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NSC 25/34 Radar

Typ 900–025...027

NSC Chartradar

Typ 950–033...035

WIDE SCREEN (16:10)

Service and Installation Manual

3749DOC020302 Edition: 21.AUG.2009

IMPORTANT WARNINGS AND SAFETY INFORMATIONS

This Radar is an aid to navigation. Its accuracy can be affected by many factors such as equipment defects, environmental conditions, or improper operation. It is the user's responsibility to exercise common prudence and navigational judgement at all times.

ATTENTION

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to IEC 60936, IEC 60872 and IEC 60945.
These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
This equipment generates, uses and can radiate radio frequency energy. If not properly installed and used in accordance with the instructions, this equipment may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The used sensor equipment pursuant to IEC 61162.
Using this NSC Radar as High Speed Radar the Gyro Sensor must be a High Speed Gyro Sensor as well.

SAFETY REGULATION

- **Warning!**
  Caution during maintenance and repairs: Avoid contact with live electrical circuits!
  All relevant safety regulations such as, e.g. VDE, VGB4, OSHA 1919 and other relevant safety standards must be ob served.

- **Caution!**
  Maintenance and repairs must only be carried out by trained and qualified personal with knowledge of the national safety regulations for electrical devices.

Observe handling regulations!
Electrostatic sensitive components.

Removal or insertion of a subgroup or printed wiring board with live voltage can lead to severe damage.

Never insert fuses with other values than those stipulated!

- **Caution!**
  If acting without authority any modifications the NSC 25 / 34 can be affects the functionality and lose the GUARANTY.

SAFETY HIGH VOLTAGE WARNING

CAUTION

HIGH VOLTAGE

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT.

DEATH ON CONTACT MAY RESULT IF PERSONNEL FAIL TO OBSERVE SAFETY PRECAUTIONS.

NEVER WORK ON ELECTRONIC EQUIPMENT UNLESS THERE IS ANOTHER PERSON NEARBY WHO IS FAMILIAR WITH THE OPERATIONAL HAZARDS OF THE EQUIPMENT AND WHO IS COMPETENT IN ADMINISTERING FIRST AID. WHEN THE TECHNICIAN IS AIDED BY OPERATORS, HE MUST WARN THEM ABOUT DANGEROUS AREAS. WHENEVER POSSIBLE, THE POWER SUPPLY TO THE EQUIPMENT MUST BE SHUT OFF BEFORE BEGINNING WORK ON THE EQUIPMENT. TAKE PARTICULAR CARE TO GROUND EVERY CAPACITOR LIKELY TO HOLD A DANGEROUS POTENTIAL. WHEN WORKING INSIDE THE EQUIPMENT, AFTER THE POWER HAS BEEN TURNED OFF, ALWAYS GROUND EVERY PART BEFORE TOUCHING IT. BE CAREFUL NOT TO CONTACT HIGH–VOLTAGE CONNECTIONS OR 115, 230 VOLT AC INPUT CONNECTIONS WHEN INSTALLING OR OPERATING THIS EQUIPMENT. WHENEVER THE NATURE OF THE OPERATION PERMITS, KEEP ONE HAND AWAY FROM THE EQUIPMENT TO REDUCE THE HAZARD OF CURRENT FLOWING THROUGH VITAL ORGANS OF THE BODY.

EXTREMELY DANGEROUS POTENTIALS GREATER THAN 200 VOLTS EXIST IN SOME OF THE UNITS COVERED IN THIS MANUAL.

POTENTIALS LESS THAN 200 VOLTS MAY CAUSE DEATH UNDER CERTAIN CONDITIONS. REASONABLE PRECAUTIONS SHOULD BE TAKEN AT ALL TIMES.

NOTICE: CALL FOR HELP FIRST, THEN ATTEND THE CASUALTY IMMEDIATELY.

HIGH VOLTAGE

There is absolutely no danger in handling the external controls of the radar while the radar is in operation. However, in the radar's interior, are high voltages which are fatally dangerous to anyone carelessly handling interior components. Be absolutely sure that the radar power switch or the radar system is switched is **OFF** before performing repair work or maintenance .

Furthermore, even when the radar power switch or the radar system is turned **OFF**, a high voltage remains in certain parts of the radar circuits. In particular, be careful of the magnetron heater circuit, cathode-ray tube anode circuit, etc.. Before touching any part of the voltage sections, use a length of wire with one end fully grounded or an insulated screwdriver to ground all high voltage sections in order to discharge the residual charges and ensure that no charges remain. In any case, the most dangerous thing to do is to touch any part of the high voltage sections without making sure that the radar power switch or the radar system is switched **OFF**.

ATTENTION

Exercise care when approaching a rotating antenna. Be sure to turn **OFF** the radar power switch or the radar system before performing maintenance or inspection of the antenna. Also, make sure that the area around the antenna is clear of personnel and equipment when turning **ON** the radar power supply.

Radiation Hazard

CAUTION

UNDER NORMAL OPERATING CONDITIONS, THE ELECTROMAGNETIC ENERGY EMITTED BY THIS RADAR OPERATION IS SAFELY BELOW GOVERNMENT EXPOSURE MAXIMUM STANDARDS.

1. WHEN AT DOCK SIDE OR CLOSE TO OTHER VESSELS, THE TRANSMITTER SHOULD ONLY BE OPERATED WHEN THE ANTENNA IS ROTATING.

2. THE RADAR SYSTEM SHOULD BE TURNED OFF BEFORE APPROACHING WITHIN 6 FEET OF THE ANTENNA FOR X–BAND AND 15 FEET FOR S–BAND.

3. THE ANTENNA SHOULD NOT BE RELOCATED OR REPOSITIONED ON THE VESSEL WITHOUT CONSULTING THE RAYTHEON MARINE COMPANY SERVICE ORGANIZATION OR AN AUTHORIZIED DEALER.

MICROWAVE RADIATION

A short exposure to the microwaves radiated by the radar antenna is harmless– however, avoid prolonged exposure to the microwaves.
Never look directly into the wave guide while checking transceiver operation since microwaves are especially harmful to the eyes.
The radiation of microwaves can be checked with a neon tube.
The neon tube will glow in the presence of microwaves.

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

1 INTRODUCTION

This manual contains the procedures for preparing the installation site, installation, setup and alignment of NSC radar components.

NSC Radar Components

NSC 25/34 (inclusive Mounting Kit)
NSC means “Nautoscan” . 25/34 means Monitor PPI Diagonal of 250mm and 340mm.
NSC 25/34 are designed as Deckstand (DS) or as Table Top (TT).

Black Box (inclusive Mounting Kit) with addional NSC Remote Panel
Black Box means only Prozessor which can be mounted depending on the availability of installation locations.
The addionally NSC Remote Panel is used for the NSC Prozessor (Power ON/OFF and Reset-Function).

Modulator-Transmitter-Receiver (inclusive Mounting Kit)
The Modulator-Transmitter-Receiver is available in 2 different versions.
The version which is destignated with “Down” has an own hausing and has to be installed respectively.
The version which is designated with “Up” is a built-in PCB of the pedestal of the radar antenna.

*X/S-band Pedestal (*inclusive Mounting Kit)
Within a NSC-System different pedestals can be used:

- X-band Pedestal inclusiv 6 foot arrays
- X-band Pedestal inclusiv 7 foot or 9 foot arrays
- X-band Pedestal inclusiv 8 foot LPR-A25 array
- S-band Pedestal inclusiv 12 foot arrays
- S-band Pedestal inclusiv 12 foot LPR-A1 array

Optionale NSC accessories (inclusive Mounting Kit):

Interswitch Unit (inclusive Mounting Kit)
The Interswitch Unit (ISU) can connect up to 6 MK2 Transceivers, additionally one 10kW Unit and interswitch up to 8 NSC Radars in normal mode.
NSC Ethernet Modul (Inclusive Mounting Kit)
The Ethernet Modul is used to read in the external AIS (Automatic Identification System) data.

Performance Monitor (PMU)
The type of Performance Monitor depends on the connected radar antenna. There are two different types of Perfomance Monitor Typen:

- Performance Monitor with Operator Unit for X–band Pedestal with 6 feet array.
- Performance Monitor für die X/S–band Pedestals with 7 / 8 / 9 or 12 foot arrays.

1.1 UNPACKING AN INSPECTION

NOTE
Retain the shipping containers, packing materials and hardware for storage or reshipment

Prior to unpacking the NSC units, shipping cartons should be checked for external damage, such as dents, holes, smashed corners, and water marks. If there is any noticeable damage, the shipping agent must be contacted before proceeding with the unpacking and installation. Depending on the type of installation, the system may be shipped in one or more containers.

1.1.1 Major Units

All major components are shipped in cardboard shipping cartons or palatalized shipping crates.
The cardboard shipping cartons contain fitted packing covers and/or loose filler pellets to provide cushioning and protection for the units. Each of the units can be removed by cutting banding or shipping tape and carefully removing the unit along with its protective cover from its shipping container.

(1) Inventory the contents of the shipment and verify that all the required components have been received. Inspect all components for any shipping damage.

CAUTION ⚠	EXERCISE CAUTION WHILE CUTTING THE SHIPPING TAPE TO AVOID DAMAGE TO THE CONTENTS. IF DAMAGE TO ANY OF THE UNITS IS NOTICED DUE TO SHIPPING OR HANDLING, A CLAIM MUST BE FILED WITH THE SHIPPING COMPANY.

(2) The shipment should be verified as complete by comparing the shipment against the carrier’s bill of lading, inventory list, or bill of materials.

(3) **Deckstand (DS), Table Top (TT), Processor Unit**

The units are shipped in a wooden container. They are bolted and banded to a pallet which serves as the bottom of the shipping container.
The procedure below should be followed when unpacking.

(4) **Antenna Array**

CAUTION ⚠	USE EXTREME CAUTION WHEN UNPACKING AND REMOVING THE ARRAY(S) TO AVOID SCRATCHING OR DAMAGING THE FIBERGLASS FACE.

(5) **MTR Up**

The MTR Up is shipped in a wooden container. The pedestal is bolted and banded to a pallet which serves as the bottom of the shipping container.
The procedure below should be followed when unpacking.

CAUTION ⚠	DO NOT REMOVE MTR UP/ANTENNA PEDESTAL FROM BOTTOM PALLET UNTIL READY TO MOUNT ON MAST. DO NOT LIFT THE ANTENNA PEDESTAL USING THE T-BAR OR ANTENNA ARRAY, DAMAGE TO THE ROTARY JOINT COULD RESULT.

1.1.2 Equipment Inspection

Complete and detailed packing lists are shipped with the equipment. After all shipping containers have been unpacked, the contents should be inspected for damage and should be checked against the packing lists to ensure that all items are accounted for prior to starting the installation.

1.2 PLANNING AND SITE PREPARATION

1.2.1 Technical Data

1.2.1.1 Safe Distances to Standard–Magnetic and Steering–Magnetic Compass

NSC 25 TFT and Prozessor Unit

Safe distance to Standard–Magnetic–Compass	0.85 m
Safe distance to Steering–Magnetic–Compass	0.50 m
Reduced safe distance to Standard–Magnetic–Compass	0.50 m
Reduced safe distance to Standard–Magnetic–Compass	0.30 m

NSC 34 TFT and Prozessor Unit

Safe distance to Standard–Magnetic–Compass	0.85 m
Safe distance to Steering–Magnetic–Compass	0.50 m
Reduced safe distance to Standard–Magnetic–Compass	0.50 m
Reduced safe distance to Standard–Magnetic–Compass	0.30 m

1.2.1.2 TFT Display

NSC 25 TFT

TFT Display Size	19“
PPI Diameter (IMO)	12” (250mm)
Resolution	1280 x 1024
Format	5:4
Display Voltage	230VAC
Max Colors	16,7 millions
Pixel Pitch	0,29 (H) x 0,29 (V) mm

NSC 34 TFT

TFT Display Size	23.1“
PPI Diameter (IMO)	16” (320mm)
Resolution	1600 x 1200
Format	4:3
Display Voltage	230VAC
Max Colors	16,7 millions

Pixel Pitch	0,29 (H) x 0,29 (V) mm

WIDE SCREEN

TFT Display Size	26“
PPI Diameter	33,5 (H) x 32,5 (V) cm
Resolution	1920 x 1200
Format	16:10
Display Voltage	230VAC
Max Colors	16,7 millions
Pixel Pitch	0,29 (H) x 0,29 (V) mm

1.2.1.3 Processor Unit

NSC Chartradar

Processor A3300M–6 (for detailed information see Service Manual A3300M Doc.No. 3954).

A3300M–6 special equipment

- IntelQ965+ICH8 ATX M.B w/GA 775 socket
- CPU–min. Intel P4 3GHz LGA775, FBS800MHz, 2MB Cache
- RAM–1GB 667MHz DDR2 Non–ECC CL5 DIMM (Kit of 2) Single Channel
- HDD–min. 40GB 2.5”, 5400RPM, SATA, automotive
- 2x RS232 (one internal/bracket), dual Ethernet, 6xUSB, 90....264VAC Full Range Power Supply, Windows 2000 Pro. Eng. SP2 or higher, 12V outlet
- Graphic–Matrox P650 128MB DDR Dual head PCIe 16X

NSC Radar

Processor A3300M–7 (for detailed information see Service Manual A3300M Doc.No. 3954).

A3300M–7 special equipment

- IntelQ965+ICH8 ATX M.B w/GA 775 socket
- CPU–min. Intel P4 3GHz LGA775, FBS800MHz, 2MB Cache

- RAM–1GB 667MHz DDR2 Non–ECC CL5 DIMM (Kit of 2) Single Channel
- HDD–min. 40GB 2.5”, 5400RPM, SATA, automotive
- 2x RS232 (one internal/bracket), dual Ethernet, 6xUSB, 90....264VAC Full Range Power Supply, Windows 2000 Pro. Eng. SP2 or higher, 12V outlet
- Onboard Graphic

1.2.1.4 Antenna Pedestal Specifications

	X–Band		S–Band
Performance	10 kW	25 kW	30 kW
Scanner size	6–ft	8–ft LPR–A25	12–ft LPR–A1
Horizontal Beam Width	1.2°	0.95°	1.9°
Vertical Beam Width	25.0°	24.4°	26.0°
Gain	29dB	31dB	28dB
Polarization	Horizontal		
Rotation RPM High Speed	22/26 RPM 40RPM		22/26 RPM
Performance			
Swing Circle	1988mm	2593mm	3884mm
Weight with Antenna	32kg	80kg	169kg
Power Requirements			
115VAC,1ϕ Start Run	xx	30A 6A	60A 13A
230VAC,1ϕ Start Run	xx	15A 3A	30A 6.5A
230VAC, 3ϕ Start Run	––	11A 3A	22A 4.5A
380–440VAC, 3ϕ Start Run	––	6A 2A	11A 3A
Power	300VA	700VA	1,400VA
Environmental			
Vibration	IEC60945		
Shock	IEC60945		
Temperature	–25° to +55°		
Wind Loading	100 Kts Relative Operating, 150 Kts Relative Survival		

1.2.1.5 MTR Specification

X–Band (10kW –NSC–)

	X–Band
Performance	XCVR Up
Peak Power	10kW
Dynamic Range (dB)	100dB
Intermediate Frequency (MHz)	60 MHz
Receiver Noise	6.0dB
Power Requirements	
Typical Power Consumption	240W
Environmental	
Vibration	IEC60945
Temperature	–25° to +55°

	X–Band			
PULSE WIDTH	SHORT RANGE 0.125, 025, 0.5, 0.75, 1.5 Nm	MED1 RANGE 3 Nm	MED2 RANGE 6, 12 Nm	LONG RANGE 24, 48, 96 Nm
	(0.08μS)	(0.3μS)	(0.6μS)	(1.2μS)
Pulse Repetition Rate (PRF)	3200 Hz	1600 Hz	1600 – 800 Hz	500 Hz

X–Band (25kW –MK2–) – S–Band (30kW –MK2–)

	X–Band		S–Band
Performance	XCVR Up/Do	XCVR Up/Do	XCVR Up/Do
Peak Power	25kW	25kW	30kW
Dynamic Range (dB)	100dB	100dB	130dB
Intermediate Frequency (MHz)	60 MHz	60 MHz	60 MHz
Receiver Noise	5.5dB	5.5dB	5.0dB
Power Requirements			
Typical Power Consumption	184W		195W
Environmental			
Vibration	1G 5Hz to 100Hz		
Shock	5G 11ms 1/2 Sinne in Three Planes		
Temperature	–25° to +55°		

	X–Band		S–Band	
PULSE WIDTH	SHORT RANGE 1/4, 1/2, 3/1, 1–1/2 Nm	MED1 RANGE 3 Nm	MED2 RANGE 6, 12 Nm	LONG RANGE 24, 48, 96 Nm
	(0.06μS)	(0.25μS)	(0.5μS)	(1.0μS)
Pulse Repetition Rate (PRF)	3000 Hz	2000 Hz	1000 Hz	750 Hz
Receiver Band Width	20 MHz	6 MHz	4 MHz	4 MHz

1.2.2 Radar Performance depends on the mounting place of the Antennas

The quality of the radar performance depends on the place of the installattion. The following places for installing the antenna can only be an example of installation–related factors which could degrade radar performance.

Frequently, the antenna place depends from on ship‘s superstructure which can generate reflections that effect the Radar PPI.
Other electronic waves can disturb the internal radar signal processing (Radio antennas, SAT nav, AIS etc.).

All these parameters leading to interferences have been considered during the project planning and design phase with target to find the best places for the radar antennas.

1.2.3 Processor Unit / Monitor Site Layout

The Processor Unit / Monitor allows the separation of the processor and monitor for ease of custom installations, i.e. console mounting.

Other guidlines to be considered include:

- The Processor Unit / Monitor must not be exposed to weather conditions. Do not install the Processor Unit / Monitor near entrances or exits that expose the unit to excessiv moisture.

- Allow sufficient clearance for service and ventilation of the unit. A minimum of clearance from rear (see dimensional drawings in the annex) to Processor / Monitor is required

- Position the Processor / Monitor a minimum of two meters away from any communications and navigation equipment that is not magnetical shielded.

1.2.4 NSC Radar for Special Uses

1.2.4.1 Explosion Proof

Please make sure that the radar is installed within the secure area.

Furthermore the installation has to comply with relevant flag state regulations and requirements of classification societies."

1.3 SYSTEM CABLING

Prior to running cables or making connections, consider the following guidelines. The display cabling is illustrated in this manual to ensure continuity during the installation to the MTRs.

(1) If a cable passes through an outside wall, or is terminated in a unit that is exposed to the weather, the cable entrance should be made watertight with an approved marine fitting. The fitting should be sealed with a packing material and covered with a caulking compound to prevent an accumulation of moisture.

(2) Avoid running cables in areas that are exposed to extremes of heat such as steam lines.

(3) Protect cables with tubing if there is a possibility that the cable will be subjected to mechanical abrasion or chafing.

(4) When existing cable runs are used to hang and secure the cables, ensure that there is no possibility of radiated interference.

(5) Determine cable entry point into the base unit. Cable entry to the base unit can be from the bottom or from an access plate at the left rear of the cabinet.

1.3.1 Power Requirements

In designing the Monitor Versions, MTR Up and MTR Down, efforts have been made to ensure satisfactory operation with power supplied by most prime power systems. In an attempt to guard against system mailfunctions caused by externally radiated or conducted transients, or from electrical signals superimposed on the power lines supplying the system and power distribution should comply with:

(1) The system power source should be capable of handling the originally installed equipment, as well as taking into consideration the possibility of adding options or future expansion.

(2) The power source should be stable and noise-free. If possible, the power should be derived from a dedicated line.

(3) Do not connect large electric motors, air conditioners, or high current-drawing equipment to the same circuit as the NSC radar.

(4) The transceiver has to be supplied with 115V (AC) through isolating transformer only!
Use a step down transformer 116-087 NG002 to connect 230V to 115V and isolate the power for both radar processor and pedestal electronics. The monitor and the antenna motor can be 230V or 115V by moving a switch or jumpers.

2 EQUIPMENT PHYSICAL INSTALLATION

This chapter contains the procedures for the physical installation of all the NSC Equipment (see Drawing Radar System Overview in the annex).

In general:
All below mentioned information of physical installation are manufacturers recommendations. At least all equipment has to be installed according to ship's conditions.

For the 6 foot antenna equipment see chapters 2.8.

2.1 GENERAL INFORMATION

2.1.1 Bonding

The purpose of bonding radar equipment to a local earth ground is to prevent radio frequency interference (RFI) and to minimize the chance of lightning damage.
Proper site planning must include provisions for installing a low resistance ground system path as close as possible (2 foot maximum) to each unit in the system.
Bonding practices considered acceptable by Raytheon Anschütz include not only the use of bonding straps but also connection of cable shields and drains to cable entrance clamps. Ground lugs adjacent to these clamps are provided in each unit and should be used for connection of unused conductors.

Copper strapping, 60 mil inch thick by 1–1/4–inch wide is provided for electrical bonding of the Pedestal, MTR(s), NSC Monitors and auxiliary units to the ground system.
These straps should be as short as possible.
While copper is the recommended material for bonding straps, its presents a corrosion problem if not treated properly.

Use of a non–migratory grease compound such as NO–AL–OX® will minimize galvanic interaction and ensure a long–lasting, low resistance connection.
The length of the bonding strap should be cut to form the shortest possible path to the bonding point. All surfaces should be carefully cleaned and coated with NO–AL–OX® compound prior to assembly.

Placing the bonding strap under an equipment mounting bolt is not considered proper bonding procedure.

2.1.2 System Cabling

Prior to running cables or making connections, consider the following guidelines. The display cabling is illustrated in this manual to ensure continuity during the installation to the MTRs.

(1) If a cable passes through an outside wall, or is terminated in a unit that is exposed to the weather, the cable entrance should be made watertight with an approved marine fitting. The fitting should be sealed with a packing material and covered with a caulking compound to prevent an accumulation of moisture.

(2) Avoid running cables in areas that are exposed to extremes of heat such as steam lines.

(3) Protect cables with tubing if there is a possibility that the cable will be subjected to mechanical abrasion or chafing.

(4) When existing cable runs are used to hang and secure the cables, ensure that there is no possibility of radiated interference.

(5) Determine cable entry point into the base unit. Cable entry to the base unit can be from the bottom or from an access plate at the left rear of the cabinet.

2.1.3 Power Requirements

In designing the NSC MTR Up and MTR Down, efforts have been made to ensure satisfactory operation with power supplied by most prime power systems. In an attempt to guard against system malfunctions caused by externally radiated or conducted transients, or from electrical signals superimposed on the power lines supplying the system and power distribution should comply with:

(1) The system power source should be capable of handling the originally installed equipment, as well as taking into consideration the possibility of adding options or future expansion.

(2) The power source should be stable and noise-free. If possible, the power should be derived from a dedicated line.

(3) Do not connect large electric motors, air conditioners, or high current-drawing equipment to the same circuit as the NSC Radar.

2.1.4 Compass Safe Distance

All below mentioned distances have een rounded up to the nearest 0.1 meter in order to allow for a maximum deviation which might be caused by the most magnetic sample of all units manufactured.
Below mentioned tables show a standard and a steering coloumn.

Standard means: “Standard–Magnetic–Compass”
Steering means: “Steering–Magnetic–Compass”

2.1.4.1 Safe Distance Magnetic Compass versus Monitor and Processor

Compass safe distances are described in Table 2–1

	Safe Distance		**Reduced Safe Distance***	
	1/4 DEG STANDARD	**1 DEG STEERING**	**1/4 DEG STANDARD**	**1 DEG STEERING**
Control Panel	0.3 M	0.3 M	-----------	----------
Processor Unit	0.4 M	0.3 M	-----------	----------
NSC 25 TFT with Processor	0.85 M	0.5 M	0.5 M	0.3 M
NSC 34 TFT with Processor	0.85 M	0.5 M	0.5 M	0.3 M

Table 2–1 Compass Safe Distance

*Reduced Safe Distance concerns restricted areas, for example coastal shipping.

2.1.4.2 Safe Distance Magnetic Compass versus Antenna

	1/4 DEG STANDARD	1 DEG STEERING
7FT X–BAND ANTENNA	0.3M	0.3M
8FT X–BAND LPR–A25	5M	5M
9FT X–BAND ANTENNA	0.3M	0.3M
12FT S–BAND ANTENNA	0.3M	0.3M
12FT S–BAND LPR–A1	5M	5M

Table 2–2 Antenna Compass Safe Distance

2.1.4.3 Safe Distance Magnetic Compass versus MTR Up

	1/4 DEG STANDARD	1 DEG STEERING
X–BAND MTR UP	1.3M	0.8M
X–BAND MTR UP with 8FT Antenna	6.3M	5.8M
S–BAND ANTENNA	4.2M	2.7M
S–BAND ANTENNA with 12FT Antenna	9.2M	9.7M

Table 2–3 MTR Up and Array Compass Safe Distance

2.1.4.4 Safe Distance Magnetic Compass versus MTR Down Pedestal

	1/4 DEG STANDARD	1 DEG STEERING
X–BAND PEDESTAL (SINGLE PHASE)	0.7M	0.4M
X–BAND PEDESTAL with 8FT Antenna (SINGLE PHASE)	5.7M	5.4M
S–BAND PEDESTAL	1.1M	0.7M
S–BAND PEDESTAL with 12FT Antenna	6.1M	5.7M
S–BAND MTR DOWN	4.1M	2.6M
X–BAND MTR DOWN	2.2M	1.4M

Table 2–4 MTR Down Pedestal and MTR Down Compass Safe Distance

2.2 PROCESSOR, MONITOR AND INTERSWITCH UNIT INSTALLATION

There are manifold configurations of installation.
In the following chapters only recommendations can be made how to install the equipment.
The base of all installations are the dimensional drawings and wiring diagrams at the annex.

2.2.1 General Installation-hints for the NSC-Processor

This Processor can be installed either:

- in the housing of a Deckstand
- anywhere close to the respective display

Each Processor has to be connected to the respective display via a “Radar Connection Module NSC” .
The installation location of this modul is also not dictated.

The following installation guide lines should be observed whenever possible.
Refer to the Dimensional Drawings for dimensions and mounting details in the annex of this Installation Manual.
The Processor Unit/Monitor allows the separation of the processor and monitor for ease of custom installations, i.e. console mounting.

Other guidelines to be considered include:

(1) The Processor Unit/Monitor/Radar Connection Module must not be exposed to weather conditions.
Do not install the Processor Unit/Monitor/ Radar Connection Module near entrances or exits that expose the unit to excessive moisture.

(2) Allow sufficient clearance for service and ventilation of the unit. A minimum of special clearance from rear of Processor Unit/Monitor/Radar Connection Modul is required.

(3) The Processor Unit is intended for bulk head mounting. The monitor is intended for table top mounting with the control panel set in to a console. Table top height should be selected for optimum viewing of the monitor.

(4) The Processor Unit, Monitor and Radar Connection Unit should be installed away from magnetic compass, MTR or other equipment with high magnetic fields to avoid magnetic disturbance of the monitors presentation (chapter 2.1.4.1).

2.2.2 NSC Monitor used as Table Top

Clearance must be provided for maintenance and ventilation.
See Dimensional Drawings:
900–015.HP005 for Monitor NSC 25 TFT
900–017.HP007 for Monitor NSC 34 TFT HT
900–021.HP005 for Monitor NSC 34 TFT
in the annex.

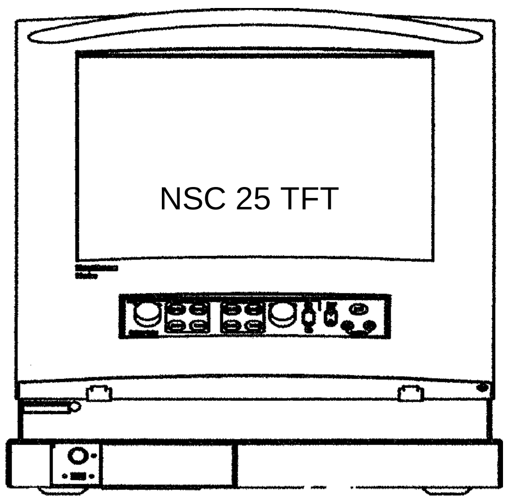


Figure: 2–1 NSC 25 Monitor TFT

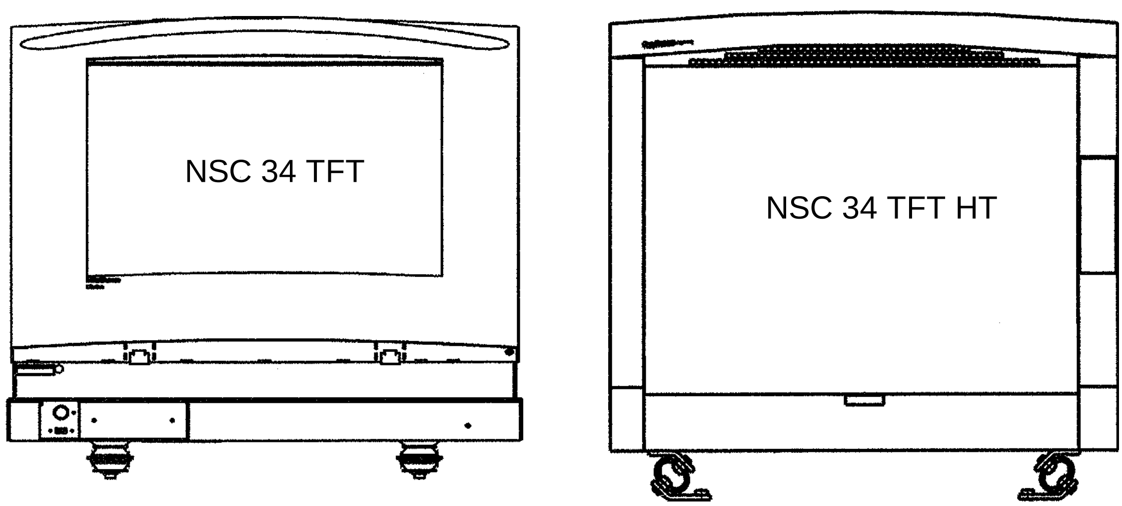


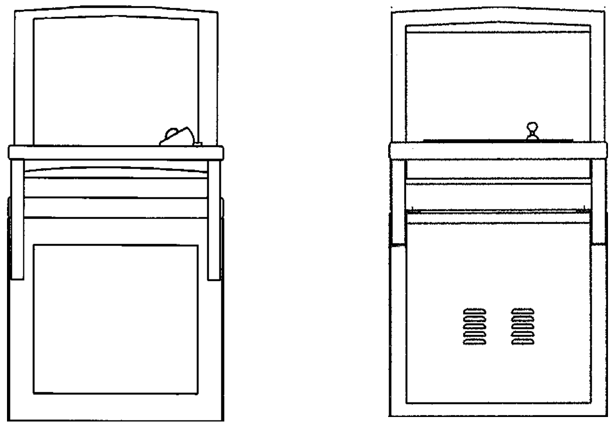
Figure: 2–2 NSC 34 Monitor (TFT and TFT HT)

2.2.3 NSC Monitor used as Deckstand

> **NOTE**
>
> NSC 25 Monitor is actually not available as a deckstand version.

