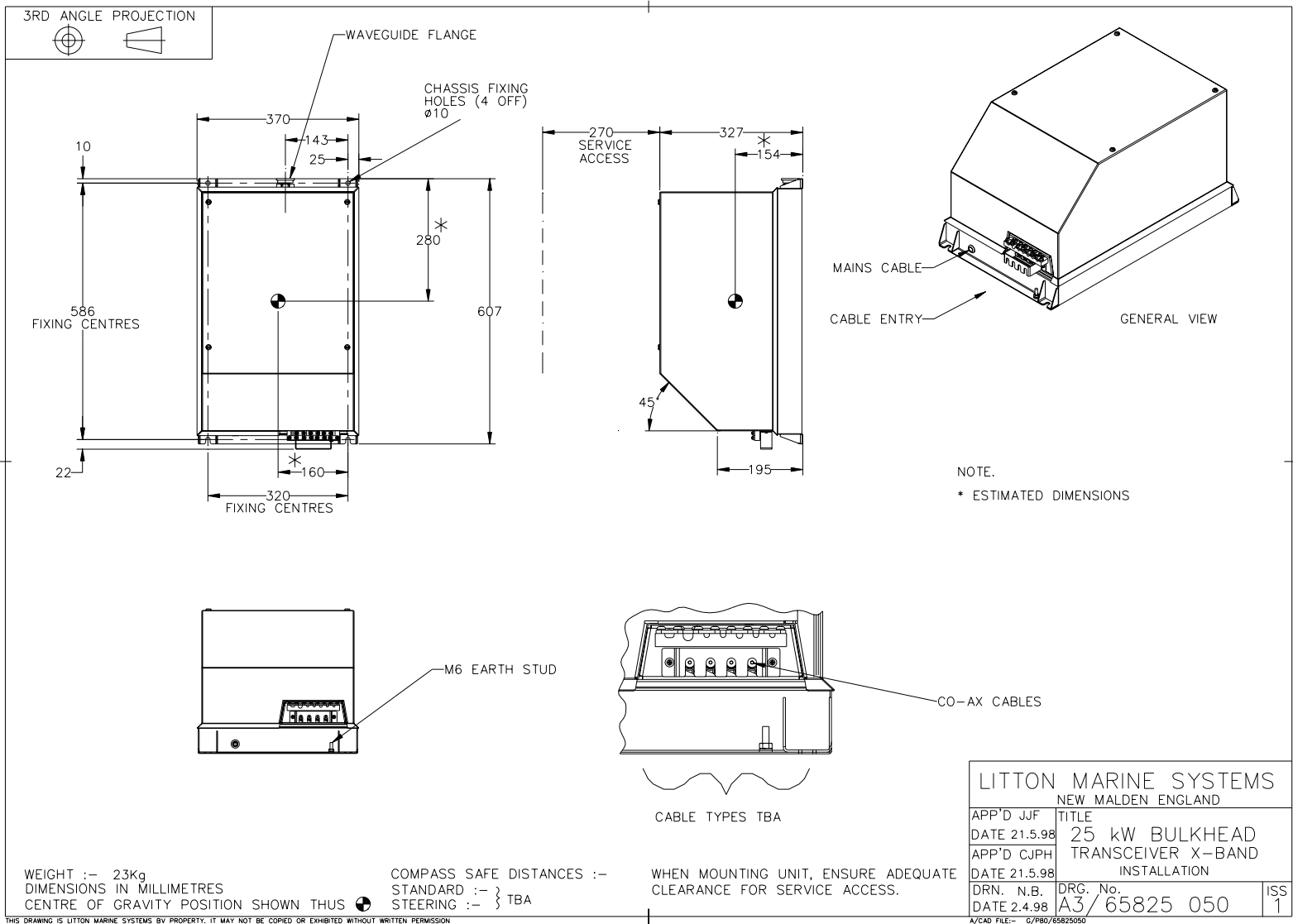


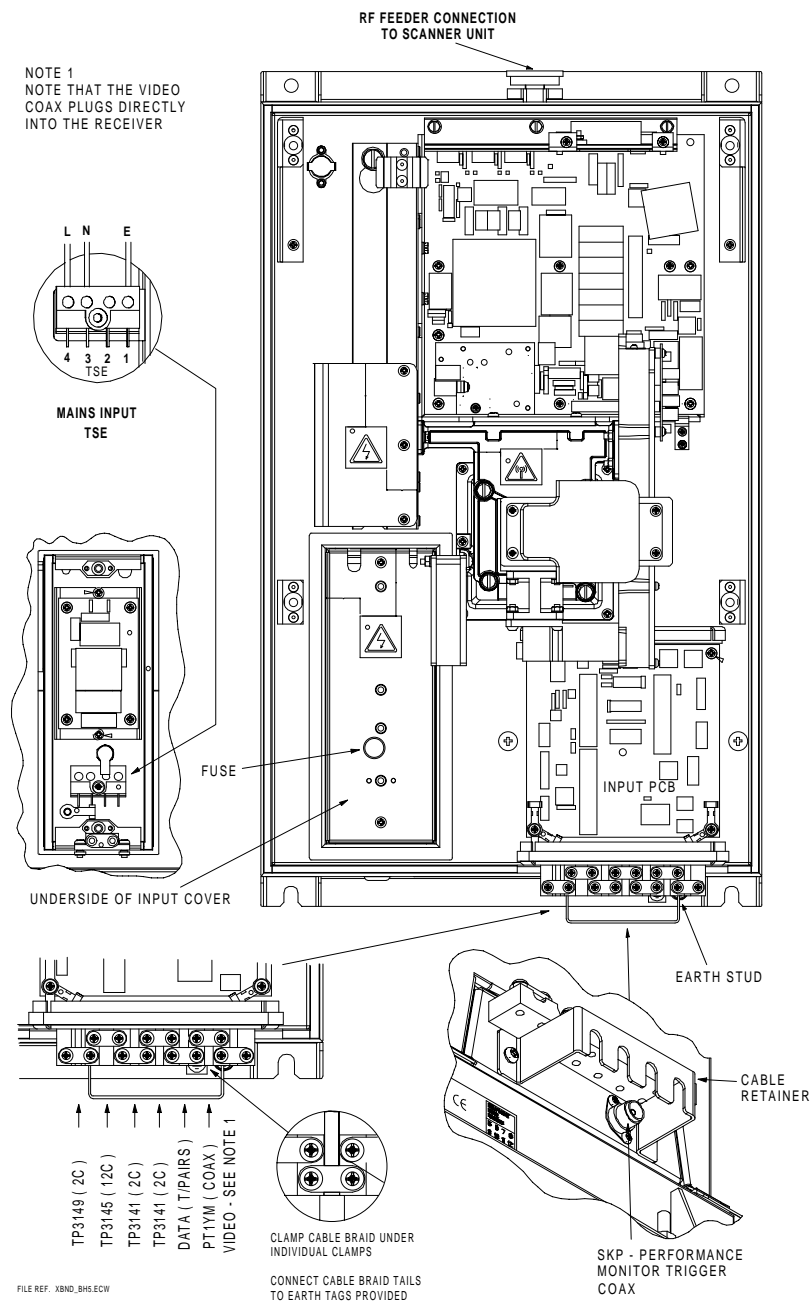
Figure 2.16 - X-Band Bulkhead Transceiver 25KW Installation

# Chapter 2

## X-Band Scanner Units and Transceivers

### 3.5.1 Cabling Information

Figure 2.17 below shows details of the cable inputs. The Transceiver cover, which is secured by four fixing screws, is shown removed. Note that the co-ax cables are retained by a cable retainer which must be fitted after the cables are in place. All other cables, with the exception of the X-Band RF Feeder ( waveguide ), are individually clamped on their cable braids to provide EMC shielding. The braids are also made off as tails and connected to earth tags provided. The a.c. mains input is connected to TSE located underneath the cover plate as shown.