The NSC Monitor Deckstand is normally secured to the deck using a customer-furnished, custom-made foundation. Customer defines the hardware to be used to secure the deckstand to the deck foundation.
Sufficient clearance must be provided for maintenance and ventilation.
See Dimensional Drawings

900-012.HP005
900-012.HP007 in the annex



NSC 34 Monitor (Deckstand) — NSC 34 Monitor (Deckstand with hood)

Figure: 2-3 NSC 34 Monitor (Deckstand)

2.2.4 NSC Interswitch Unit

Depending on the type of NSC radar system, the interswitch unit can be mounted into a deck stand or near the Processor Unit.
See Dimensional Drawings:
900–020.HP005
900–020.HP013

The NSC Interswitch Unit must not be exposed to weather conditions.
Do not install the NSC Interswitch Unit near entrances or exits that expose the unit to excessive moisture.

2.2.5 NSC Ethernet Modul

Depending on the type of NSC radar system, the Ethernet module can be mounted into a deck stand or near the Processor Unit.
See Dimensional Drawings:
928–009.HP005

The NSC Ethernet Modul must not be exposed to weather conditions.
Do not install the NSC Ethernet Unit near entrances or exits that expose the unit to excessive moisture.

2.3 NSC MTR UP/PEDESTAL AND MTR DOWN INSTALLATION

2.3.1 Mounting Structure Installation

Mounting structures must be designed to provide proper support for the Pedestal with Antenna Array and provide safe access for service personnel. More than the static weight of the Pedestal must be taken into consideration when designing the support structure to account for harmonic vibration and high acceleration forces generated under dynamic shipboard conditions.
Extreme environmental conditions must also be considered.

Consider Compass safe distances when planning the mounting structure to ensure that the equipment being installed is provided with the minimum safe distance.

2.3.2 Mounting and Service Platform

A typical installation of the Pedestal is illustrated in Figure: 2–4 . In this type of installation, the higher the antenna generally provides a less restricted antenna radiation pattern and as in any installation, antenna height is one factor that determines the maximum range of the radar.

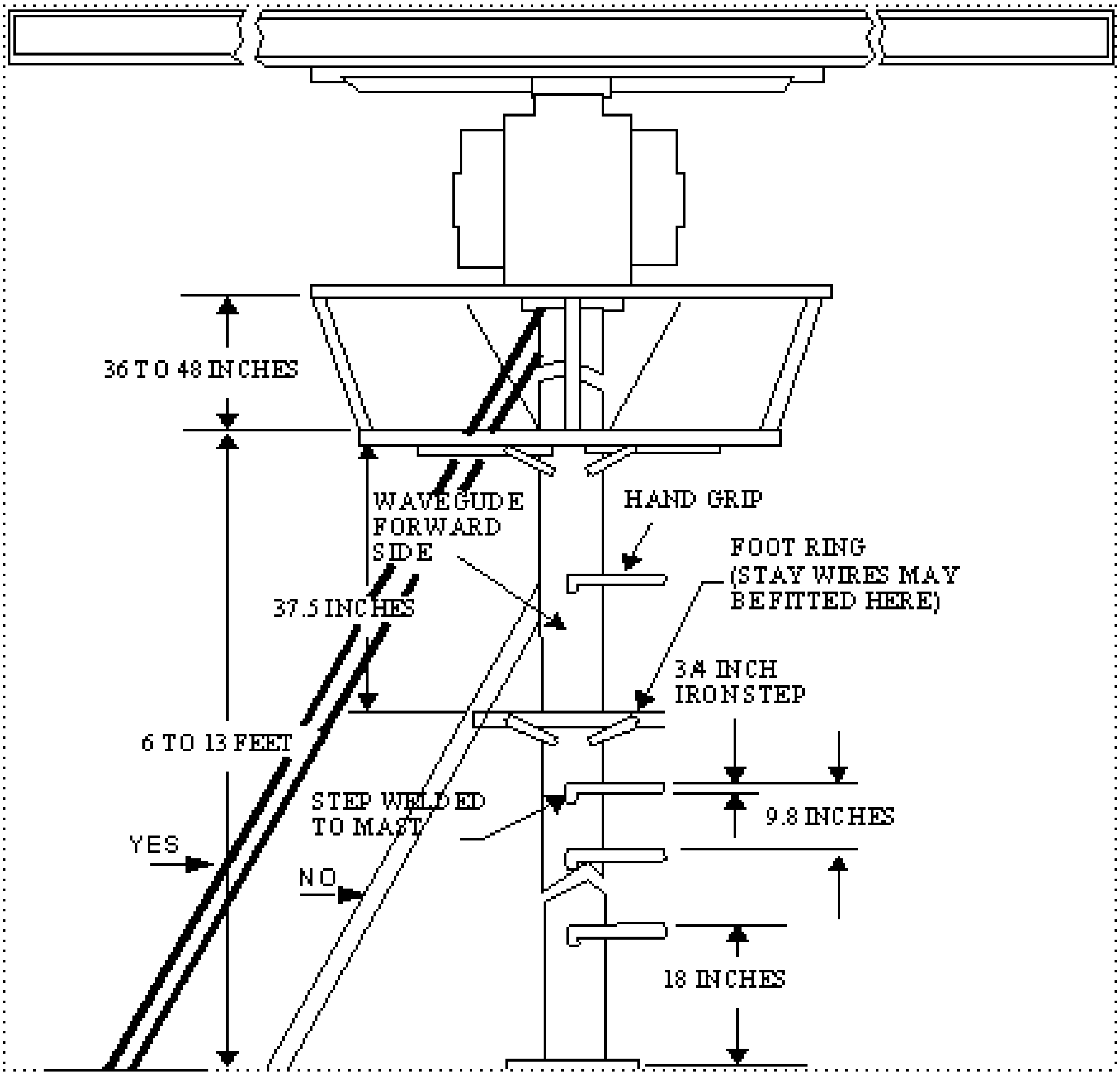


Figure: 2-4 Typical Mounting Platform

NOTE
The radar system meets the vibration requirements according to EN60945 (IEC 60945). On installing the NSC Pedestal/Transceiver this has to be taken into account by all means.

2.3.3 Mechanical Installation

The NSC MTR Up/Pedestal unit should be isolated from steel mounting plates and aluminum pedestal.
Secure the NSC pedestal to the mounting plate with customer supplied hardware (Installation Kit). Refer to Figure: 2-5 for hardware requirements.
Refer to Table 2-2 through Table 2-4 for compass safe distances (chapter 2.1.4.2).
The MTR Up/Pedestal should be bolted to a flat, 1/2 inch (12.7mm) horizontal (±3°), steel mounting plate. The plate should be welded to a pipe or bracket assembly of sufficient strength to support 350 pounds (159kg) static weight (vibration).

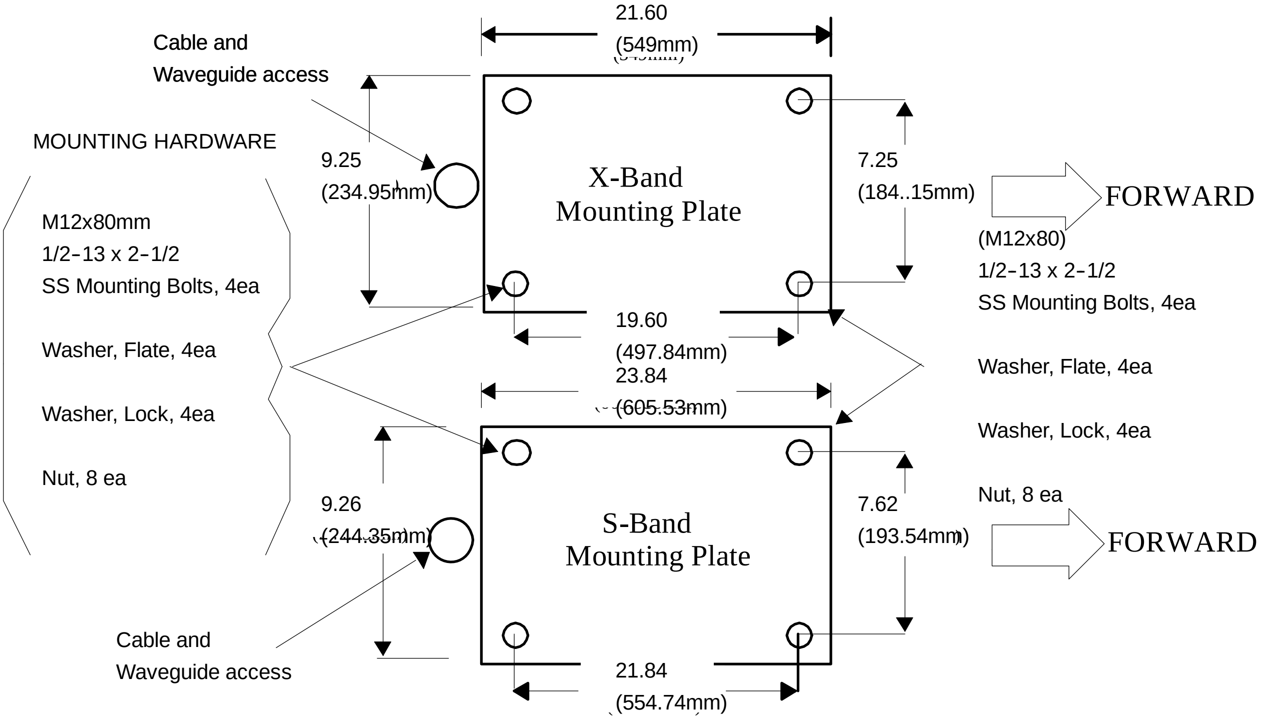


Figure: 2-5 NSC MTR Up/Pedestal Mounting Plates

The NSC MTR Up/Pedestal must be bonded to the ships hull using a 500 millimeter long, 1-1/4 inch (32mm) wide copper strap. The bonding strap, bolts and bonding surfaces should be treated with an anticorrosive grease such as NO-AL-OX® to prevent galvanic corrosion.

2.3.3.1 NSC MTR Up/Pedestal Hoisting and Mounting

When installing the NSC MTR Up/Pedestal, it is recommended that the antenna array and the NSC MTR Up/Pedestal be assembled on the ground first, then hoisted into position.

CAUTION	WHEN LIFTING, EXERCISE EXTREME CARE TO PREVENT DAMAGE TO THE ANTENNA ARRAY, PARTICULARLY THE ARRAY FACE PROTECTIVE COVER.

When hoisting the assembled array and NSC MTR Up/Pedestal, care should be used to prevent the lifting straps from rubbing against the array face. The following procedure is recommended for hoisting the assembled NSC MTR Up/Pedestal and antenna array:

(1) Rotate the antenna so that the face of the array faces to the rear of the NSC MTR Up/Pedestal. Maintain the antenna in this position while hoisting.

(2) Carefully hoist by the hoisting brackets, see Figure: 2-6 unit is in position above the pre-installed mounting plate. Align mounting holes in NSC MTR Up/Pedestal with those on the mounting plate and carefully lower unit.

(3) Carefully lower NSC MTR Up/Pedestal to allow placement of four bolts through the feet and the mounting plate. Keep tension on the hoist, allowing for customer supplied isolation shim placement.

(4) Before lifting straps are removed, if required level the MK2 MTR Up/Pedestal by raising the MTR Up/Pedestal and inserting additional customer supplied 1/32-inch fiberglass shim(s) or 1/16 inch fiberglass shim(s) between the MTR Up/Pedestal and mounting plate to assure a sound mechanical contact of the MTR Up/Pedestal and mounting plate. See Figure: 2-7 .

(5) Before lifting straps are removed, secure the MK2 MTR Up/Pedestal to the mounting plate using four 1/2-13 x 2-1/2 inch (M12x80) bolts, eight flat washers, four lock washers and nuts.
Hardware should be of 18-8 stainless steel, coated liberally with grease. Customer will supply hardware.

(6) Remove hoisting line.

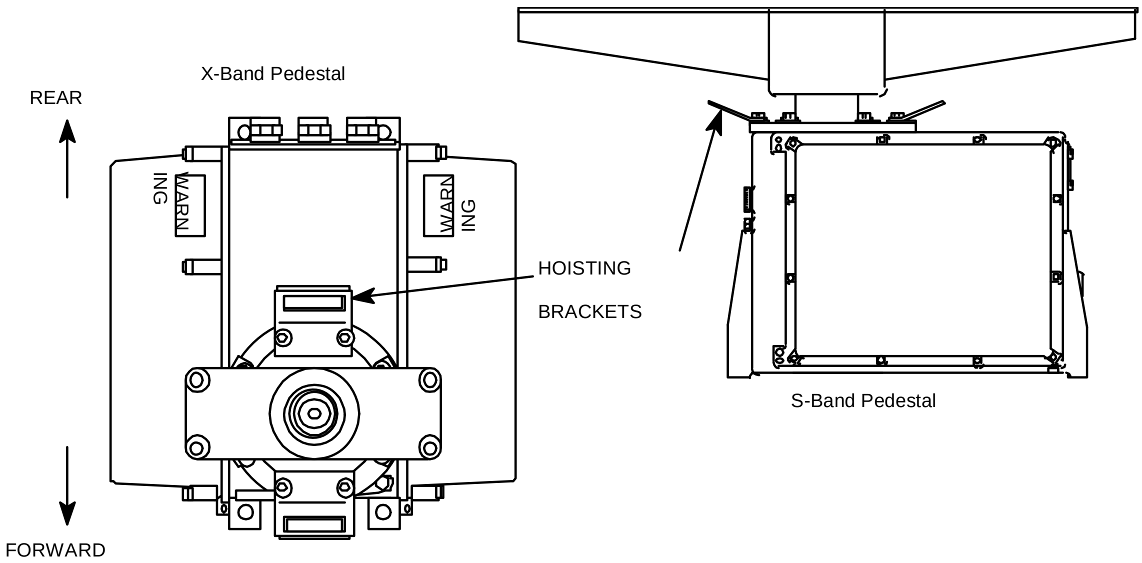


Figure: 2-6 NSC MTR Up/Pedestal Hoisting Brackets

2.3.3.2 NSC MTR Up/Pedestal Bonding

(1) After the NSC MTR Up/Pedestal has been properly positioned on the mounting plate and securely bolted in place, the unit must be bonded to the ship's hull.

(2) Connect the bonding strap, Figure: 2-7 from the NSC MTR Up/Pedestal to the mast and then to the ships hull, using customer supplied hardware. Coat bonding hardware liberally using NO-AL-OX®.

NOTE
Remove Hosting Brackets and to prevent dissimilar metals from corroding. These temporary brackets will rust.

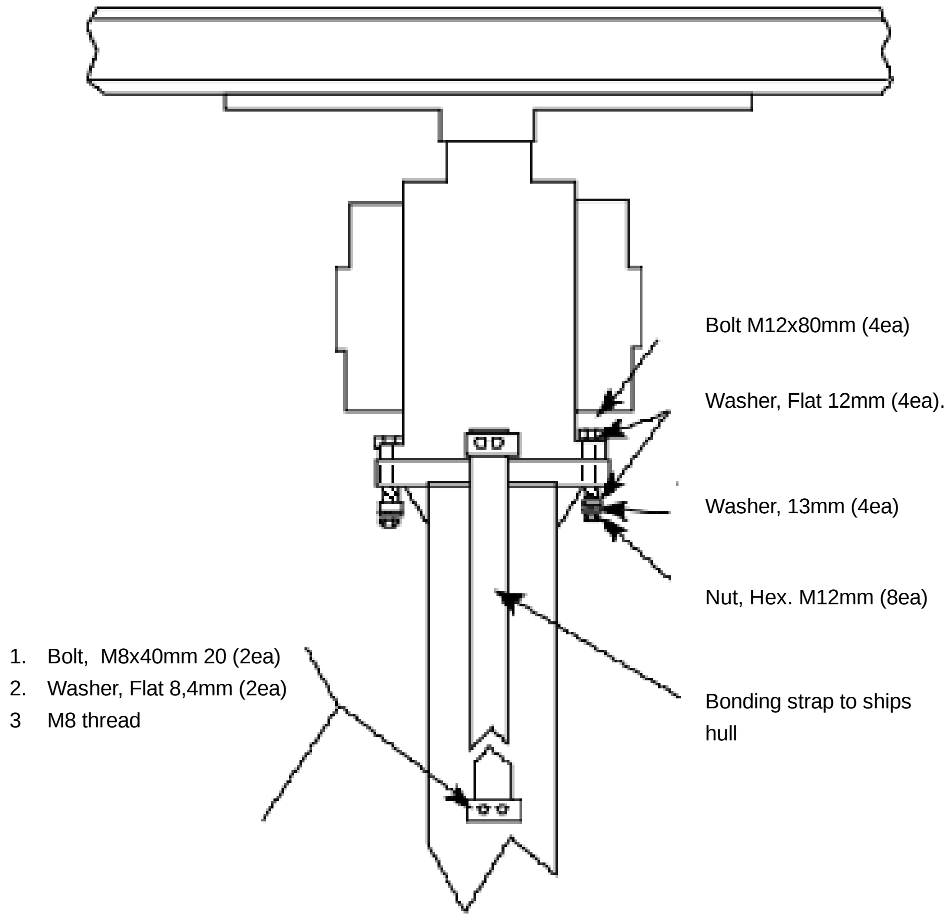


Figure: 2-7 NSC MTR Up/Pedestal Mounting and Bonding

2.3.3.3 MTR Up/Pedestal Oil Check

NSC MTR Up/Pedestals are shipped with the proper level of oil added. The MTR Up/Pedestal has an oil level sight gage to verify the oil level.

(1) Remove power from MTR Up/Pedestal, and place the Antenna Safety Switch to OFF.

(2) Check the gear box assembly lubricant level by observing the oil level sight gage, .Figure: 2–8 The oil level should be seen 1/2 way up the oil sight gage. Gear box assembly lubricant capacity is 1.8 quarts, (1.7L) for X–Band and 2.11 quarts, (2.0L) for S–Band. Use Mobil synthetic oil (SHC 634) Raytheon. Remote Antenna Safety Switch

CAUTION
DO NOT OVER FILL OIL RESERVOIR

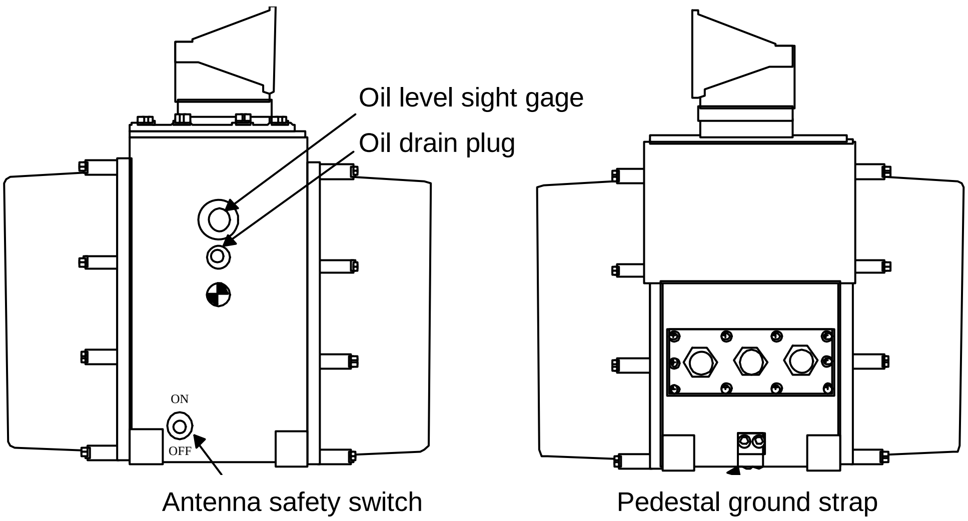


Figure: 2–8 MTR Up/Pedestal

2.3.4 Antenna Array Mounting

The 7ft., 9ft., 12ft. X–Band or 8ft. LPR–A25 X–Band and 12ft. S–Band or 12ft. S–Band LPR–A1 Arrays and the NSC MTR Up/Pedestal are shipped in separate crates and must be assembled at the installation site. Use the following procedure for assembly of the Antenna Array to the MTR Up/Pedestal:

CAUTION

DO NOT SCRATCH, PAINT OR OTHERWISE DAMAGE THE PROTECTIVE COVER OF THE ANTENNA ARRAY.

2.3.4.1 X–Band Array Mounting

(1) Unpack array using care not to damage array mounting studs.

(2) Remove tape from waveguide flange of antenna array.

(3) Remove antenna probe feed protection cover. Use caution when lifting the array into position to avoid damaging the probe.

(4) Grease O–Ring located around rotary joint housing with Silicone Grease.

(5) Lift the antenna array into position above the mounting bar and carefully align the mounting holes; then lower the array onto the mounting bar. Coat array mounting studs with silicone grease, Figure: 2–9 .

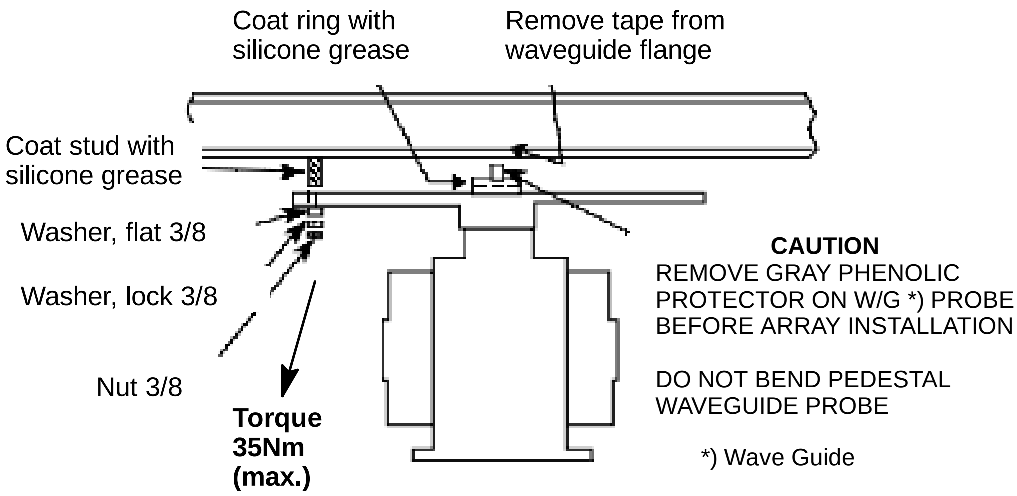


Figure: 2–9 X–Band Array Mounting

(6) Secure the X–Band antenna array to the MTR Up/Pedestal with four stainless steel flat washers, with four 3/8“ lock washers and with four nuts provided. Tighten hardware using 14 MM or 9/16 socket.

2.3.4.2 8ft X‑Band LPR‑A25 Array Mounting

(1) Unpack array using care not to damage array mounting studs (Stock‑No. 2.808435).

Use the separate Mounting Kit which is lying in the box.

(2) Remove tape from waveguide flange of antenna array.

(3) Remove antenna probe feed protection cover. Use caution when lifting the array into position to avoid damaging the probe.

(4) Grease O‑Ring located around rotary joint housing with Silicone Grease.

(5) Lift the antenna array into position above the mounting bar and carefully align the mounting holes; then lower the array onto the mounting bar. Coat array mounting studs with silicone grease, Figure: 2‑10 .

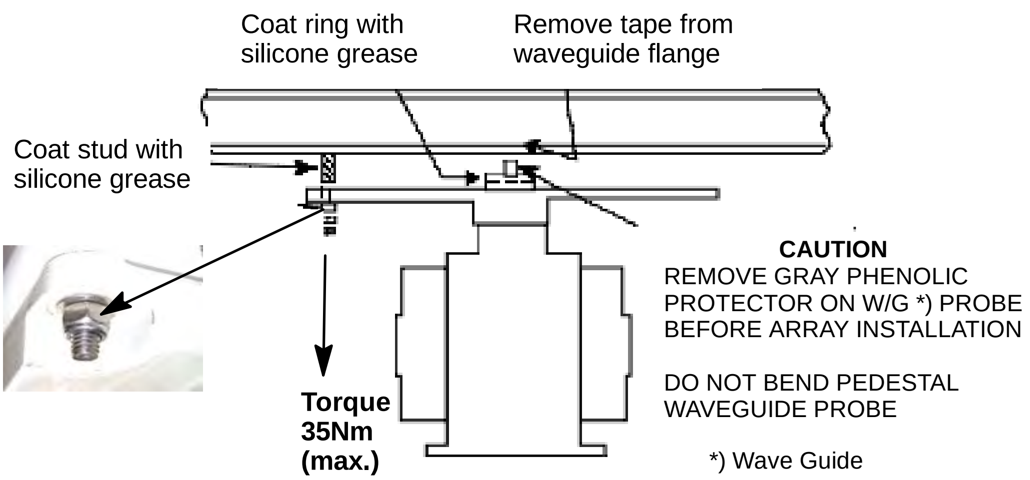


Figure: 2‑10 X‑Band Array Mounting

(6) Secure the X‑Band antenna array to the MTR Up/Pedestal with four self‑locking nuts (M8).

2.3.4.3 12ft S–Band Array Mounting

Prior mounting the array to the MTR Up/Pedestal, install the 1/2” array coax with the 7–16 DIN, 90° elbow connectors, as shown in Figure: 2–11 . Coat inside of coax connectors with DC–4 compound.

CAUTION	NEVER USE GREASE OR RTV INSIDE RF CONNECTORS. DC–4 COMPOUND IS AN INSULATOR DESIGNED WITH A VERY LOW SURFACE TENSION FOR USE AS AN INSULATOR IN CONNECTORS.

(1) Unpack the array, using care not to damage the array end feed 7–16 DIN RF Connector.

(2) Unpack the 1/2–coax cable from shipping box.

(3) Locate and remove saddle clamp located at the end of the T–bar using a number 3 metric allen wrench.

(4) Locate and remove the two (2) 90° DIN connectors from the installation materials.

(5) Carefully remove the O–rings from the two 90° DIN connectors and the DIN connectors of the 1/2–in coax cable. Apply a thin coat of silicone grease to the rubber O–rings and re–install O–rings into the DIN connectors.

(6) Loosely attach a 90° DIN connector to the MTR Up/Pedestal.

(7) Attach the coax cable to the 90° DIN connector attached to the MTR Up/Pedestal. Use a 1-1/4 inch open end wrench and tighten coax cable to the DIN connector.

(8) Attach the coax cable to the T-bar using the saddle clamp removed in step 3.

(9) Lift the antenna array into position above the mounting bar, and carefully align the mounting holes; then, lower the array onto the T-bar.

(10) Secure the antenna array to the MTR Up/Pedestal using sixteen (16) stainless steel bolts, 5/16 inch flat washers and 5/16 inch lock washers provided.

(11) Coat bolts with a thin film of silicone grease.

(12) Attach the coax cable to the bottom of the array using saddle clamps. Saddle clamps attach to the threaded studs mounted to the under side of the array.

(13) Attach a 90° DIN connector to the array end-feed and the coax cable to the 90° DIN connector. Use a 1-1/4 inch open end wrench and tighten coax cable to the DIN connector.

(14) Use a 3/8 to 1-1/4 Basin Wrench to tighten the DIN connector to the array end-feed.

(15) Use a 3/8 to 1-1/4 Basin Wrench to tighten the DIN connector at the MTR Up/Pedestal rotary joint.

(16) Weather seal wrap the Coax DIN connector at the array

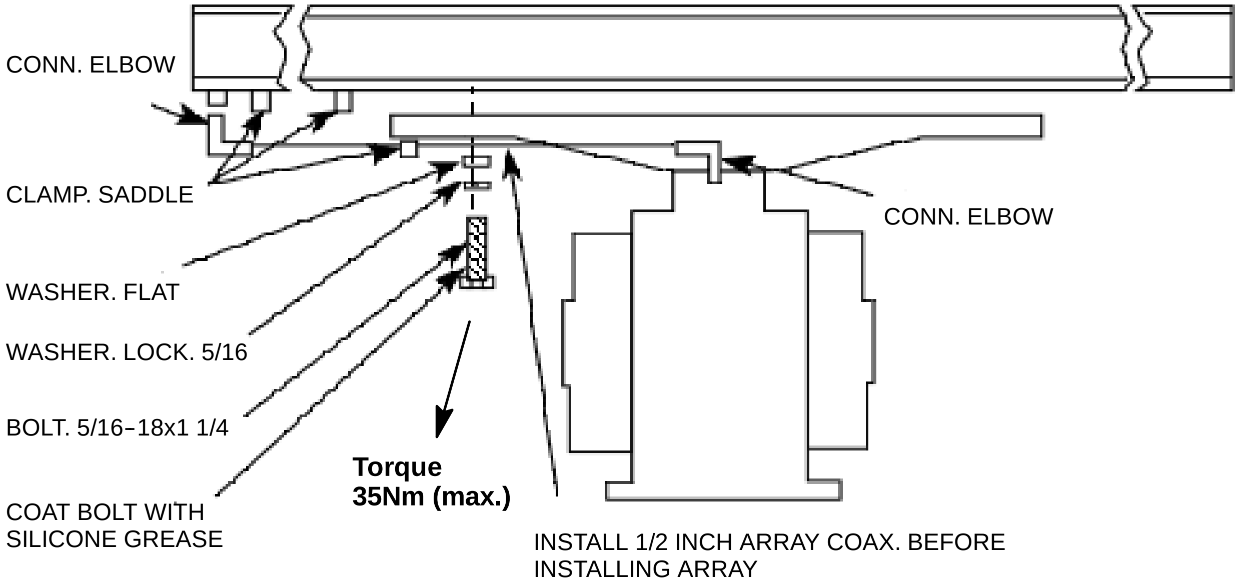


Figure: 2–11 S–Band Array Mounting

2.3.4.4 12ft S-Band LPR-A1 Array Mounting

CAUTION	NEVER USE GREASE OR RTV INSIDE RF CONNECTORS. DC-4 COMPOUND IS AN INSULATOR DESIGNED WITH A VERY LOW SURFACE TENSION FOR USE AS AN INSULATOR IN CONNECTORS.

- Preliminaries

(1) You have to uninstall the 90° elbow connector from the T-bar female.

The elbow connector is pre installed.

Use 27mm open end wrench.

(2) Unpack the 1/2-coax cable from shipping box.

Remove the male cover ((blue plastic cap) Fig. **A**) from the 90° DIN connector (Figure: 2-12).
Remove the saddle clamp located at the end of the T-bar using a number 3 metric allen wrench (Fig. **B**).

A

B

Figure: 2-12 1/2-Coax Cable -Preliminaries-

(3) Attach the coax cable (90° DIN connector) to the female T–bar (Fig. **A**). Fix the connector by hand.
Attach the coax cable to the T–bar (Fig. **C**) using the saddle clamp removed in step (2) **B** (Figure: 2–12).
Use a 32mm open end wrench and tie up (***very carefully***) the male connector to the female T–bar as tightly as possible (Fig. **B**).

A **B** **C** **D**

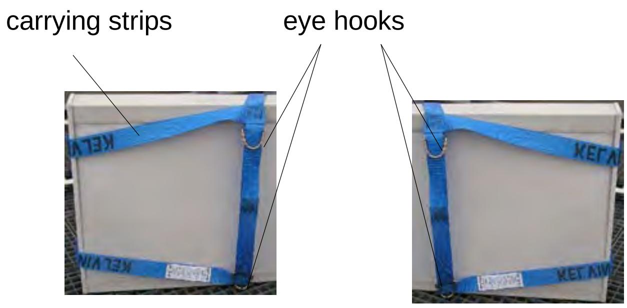
Figure: 2–13 1/2–Coax Cable Mounting

- Array mounting

(1) Unpack the array, using care not to damage the array.
(Stock–No. 2.808434).
Use the separate Mounting Kit which is lying in the box.

(2) Put the carrying strips (tautened) over the left and right array side.
Attach the transport hooks from crane to the eye hooks.

Coat bolts with a thin film of silicon.



this figure shows the antenna cross up–end.
For the transport the antenna has to lay down plane.

Figure: 2–14 Array Transport

(3) Lift the antenna array into position above the mounting bar, and carefully align the mounting holes; then lower the array onto the T-bar.
Secure the antenna array to the MTR Up/Pedestal using the twelve stainless steel bolts, 12 conical spring washer and 24 nuts.

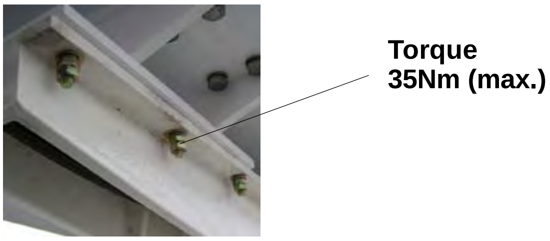
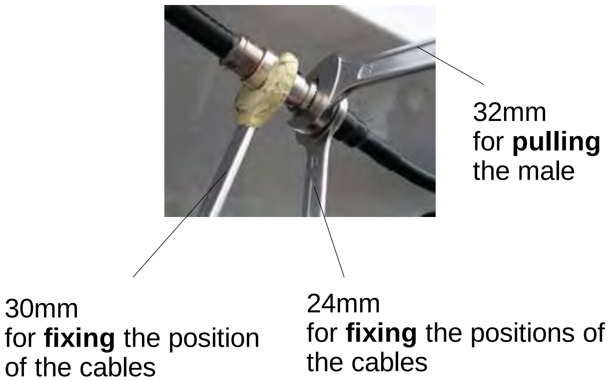


Figure: 2-15 Array Mounting

(4) Remove the female cover (white plastic cap) from the coax cable. connect the coax cable with the array coax part **very carefully** (Fig. **A** and **B**) **without twisting the coax cable**.

Figure: 2-16 Coax Cable Compounding

(5) Attach the coax coupling. For this job you need a second person for help. Use 24mm, 30mm and 32mm open end wrench.



CAUTION

Do not twist the coax cables !

Figure: 2–17 Coax Coupling Attaching

(6) Wrap weather sealing tape (approximately 0,5m) around the coax coupling (Fig. **A** and **B**)

A **B**

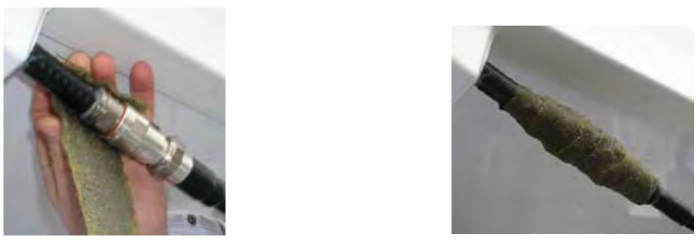


Figure: 2–18 Coax Coupling Isolating

2.3.5 MTR Down Physikal Installation

Install the MTR Down unit using 4 each 3/8–16 (M10) mounting hardware is recommended. Refer to chapter 2.4.2 Transmission Line Installation and Dimensional Drawing G624721.

2.3.5.1 MTR Bonding

Follow the procedures in chapter 2.1.1.

2.4 ELECTRICAL INSTALLATION / CONNECTION NSC MTR AND PEDESTAL

This chapter contains information about:

- Connection of all electrical plugs and wires
- Connection of bonding
- Installation of Transmission Lines

2.4.1 General Information concerning on-board wiring

See Project Diagramm.

2.4.2 Transmission Line Installation

Figure: 2-19 illustrates a typical X-band, Figure: 2-20 illustrates a typical S-Band transmission line installations.

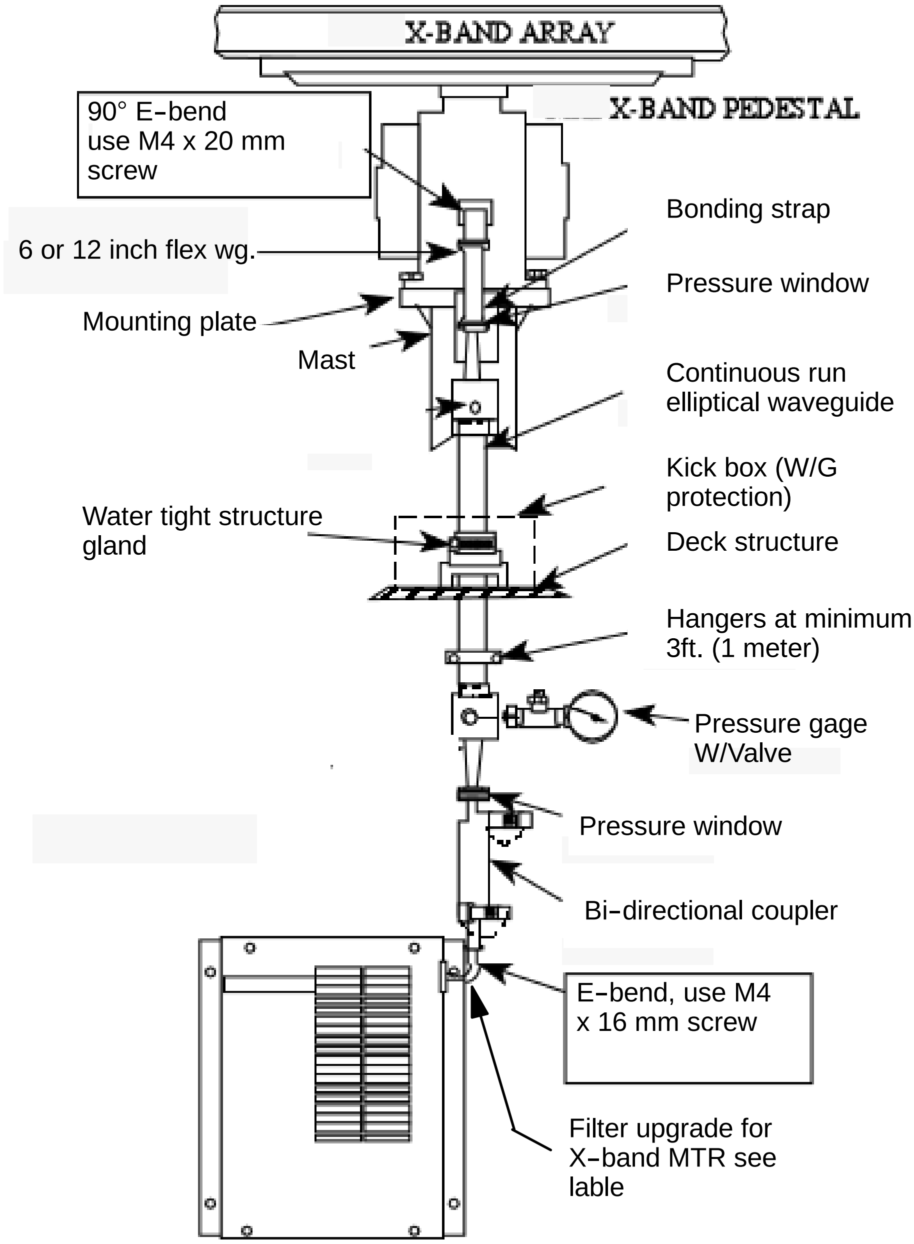


Figure: 2-19 X-Band Transmission Line Installation

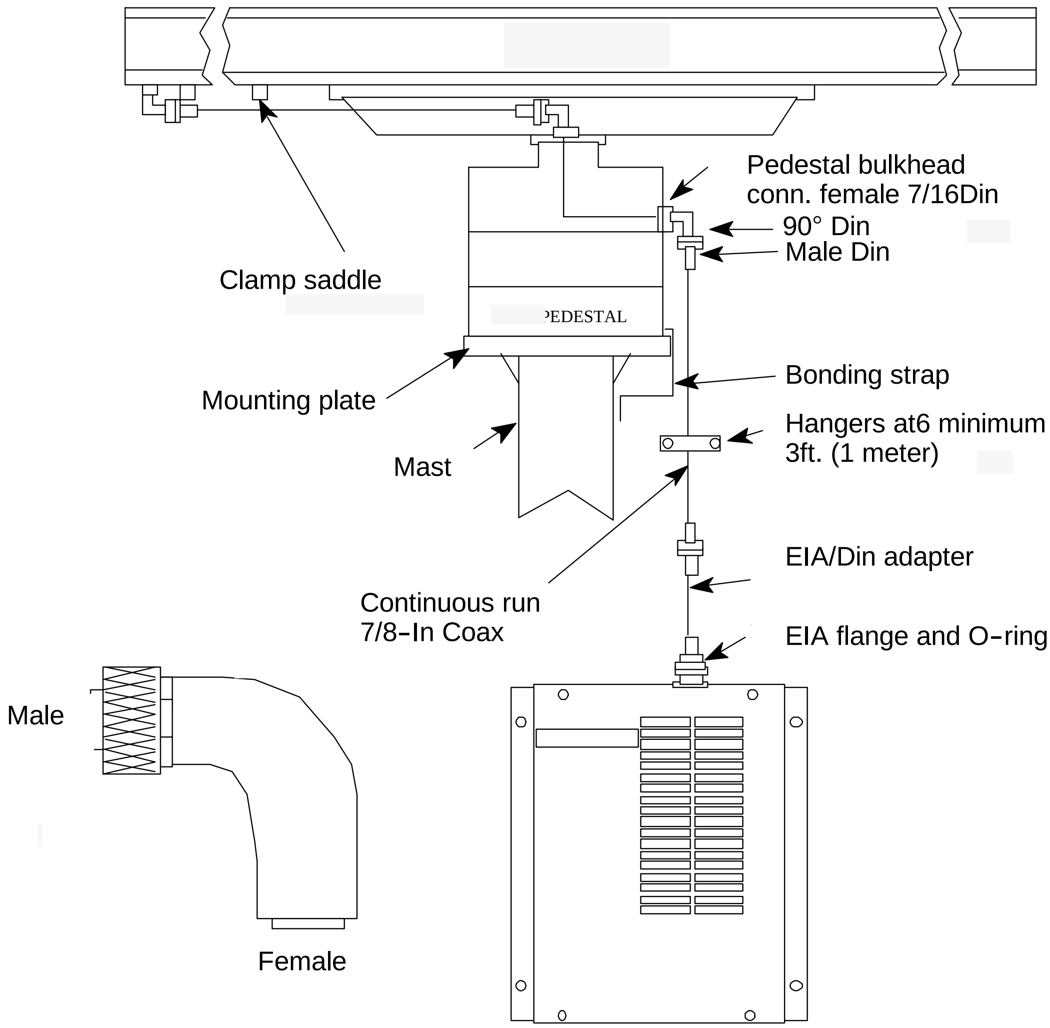


Figure: 2-20 NSC Down Physical Installation

Microwave energy is carried between the MTR and the Antenna by means of waveguide or transmission lines. At the microwave frequencies used in radar systems, the type of lines most often employed are enclosed waveguide (X-Band) or coaxial lines (S-Band). The characteristics which determine their efficiency of these transmission lines are a result of the waveguide dimensions and geometrical configuration as well as the dielectric material used as coaxial filler material.

Before proceeding with the waveguide installation, ensure that all waveguide components and accessories are on hand. Ensure that proper climbing gear is worn while working on the tower, and that all safety precautions are followed.

The primary objective in the planning and installation of a transmission line is to provide the lowest signal loss between the MTR and the antenna. Considerations critical to this primary objective are:

(1) Minimum length.

(2) Minimum number of bends and flanges.

(3) Careful attention to proper fabrication techniques for flanges and connectors.

(4) Careful attention to physical support and location.

(5) Extreme caution in handling the lines to prevent kinks, dents, water or dirt infiltration and any other physical damage or contamination.

A waveguide run is required from the X-band pedestal waveguide rotating joint to the waveguide output flange of the MTR. Rigid waveguide (in standard 12-foot lengths) and choke and cover flanges are available from Raytheon.

NOTE

Table 2-5 illustrates the signal loss in dB per 50or 100 feet length of various types of transmission lines.

An “O“-ring gasket must always be used when assembling waveguide runs in a choke-to-cover coupling. The choke flange must be positioned to face away from the Antenna and toward the MTR along the line of the run.

Coupling flanges must be silver-soldered to the waveguide ends. The following guidelines should be observed.

(1) The waveguide ends and flange walls must be chemically cleaned to ensure an efficient bond.

(2) The finished joint must be smooth and clean.

(3) The internal walls must be smoothed and polished to ensure a continuous contact.

(4) Rectangular plastic brackets must be used to secure the waveguide run to the tower and to the ceilings and walls of the equipment room.

2.4.2.1 Recommended Types of X–Band Transmission Lines

The following types of X–Band transmission lines (waveguides), Table 2–5, are recommended.

Type	Attenutation dB/100ft. @ 9.375 GHz	Length ft (m)
Rigid, Large X, WR112 (UG–51U), Copper	2.4 dB	100 (30.5)
Elliptical (Raytheon P/N 166606–1) EW85, Copper	2.7 dB	100 (30.5)
Rigid, Small X (Raytheon P/N 341–1006P1) WR90 (RG–52U), Copper	3.8 dB	50 (15.25)

Table 2–5 Recommanded X–Band Transmission Lines:

2.4.2.2 Elliptical Waveguide Installation

(1) Elliptical waveguide is available in various lengths; use a continuous length where possible.

(2) Use manufacturer–approved methods for hoisting continuous lengths of waveguide into position. Exercise extreme caution to avoid physically damaging the waveguide.

(3) If it is necessary to chapter the run, use elliptical waveguide splices to connect chapters together.

(4) Bend waveguide with a bending tool, using extreme caution to ensure proper bend radius without damaging waveguide.

a. The minimum bend radius in the E–Plane is 8 inches (203.2mm).
b. The minimum bend radius in the H–Plane is 19 inches (482.6mm)

(5) Use Waveguide Hangers, at minimum 3 foot (914.4mm) intervals to ensure proper support.

(6) Use structure glands to ensure weather tight fit at walls or ceilings, etc.

(7) Flex chapters are required to minimize the effects of shock and vibration. Do not exceed recommended lengths of flex waveguide.

(8) Internal walls must be clean to ensure continuous conductivity. No oxidation should be present.

(9) All joints must be choke–to–cover. Choke flanges must face the MTR along the line of the run. For EW–85 elliptical run, a choke to choke Waveguide chapter is required at the Pedestal end to mate with the EW–85 adapter.

(10) All joints must have O–rings to ensure a proper seal. Coat O–rings with a small amount of silicone grease (DC–4 or equivalent).

(11) Use 8–32 X5/8 inch stainless steel attaching hardware for flange joints. Coat hardware with anti–seize compound.

(12) Andrews elliptical connectors must be carefully assembled per manufacturers' instructions.

(13) The waveguide run should be provided with a protective encasement, where possibility of physical damage exists.

2.4.2.3 Fabrication of Rigid Waveguide

Faulty fabrication of waveguide chapters (improperly fitted flanges, flux and dirt contamination, oxidation, etc.) is a primary cause of high signal losses which result in poor radar operation. Advance planning of the transmission line will allow the proper chapters to be obtained pre–assembled from the supplier of these components.

If on–site fabrication is required, only qualified personnel should attempt the operation. Due to its nature, no detailed instruction in waveguide fabrication will be provided here. However, the following notes should be considered.

(1) Determine length of the chapter required, then cut to length less the combined length of both flanges to be fitted.

(2) Cut must be precisely 90° (perpendicular) to the waveguide chapter.

(3) De–burr cut ends and clean with a chemical solvent. The waveguide ends and flange walls must be chemically cleaned to ensure an efficient bond.

(4) Flanges must be silver–soldered or brazed to the waveguide chapter. Under no circumstances is soft–solder acceptable due to its lack of mechanical rigidity and susceptibility to shrinking and cracking.

(5) Finished chapters should be purged with pressurized dry air and pressure checked.

(6) Internal space variation between walls, after bending or twisting, shall not exceed 0.5mm.

(7) Coupling flange faces must not be damaged in any way.

(8) The finished joint must be smooth and clean.

(9) The interior surfaces of the waveguide and flanges must be free of flux, dirt, oxidation, salt and corrosion.

Use of Andrews elliptical waveguide eliminates the need to fabricate rigid waveguide flanges since, due to its flexibility, it can be supplied and installed in a single continuous length. Flanges, which add a 0.1db loss per unit, are thus eliminated, and due to this principle advantage, the Andrews elliptical waveguide is best suited to many applications.

2.4.2.4 Rigid Waveguide Installation

(1) Plan run for a minimum of joints. Each joint can add as much as 0.1 dB attenuation.

(2) Flex chapters are required to minimize the effects of shock and vibration. Do not exceed recommended lengths of flex waveguide.

(3) Use rigid bends and twists in lieu of flexible waveguide for the same purpose. A variety of styles are available to meet most needs.

(4) Internal walls must be smooth and polished to ensure continuous conductance. No oxidation should be present. Use extra–fine emery or crocus cloth for this purpose. Do not file or mar surface in any way.

(5) All joints must be choke–to–cover. Choke flanges must face the MTR along the line of the run.

(6) All joints must have O–rings to ensure a proper seal. Coat O–rings with silicone grease (DC–4 or equivalent).

(7) Use 8–32 stainless steel attaching hardware for flange joints. Coat hardware with anti–seize compoun

(8) Use Waveguide Hangers, at minimum 3 foot (914.4mm) intervals to ensure proper support.

(9) The waveguide run should be provided with a protective encasement where possibility of mechanical damage exists.

2.4.2.5 Running the Waveguide

To run the waveguide into position, place the bulk coil at or near the MTR location. Unroll the coil as needed while feeding the waveguide along the predetermined route. On–site evaluation is necessary to determine the best routing.

2.4.2.6 Cutting the Waveguide

CAUTION	A PRESSURE–TIGHT SEAL DEPENDS ON THE CAREFUL PREPARATION OF THE WAVEGUIDE END. FOLLOW THESE DIRECTIONS CLOSELY TO OBTAIN OPTIMUM RESULTS.

(1) Firmly pack clean cloth into the waveguide beyond the point where cut is to be made. This prevents chips and metal dust from entering the waveguide.

(2) Clamp the cutting vise to a straight chapter of waveguide which is to be prepared for the connector. Align the hardened steel face of the vise with the mark at the point where the cut is to be made. Assure that waveguide is seated squarely in channel which forms the base of the vise.

(3) Place hacksaw blade against hardened steel face plate of vise and use this as a guide to cut through waveguide.

(4) Place file against face plate and smooth off saw marks. Finish smoothing the facing with the emery block provided. Remove the waveguide from the cutting vise.

(5) Remove all burrs with a sharp razor knife. Take care not to create a large bevel on inside edge of the waveguide face. However, a 1/16 inch (1.587mm) chamfer on the outside edge of the face will make the connection procedure easier.

(6) Remove all scratches and nicks on the outside surface of the waveguide in the area within one inch of new face (end). Use a fine file and emery paper; do not remove any more metal than necessary.

(7) Remove cloth slowly; be careful to remove all chips that are inside the waveguide.

(8) Cover and seal prepared end until a connector is ready to be installed.

2.4.2.7 Waveguide Support

Support the waveguide with standoffs or bulkhead mounting (customer supplied) at a maximum of 3 feet apart. Also, support the waveguide on both sides of a bend. Fasten the waveguide to each standoff.

2.4.2.8 Waveguide Cleaning

After the waveguide has been mounted and the transitions installed, the interior of the waveguide should be checked, and cleaned if any contamination is present. A vacuum with a soft head will assist in this procedure.

CAUTION

NEVER USE A METALLIC FISH TAPE OR WIRE TO PULL A CLEANING WAD THROUGH THE WAVEGUIDE.

2.4.2.9 Waveguide Bonding

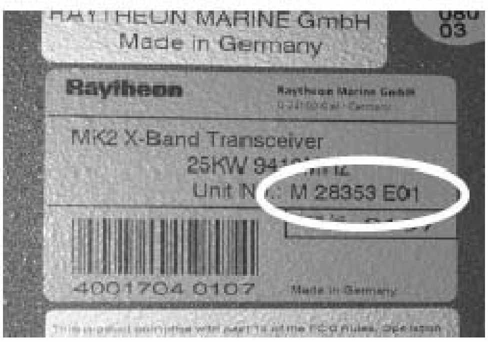
For general information about bonding, chapter 2.1.1.
The waveguide should be bonded to the earth, using the copper bonding strap and associated hardware supplied.
Clean the surfaces where the strap mates with the waveguide and grounding rod. Coat these mating surfaces with an oxide inhibiting compound. Tighten the waveguide bonding clamp evenly. Connect the other end of the strap directly to the grounding rod.

2.4.2.10 Waveguide Penetration Gland Installation

The structure penetration gland affords a weatherproof passage for the waveguide where it penetrates a weatherproof wall or ceiling.
A 2–1/2–inch, (63.5mm) knockout hole 2–7/16–inch, (51.9mm) actual clearance] is required for mounting the gland body. Paint the bare metal before mounting the gland, using a zinc chromate primer. Apply a sealant such as butyl caulk or RTV silicone around the body where it contacts the wall or ceiling.
Install the locking nut and tighten securely. Install the bushing supplied. Remove cap and apply anti–seize compound to cap and body threads. Replace cap but do not tighten until waveguide is in place.
After installation, paint all exposed metal surfaces with primer and a finish coat. Run waveguide through the gland body with the bushing, rubber grip and cap in place. After waveguide is mounted and strapped in place, tighten the cap to seal waveguide. Apply sealer around the waveguide and cover cap.

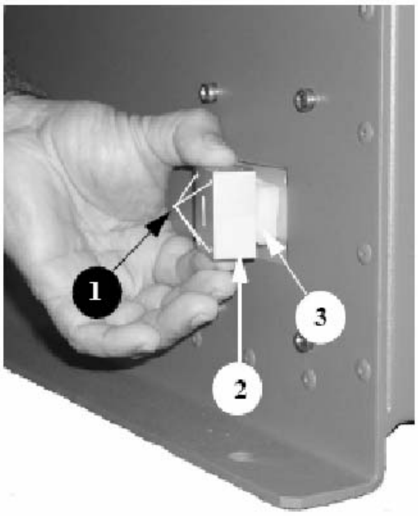
2.4.2.11 X–Band MTR Waveguide Installation

The X–Band MTR has the waveguide output port at the side of the unit, as shown in Figure: 2–21 . This connection is a small X cover flange for hookup to the waveguide.
Ensure that the correct hardware is used. To facilitate transmitter power and VSWR checkout of the antenna system, a Bi–Directional Coupler (optional) may be used as a means of connecting the MTR Down Transceiver to the Antenna system.



X–band MTR identification

Type lable:
Unit No.: **M 28353 E01**

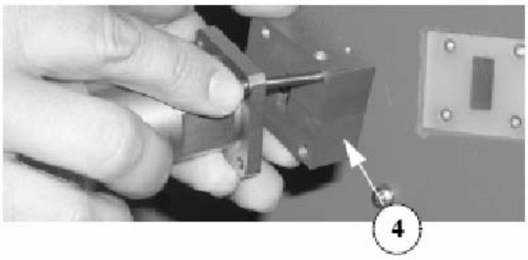


Handling the filter element.

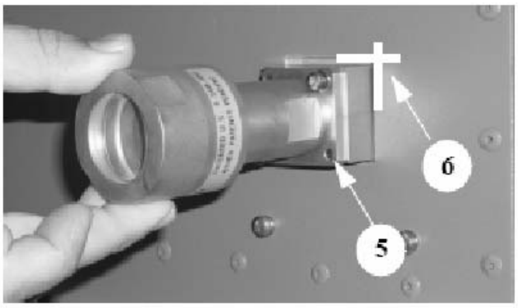
1) screw off all screws

2) lift off the filter unit (upgrade)

3) remove the styrofoam (shipping protection)



4) put the (in this case) waveguide connector and the filter unit together.



5) install the 4 screws

6) before fastening the group you have to center it

Figure: 2–21   X–band MTR with filter upgrade

2.4.2.12 NSC S-Band Transmission Line Installation

The S-Band Pedastal female 7-16 DIN bulkhead connector mates to a 7-16 DIN 90° elbow as shown in Figure: 2-22 . The MTR Down has a 7/8-inch EIA connector output port at the top of the unit. The 7/8-inch coax kits are configured with a 7-16 DIN connector at each end. An EIA Adapter must be used to make the transition from coax to EIA at the MTR.

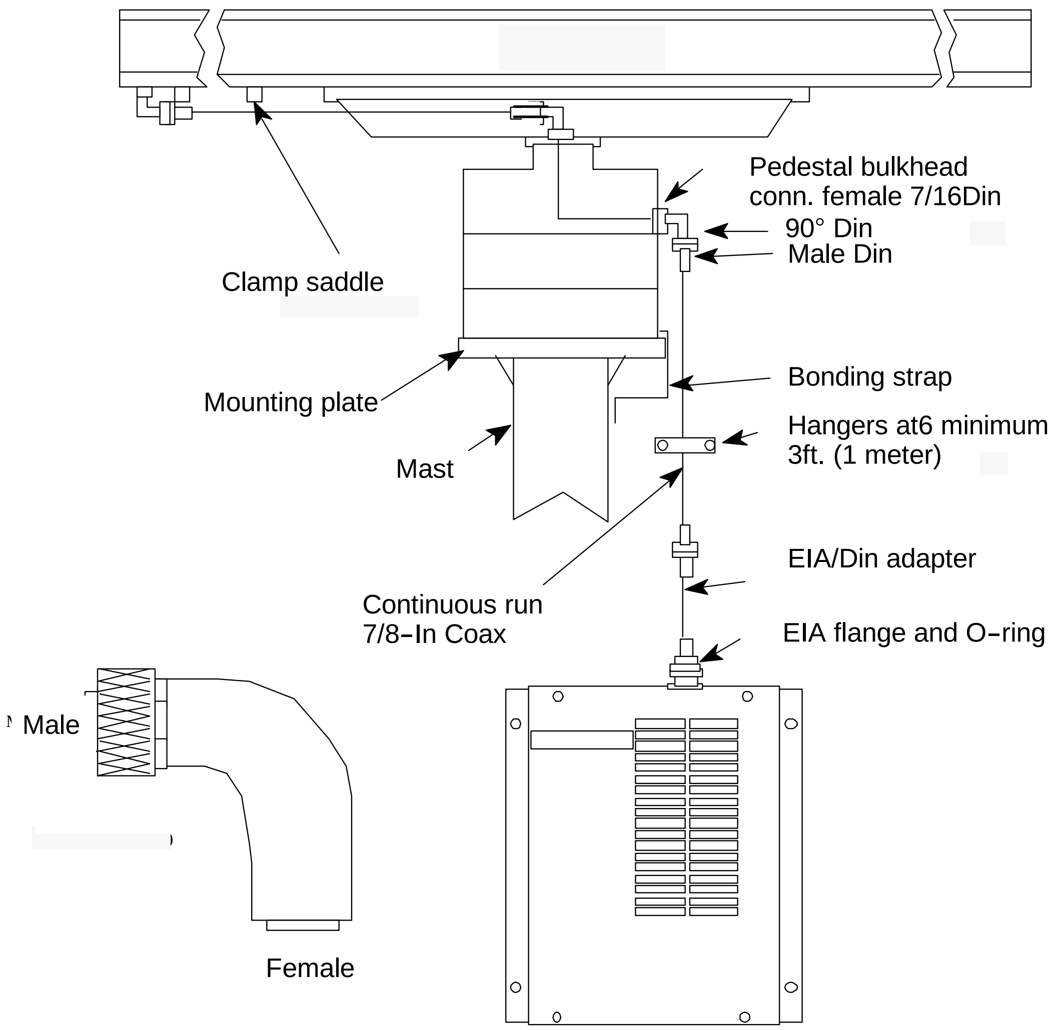


Figure: 2-22 NSC Down Physical Installation

2.4.3 MTR Up/Pedestal Cable Installation

Cables routed from the MTR Up/Pedestal to the MTR must be properly supported, especially for the long vertical run up the tower structure. Omission of necessary cable supports will result in excessive strain at the cable entrance point and, in time, cause the cable to fail. Additionally, the location of these cables should not be such that they provide impromptu foot or hand-holds.

2.4.3.1 System Interconnection Cabling

The connections have to be made according to the respective wiring diagrams.

2.4.4 MTR Down Physicel Installation

Install the MTR down unit using 4 each 3/8–16 (M10) mounting hardware is recommended. See NSC Dimensional Drawing MTR X/S–band MTR Down in the Annex from this Installation Manual.