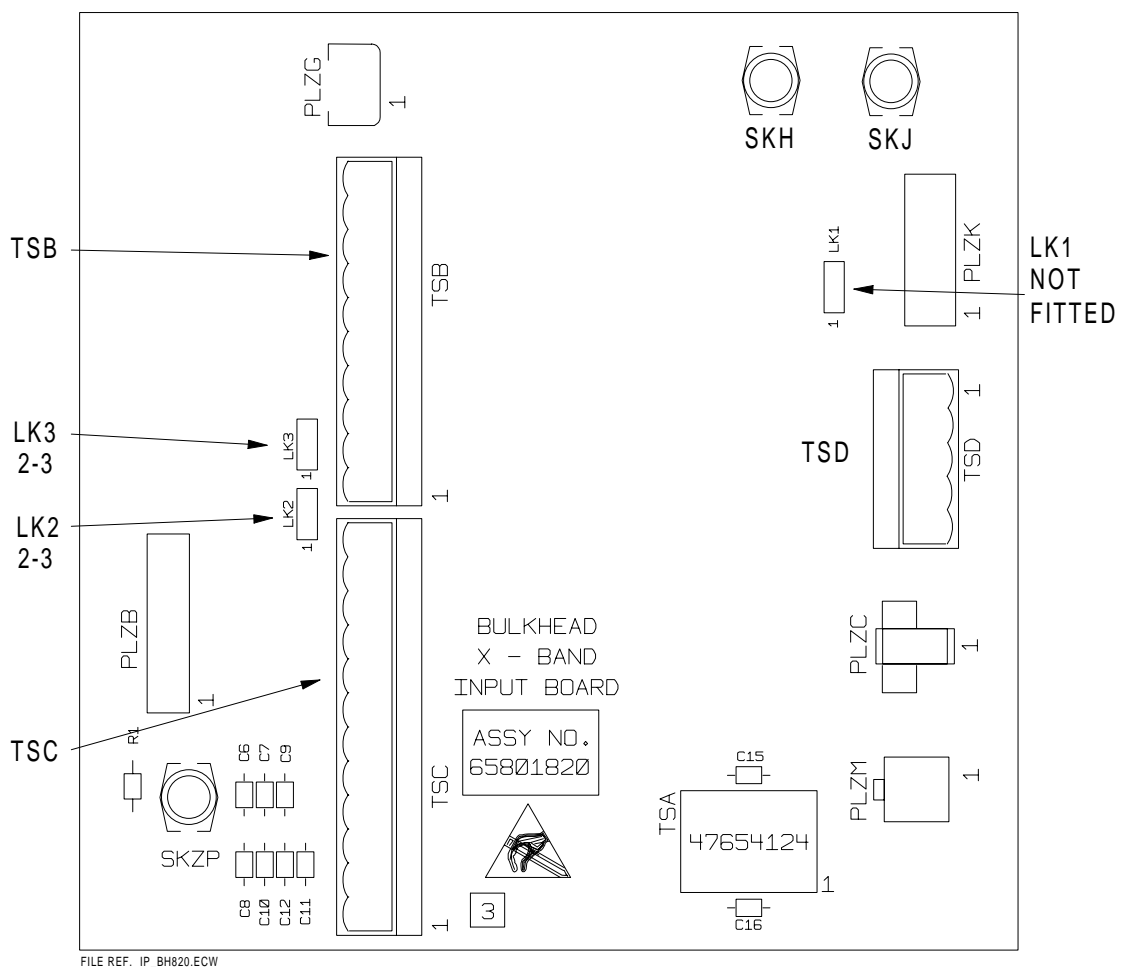
**Figure 2.17** - X-Band Bulkhead Transceiver - Cable Input Details

X-Band Scanner Units and Transceivers

Figure 2.18 below shows details of the Input Board 65801820. Access to the board is made by removal of the main Transceiver cover. Refer to the cabling schedules for details of the connections, which are made via the two part connectors provided.

Configuration for normal operation is by link settings as follows:

- Link 1            Not Normally Fitted
- Link 2            Link Pins 2 & 3
- Link 3            Link Pins 2 & 3



INPUT BOARD 65801820 - BULKHEAD TRANSCEIVER

**Note** - SKH, SKJ, PLZK and TSD are not normally fitted.

**Figure 2.18** - X-Band Bulkhead Transceiver - Input Board Details

### **3.5.2 Scanner Speed Settings**

Two scanner speed settings, 'LOW' and 'HIGH', are available, depending on the position of the link LK1 fitted to the Motor Drive Board 65801811.

Ensure that the correct scanner speed is selected, and that the corresponding Pulse Bearing speed is also selected. Refer to sub-section 3.3.1

### 3.5.3 Fitting the RF Elliptical Waveguide (X-Band)

#### General Information

1. A 33.5mm x 22.9mm corrugated elliptical waveguide is used for the run between the Bulkhead Transceiver Unit and the Turning Unit with X-Band radars. The waveguide used is Andrew Antennas Type EW85 - 9.8GHz.