2.4.4.1 MTR Bonding

For general information for bonding see chapter 2.1.1.

2.4.4.2 MTR Cabling

Cables routed from the Pedestal to the MTR, to the NSC and other associated units, must be properly supported.
Cabling details see respective wiring diagrams in the annex.
For MTR, NSC Display and other associated MTR Down units internal interconnection diagrams.

2.5 NSC CAN– BUS (Option)

For the CAN–Bus, following hardware conditions are to be prepared within the NSC radar systems.

Connection Module (e.g. Connection Diagram 900–012.HP018)
Terminal Module U14 – *take out the resistor R1* –

Interswitch Unit (Connection Diagram 900–020.HP007)
NSC ISW Controller PCB – *take out jumper B45* –

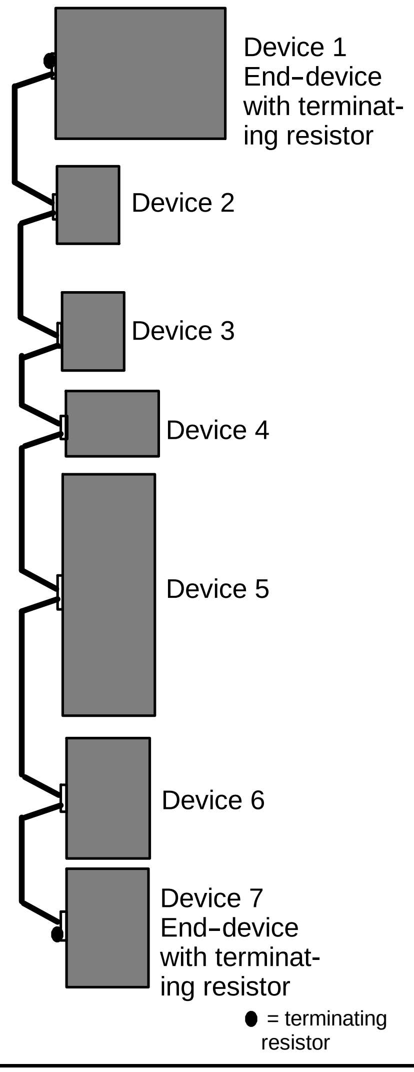
Transceiver Control Unit
Transceiver Control Module – *take out jumper B19* –

2.5.1 CAN- Bus Application

(CAN = Controller Area Network)

The NSC Radar Units can be connected with the CAN bus assembly (Figure: 2-23).

The transmission distance is maximum 400 meter.



The CAN bus is a Multi-Master-Bus allowing the connection of all devices and systems regardless of their task and function. This means that any number of devices can be connected. These devices must be designed for CAN bus technology.

For the CAN bus it is essential that every bus user is addressable via a unique address. This address is set within each bus user.

The usable address range is from $01_{(16)}$ to $3F_{(16)}$ (address $00_{(16)}$ is reserved for development purposes).
Each bus user can send and receive data via the CAN bus.

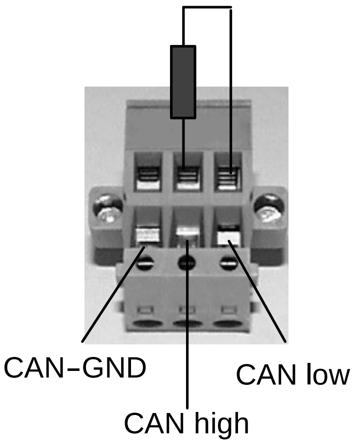
The CAN bus must be terminated at both ends via an resistor (125 ohms). This terminating resistor is activated by jumpers on the respective PCB or by an additional resistor at a terminal board.

Figure: 2-23 Principle of CAN bus technology

2.5.2 Connecting the CAN bus

For each CAN bus, a screened 3-core twisted cable with a conductor cross-chapter of ≥ 0.5mm² must be used.
All the CAN bus connections to be used are identical.

CAN Connection to a plug with termination (End-device)



StandardCAN connection to the plug:

1 = CAN Low
2 = CAN high
3 = GND

CAN Connection to a plug without termination

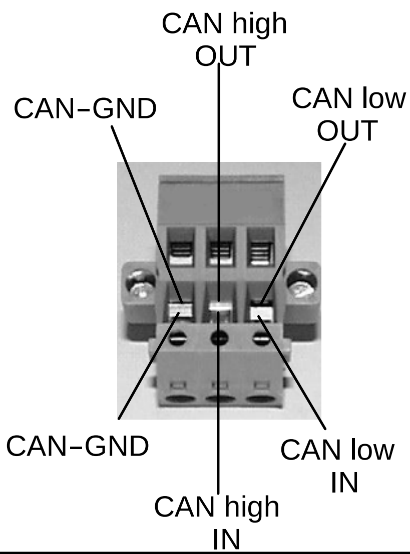


Figure: 2-24 Example for a CAN bus plug connection

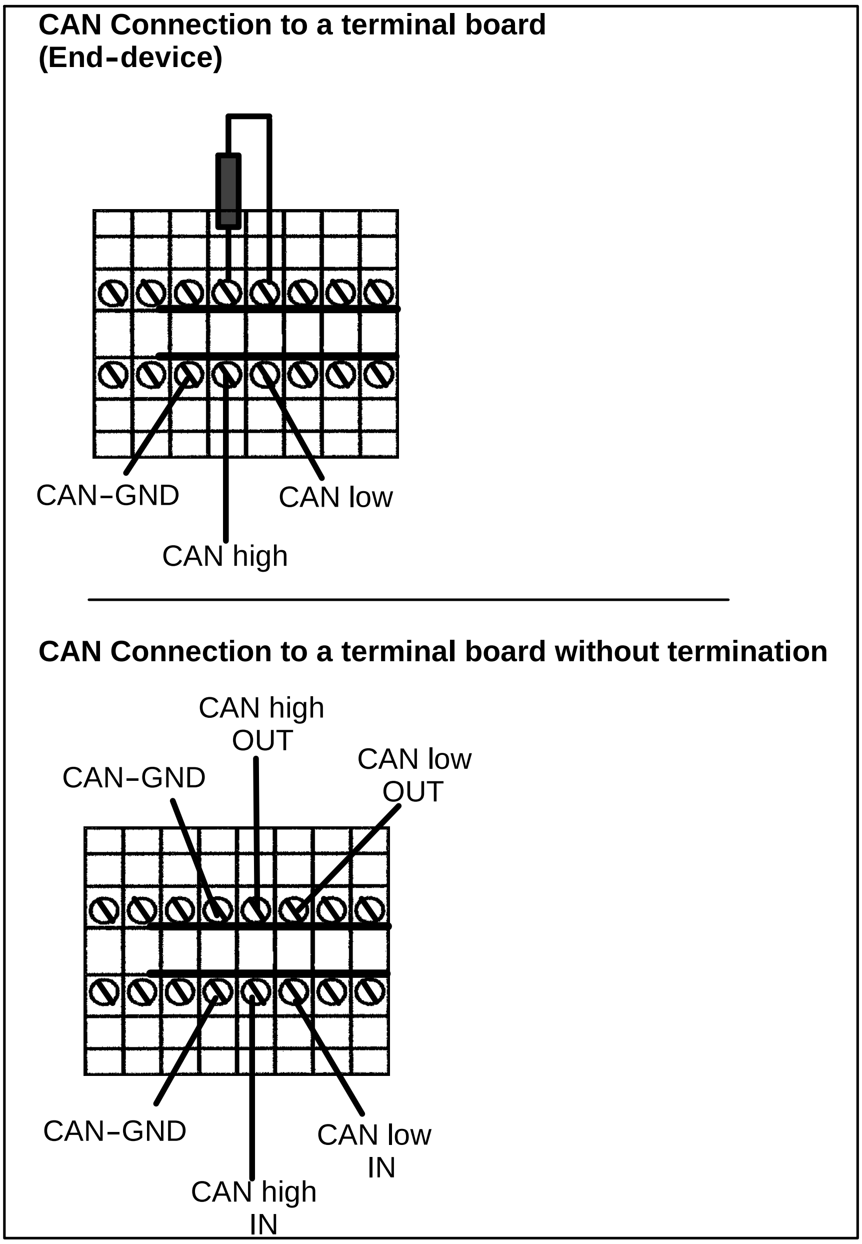


Figure: 2-25 Example for a CAN bus plug connection

2.6 SETUP AND LINKING (REFERING X-BAND 7ft., 8ft LPR-A25, 9ft., AND S-BAND 12 ft., 12ft LPR-A1)

This chapter contains drawings, diagrams and related material to illustrate the setup and linking procedures for the NSC Pedestals and MTRs.

2.6.1 Safety

The following safety precautions must be observed.

CAUTION ⚠	WHEN OPERATING, THE NSC MTR UP, MTR DOWN AND NSC DISPLAY (CATHODE RAY TUBE) CONTAIN VOLTAGES HAZARDOUS TO LIFE. HAZARDOUS AC VOLTAGES ARE PRESENT IN THE UNITS EVEN THOUGH THEY ARE DE-ENERGIZED, UNLESS THE PRIMARY POWER CIRCUIT BREAKERS HAVE BEEN TURNED OFF. MAINTENANCE PERSONNEL ARE CAUTIONED TO EXERCISE EXTREME CARE AND USE COMMON SENSE WHEN SERVICING THESE UNITS.

CAUTION ⚠	ALWAYS DE-ENERGIZE EQUIPMENT BY TURNING THE MTR OR DISPLAY INPUT POWER OFF BEFORE REMOVING PLUG-IN PRINTED CIRCUIT BOARDS AND ASSEMBLIES.

CAUTION ⚠	SETUP AND LINKING SHOULD ALWAYS BE MADE WITH POWER REMOVED FROM THE UNIT.

2.6.2 MTR Up/Down Set

The following paragraphs describe the procedures for NSC System Setup and Linking.

2.6.2.1 MTR Up/Down Input Power Setup

It is mandatory that an Isolation Transformer be used with 115VAC output.

Function	Linking
MTR Power Input	None

Table 2–6 MTR Up Input Power Setup Linking

2.6.2.2 MTR Up/Down Pedestal Motor Power Linking

The MTR Up motors operate on 115/230 1Ø or 230/380–440VAC, 3Ø and require configuration for the proper input voltage. Refer to chapter (1) for 115/230VAC, 3Ø input power and Para. (2) for 230/380–440VAC, 3Ø input power for a 9–pole motor and chapter (3) for 230/380–440VAC, 3Ø input power for a 12–pole motor.

(1) MTR Up/Down Pedestal 115/230VAC, 1Ø

Figure: 2–26 illustrates MTR Up and Down Pedestal motor configuration linking using 115/230VAC, 1Ø. Table 2–7 describes link positions. Permanent links are installed on TB2–5 to 6 to 7, 9 to 10, and 11 to 12. These links must not be removed.

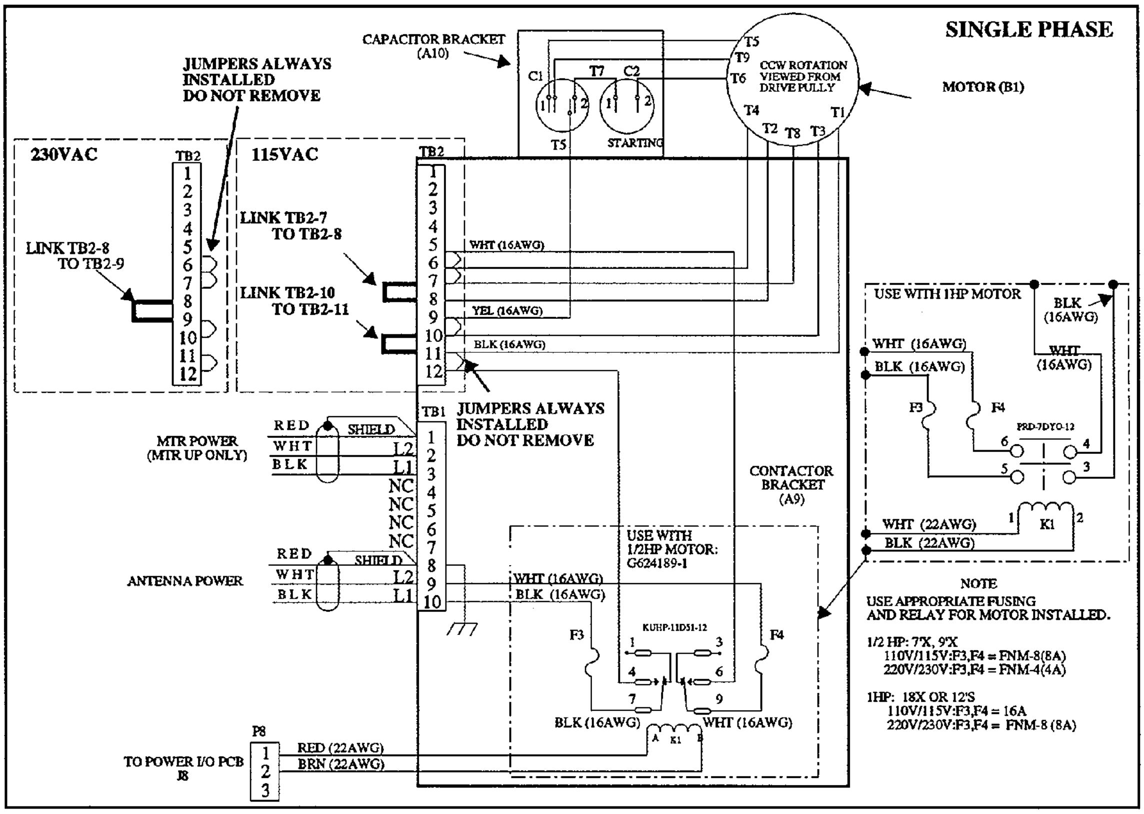


Figure: 2–26 MTR Up/Down Pedestal Motor Linking (115/230VAC, 1Ø)

Function	Linking
115VAC, 1Ø	TB 2–7 to TB 2–8 TB 2–10 to TB 2–11
230VAC, 1Ø	TB 2–8 to TB 2–9

Table 2–7 MTR Up/Down Pedestal Motor Linking (115V/230VAC, **1**Ø)

(2) MTR Up/Down Pedestal 9‑Pole Motor, 230/380‑440VAC 3Ø

Figure: 2‑27 illustrates the 9‑Pole MTR Up and Down Pedestal motor configuration linking, using 230/380‑440VAC, 3Ø input power. Table 2‑8 describes link positions. Permanent links are installed on TB2‑3 to 4, 7 to 8, and 11 to 12. These links must not be removed.

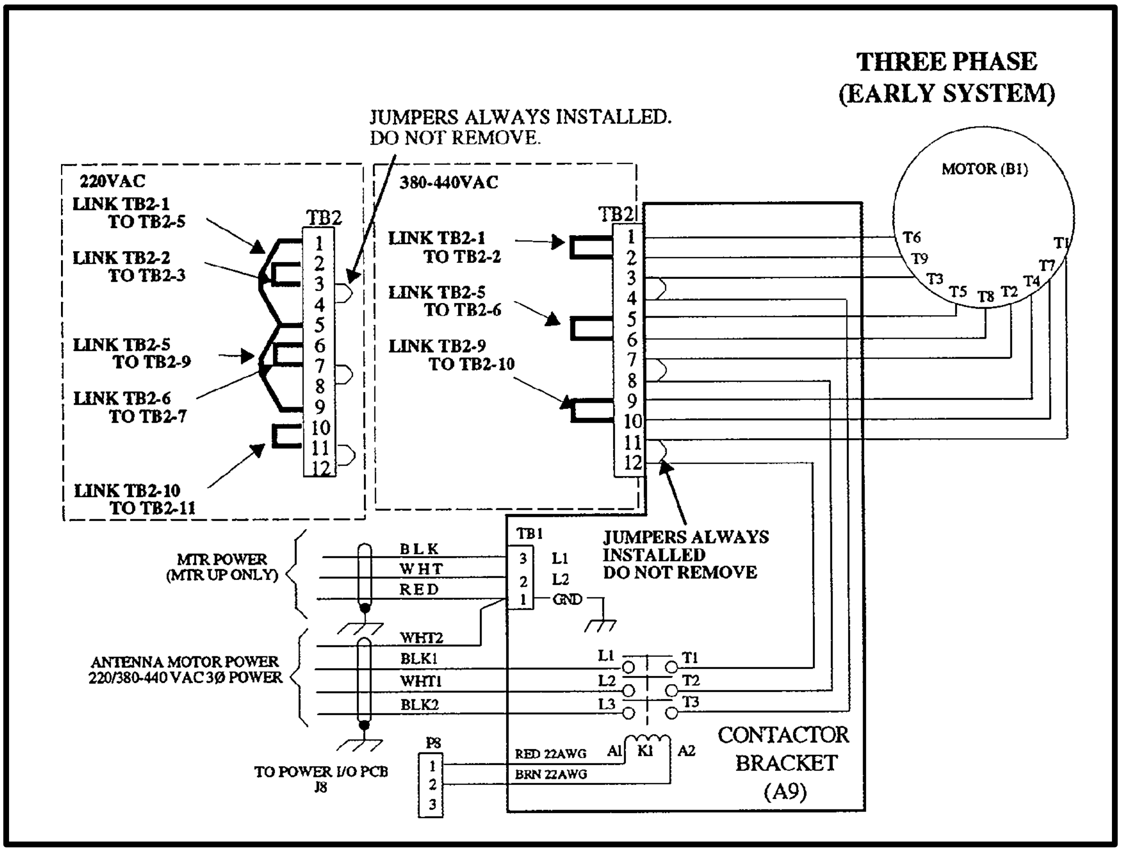


Figure: 2‑27 MTR Up/Down Pedestal 9‑Pole Motor Linking (230/380‑440VAC, **3**Ø)

3Ø MTR Up Motor Linking	
Function	Linking
230VAC, **3**Ø	TB 2‑1 to TB 2‑5 to TB 2‑9 TB 2‑2 to TB 2‑3 TB 2‑6 to TB 2‑7 TB 2‑10 to TB 2‑11
380‑440VAC, **3**Ø	TB 2‑1 to TB 2‑2 TB 2‑5 to TB 2‑6 TB 2‑9 to TB 2‑10

Table 2‑8 MTR Up/Down Pedestal 9‑Pole Motor Linking (230/380‑440VAC, **3**Ø)

(3) MTR Up/Down Pedestal 12–Pole Motor, 230/380–415/440–460VAC, 3Ø

Figure: 2–28 illustrates the 12–Pole MTR Up and Down Pedestal motor configuration linking, using 230VAC, 380 to 415 or 440 to 460VAC, 3Ø input power. Table 2–9 describes link positions.

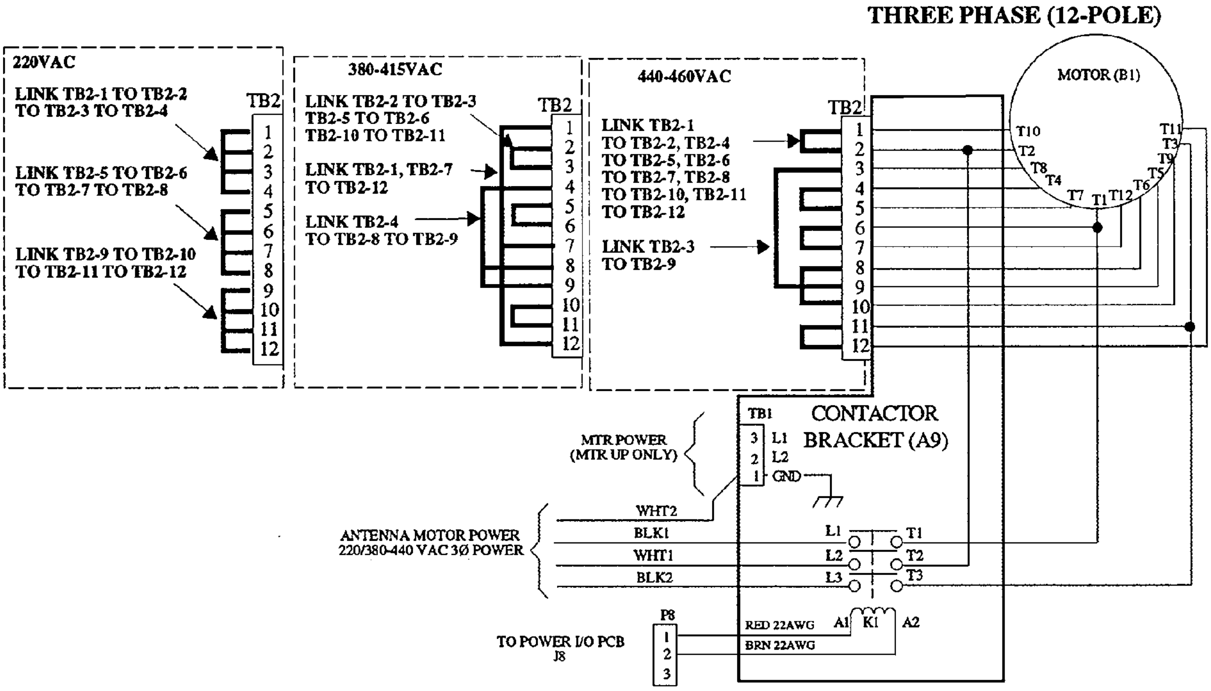


Figure: 2–28 12–Pole Motor, 230/380–415/440–460VAC, 3Ø Linking

3Ø MTR Up Motor Linking	
Function	Linking
230VAC, 3Ø	TB 2–1 to TB 2–2 to TB 2–3 to TB 2–4 TB 2–5 to TB 2–6 to TB 2–7 to TB 2–8 TB 2–9 to TB 2–10 to TB 2–11 to TB 2–12
380–440VAC, 3Ø	TB 2–1 to TB 2–3 TB 2–5 to TB 2–6 TB 2–10 to TB 2–11 TB 2–1 to TB 2–7 TB 2–12 TB 2–4 to TB 2–8 TB 2–9
440–460VAC, 3Ø	TB 2–1 to TB 2–2 TB 2–6 to TB 2–7 TB 2–11 to TB 2–12 TB 2–4 to TB 2–5 TB 2–8 to TB 2–10 TB 2–2 to TB 2–9

Table 2–9 12–Pole Motor Linking (230/380–440VAC, 3Ø)

2.6.2.3 MTR Up/Down Linking

CAUTION	THE MODULATOR PCB CONTAINS STATIC SENSITIVE DEVICES. GRASP ONLY THE PCB EDGES WHEN HANDLING.

(1) Modulator PCB Linking

Figure: 2‑29 illustrates link locations, Table 2‑10 describe linking requirements.

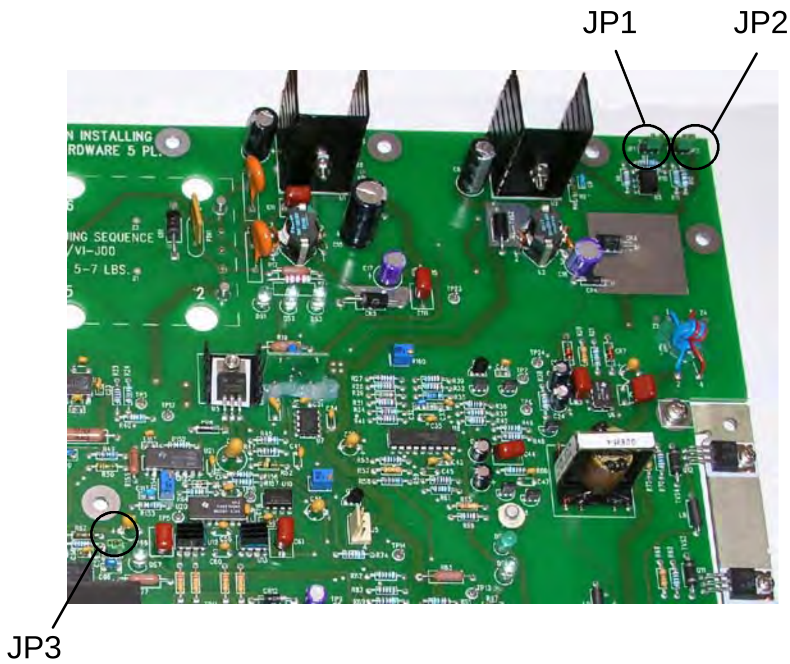


Figure: 2‑29 Modulator (A2) Link Location

Link	X‑Band	S‑Band	Remarks
JP1	1‑2	2‑3	Sets Up Filament Voltage
JP2	1‑2	2‑3	Sets Up Filament Voltage
JP3	1‑2	2‑3	Senses Pulse Width for Filament Voltage

Table 2‑10 MTR Modulator (A2) PCB Filament Linking

(2) Controller PCB Linking

Figure: 2‑30 illustrates link locations, Table 2‑11 describe linking requirements.

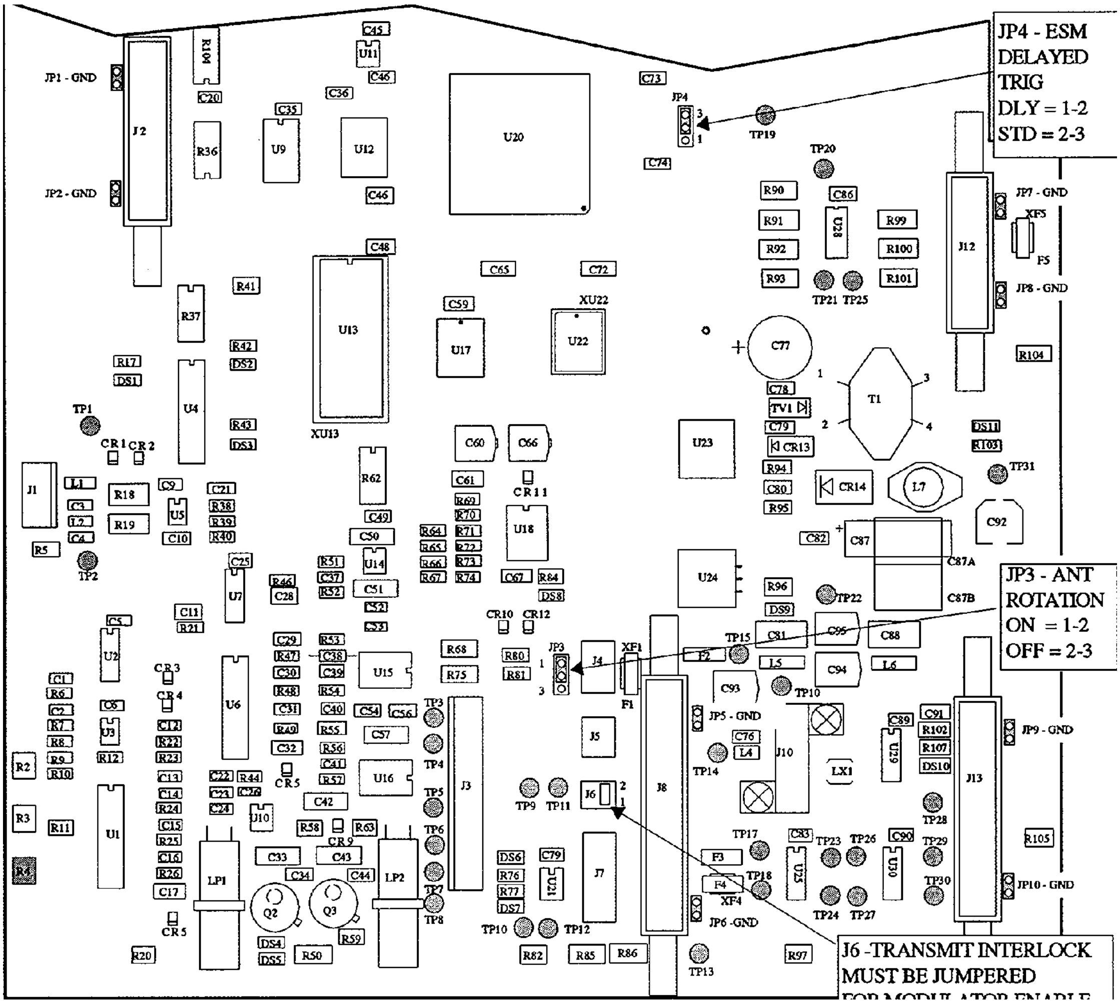


Figure: 2‑30 Controller (A3) PCB Link Location

Link	Position	Standard	Other
JP1, JP2, JP5, JP10	N/A	Not installated	Not Installed
JP3	1–2	Enables Antenna Rotation	2–3 Storage –Antenna Rotation is disabled.
JP4	1–2	Undelayed Internal Trigger	1–2 used with systems that require a delayed trigger, i.e. ESM Option.
JP6	1–2	MTR Up	Remove Link for MTR Down system. Main harness connects to J6 adding interlock switch in MTR Down system.

Table 2–11   Controller (A3) PCB Linking

2.6.3 Initial Setup

1. Prior to initial power-up of the NSC MTR, ensure that each component of the system installed has been linked for proper operation.

2. Ensure that all system circuit breakers are energized; all unit power switches are in the ON position.

3. If the radar system is being turned on for the first time, it will be necessary to perform the setup procedures for the NSC Display.

CAUTION ⚠	THE SYSTEM MUST BE PROPERLY LINKED PRIOR TO ALIGNMENT. THIS ALIGNMENT PROCEDURE MUST BE PERFORMED IN ITS ENTIRETY AND IN THE ORDER PRESENTED TO ENSURE PROPER SYSTEM PERFORMANCE.

2.6.4 Initial Turn On NSC MTR

1. Ensure that all system linking has been accomplished, chapter 2.6.2.

2. Close the breaker(s) supplying power to the radar system.

3. Refer to chapter 3 of this manual when operating the MTR locally at the MTR or refer to the manual delivered with the NSC Radar.

2.7 MTR OPERATION (REFERING X-BAND 7ft., 8ft. LPR-A25, 9ft., AND S-BAND 12ft., 12ft. LPR-A1)

2.7.1 Introduction

There are no operation procedures for the MTR Up units. MTR Up unit must be interfaced with the display to obtain the 15VDC System Enable to enable the display to turn on. Refer to the Operator Manual.
With a display interfaced with the NSC Down, the MTR maybe locally controlled at the MTR using two rotary switches.
One switch selects Remote (RMT), Standby (STBY) or Transmit On (TXON) conditions. The second switch determines the source of the trigger used in a particular range group, i.e. Short, Med1, Med2 or Long. In this position triggers are locally generated within the MTR. When this switch is placed to XTRIG RMT, triggers are applied from the display.

NOTE

The display must be on to obtain 15VDC System enable.

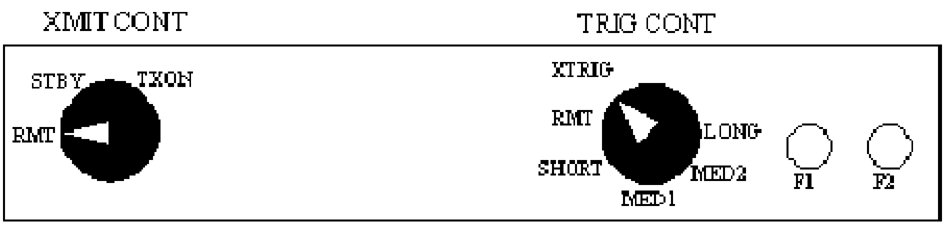


Figure: 2-31 MTR Down Control Panel

2.8 10kW X-BAND PEDESTAL WITH 6ft. ANTENNA

See dimensional drawing NB99-HP0048.

2.8.1 Pedestal (mechanical installation)

After the pedestal has been positioned properly on the mounting plate tighten the four bolt securely.
Pull up the pedestal cover; loose with care the cover bolts.

The mounting details with all mechanical accessories are outlined in Figure: 2-32 .

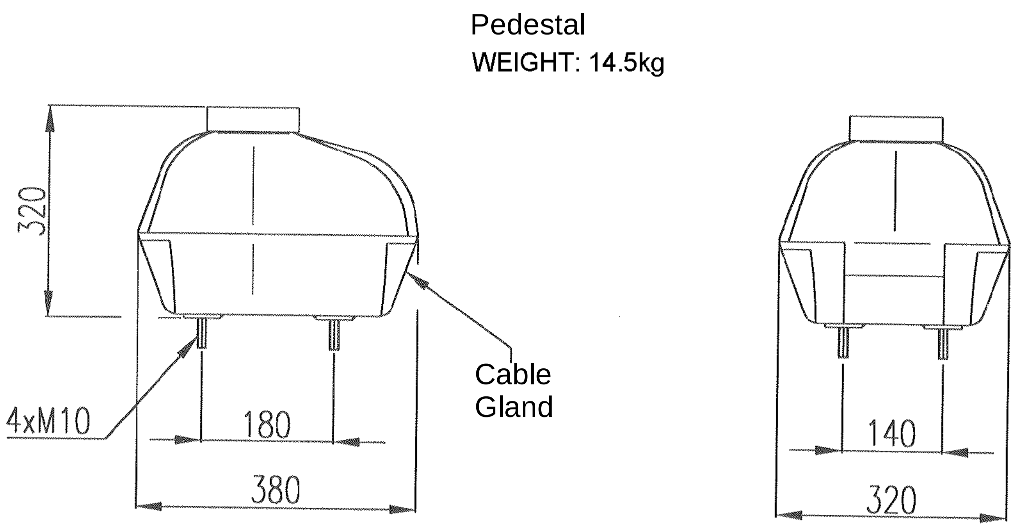


Figure: 2-32 Pedestal dimensions

Apply a thin layer of silicone grease to the pedestal seal.

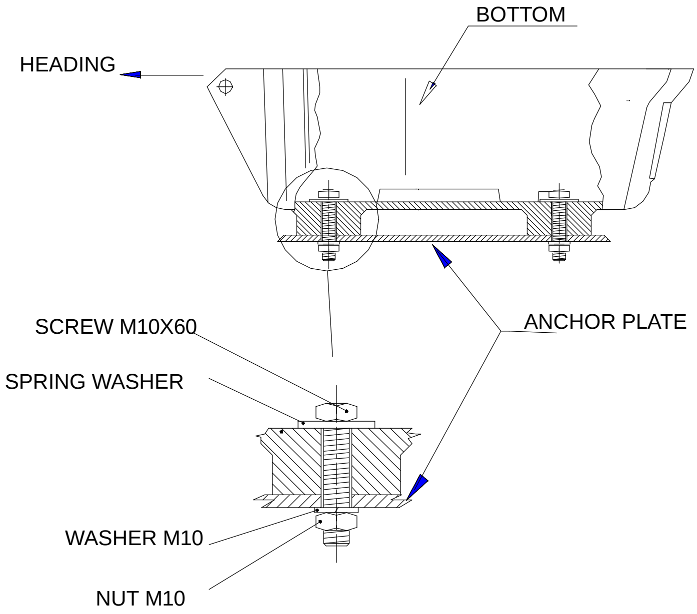


Figure: 2–33   Pedestal installation scheme

Pull down the scanner cover; tighten with care the cover bolts.
Be sure to avoid water infiltration.

2.8.1.1 Antenna

The following procedure must be used to install the antenna unit.

- remove the protective cover both from the antenna waveguide and from the waveguide transition on the pedestal
- lubricate with grease the supporting base of the pedestal and the antenna mounting surface;
- insert the antenna in order to match the waveguide with the waveguide transition;
- mount the array assembly using four M8 x 30 screws with a flat washer and a spring washer.

2.8.2 X-Band Pedestal with 6 ft. Antenna (electrical installation)

Electrical installation consists of:

- preparing and connecting the interconnecting cable between the radar display and pedestal;
- preparing the grounding cable of the pedestal to the ships hull.

To install the cable use the supplied installation kit. Use appropriate cable lugs to connect the conductors to the terminals.

NOTE	
	Before you start with the cable setting-up procedure switch the pedestal SAFETY SWITCH to **OFF**.

2.8.2.1 Cable Setting-up procedure

Special tools:
Hand crimping tool for contact diameter f 1.6 mm

Refer to Figure: 2-34 and Figure: 2-35 for examples of crimping for standard and coaxial conductor
.

(1) Arrange in advance 30 mm. of shrinkable sleeve with inner diameter of 25 mm.

(2) Insert cable through cable gland of the pedestal

(3) Strip the cable for about 90 cm; collect the braided wire shields and shorten it to obtain a length suitable to be tightened between the clamp located just after the input cable gland. Push the shrinkable sleeve over the wires.

(4) Tighten the cable gland on the pedestal.

(5) Shrink the piece of sleeve in correspondence with the metallic cable clamp and tighten it to assure a first fixing point of the cable in the pedestal.

(6) The second fixing point is established by an adhesive plastic support already present in the scanner unit.
The cable is fixed with a cable–stop band contained in the kit.

(7) Strip all the conductors for about 5 mm.
Procedure to prepare coaxial cables:
strip the cables for about 5 cm, then separate the core from the shield; roll–up the shield and protect it with shrinkable sleeve leaving 5 mm uninsulated. Strip also the core for about 5mm. Crimp all the conductors with supplied lugs for terminal connection.
With reference to Figure: 2–36 , carry out the connection with the terminal boards J8 and J9 separating the conductors assigned to J8 from those assigned to J9 with two cable ties for a length of 10 cm.

NOTE

Be sure that no pieces of conductor or other pieces remain inside the unit after this task.

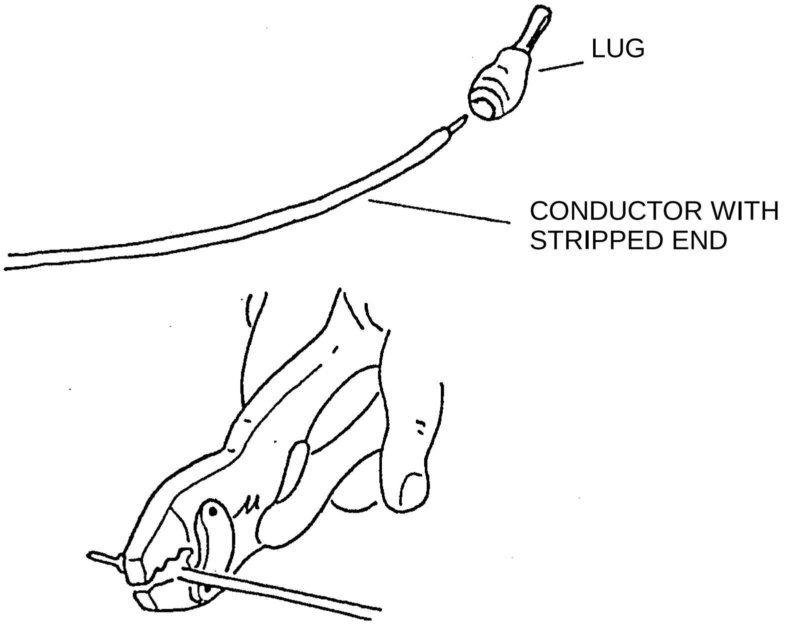


Figure: 2–34 Fitting Lugs

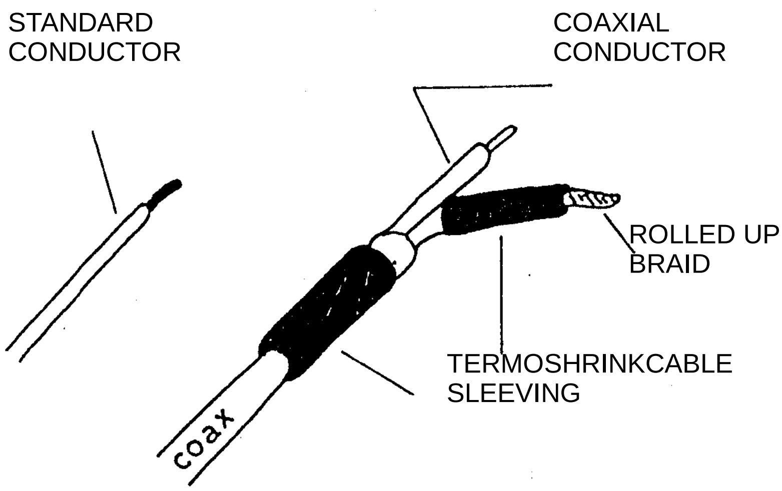
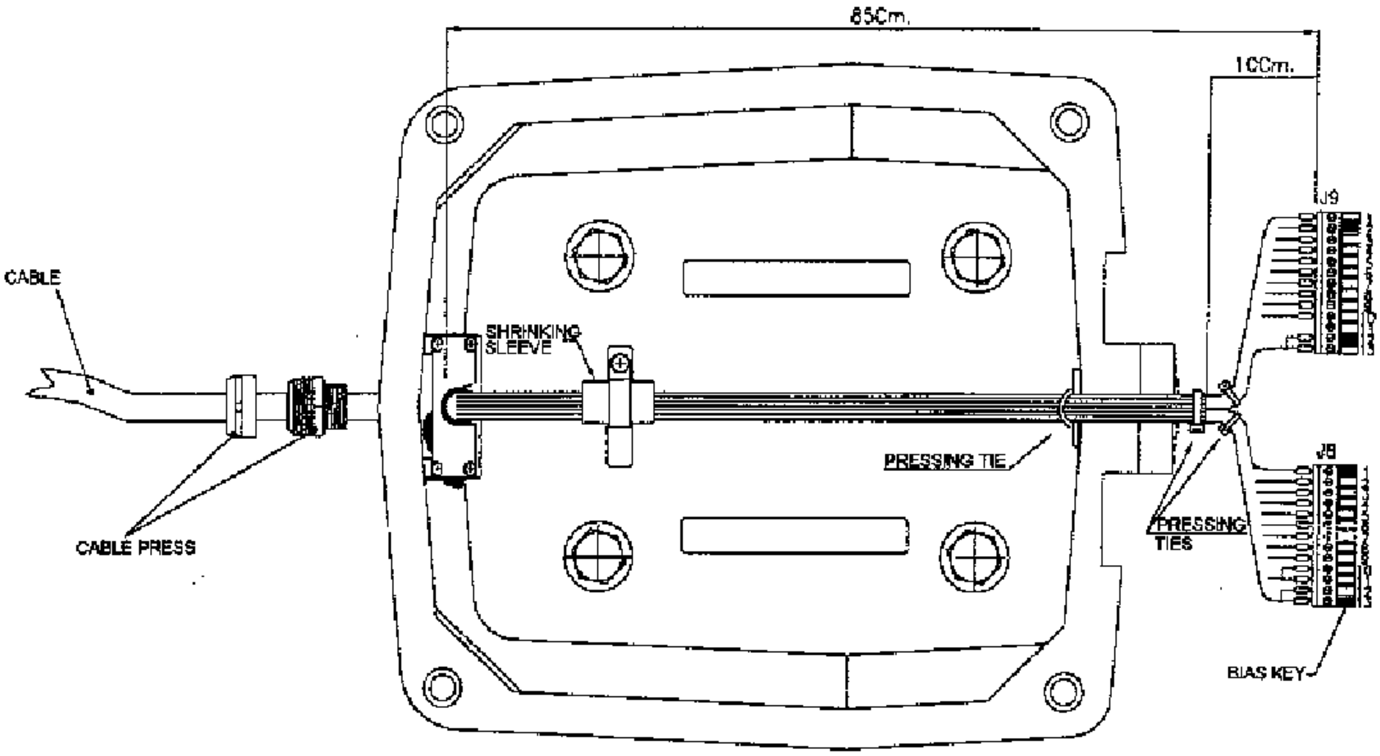


Figure: 2–35 Setting–Up Coaxial Cables



Cable ∅ 14mm			
Cable No.	Description	Cable ∅	Cable Identification
1 – 9	AWG20 conductor, soldered copper, format 19x0.20, isolated PVC 1,55mm max.	0.5	Brown–Black, Red–Black Orange–Black, Yellow–Black Green–Black, Blue–Black Violet–Black, Gray–Black White–Black
10 – 21	AWG20 conductor, soldered copper, format 19x0.127, isolated PVC 0,94mm max.	0.062	Numbered from 1 to 3
22 – 24	RG174 coaxial		Numbered from 1 to 3
25	Poly strip		
26	Full shield Soldered copper > 85%		
27	PVC grey strip, RMG label, step 50 cm, ext. diam max 15mm		

Figure: 2–36 Cable installation to pedestal

2.8.2.2 Connection of pedestal terminal boards (J8, J9)

J8 Terminal board	Function	Conductor–conductor section (sq.mm.)
1	P.MOT	BLACK/BROWN 0.5
2	P.MOT	BLACK/RED 0.5
3	N.MOT	BLACK/ORANGE 0.5
4	N.MOT	BLACK/YELLOW 0.5
5	GND	BLACK/GREEN 0.5
6	GND	BLACK/BLU 0.5
7	+24 V	BLACK/VIOLET 0.5
8	+12 V	BLACK/GREY 0.5
9	–12 V	BLACK/WHITE 0.5
10	TRG–S	GND COAX 1
11	TRG	COAX 1
12	TRG–R–S	GND COAX 2
13	TRG–RTN	COAX 2

Table 2–12 Connection of pedestal J8 terminal board

J9 Terminal board	Function	Conductor–conductor section (sq.mm.)
1	ACP	BROWN 0.08
2	HL	RED 0.08
3	SB–OP	ORANGE 0.08
4	RAD 0	YELLOW 0.08
5	RAD 1	GREEN 0.08
6	MAG I	BLU 0.08
7	TN–IND	VIOLET 0.08
8	TN–REG	GREY 0.08
9	TUNE	WHITE 0.08
10	PM	BLACK 1
12	VD–S	GND COAX 3
13	VD	COAX 3

Table 2–13 Connection of pedestal J9 terminal board

2.8.2.3 Signals Description

Name	Description	Value/feature
P_MOT	Positive motor power supply	+24 VDC ± 20% I = 0.3 A (typical), 10 A (peak)
N_MOT	Negative motor power supply	–24 VDC ± 20% I = 0.3 A (typical), 10 A (peak)
GND	Ground	
GND	Ground	
+24V	+24 VDC voltage	24 VDC ± 10% I = 1 A (typical), 1.5 A (peak)
+12V	+12 VDC voltage	12 VDC ± 10% I = 0.5 A (typical), 0.7 A (peak)
–12V	–12 VDC voltage	–12 VDC ± 10% I = 0.7 A (typical), 1 A (peak)
TRG	Transmission trigger	positive logic width = 10 VDC; duration 1μs impedance 50Ω
TRG–S	Trigger ground	
TRG–RTN	Trigger return	positive logic width between 5 and 10 VDC duration = 1μs; impedance = 50Ω (*always to be loaded, also when not used*)
TRG–RTN–S	Trigger return ground	
ACP	Azimuth Clock Pulse	open collector V_{MAX} = 15 VDC; I_{MAX} = 10 mA; 2048 pulses/revolution
HL	Head Line (North)	positive logic open collector V_{MAX} = 15 VDC; I_{MAX} = 10 mA duration = 50 ms at 22 r.p.m.

Name	Description	Value/feature
SB_OP	Standby / Operation selector(see Table 2–15)	open collector V_{MAX} = 5 VDC; I_{MAX} = 10 mA
RAD0	Pulse Width selector (LSB)(see Table 2–15)	open collector V_{MAX} = 5 VDC; I_{MAX} = 10 mA
RAD1	Pulse Width selector (MSB)(see Table 2–15)	open collector V_{MAX} = 5 VDC; I_{MAX} = 10 mA
MAG I	Magnetron power indicator	voltage between 8 and 12 VDC high impedance
TN_IND	Tune indicator	voltage between 0 and 4 VDC high impedance
TN_REG	Tune regulator	adjustable voltage between 0 and 5 VDC high impedance
TUNE	Tune voltage	between 0 and 30 VDC (12 VDC typical) high impedance
PM	Performance Monitor (not used)	open collector V_{MAX} = 12 VDC; I_{MAX} = 10 mA
VD	Video output (negative)	4 Vdc peak; impedance = 50Ω
VD–S	Video ground	

Table 2–14 Interface signals

Pulse Width	SHORT (80 ns)	MEDIUM (300 ns)	LONG (600 ns)	EXTRALONG (1.2 μs)
PRF	FAST (3200 Hz)	MEDIUM (1600 Hz)	SLOW (800 Hz)	VERY SLOW (500 Hz)

Table 2–15 Suitable frequencies for the TRG trigger signal

2.8.3 Putting into Operation

2.8.3.1 Operation X-Band Pedestal with 6 ft Antenna

SAFETY SWITCH

The ON/ OFF switch Figure: 2-37 located on the pedestal is a safety switch only, its purpose is to enable / disable antenna rotation for maintenance purposes.

NOTE 	**STBY mode** (Display in STBY mode) During normal operating conditions as well as maintenance the antenna rotation can be stopped by setting the safety switch to the **OFF** position.

ATTENTION 	**Tx mode** (Display in Tx mode) The antenna rotation can be stopped by setting the safety switch to the **OFF** position.
MICROWAVE RADIATION 	Single RF Pulses are emitted every 20s for 0.5s! **SEE SAFTEY REGULATION** at the beginnig of this serice and installation manual.

Figure: 2-37 Safety switch on the pedestal

2.9 PERFORMANCE MONITOR UNIT FOR X-BAND (7ft., 8ft, 9ft..) AND S-BAND (12ft..) ANTENNA

Safety Precautions

CAUTION	The operator and maintenance crew in particular must follow general safety rules: - In case of overload (due to short circuit or malfunction in the units, the protective devices operate. In this case the operator must switch off the equipment completely and call in the maintenance crew. The operator must not under any circumstances change the setting of the controls and adjustments located inside the unit, and must inform maintenance personnel of any abnormality observed in operation. - Switch off the equipment during removal and replacement of any malfunctioning component. - Dangerous potentials may be present in the units even when the power has been switches off (for example, charges on capacitors). As a preventive measure, ground and discharge circuits prior to working on them. - It is advisable to use tools with insulated handgrips and to wear insulated shoes. - Maintenance technicians must be especially careful when performing measurements and/or inspections with the radar switched on.

2.9.1 PMU Installation Instructions

(1) Open right pedestal access door.

(2) Remove access panel above cable gland nut panel on pedestal.

> **NOTE**
> Panel may offer resistance due to the RTV used to make panel water tight.

(3) Clean RTV residue from pedestal.

(4) Inspect PMU access area and if installed remove burnt orange color gasket from access well.

(5) Coat both sides of the conductive gasket that's included with the PMU Cable with a thin coating of NO–AL–OX®. DO NOT USE RTV.

(6) Route PMU control cable through the 1 x 2 inch hole of the pedestal. Feed cable assembly attached to PMU and seat conductive grommet, RPN in PMU access well.

> **NOTE**
> The conductive gasket and cable are shipped as part of the PMU and must be shipped with the defective PMU when the PMU is removed for maintenance.

(7) Place a thin coat of RTV around PMU mounting plate. Mount PMU in place using four M6 bolts, RPN , four flat washer and four lock washers.

(8) Tighten PMU mounting bolts.

(9) MTR Up – Connect cable to J8 on the Controller PCB.
Connect ground of cable to J5.

MTR Down Pedestal – Connect cable from PMU to J6 on the Power and I/O PCB.

MTR Down – Connect to J8 on the Controller PCB. Connect ground of cable to J5. On early cable that do not have an ground ring terminal, cut two pin connector off cable end that's being attached to the Power and I/O PCB and splice a 6–inch wire with an ring terminal attached. Attach ground wire to the nearest mounting screw of the Power and I/O PCB.

(10) Route and Ty–Rap PMU control cable to pedestal.

Attention

ENSURE THAT ENOUGH SLACK IN THE CABLE IS AVAILABLE TO OPEN PEDESTAL COVERS WITH OUT APPLING STRESS TO THE EXISTING CABLE HARNESS OF THE PEDESTAL

(11) In MTR Up, verify fuse F4 on the Controller PCB to determine if 1 amp fuse is installed. If 1/2 amp fuse is installed, replace F4 with fuse, a 1 amp fuse supplied with PMU installation kit.

(12) If MTR Down perform step 12a through 12d below.

a. Locate W7 control cable at the MTR Down Pedestal.

b. Connect W7 conductors associated with the PMU to TB4A and TB4B of Power and I/O PCB (see Connection Diagram Performance Monitor connection).

NOTE

If PMU is being installed to a previously install MK2, locate the tied back cabling and connect conductors to MTR Down Pedestal using.

c. Remove MTR Down cover and locate W7 control cable.

d. Connect W7 conductors associated with the PMU to TB4A and TB4B of Power and I/O PCB, (see Connection Diagram Performance Monitor connection)

(13) Secure MTR Down Pedestal access door (s) opened in step 1. Install MTR Down Cover.

2.10 PERFORMANCE MONITOR FOR 6ft. ANTENNA (PM30-02)

Safety Precautions

CAUTION

The operator and maintenance crew in particular must follow general safety rules:

- In case of overload (due to short circuit or malfunction in the units, the protective devices operate. In this case the operator must switch off the equipment completely and call in the maintenance crew. The operator must not under any circumstances change the setting of the controls and adjustments located inside the unit, and must inform maintenance personnel of any abnormality observed in operation.

- Switch off the equipment during removal and replacement of any malfunctioning component.

- Dangerous potentials may be present in the units even when the power has been switches off (for example, charges on capacitors). As a preventive measure, ground and discharge circuits prior to working on them.

- It is advisable to use tools with insulated handgrips and to wear insulated shoes.

- Maintenance technicians must be especially careful when performing measurements and/or inspections with the radar switched on.

2.10.1 Configuration of the Unit

The configuration of the Performance Monitor PM 30-02, see NB99-HP004 in the annex, is constituted by following unit:

- SPM-010 sensor unit;
- APM-030 local power source unit;
- cable of interconnection between unit local power source and unit sensor;
- installation kit.

2.10.2 General Specification

Applicable to radar set with:
Peak power: 50kW Max
Frequency: 9250-9500 MHz

Unit Specifications

- Wide Spectrum Retransmission (no tuning required on the radar set)
- Deterioration of transmitting power
  Detectable range 10 dB
  Detection step 2 dB
- Deterioration of receiving sensitivity
  Detectable range 12 dB
  Detection step 3 dB

Power Supply
The power supply of Performance Monitor PM30-02 is 24Vdc.

Environmental Conditions

Operative temperature range: from –15°C to +55°C and

Humidity: 95% at 35°C

EMI

Fully compliant with IEC–60945.

Weight and Dimensions

For weight and dimensions of the performance monitor units NB99–HP004 in the annex.

2.10.3 Mechanical Installation of Performance Monitor (PM30-02)

This chapter describes all the procedures needed for a correct installation and performance check of the performance monitor PM30-02.
The mechanical installation consists of fitting and fixing the unit.
The installation area must not be subject to high temperatures or exceeding vibrations.
Fixing must be carried out to allow easy access to the unit for assuring the easiest management of the maintenance operations.
For the mechanical installation, place the SPM-010 unit apposite to the radar antenna (NB99-HP004 in the annex) and the APM-030 unit near to radar display unit.
Dimensions and weights of performance monitor units are reported NB99-HP004in the annex.
It is recommended to fix, in definitive way, the SPM-010 unit, only when the installation procedure is finished as, in order to reduce the effect of the probable reflections due to the surrounding atmosphere to the antenna radar, could be necessary to vary the position of the same unit.
Refer to interconnecting diagram NB99-HP004 in the annex to carry out the following procedures:

- connect to sensor cable to J3 connector of APM-030 unit;

- connect the contact switch cable to J2 connector;

- Supply 24Vdc for J1 connector.

Contact switch is used for switch on and switch off remotely of equipment. For this reason the switch present on APM-030 must be set on OFF.
Switch on radar and performance monitor and wait for 30 minutes at least in order to allow both systems to become stabilised in temperature.
Put in transmission the radar on scale 24 Nm. and be sure that it is at maximum tune.
The angular representation of 4 markers, for the reflections due to the obstacles nearest to the radar antenna, can appear outlined; in order to improve the image of the markers, rotate slightly the SPM-010 unit on itself.

The trimmer VR2 allows to adjust, in fine mode, the performance monitor tune optimising this way the image of markers on display.

The markers intensity can be varied adjusting the trimmer VR2; for this purpose it is better to adjust the gain of radar receiver after warm up, so to obtain a floor noise just visible.
Now rotate clockwise the trimmer VR2 up to the marker intensity farther from centre is just distinguishable by floor noise.

The trimmer VR1 allows to adjust the markers distance by display centre, rotating clockwise the markers come near to centre to step of 2Nm.
The distance from display centre of marker innermost, during normal operation of transmitter, must be adjust to 14 Nm., moving the radar VRM to 14 Nm. as reference.

Now rotate the trimmer VR1 counterclockwise completely, the 4 markers will appear nearest to centre with angular width reduced, rotate again and slowly VR1 clockwise up to the marker innermost shift from 12 Nm. to 14 Nm. If the markers distance from display centre is always 14 Nm. and fails to decrease by trimmer VR1, (the SPM–010 unit picks up a signal too strong), it is necessary try to lower the position of SPM–010 respect to radar antenna, or to lower the relative distance, or to vary of the SPM–010 inclination.

On the contrary, if it fails put the markers to distance 14 Nm. (SPM–010 unit picks up a signal too weak), try to vary the SPM–010 unit distance from radar antenna.
Now the installation is terminated; close the APM–030 unit with special clamping screws.

2.10.4 Electrical Installation of Performance Monitor (PM30‑02)

Refer to figure Figure: 2‑38 .

- Connector NUVAL 3p.f.s.

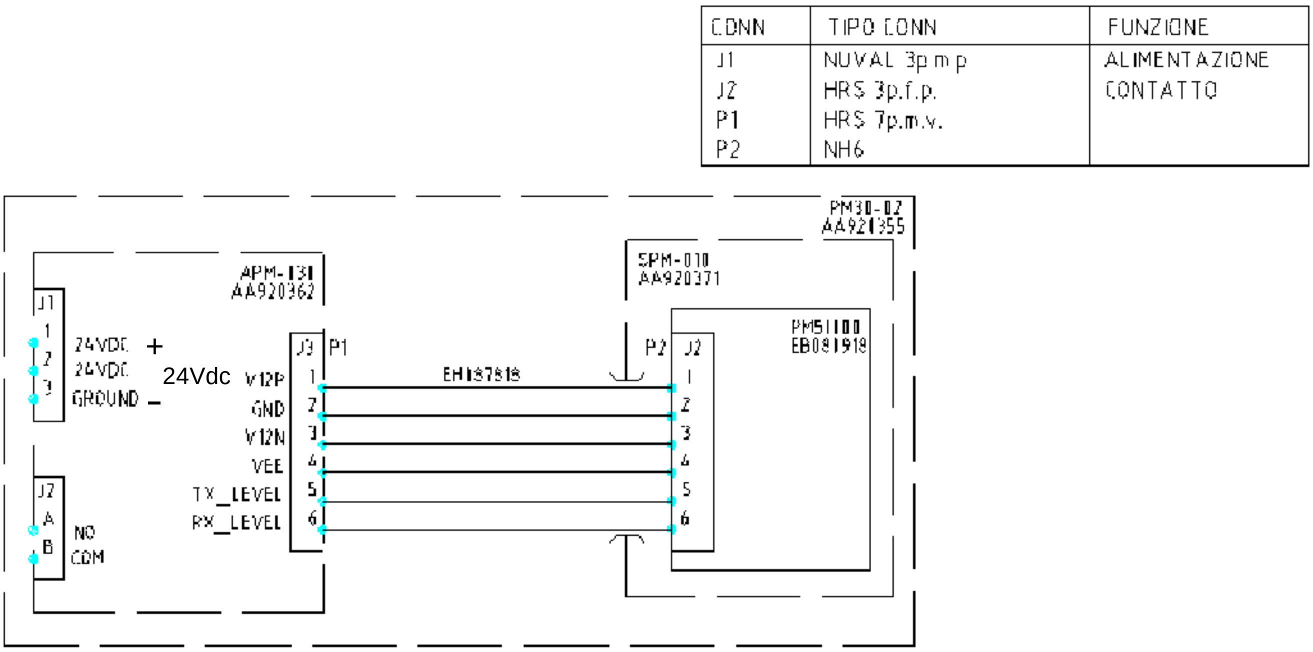


Figure: 2‑38 Wireing the Performance Monitor

APM‑030 J1 NUVAL 3p.p.p.	Function	Conductor
1	**+** 24Vdc	AWG18
2	24Vdc	AWG18
3	**-** Ground	AWG18

Table 2‑16 Connection of APM‑030 unit J1 for power supply

- Connector HRS 3p.f.p.

APM–030 J2 HRS 3p.p.s.	Function	Conductor
A	NO	AWG20
B	COM	AWG20

Table 2–17 Connection of APM–030 unit J2 connector for remote switching

– Connector HRS 3p.f.p.