A 12" flexible waveguide (Part No. 1189.z, supplied) must be fitted between the elliptical waveguide and the turning unit.

(Figures 2.19 to 2.26 are reproduced by permission of Andrew Antennas).

2. Although apparently robust, the waveguide must be protected against strain and kinking, and must be treated with the utmost care at all times. The ends of the waveguide must be kept sealed against the ingress of moisture before the connectors are assembled. The maximum permissible twist is 3°/metre (39").
3. Wherever possible, bends should have as great a bending radius as practicable. A single bend may be made when necessary with a minimum bending radius (measured from the axis of the cable) of 203mm (8in.) in the 'E' plane, and 482mm (19in.) in the 'H' plane
4. For convenience, the upper (Turning Unit) connector can be fitted prior to installation of the waveguide, but the following precautions must be taken:-
  - 4.1 Any bend required within 1m (3ft) of the waveguide end must be preformed before carrying out the cutting and assembly procedure detailed in subsequent paragraphs. Note that no bend may be nearer than 250mm (10in.) from the end of the waveguide.
  - 4.2 To allow for relative movement between the Turning Unit and mast, whenever possible a double bend should be formed in the cable so as to produce an offset immediately below the Turning Unit.
  - 4.3 The waveguide and assembled connector should be fitted to the Turning Unit so that a minimum amount of distortion of the waveguide occurs between the connector and the pre-formed bend.
  - 4.4 The waveguide should be installed and secured in position (using the waveguide supports shown in Figure 2.26) as far as is practicable before the lower (Transceiver Unit) connector is fitted to the waveguide. The precautions given in sub-para. 4.1 above must be observed if a bend is required adjacent to the Transceiver Unit.

### ASSEMBLING THE CONNECTORS

#### General

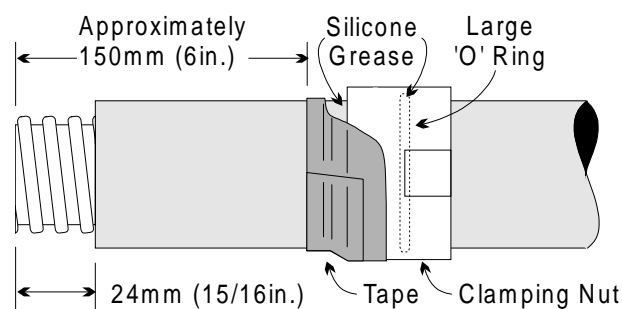
5. A straight connector (Type I85BC) is used to terminate the waveguide at each end.

#### Tools required

6. The normal tools found in an Engineer's tool kit, plus a hacksaw (with a fine-toothed blade) and 1-15/16in. open-ended spanner, will be sufficient for fitting the connectors to the waveguide.

#### Procedure

7. The procedure which follows is applicable to the straight connectors at each end of the waveguide. Note that it is most important that swarf and other foreign matter should be prevented from entering the waveguide.
8. Prepare the waveguide end and assemble the connector as follows:-
  - 8.1 Ensure that the end of the waveguide is straight for at least 250mm (10in.). The ends of the EW85 must be cut squarely. Wrap a straight edged piece paper around the wave guide to ensure squareness, tilt waveguide downwards to prevent copper swarf entering, then remove a 24mm (15/16in.) Length of the polyethylene jacket. Clean external copper with Comothene (or Ultraclean) solvent and the interior with a bottle brush, see Figure 2.19.

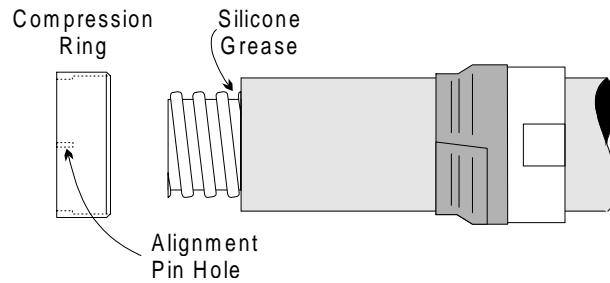


**Figure 2.19** - Cut Jacket

- 8.2 Apply a thin film of silicone grease (MS4 or similar) to the large 'O' ring and insert in the internal groove of clamping nut; apply a thin film of grease to smooth internal surface of clamping nut and slip the nut over end of waveguide as shown in Figure 2.19. Wrap several turns of tape around clamping nut and jacket to prevent foreign matter from entering.
- 8.3 Grease the cut edge of jacket, slip chamfered end of compression ring over