APM–030 J3 HRS 7p.p.s.	Function	Conductor	SPM–010 CABLE GLAND (NH6 of PM510).
1	V12P	AWG20	1
2	GND	AWG20	2
3	V12N	AWG20	3
4	VEE	AWG20	4
5	TX_LEVEL	AWG20	5
6	RX_LEVEL	AWG20	6

Table 2–18 Connection between APM–030 unit J3 connector and SPM–010 (through cable gland)

2.11 NSC INTERSWITCH UNIT (ISU)

2.11.1 General Information

The ISU can connect up to 4 MK2 Transceivers, additionally one 10kW Unit and interswitch up to 8 displays in normal mode (chapter 3.4.1).

The ISU has two modes of operation:

(1) **Normal mode** for free interswitching of up to 8 displays and 4 MK2 XCVRs. In this mode the displays are sending the uplink via CAN– BUS and the ISU is generating the UPLINK and 15V enable to the XCVRs. The downlink of the selected XCVR is routed to the respective display by the ISU.

(2) **The emergency** mode (also ISU OFF); in this mode the first 4 displays are directly assigned to the four MK2 XCVRs without interswitch capability. The Uplink and 15V enable signals generated by the displays are routed through the ISU without interacting of the same.(Dispays have a direct galvanic connection to their respective display).

2.11.2 Setting up the NSC Interswitch Unit

Steps for correct wiring:

NOTE
Strip all cables outside the ISU wire strands may cause short circuits!

(1) Open ISU

(2) Locate terminal B2 and connect the CAN– BUS between the displays and the ISU in series, make sure the CAN– BUS is terminated properly at the beginning and the end.

(3) Power up the ISU and one display at a time and observe the LEDs in the ISU (Figure: 2–39).

(4) There should be NO flashing red LED (if red LED flashing, reverse CAN– BUS on the display).

(5) Deenergize all units and connect the transceivers (uplink, 15V enable, ground) to terminal B40 observing the correct order/ numbering of the XCVRs and downlink of the XCVRs to TB2 using BNC connectors.

(6) Route a coax cable from the ISU video outputs to the corresponding displays primary video input.

(7) Energize the ISU and displays 1– 4.

(8) At the displays use the service menue, configuration, transceiver setup, set the correct number of displays and transceivers, leave the tool and restart the radar program.

(9) Go back to XCVR configuration, enable at the primary input ISU and ALL XCVRs, restart the radar program.

(10) make sure the first display is marked as “A”, the second as “B“ and that display A is master of xcvr 1, B master of xcvr 2, ...

(11) There should be no uplink fault indication on any of the first four displays.

(12) If an uplink fault is indicated swap the uplink wires of the corresponding xcvr at terminal B40 of the ISU, the error should disappear.

(13) The interswitch is now working in the normal mode.

(14) Deenergize all units and connect the uplink/ 15V enable/ ground lines from the displays to terminal B39 of the ISU observing the correct order/ numbering of the displays.

(15) Energize all dispays but NOT the ISU.

(16) Make sure all displays are assigned master of their corresponding XCVRs.

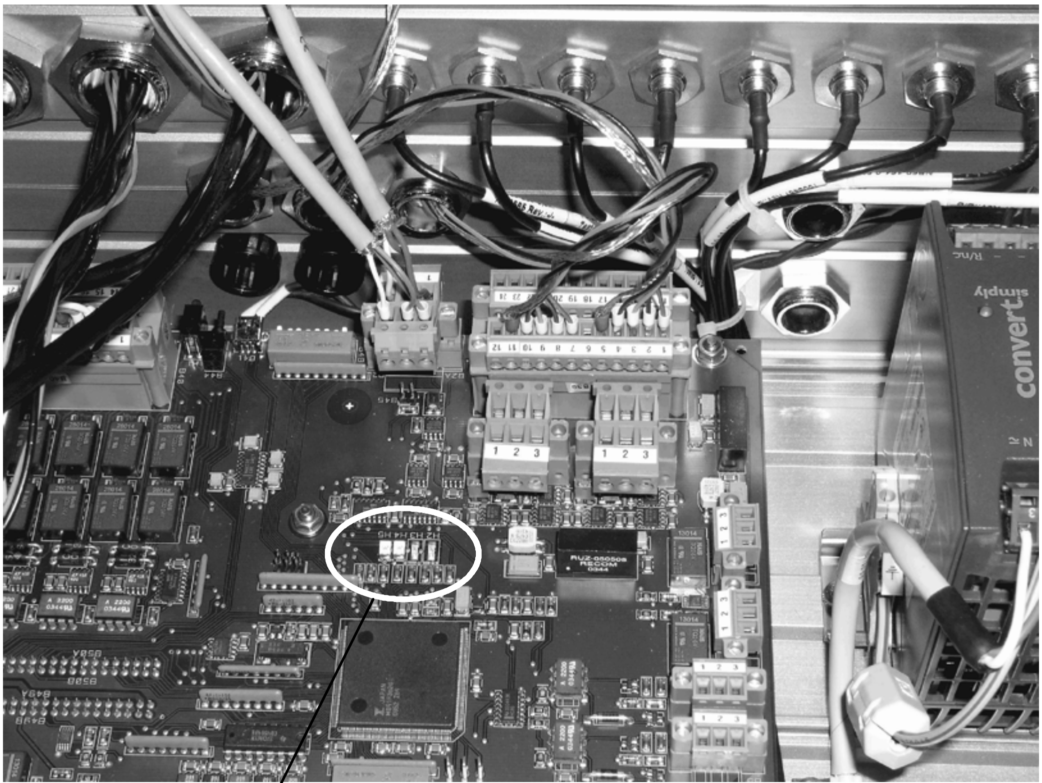
(17) There should be no uplink fault indication on the first four units.

(18) The XCVRs are now controlled by their carresponding displays via the uplink generated in the display, the CAN– BUS is not used to control the ISU or XCVR.

(19) If an uplink fault is indicated swap only the uplink wires at the corresponding display, **DO NOT change the wiring to the XCVRs in the ISU!!!**

(20) The fault should be eliminated.

(21) Now the ISU can be energized and the system is ready for alignments.



LED's
H1 two color LED
GREEN static – indicates Operating Status o.k.
GREEN blinking – indicates Emergency Mode
RED static – indicates CAN BUS failure
H2
RED static – indicates CAN BUS failure
H3
no function
H4
blinking – indicates Timer 100ms

LED frontside, two color LED
GREEN static – indicates Operating Status o.k.
GREEN blinking – indicates Emergency Mode
RED static – indicates CAN BUS failure

Figure: 2–39 LED indication Interswitch Unit

2.11.2.1 Aids to Troubleshooting the NSC Interswitch Unit (ISU) and the Transceiver Control Module (TCM)

The ISU as well as the TCM has a mini USB port which is normally intended for loading the controller software or upgrading the software

Nevertheless, these mini USB ports are active during normal operation and output important data which can be viewed using another computer (Laptop) with a serial COM port, the mini USB to DB 9 cable (Ident. No.: 1 505 283) and a serial port viewer program like terminal or winmon.
The Baud rate is 9600, 8,1,N.

Different (fault) conditions will be displayed in plain text, below are some sample recordings depicted.

- **ISU, normal mode, B48, dip switch 8 to the down position, video power disabled, no downlink present at any output BNC jack**
  (see Assembly Drawing with Configuration 900–042.HP100).:

```
Rxd 1:{22:26:38.328}ISW–Status:  OK VideoPower OFF      <0D><0A>
Rxd 1:{22:26:38.375}SYS–Status:  OK                     <0D><0A>
Rxd 1:{22:26:38.406}VideoPower:  OFF                    <0D><0A>
Rxd 1:{22:26:38.437}    Relais:  OFF                    <0D><0A>
Rxd 1:{22:26:38.468}VideoOut 1:  disable                <0D><0A>
Rxd 1:{22:26:38.500}VideoOut 2:  disable                <0D><0A>
Rxd 1:{22:26:38.546}VideoOut 3:  disable                <0D><0A>
Rxd 1:{22:26:38.578}VideoOut 4:  disable                <0D><0A>
Rxd 1:{22:26:38.609}VideoOut 5:  disable                <0D><0A>
Rxd 1:{22:26:38.640}VideoOut 6:  disable                <0D><0A>
Rxd 1:{22:26:38.671}VideoOut 7:  disable                <0D><0A>
Rxd 1:{22:26:38.718}VideoOut 8: auf VideoIn: 2          <0D><0A>
Rxd 1:{22:26:38.750}Offst Emer:+ 00.110 V               <0D><0A>
Rxd 1:{22:26:38.781}CAN Adress: 24                      <0D><0A>
Rxd 1:{22:26:38.812}ISW BtrStd: 0000504:34              <0D><0A>
Rxd 1:{22:26:38.843}  Neustart: 0000000025              <0D><0A>
Rxd 1:{22:26:38.875}CANTOD ges: 0000000000              <0D><0A>
Rxd 1:{22:26:39.421}<1B>[1;1HNSC Interswitch Modul (ISW)    <0D><0A>
```

Rxd 1:{22:26:39.468}Version: P0001 E00.02 Build: 05C5 <0D><0A>
Rxd 1:{22:26:39.531} MainPower: 23.485 V <0D><0A>
Rxd 1:{22:26:39.562} Emergency: 23.386 V <0D><0A>
Rxd 1:{22:26:39.593}– 5V Video:– 02.095 V <0D><0A>
Rxd 1:{22:26:39.640}ISW–Status: OK VideoPower OFF <0D><0A>
Rxd 1:{22:26:39.671}SYS–Status: OK <0D><0A>

The present display/ transceiver connections are also visible:

Display 5 to xcvr 4
Display 7 to xcvr 1
Display 6 to xcvr 2
Display 8 to xcvr 2

Rxd 1:{08:47:20.297}18181:37:10 en: 5 to In: 4 <0D><0A>
Rxd 1:{08:47:20.487}18181:37:10 en: 7 to In: 1 <0D><0A>
Rxd 1:{08:47:20.687}18181:37:10 en: 6 to In: 2 <0D><0A>
Rxd 1:{08:47:20.727}18181:37:10 en: 8 to In: 2 <0D><0A>
Rxd 1:{08:47:21.048}18181:37:11 en: 5 to In: 4 <0D><0A>
Rxd 1:{08:47:21.238}18181:37:11 en: 7 to In: 1 <0D><0A>
Rxd 1:{08:47:21.429}18181:37:11 en: 6 to In: 2 <0D><0A>
Rxd 1:{08:47:21.809}18181:37:12 en: 5 to In: 4 <0D><0A>
Rxd 1:{08:47:21.849}18181:37:12 en: 8 to In: 2 <0D><0A>
Rxd 1:{08:47:22.019}18181:37:12 en: 7 to In: 1 <0D><0A>

Emergency Mode, Displays 1,2,3,4 to xcvrs 1,2,3,4:

Rxd 1:{08:51:55.773}18181:41:46 en: 1 to In: 1 OK Emergency Mode <0D><0A>
Rxd 1:{08:51:55.823}18181:41:46 en: 2 to In: 2 OK Emergency Mode <0D><0A>
Rxd 1:{08:51:55.873}18181:41:46 en: 3 to In: 3 OK Emergency Mode <0D><0A>
Rxd 1:{08:51:55.923}18181:41:46 en: 4 to In: 4 OK Emergency Mode <0D><0A>

- **Similar results can be seen at the TCM:**

10kW not selected, reset, warm up:

Rxd 1:{08:57:12.428}Status TRGRTN ACP HLtime TUNE TN_IND TCM_error <0A><0D>
Rxd 1:{08:57:18.687} 0100 -- -- --- 00000 0000 0000 0000 <0D><0A>
Rxd 1:{08:57:24.936} 0100 -- -- --- 00000 0000 0000 0000 <0D><0A>
Rxd 1:{08:57:31.185} 0100 -- -- --- 00000 0000 0000 0000 <0D><0A>
Rxd 1:{08:57:37.444} 0100 -- -- --- 00000 0000 0000 0000 <0D><0A>

10kW in transmit:

ACP: 4096 pulses/ min.
HLtime: 2.26sec./rev.
Tunevoltage: 11.667V

Rxd 1:{08:59:15.786} 1110 01852 4096 0226 11667 2839 0000 0000 <0D><0A>
Rxd 1:{08:59:18.610} 1110 01855 4096 0226 11667 3029 0000 0000 <0D><0A>
Rxd 1:{08:59:21.434} 1110 01855 4096 0226 11667 3078 0000 0000 <0D><0A>
Rxd 1:{08:59:24.278} 1110 01860 4096 0226 11667 3113 0000 0000 <0D><0A>
Rxd 1:{08:59:27.112} 1110 01860 4096 0226 11667 3308 0000 0000 <0D><0A>
Rxd 1:{08:59:29.956} 1110 01863 4096 0227 11667 3376 0000 0000 <0D><0A>

For troubleshooting, the data stream needs to be recorded for a few seconds/ minutes and either analysed at once or sent to RAN via e- mail for evaluation.

3 SETUP, TEST AND CALIBRATION

It is recommended to follow the procurement sequences.

It is recommended to note adjusted values in the Installation Protocol (see annex).
Follow the items shown as configuration points ***CP***....
in this chapter.

For doing this SETUP procedure you have to use

- a USB keyboard (alternative On Screen Keyboard OSK)
- a USB memory stick
- PS 2 mouse

*) the USB port built–in depents from the Console Type

Figure: 3–1 NSC

3.1 SYSTEM SETUP AND TEST

1. **TRANSCEIVER**	Setting to define the transceivers and displays of the equipment.	chapter 3.3.2
2. **VIDEO SET/ TEST**	Signal trigger true bearing and true distance (see also Video Levels a.m.)	chapter 3.4.4
3. **USER PREF.**	Setting of: Pulse with Heading line Curved Heading line Arpa Configuration CRP Adjustment of Transceivers: – Antenna high – Pedestal fwd/aft pos. – Pedestal port/stbd pos. – Transmission line length – Zero range – Antenna Azimuth Offset – Tuning preset – Noise Preset – Video Level – Sector Blanking	chapter 3.6.1 chapter 3.3.2 chapter 3.4.5 and chapter 3.4.3 chapter 3.4.5.1 chapter 3.4.5.2 chapter 3.4.5.3 chapter 3.4.5.4 chapter 3.4.4 chapter 3.4.5.5
4. **COM–PORTS**	Setting of data for all COM ports	chapter 3.7.1
5. **DEFAULT/ TEST/SAVE**	Includes: Installation test Factory test Extended tools (BITE)	actually not imple-mented chapter 3.9.1
6. **ETHERNET**	Setting of dataformat for the ETHERNET interface	chapter 3.8.1

3.2 START OF SYSTEM SETUP AND TEST

The service installation and setup menu is found in the STANDBY (***step*** 1) condition – SERV.

For Testing the menus can be used in any order .

For Installation, at new building or adding new transceivers, **follow the chapter 3.3.2.**

A keyboard is connected at the USB connector to enable entering LABEL data. For software E0010 and later, a USB keyboard is not necessary, an on screen keyboard (OSK) will appear.

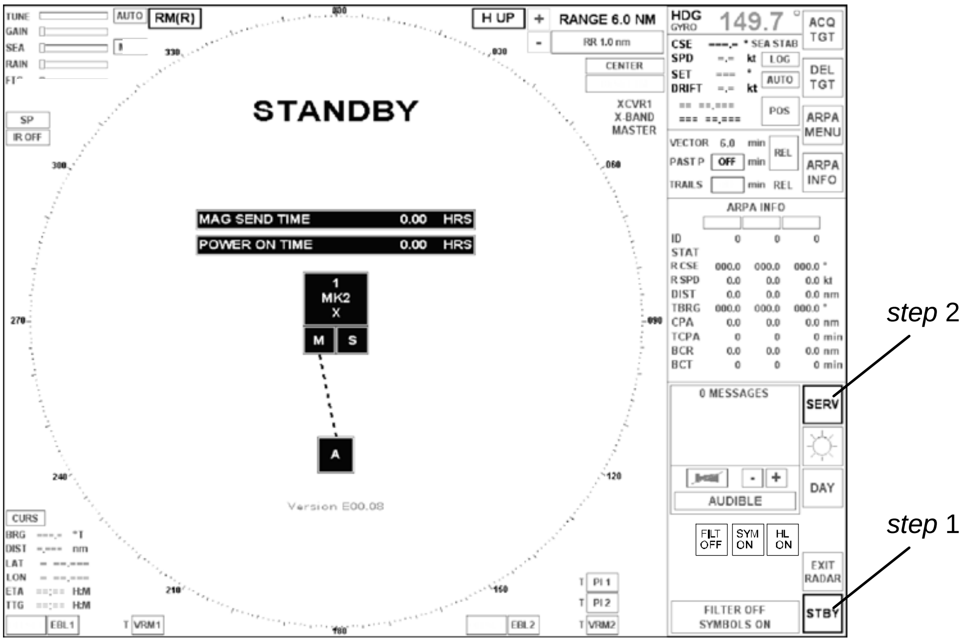


Figure: 3‑2 Start of Installation Setup

Setup menu can be selected by activating “SERV” (***step*** 2), see Figure: 3‑2

After Selecting “SERV” below mentioned Software–module has to be activated by a doubleclick (Figure: 3–3 ***step*** 1).

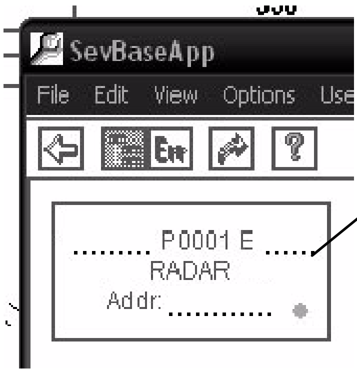


Figure: 3–3 Software module for Setup procedure

After selection of the Software–module the respective program has to be selected and started (Figure: 3–4 ***step*** 2).

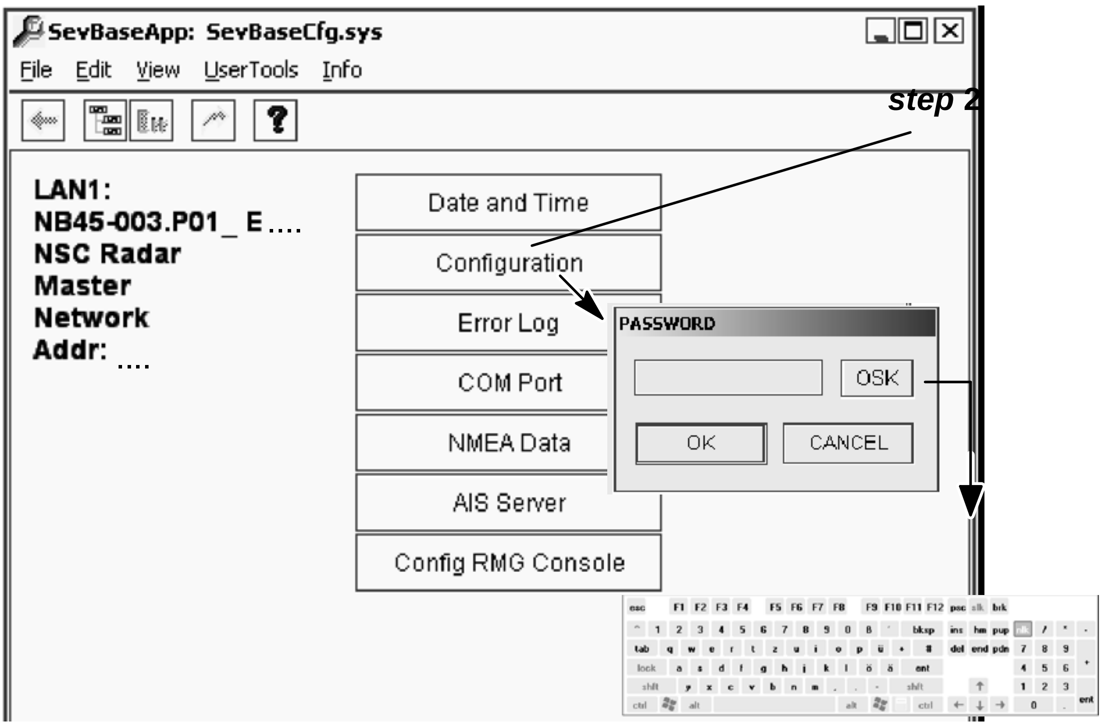


Figure: 3–4 Start program for Setup procedure

- **Date and Time**
  This is normally always U.T.C.. User can also change it at the Radar Start Menu.

- **Configuration** – *PASSWORD* protected – *)
  This is for Radar SETUP (Figure: 3–4), Oscilloscope function and some Built in Testing.
  *) please contact our Raytheon Service Station

- **Error Log**
  This is to save an ERROR RECORD to USB memory to send to Raytheon or your Agent or to the Radar Store to receive later.

- **COM Port** (chapter 3.12)
  Port Viewer tests all data coming into the computer before Raytheon software tries to use it. In workshop testing, connect loopback cables from out puts to inputs to use RUN.

- **NMEA Data**
  This can be used to check real data inputs as seen by Raytheon Systems from Sensors.

- **AIS Server**
  AIS data can be used over a Network cable from ECDIS, or by direct input to an COM Port. Normally use the RADAR CONFIGURATION menu.
  This menu does the same function and is not necessary except for later testing.

- **Config RMG Console** (used for Multifunction System only)
  Special *Multifunction System* configuration for enabling a SYSTEM MESSAGE OUTPUT and for configuration the NMEA ROUTE Telegram.

3.3 THE CONFIGURATION MENU

3.3.1 General Information

This configuration menu is used for both NSC types (NSC 25 / 34).
The following Figure: 3-5 gives an overview to handle this menu.

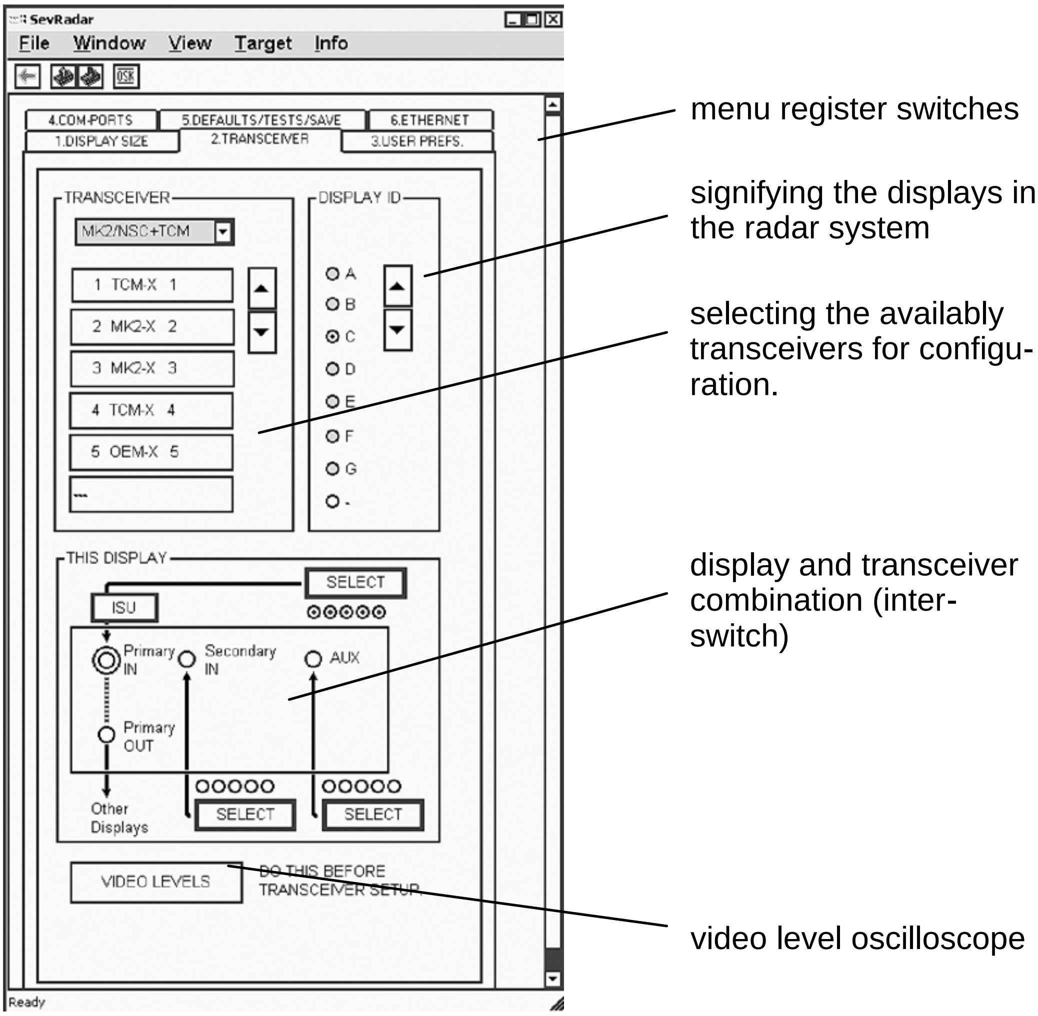


Figure: 3-5 Configuration Menu

3.3.2 Before starting the Configuration

PROJECT DIAGRAM (chapter 3.4.1)
It is necessary to know the Transceiver (XCVR1, 2, 3, 4, 5, 6) and Display (A, B, C, D, E, F) connections. Consult the project diagrams, confirm which transceivers (XCVR) are MK2 25kW/30kW and which transceiver (NSC) 10kW pedestal are TCU controlled. The system is completely flexible. Change or modification to the plan is always possible and can be done now.

Transceiver Control Unit TCU
A TCU interfaces a NSC 10kW transceiver into a combined radar system (Mk2 25kW/30kW and NSC 10kW).

NSC 25 / 34
NSC25 or 34 can have two TCUs connected to Primary IN and Secondary IN. A third is possible using AUX. input (special order computer from factory).

Integrated Interswitch
The Integrated Interswitch is used to route the downlink and uplink (XCVR control signals) between all of maximal 3 XCVRs (MTRs) and maximal 3 Displays in the interswitch system. The advantage of Interswitch is “cross–over” function when one display or monitor is defective or being serviced.
The maximal XCVR combination facilities are 2MK2 XCVRs and 1 NSC 10kW transceiver.

Interswitch Unit ISU (option)
The function of the interswitch (ISU) is to route the downlink and uplink (XCVR control signals) between all of maximal 6 XCVRs (MTRs) and maximal 8 Displays in the interswitch system. The advantage of ISU is “cross–over” function when one display or monitor is defective or being serviced.

SETUP
It is necessary to set the complete ship system in this Installation menu at this display and again at each other display.
There is no exchange of interface information over network.
NSC25 (10kW) or NSC34 (10kW) use Transceiver Control Units (TCUs).

To set the configuration follow the items shown as configuration points ***CP ...*** .

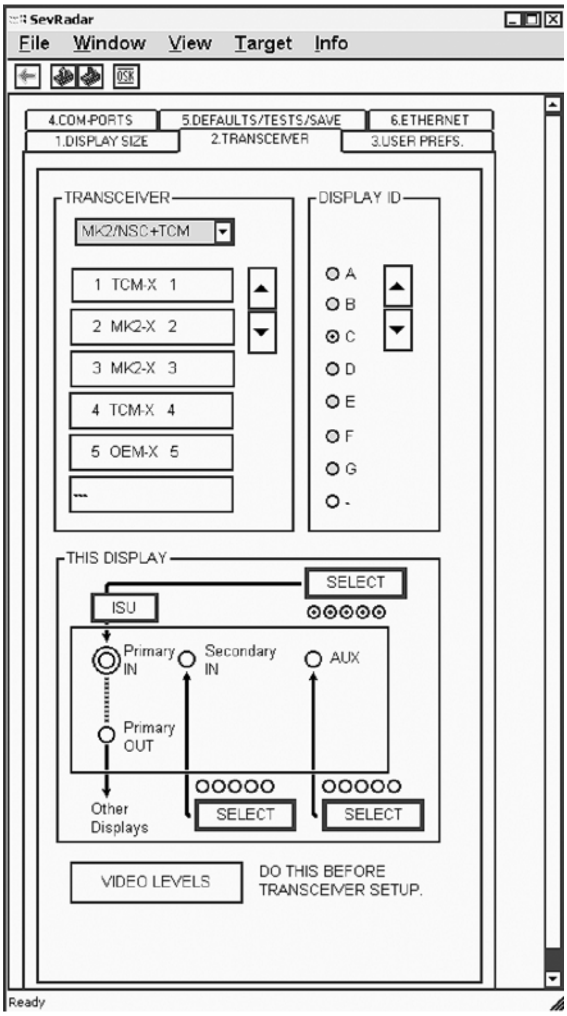


Figure: 3-6 **Configuration Step One – Transceiver –** (basic menu for system configuration)

3.4 CONFIGURATION

3.4.1 Project Planning (Info and Examples)

The type of radar to be installed depends on customer requirements. NSC is very flexible. Visibility is the first priority, and will determine where and what masts are necessary. When radiation safety is critical, the NSC can set Blank Sectors for any Scanner where no transmissions occur.

NOTE

NSC25 and 34 can take two TCU inputs as standard.

In principle, with workshop work, all displays can each be replugged to take 3 10kW transceiver (three TCUs for the NSC25 and 34), however this should be ordered specially from factory or can only be done by fully trained Raytheon Service Personnel.

Example One

The system has two radars. Using Integrated Interswitch, any display can control or view any scanner. Up to three Uplink/Downlink (2 MK2 and 1 NSC) scanner types can be connected.