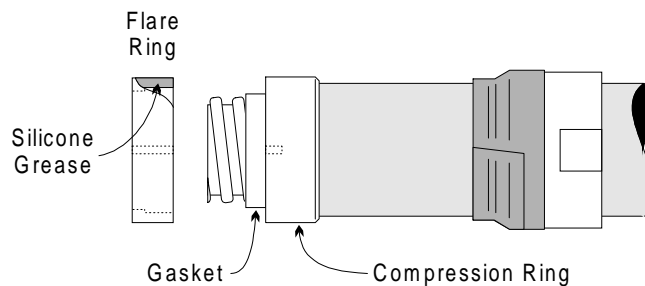
## X-Band Scanner Units and Transceivers

until recessed edge bottoms against jacket (align pin in holes facing away from jacket) as shown in Figures 2.20 and 2.21.



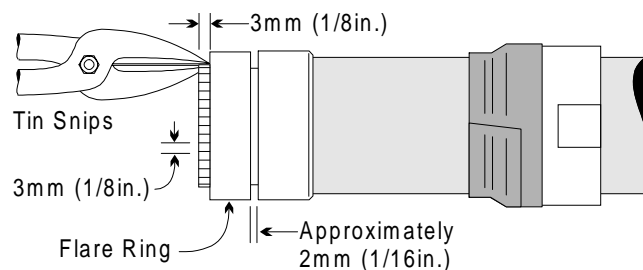
**Figure 2.20** - Fit Compression Ring

- 8.4 Turn gasket inside out and fit on end of waveguide, apply thin film of silicone grease to gasket threads, roll gasket over to correct position and against compression ring. See Figure 2.21 and apply a thin film of grease to outside surface of gasket. Clean any grease from exposed copper, with solvent.



**Figure 2.21** - Fit Flare Ring

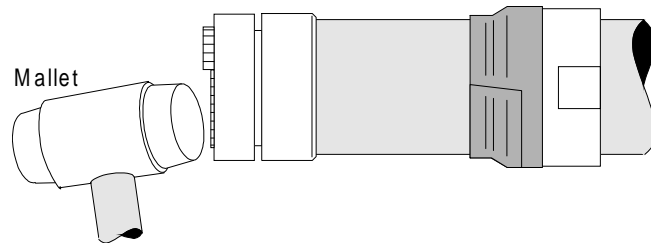
- 8.5 Fit recessed side of flare ring over gasket, with alignment holes of flare ring and compression ring corresponding. Push flare ring firmly against compression ring, see Figure 2.22.



**Figure 2.22** - Cut Tabs

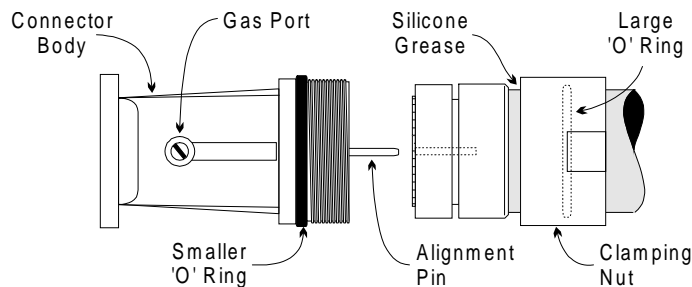


- 8.6 With tin-snips, cut the bared end of EW85 into tabs 1/8in wide and 1/8in deep - as close to flange as possible, see Figure 2.22. Flatten tabs against flare ring with a mallet using minimum force, heavy blows will reduce thickness of copper, see Figure 2.23. Trim off any tab protruding beyond periphery of flare ring; clean tabs with solvent to remove any silicone grease.



**Figure 2.23** - Flare End

- 8.7 Ensure that the mating R.F. contact face of the Type 185AC Connector body is clean and thoroughly grease-free. Clean inside of waveguide with a bottle brush.
- 8.8 Fit the smaller 'O' ring to external groove on connector body without any grease, see Figure 2.24. Apply a thin film of grease to rear outer surface of compression ring (so that large 'O' ring in clamping nut will slide over compression ring and seat in the recess).