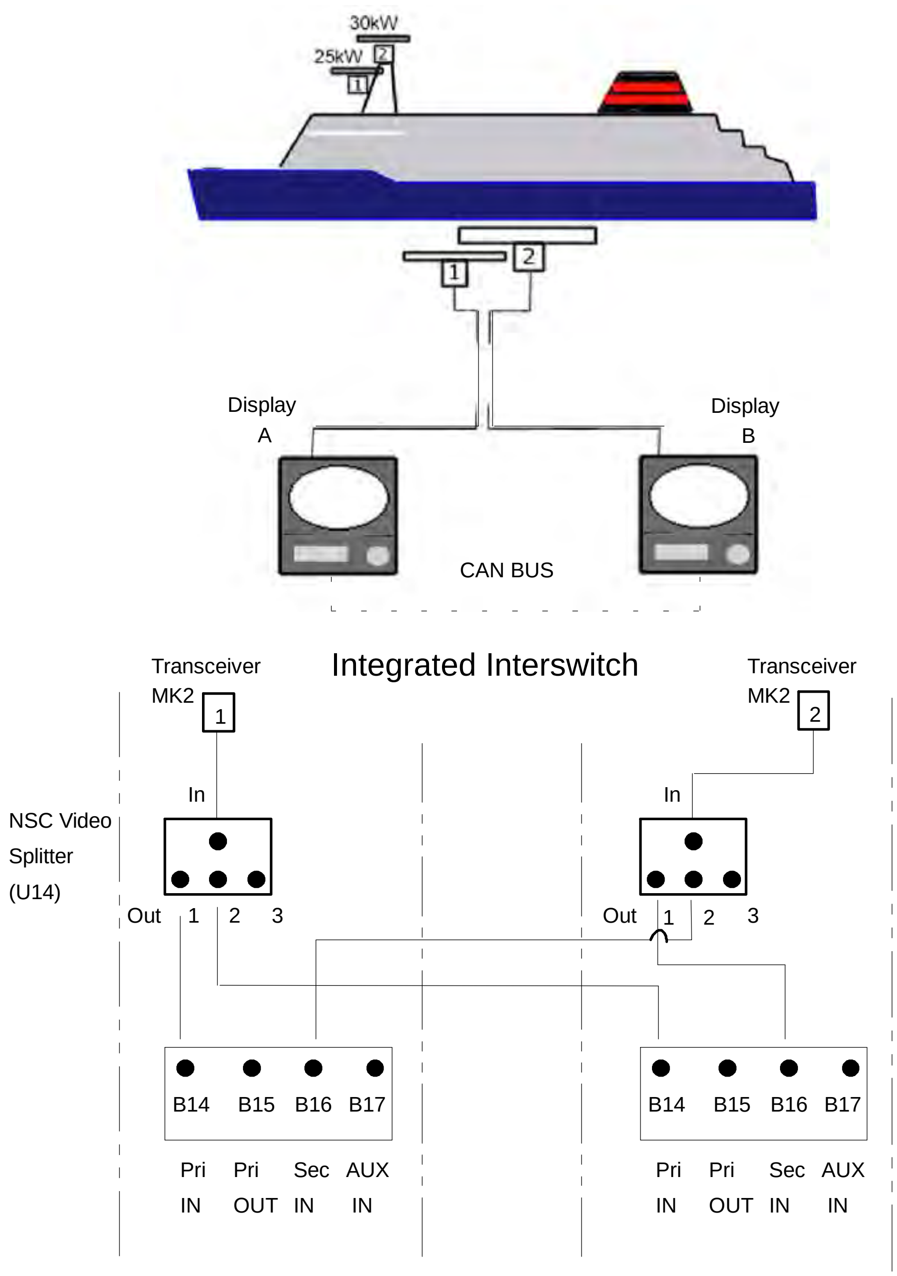


Figure: 3-7   Passenger Ferry with 2 Radar

Example Two

The system has three radars. Using Integrated Interswitch, any display can control or view any scanner. Up to three Uplink/Downlink scanner types can be connected.

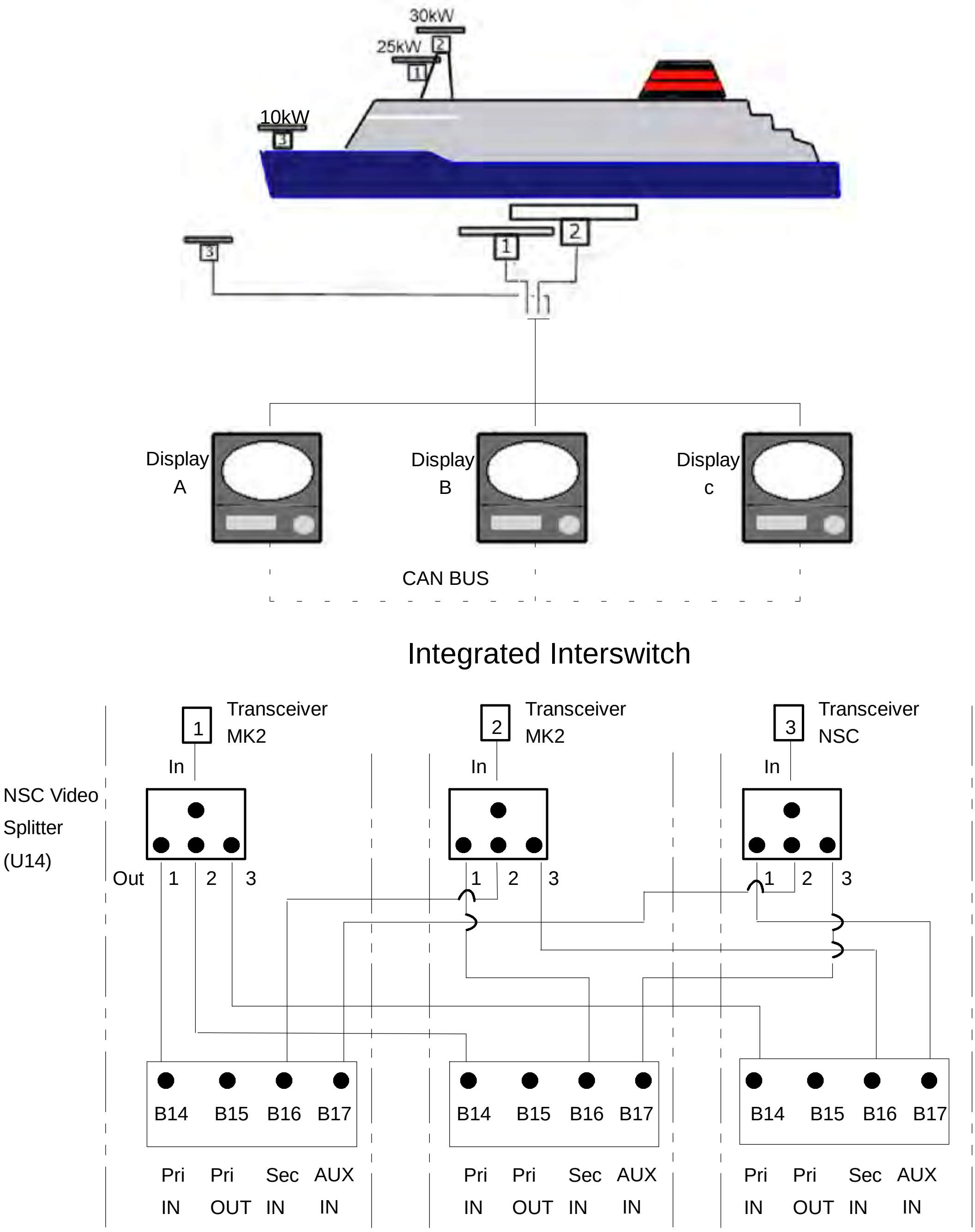


Figure: 3–8 Passenger Ferry with 3 Radars

Example Three

The system has four radars but only two displays. Using ISU, any display can control or view any scanner. If ISU power fails, it switches direct through ”fail safe”. Then A will control scanner 1, and B control scanner 2 only. Scanners 3 and 4 will not operate until power is restored to the ISU.

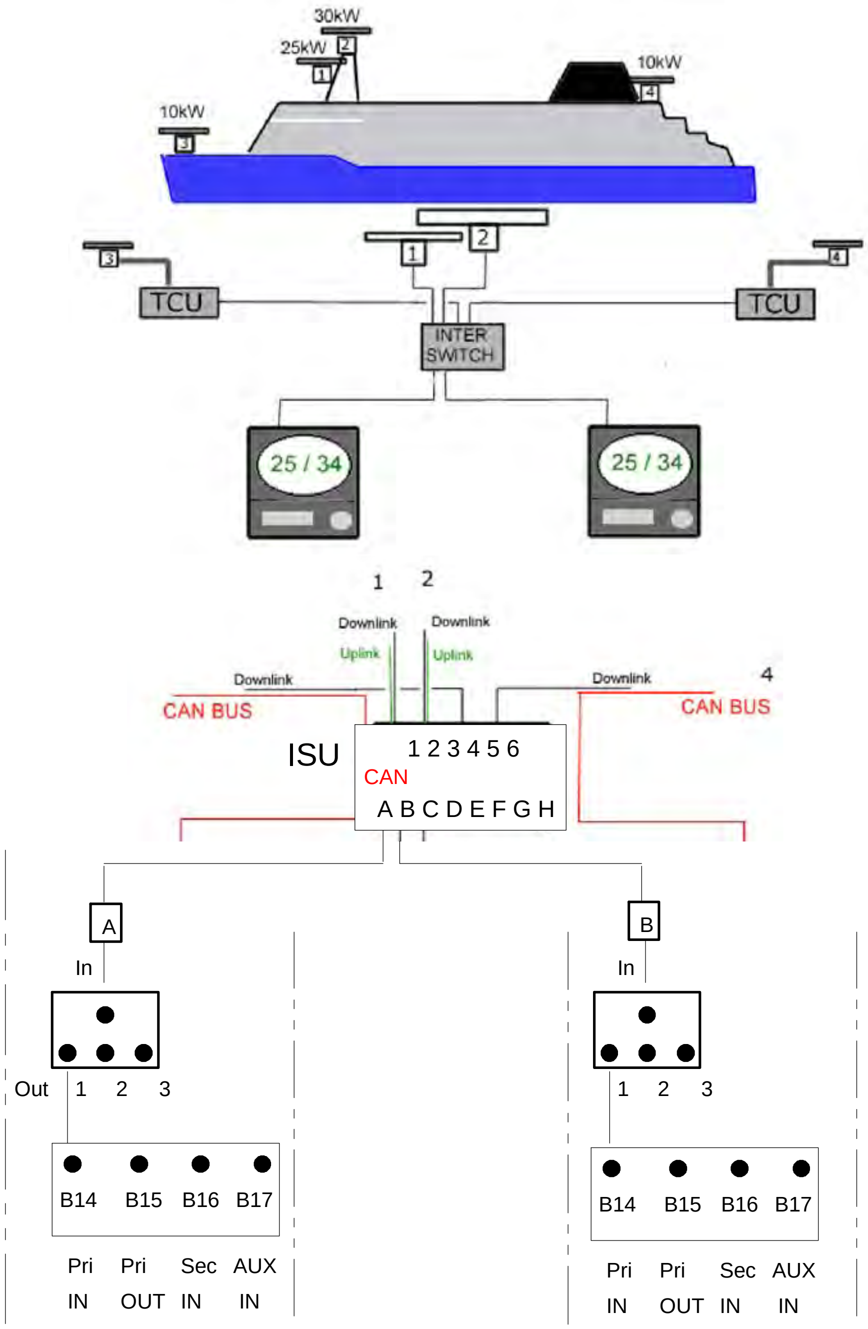


Figure: 3–9 Passenger Ferry with 4 Radars

3.4.2 Using Interswitch in the System

- **General information using the Configuration Menu**

Refer to Figure: 3–10

CP 1.

In this example, there are XCVRs set using the down arrow key, and two displays on the vessel.

CP 2.

The button for A has been selected to name this display as A.

CP 3.

The XCVR count for This Display increases automatically in the connection diagram. Initial is all XCVRs connected to Primary IN.

CP 4.

In this example XCVR 1, 2, 3, 4 and the ISU are selected.

CP 5.

The interswitch unit is connected to PRIMARY IN.

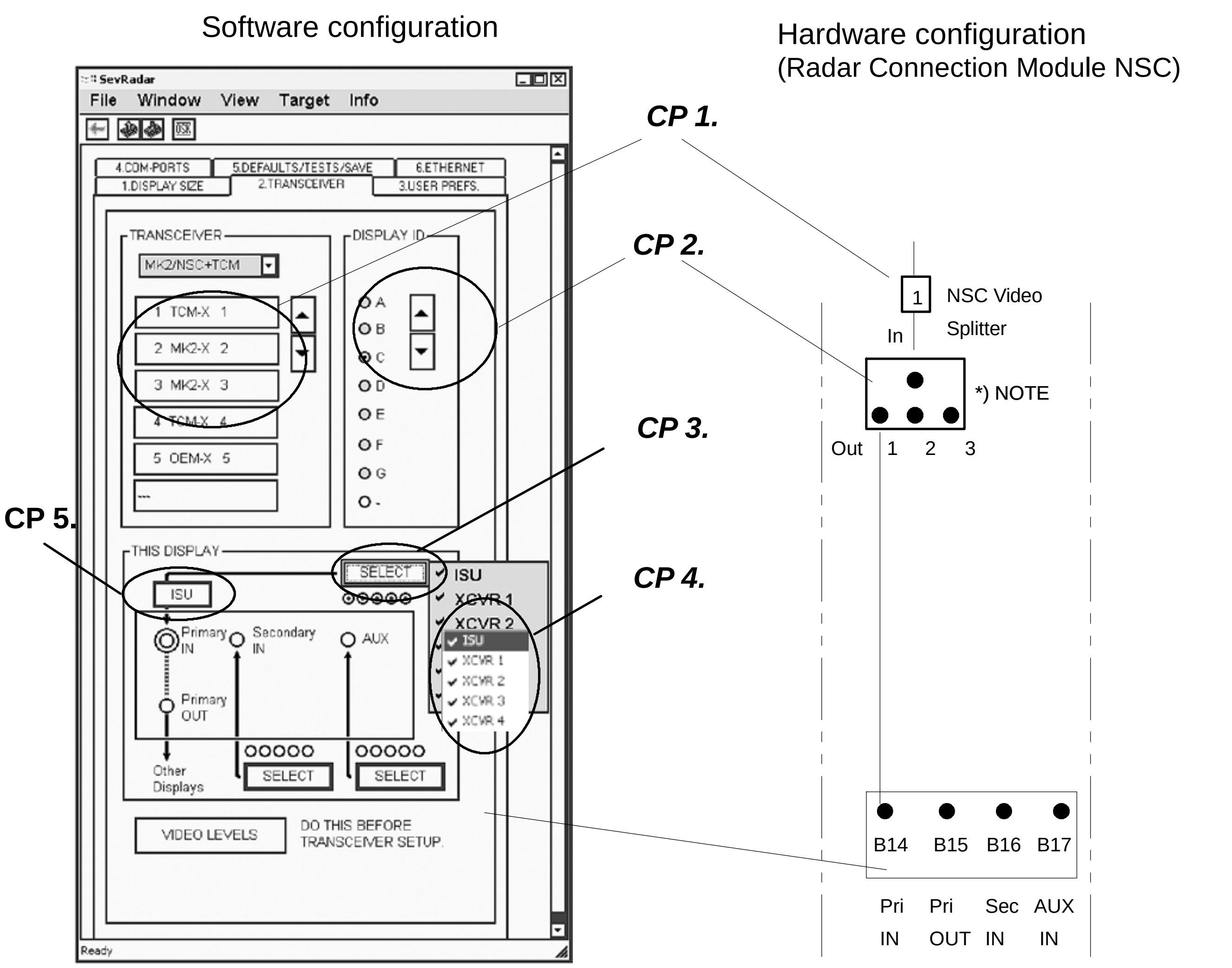


Figure: 3-10 Display A

> **NOTE** for NSC Video Splitter
>
> See Assembly Drawing with Configuration (900-020.HP016).
>
> Connected or not connected data links (OUT 1, 2 , 3) has to be configurated per jumper, see schedule JUMPER PANELS.

3.4.2.1 Interswitch Unit

Please look at Project Diagrams when an Interswitch Unit (ISU) is installed it is normal to connect to **PRIMARY IN** on all displays.

However Secondary IN can be used for ISU connection, its a free decision.

All displays using ISU can taken additional MK2 (Slave) or TCU (Master) signals on spare ports.

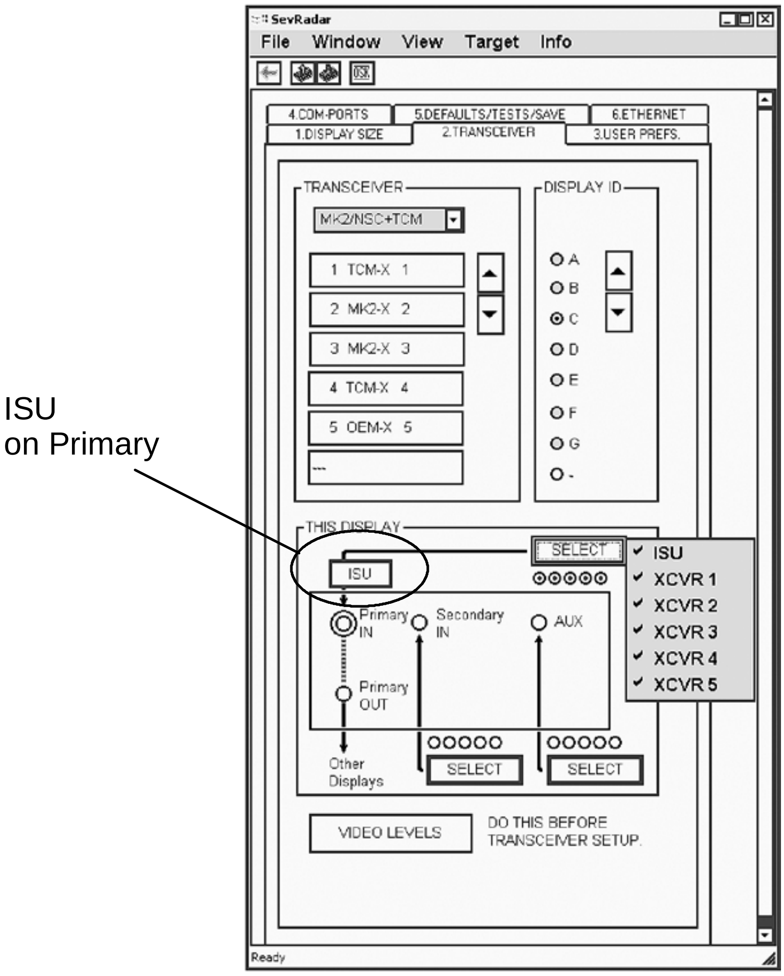


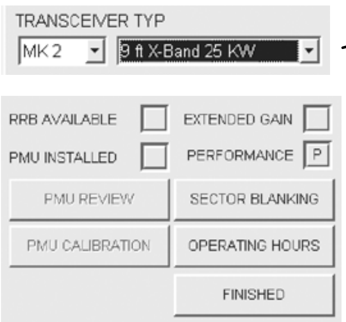
Figure: 3–11 Example with Interswitch Unit

3.4.3 Transceiver Types

> **NOTE**
> MAKE A RESTART OF RADAR. CLOSE SERV MENU AND SELECT "EXIT RADAR". RESTART THE RADAR NOW BEFORE CONTINUE THIS CHAPTER:

These details have to be entered at each display on the bridge.
There is no transfer of details from one display to the other by network.
In this case the NSC system can be connected to different Transceiver Types with different settings in the configuration menu.

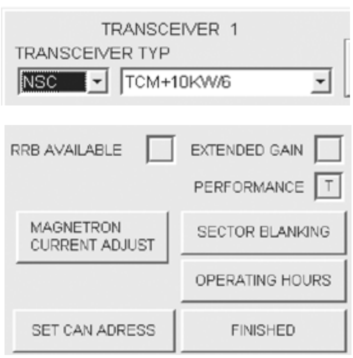
MK2 Transceiver



NOTE
for 8ft. LPR-A25 X-Band antenna select
7ft X-Band 25 KW

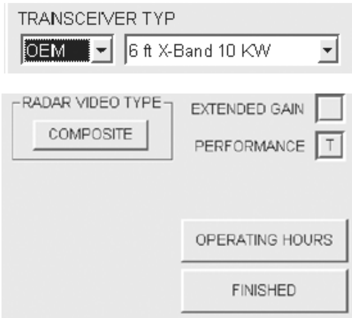
RRB ≥ Radar Radio Beacon
PMU ≥ Installed ?
EXTENDED GAIN (not used)
PERFORMANCE ≥ **P** (default)

NSC Transceiver



RRB ≥ Radar Radio Beacon
EXTENDED GAIN (not used)
PERFORMANCE ≥ **T** (default)
MAGNETRON CURRENT
ADJUST ≥ Pedestal motor STOPS
TRANSMITTING is possible

OEM Transceiver



Special customer request
COMPOSITE ≥ for Downlink complete
SEPARATE ≥ Trigger,Video,Heading are separate interfaced to the Interface PCB
AUTO ≥ not used

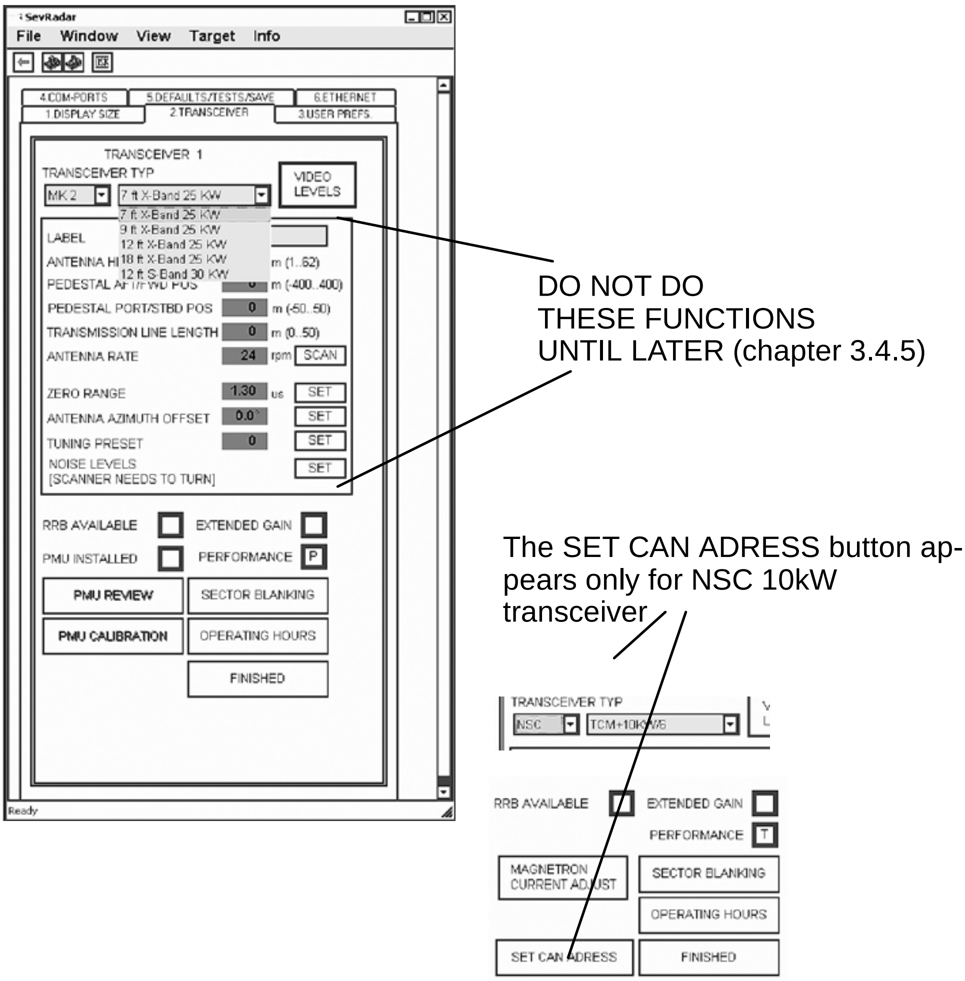


Figure: 3–12 Example ***CP 6.***

CP 6.

First the TRANSCEIVER TYPE is selected and a label entered if desired, but this is optional. In this example (Figure: 3–12), a Mk2 pedestal.

IF USING ONLY MK2 PEDESTALS, GO NOW TO CHAPTER 3.4.4.

IF USING TCM OR TCU TO CONNECT 10kW PEDESTALS CONTINUE HERE.

All TCM delivered from the factory are ready for connection as XCVR1 when in-side TCU.

It is necessary to “program” the extra TCMs or TCUs as 2 or 3 or 4 or 5 or 6 onboard the ship.

This program function is using the red SET button (Figure: 3–12) and sends a command from this display, using CAN BUS to external TCU (NSC25/34).

All TCM and all TCU **are listening** for this command at all times. Any display can be used as a tool to program any TCM or TCU because all are connected by CAN BUS.

CP 7.

Therefore before pressing SET it is necessary to have only one Display and one TCM/TCU with power.
All other equipment must be powered OFF.
The CAN BUS must be connected in full, and terminated.

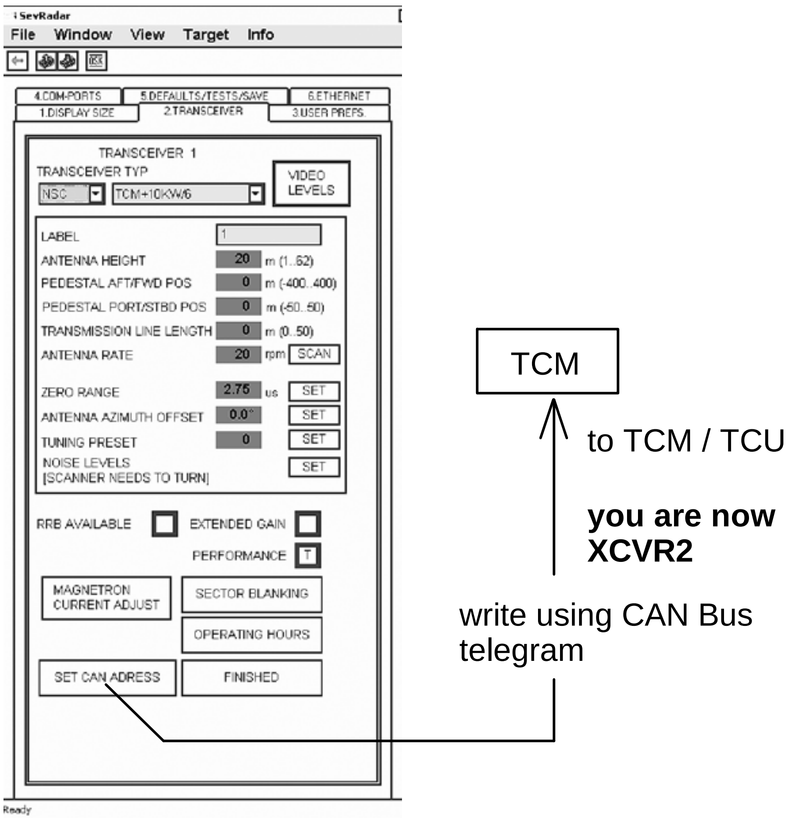


Figure: 3-13 Example ***CP 8.***

CP 8.

This example (Figure: 3-13), the local TCM or powered TCU is being programmed as XCVR2. The label is optional and the choice of the Master of the Vessel can be decided later.

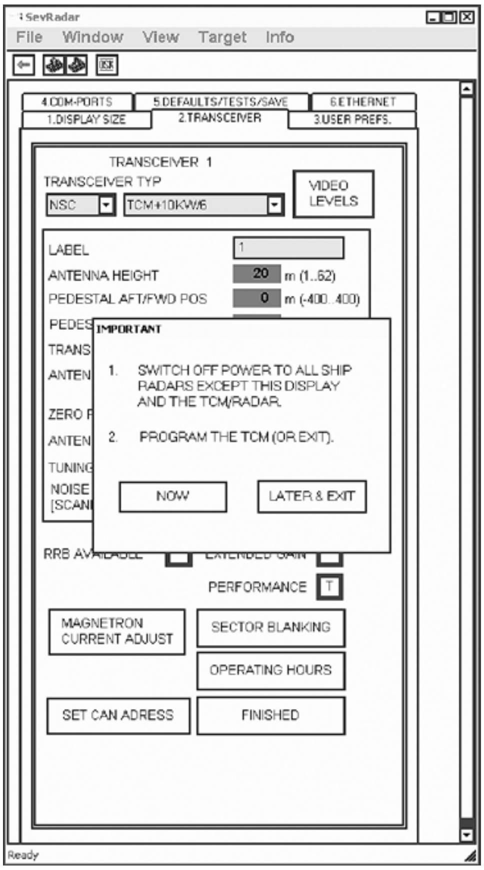


Figure: 3–14 Example ***CP 9.***

CP 9.

In this example, the local TCM or powered TCU is being programmed as XCVR2. The label is optional and the choice of the Master of the Vessel can be decided later.

For example:
Display B (any NSC) can be used to program a
TCU for identification as TCU/XCVR4.
When all TCM and TCU have been permanently programmed, it is possible to switch power on to all equipment at the same time on the ship. If SET is accidentally pressed again, while power is applied, then all TCM and TCU will receive the same number. The programming procedure will have to be repeated.

CP 10.

Now select FINISHED, select EXIT RADAR.

Make a new start.

> **NOTE**
>
> When an NSC 10kW transceiver TCU has been programmed, it is not necessary to program that XCVR TCU again from any other display. When programming other TCU XCVRs later, that XCVR MUST be switched OFF by removing power.

3.4.4 Video Levels

All below mentioned settings and adjustments have to be performed for each transceiver at each display. It is to recommend to note the settings.

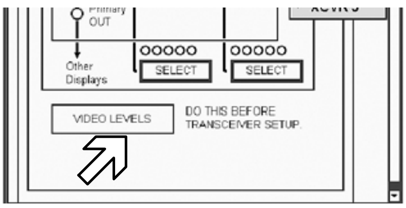
CP 11.

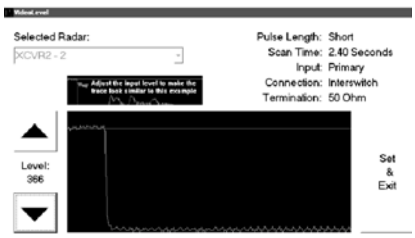
Before doing this, the display must be restarted CLOSE SERV TOOL. SELECT “EXIT RADAR” and choose RADAR RUN.

> **NOTE**
>
> If there is no signal trigger, the level has to be set to “400”.
> After that the level adjustment can be set to the yellow line (as shown in Figure: 3–16).

Before doing the zero range or noise level, it is necessary to have the correct trigger level on the XCVR selected.

There are two possibilities (a, b) to find the optimal adjustments. We suggest the second possibility because it is more comfortable to do the adjustments for several XCVRs. In this case the NSC software doesn’t reboot between the adjustments.