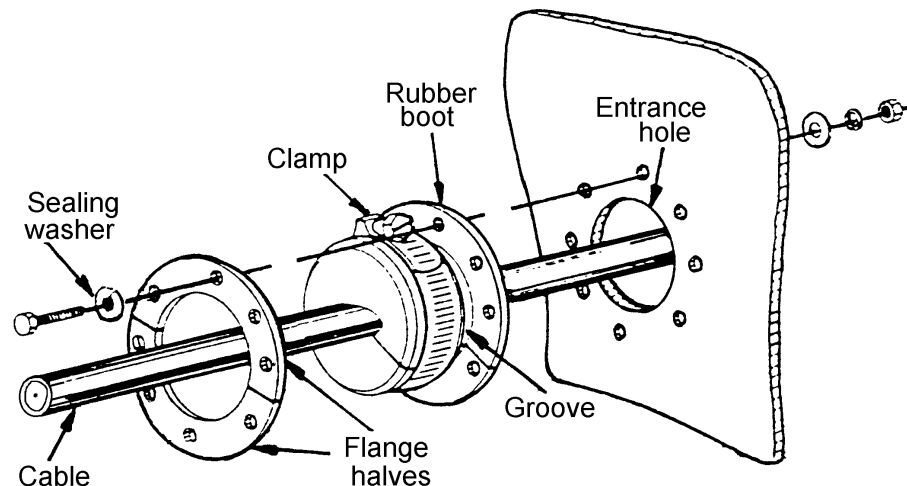


**Figure 2.24** - Fit Connector

- 8.9 Place connector body against flare ring, insert alignment pin in holes of flare ring and compression ring. Untape the clamping nut, slide it over the rings and screw to thread on connector body.
- 8.10 Hold the rectangular part of connector body with an adjustable spanner and tighten the clamping nut with a 1-15/16in set spanner across the flats. DO NOT turn connector body.

### Fitting the Deck Gland

9. The EW85 waveguide passes through its own separate deck gland (Part No. SKS.86347.A), positioned near to the foot of the mast. The gland kit comprises a rubber boot, metal flange halves, eight Lock-o-seal washers and an adjustable clamp (Jubilee clip). In addition eight 1/4in. bolts (of a suitable length), flat washers, lock washers and nuts will be required.
10. To fit the deck gland refer to Figure 2.25 and proceed as follows:-
  - 10.1 Cut a 75mm (3in.) diameter hole in the deck and, having installed and secured the waveguide from the Turning Unit downwards, pass the Transceiver Unit end down through the hole.
  - 10.2 Apply silicone grease to the hole and to the slit and tapered edge of the rubber boot.
  - 10.3 Place the boot around the feeder, slide the boot down into the hole in the deck and then mark the location of the eight holes for the fixing bolts.
  - 10.4 Withdraw the boot from the hole and drill eight 8mm (5/16in.) mounting holes through the deck.
  - 10.5 Slide the boot back into the hole in the deck and position the flange halves in the groove in the boot.



**Figure 2.25** - Deck Gland Details

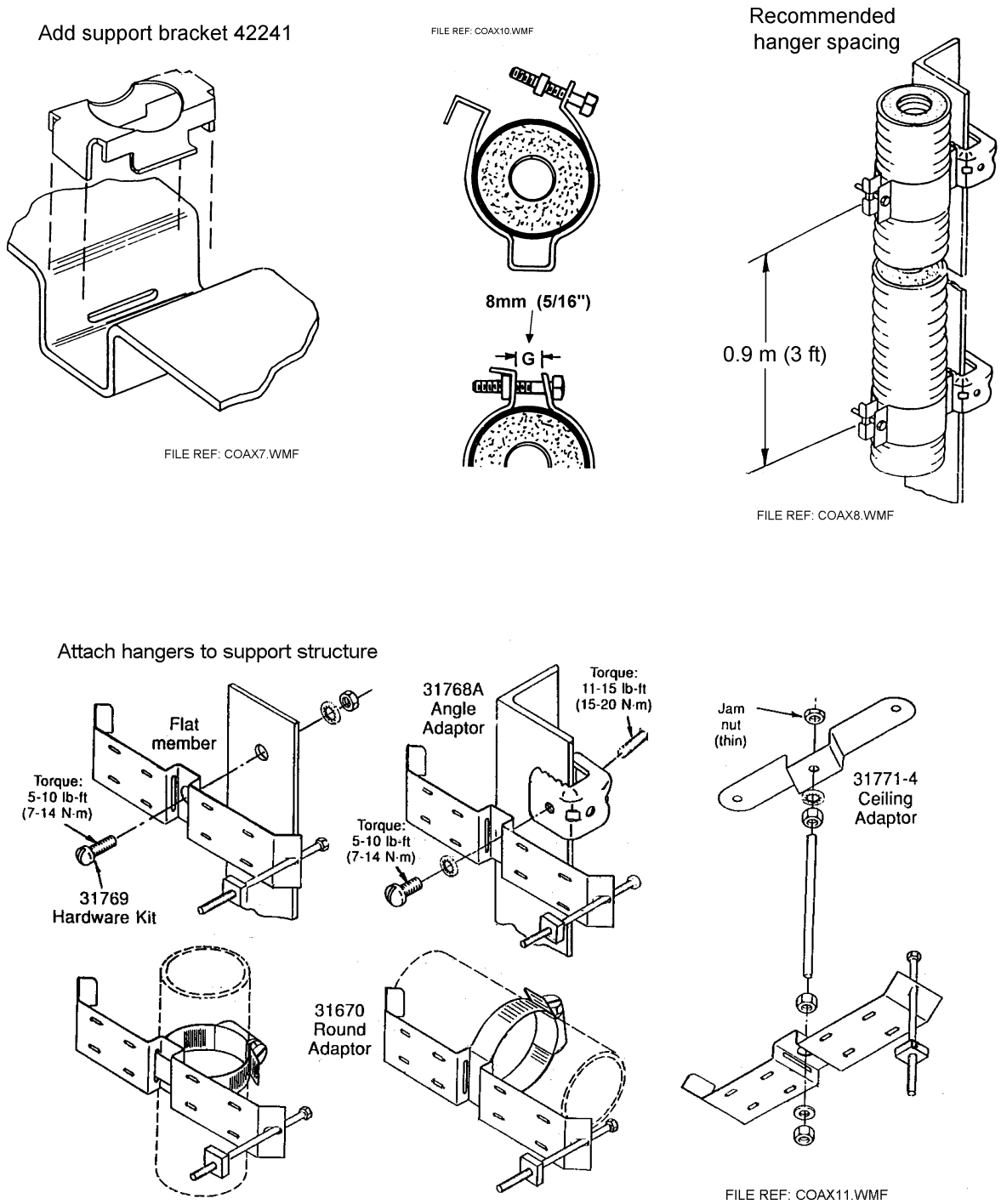
- 10.6 Align the flange holes with the boot holes and secure the assembly in position with eight 1/4in. bolts, flat washers, lock washers and nuts, together with the Lock-o-seal washers provided in the gland kit. Note that the bolts are

inserted downwards and that the Lock-o-seal washers only go under the bolt heads.

- 10.7 Fit the adjustable clamp (Jubilee clip) around the boot and tighten to ensure a leakproof seal.

### **Installing the Waveguide**

11. Waveguide Hangers are supplied (Andrew Hanger Kit Type 42396A-5) for supporting the waveguide along its run between the Scanner Unit and the Bulkhead Transceiver. Each kit contains Hangers plus their associated Support Brackets (Andrew Type 42241), the quantity supplied is dependant on waveguide length. Normally, a hanger is attached to a cable tray, using suitable bolts, at a recommended spacing of 0.9 metres (3 feet). The support brackets must be fitted to the hangers to prevent distortion when the hanger is wrapped around the waveguide as shown in Figure 2.26.
12. Figure 2.26 also shows additional hardware (not supplied in the Installation Kit) which facilitate special mounting arrangements. If required, these are obtainable from Andrew Corporation.



**Figure 2.26** - Waveguide Support Details

### **3.6 Initialisation and Commissioning**

The X-Band Scanner Unit and Transceiver are only part of a complete BridgeMaster E Series Radar, and cannot be operated independently. For details of complete system installations refer to the BridgeMaster E, Ship's Manual 65800010B.

After a complete system has been installed it must be Initialised and Commissioned as detailed in Chapter 4 of the BridgeMaster E, Ship's Manual 65800010B.