Step 1

press the soft button for selecting the VIDEO LEVELS

Figure: 3–15 Example a) (***CP 11.***)

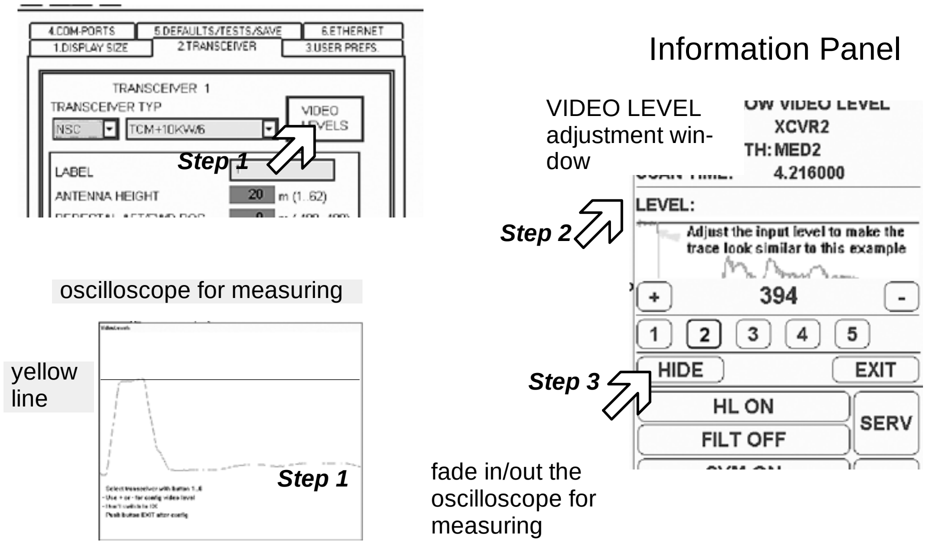


Figure: 3–16 Example b) (***CP 11.***)

The function is an oscilloscope for measuring the level of the signal from the XCVR that you are working with now. The tool will already know which port to measure from the information already entered at ***CP 6.*** to ***CP 12.*** repeated for a different transceiver.
Use the + and – keys to set the trigger level to the yellow line (as shown in Figure: 3–16).

NOTE

The **Primary IN** Port level can also be viewed at Primary Output using an oscilloscope instead of this tool. The trigger level at yellow line is equivalent to 5V trigger level (terminated 50 Ohm), or 10V unterminated.

It is possible to continue with the full setup for this radar, (***CP 13***) onwards, or repeat (***CP 6.***) to (***CP 12.***) for each XCVR. This choice may depend on shipyard work and which pedestals have power and can rotate.

When EXIT has been pressed, the measurement has been saved for this display for that XCVR only. The main radar will restart so that another different port can be calibrated.

3.4.5 Mk2 pedestals under use

Find the Common Reference Point of the ship for ECDIS or autopilot (chapter 3.6.1).
If there is no CRP, then it is normal to choose a central point on the bridge, for example steering position.

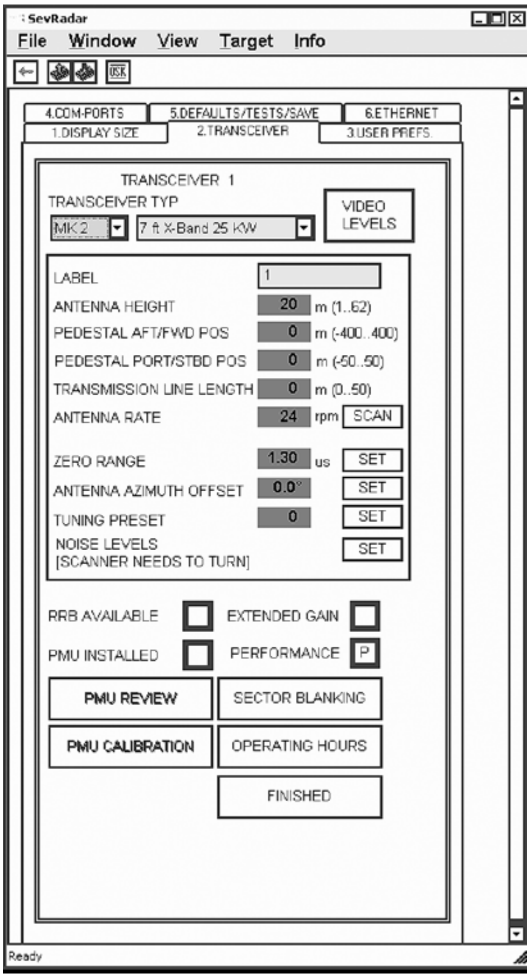


Figure: 3–17 Example ***CP 12.*** and ***CP 13.***

CP	Designation	Comment
CP 12.	ANTENNA HEIGHT	can be set by click and slide – is height above sea level.
	PEDESTAL FWD/AFT POS	+ = forward of the Common Reference Point (often this is chosen as the steering position on ship center lines see chapter 3.6.1).
	PEDESTAL PORT/STBD POS	+ = starboard of the Common Reference Point.
	TRANSMISSION LINE LENGTH	length of waveguide used if XCVR is MTR DOWN. All 10kW and MTR UP = 0.
	ANTENNA RATE / SCAN ⚠ **VERY IMPORTANT FOR CORRECT ARPA FUNCTION.** 50Hz antenna rate is 24 rpm 60Hz antenna rate is 28 rpm HSC antenna rate is 40 rpm (HSC High Speed Craft)	is the normal speed in light winds. This is different for 50/60Hz power and different for 10kW pedestals. Can be set by trackball using a stopwatch, or the SCAN feature. This reference speed is used to detect if the belt or encoder slips to make ANTENNA ALARMs.
	ZERO RANGE	Adjustment of displayed distance versus true distance.
	ANTENNA AZIMUTH OFFSET	Adjustment of displayed bearing versus actual bearing.
	TUNING PRESET	This setting is essential for NSC–Radar. Is has to be performed in 4 occasions: 1 First installation 2 Magnetron change 3 Receiver change 4 Control board change By this the tuning point is set to the middle of the display.

CP	**Designation**	**Comment**
CP 13.	NOISE PRESET **VERY IMPORTANT MUST BE DONE AFTER VIDEO LEVELS FINISHED**	This is to adjust the gain in that manner, that also small radar contacts are displayed but not the dots caused by radar noise.
	PMU INSTALLED	For MK2 XCVR only.
	EXTENDED GAIN	Normally OFF.
	RRB AVAILABLE	This is used only for warships and rescue craft which have an receiver connected to display helicopter transponder.
	PMU	ON for MK2. OFF for 10kW TCM/TCU (manual, external PMU).
	SECTOR BLANKING	This is to set sectors in which no Radar transmission sectors is sent out. Value 0.0 is not accepted for 10kW (do not start a blank sector on ship’s head).

3.4.5.1 Zero Range

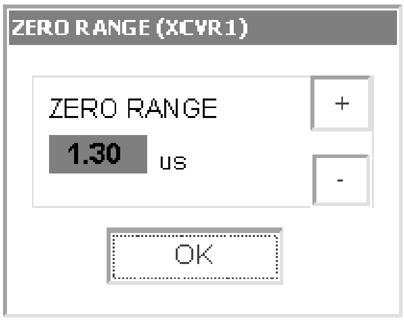


Figure: 3–18 Example ZERO RANGE

> **NOTE**
> It is to recommend to switch to “max 3Nm” range scale.

CP 14.

ZERO RANGE – can be copied from another display where this data is already measured for this transceiver. Or press SET.

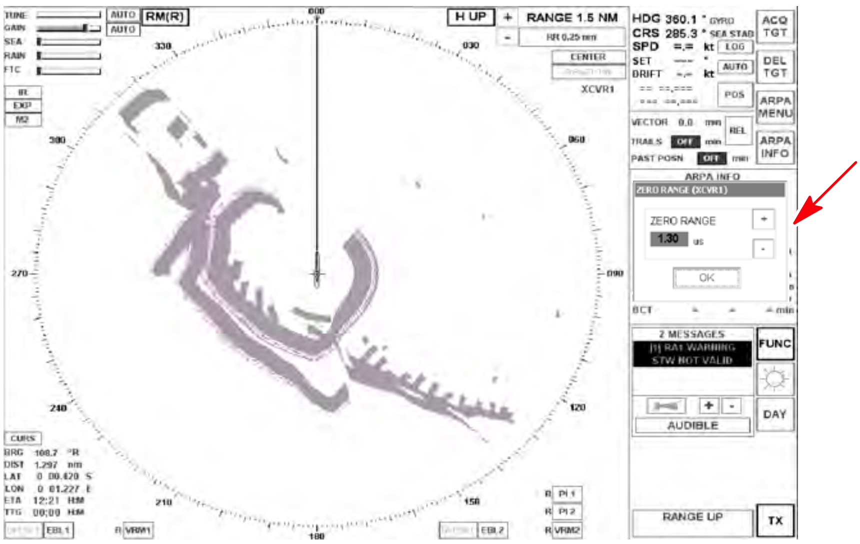


Figure: 3–19 Example ***CP 14.***

Refer to Figure: 3–19
The XCVR is selected, the STDBY button is pressed to change status to TX.
The zero range is false. The Bank to starboard is not straight as it should be compared to charts or visual. The Bank can be pulled to correct shape.

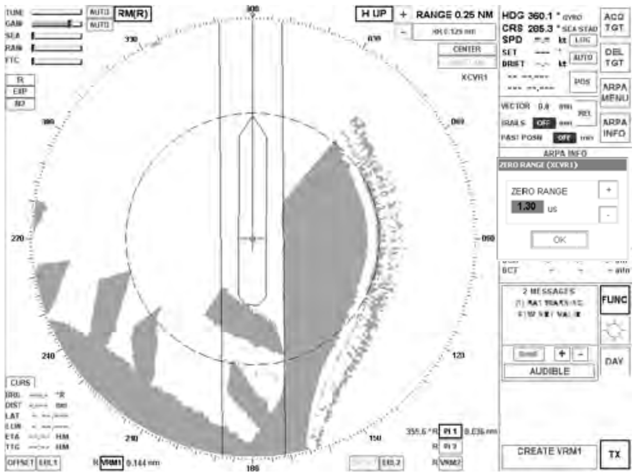


Figure: 3–20 Example ***CP 14.*****,** continued

Refer to Figure: 3–20
The Range Scale can be reduced, Parallel Index lines are useful tools to make straight edges.

VRM can be used to measure and make a particular range.
The picture is correct when the Bank is not pulled, when it is straight.
Record this zero range to enter into the Transceiver Page on other displays concerning this XCVR.

> **NOTE**
>
> After Zero Range has been set, if radar presentation on ECDIS is not correct in range, investigate the Common Reference Point settings for radar and for position sensors GPS1,2 etc. <u>in ECDIS</u>.
> If a scan converter (radar underlay) on ECDIS is not correct, check the setup menus <u>at ECDIS</u>.

3.4.5.2 Antenna Azimuth Offset

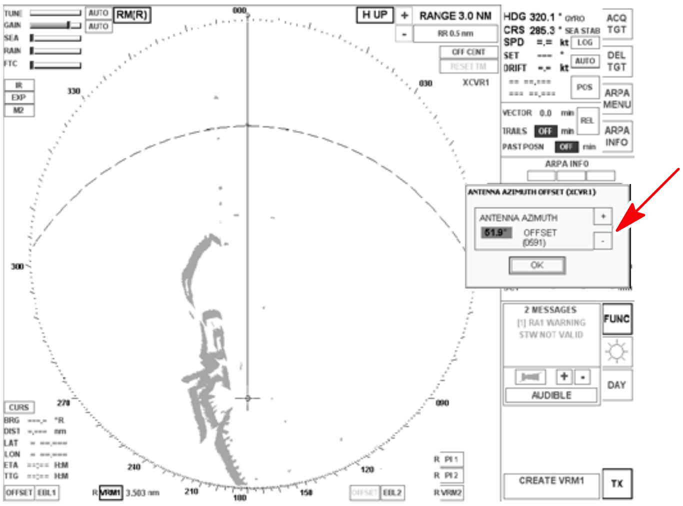


Figure: 3-21 Example ***CP 15.***

CP 15.

AZIMUTH OFFSET can be used from another display where this data is already measured for same transceiver. Or press SET.

BEST METHOD

Refer to Figure: 3-21

The XCVR is selected, the TX button is pressed to change status to TX. HUP is selected. Offcentre.

The best target is something floating in the same stream of water, 3 miles from own ship. For example a tug.

This cancels the effect of drift, when we are in the same tidal stream, and makes alignment easier.

The tug can be controlled by radio to move to own ship head.

This is easier than trying to steam toward the tug.

SECOND METHOD

If no target can be controlled, or no target is on ship head, or own ship cannot manoeuvre, or own ship is yawing; it will be possible to use North Up mode later.

For using North Up mode, the COMPORTS menu 4 is used to enable Gyro data.

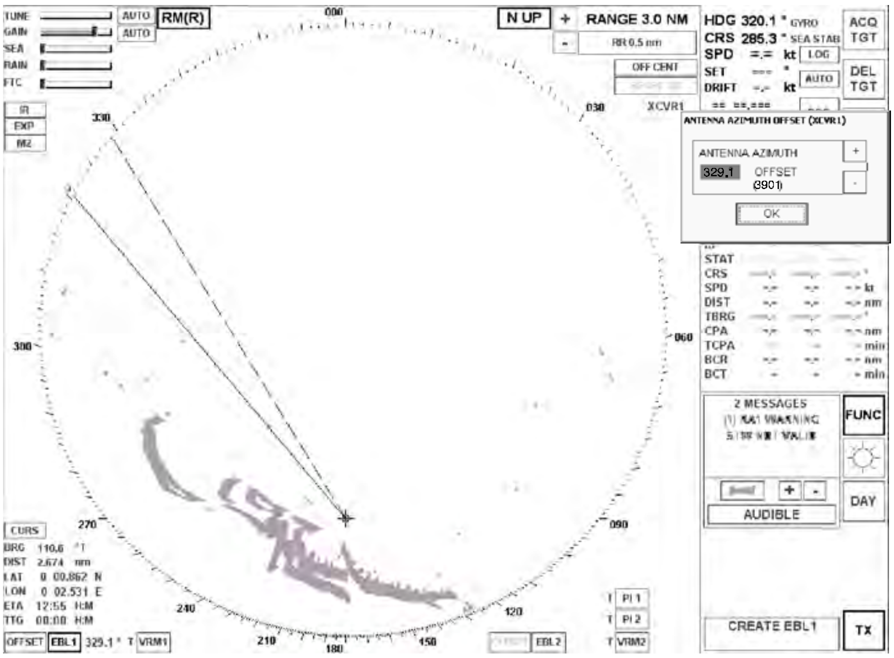


Figure: 3‑22   Example ***CP 15.***, continued

Refer to Figure: 3‑22

An azimuth pylorus, or camera is used, with the same gyro as the radar display. In this example a target is found at 329.1 degrees.

On the radar EBL1 is used to set 329.1 degrees, NUP set.

Azimuth Offset is adjusted until the video echo moves correctly to that bearing 329.1 degrees.

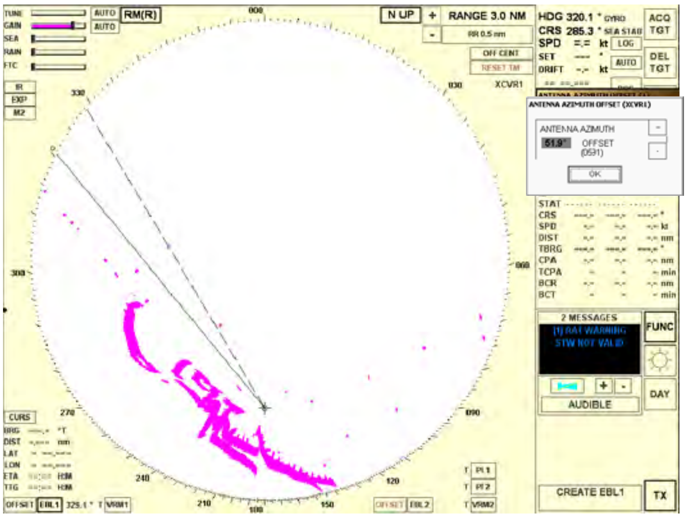


Figure: 3–23   Example ***CP 15.***, continued

NOTE

This adjustment using North Up will be unaffected when own ship is yawing or sea state is rough. The azimuth pylorus readout can discriminate to 0.25 degrees with an experienced user. Ask the Master for assistance to do this measurement well. Using gyro, because of Latitude, temperature, speed, there is always absolute error at pylorus and radar but it is the same error. Therefore the method is possible but not as good as. BEST METHOD HEAD UP (HUP).

NO METHOD

Never use a Chart with this NUP method to measure an angle from own ship position. Using Chart readouts, the absolute error of the gyro will affect the radar as usual. Comparison is not possible with true chart information which has no error. Never use an ECDIS Radar overlay.

Never use a Chart underlay for Azimuth Offset adjustment in any mode. All radar + chart presentations are affected by absolute gyro errors. The radar is not at fault, the radar azimuth offset cannot be done using those systems.

Never use AIS target comparison.
Azimuth Offset is complete using raw video and visual targets on ship head or using pylorus. Later, if radar presentation on ECDIS or Chart Underlay is not correct, investigate the Gyro. Latitude and Speed correction, the condition of the gyro and consider service may be necessary for the Gyro. If gyro quality cannot be improved, the ECDIS program may have Gyro correction input for the user.

3.4.5.3 Tuning Preset

CP 16.

The radar switches to tune setup. The control of the tune bar is blocked and only possible by “+” or “–” softbutton.

- Typical values for 10kW are **80 ...... 150.**
- Typical values for MK2 is **127.**

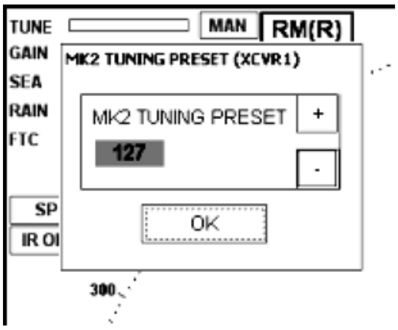


Figure: 3–24 Tuning Preset

> **NOTE**
>
> Be careful to ignore smaller tune points in the range **0 ..... 50**.

3.4.5.4 Noise Levels

CP 17.

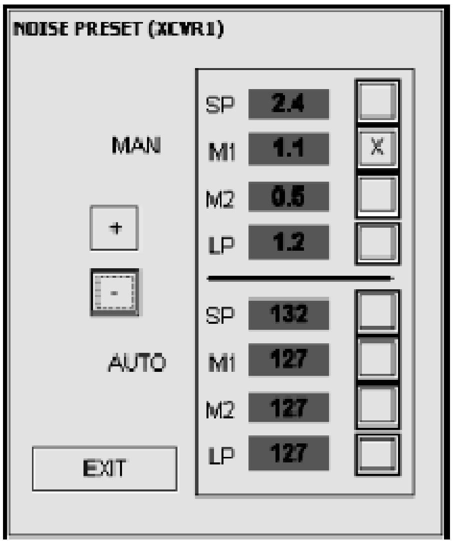


Figure: 3‑25 Example to adjust Noise Preset

Noise Preset is done for MAN and AUTO anti‑clutter modes.
The radar should be Master (M) of XCVR. It switches automatically to 24Nm and required pulse lengths.

Figure: 3‑26

NOTE
The scanner will turn!

3.4.5.5 Sector Blanking

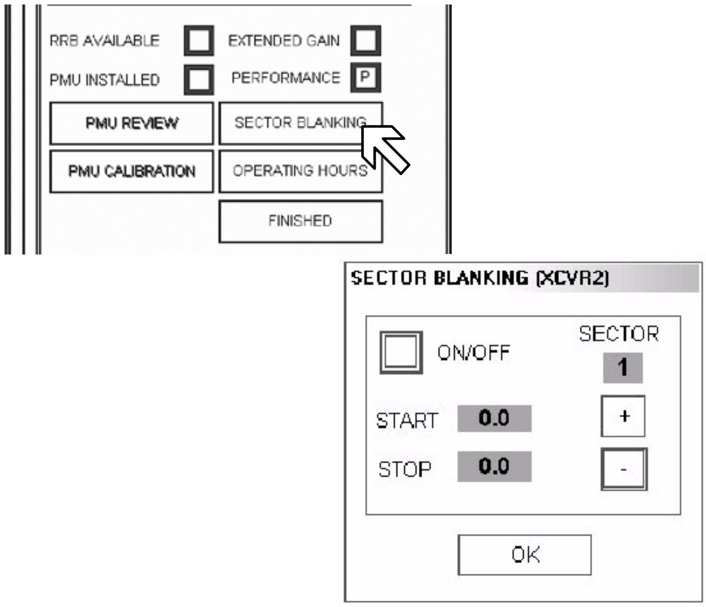


Figure: 3‑27 Example to adjust Sector Blanking

CP 18.

SECTOR BLANKING is used to stop transmission only on certain sectors.
This can be for safety for passenger areas on some vessels.
This can be necessary because reflections from mast structures make false indications.
After sectors have been done, a sheet must be given to the the Master and in this book for each XCVR (see sector diagram for echo reflection in the annex).
The Operator will be able to switch all ON or OFF in normal use, but not able to modify the sectors.
(The radar will start up for the user with sectors blanked).

The blank sectors for each XCVR are best copied into each display for each XCVR.
However, they are stored permanently in the XCVR itself or its TCM.

The displays SERV menus are used as editors for those sectors stored in the pedestal or TCM/TCU.

3.4.5.6 PMU Calibration

Take care, while performing the PMU calibration, you have to work in the Transmit Mode (TX), that means:

- the Antenna is rotating
- the transceiver is active – microwave radiation –

ATTENTION

Exercise care when approaching a rotating antenna. Also, make sure that nothing or no one is near the antenna when turning on the radar power supply.

MICROWAVE RADIATION

A short exposure to the microwaves radiated by the radar antenna is harmless. However, avoid prolonged exposure to the microwaves.
Never look directly into the wave guide while checking transceiver operation, since microwaves are especially harmful to the eyes.

NOTE

PMU Calibration should only be performed if a replacement of the magnetron, Controller PCB, Moulator or Receiver has been performed.

PMU Calibration should be performed in good weather conditions.
Calibration should not be performed when snowing or raining.

(1) TX Cal

Select the PMU CALIBRATION button.
The PMU CALIBRATION window appears.
Switch over from STBY mode to TX mode.

Select the **Tx** softbutton. The Transmit Call is reset to zero. When TX soft-button is selected, it places a 3dB attenuation in circuit of the PMU received RF.

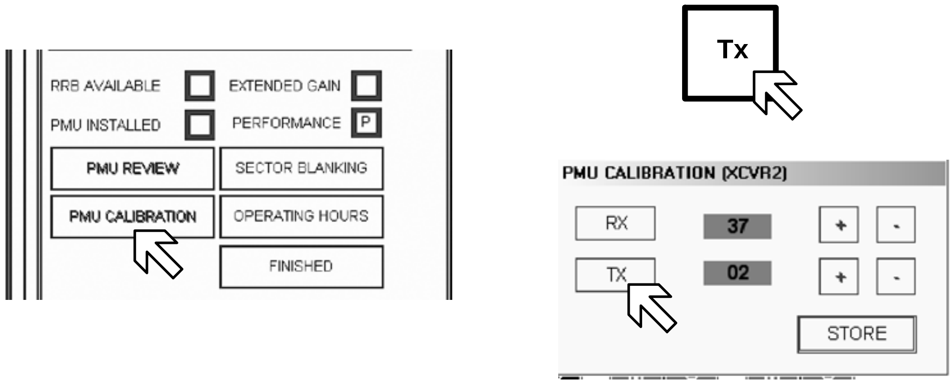


Figure: 3–28 Example to adjust PMU TX Calibration

Adjust the radar controls as follows:

- Adjust the GAIN for a light back ground speckle in the radar display area.
- Set the RAIN Rate to zero.
- Set the SEA to zero.
- Set the FTC to zero.
- Place the range switch to 6Nm
- Select Long pulse.

NOTE

The PMU functions only in Medium 1, Medium 2 and Long pulse. Long pulse provides the best visual representation. The PMU does not function in Short pulse.

Using the toggle field TX with slider (or alterative by "+" or "–" softbutton) and adjust until the PMU it is just responding.
This is represented by narrow wedge or arcs approximately 5° in width. This is the TX Calibration width.

Press on the TX softbutton. The wedge or arcs will increase to approximately 30° in width for an X–band, and approximately 50° in width for an S–band.

NOTE

The width of the display arcs is a measure of transmitted power.
The Calibration of transmitted power is set for about 3dB down. During normal operation when the PMU is turned on and if the width of the arcs decreases to the Calibration width, transmitted power is down approximately 3dB and service is required (Attention to the Magnetron or Modulator).

(2) RX Cal

Select the **Tx** softbutton. The Transmit Call is reset to zero. When RX softbutton is selected, it places a 7dB attenuation in circuit of the the PMU transmitted RF.

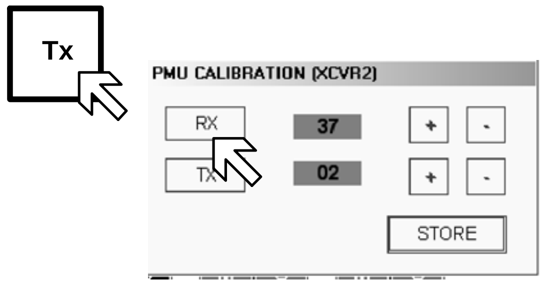


Figure: 3–29 Example to adjust PMU TX Calibration

Adjust the radar controls as follows:

- Adjust the GAIN for a light back ground speckle in the radar display area.
- Set the RAIN Rate to zero.
- Set the SEA to zero.
- Set the FTC to zero.
- Place the range switch to 6Nm

Using the toggle field RX with slider (or alterative by “+” or “–” softbutton) and adjust that the PMU display arcs are just visible.

NOTE

The quality of the PMU arcs are a measure of the Minimum Discernible Signal (MDS) of the receiver. The RF output power of the PMU is set for 7dB above MDS. If the quality of the arcs become broken while in normal mode of operation when the PMU is selected, then the MDS of the radar has decreased by 7dB and service is required (Attention to the receiver).

(3) Store
Before storing the TX and RX calibration values you have to deselect all softbuttons and numerical fields.

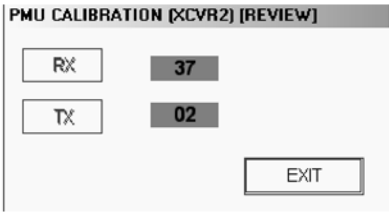


Figure: 3-30 Store the calibration values

3.4.5.7 PMU Review

PMU Review allows the operator to verify the current settings for TX and RX Calibration!

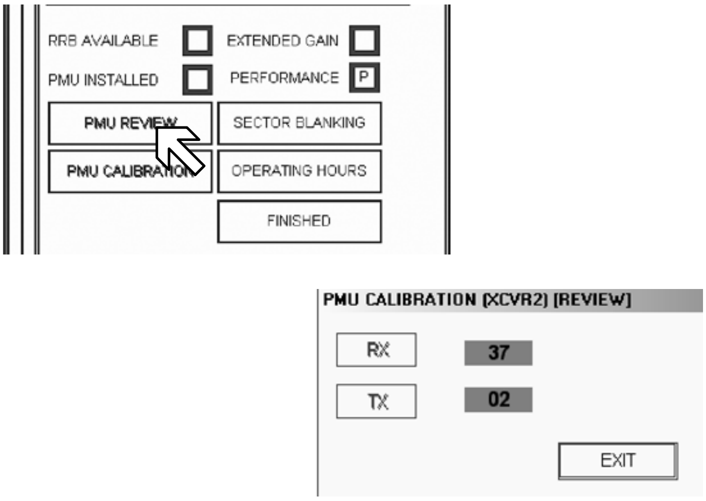


Figure: 3-31 PMU Review

3.4.5.8 Operating Hours

Operating Hours allows the operator to RESET the Magnetron Send Time and the Power On Time for the selected XCVR.
This RESET has to be done after exchanging the Magnetron (Magnetron Send Time) or after exchanging e.g. the Controller PCB (Power On Time) in the transceiver.

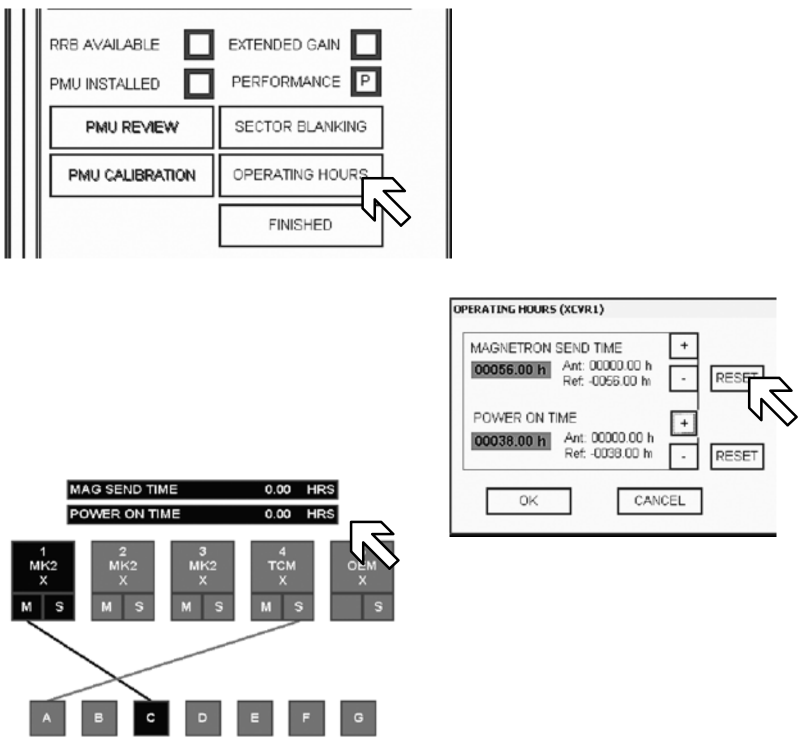


Figure: 3‑32 Operating Hours

3.4.5.9 Finished

FINISHED means all details have been written into this display for that XCVR.

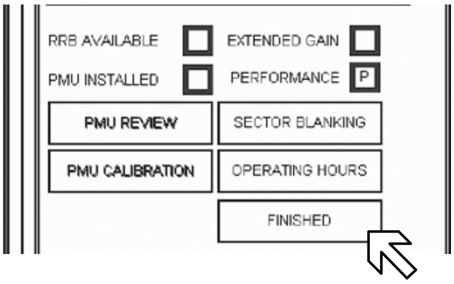


Figure: 3–33 Finishing the User Preferences

3.5 CONFIGURATION 2.VIDEO SET/TEST

(see chapter 3.4.4)

3.6 CONFIGURATION – 3.USER PREFS. –

3.6.1 User Prefs

USER PREFS – User Preferences

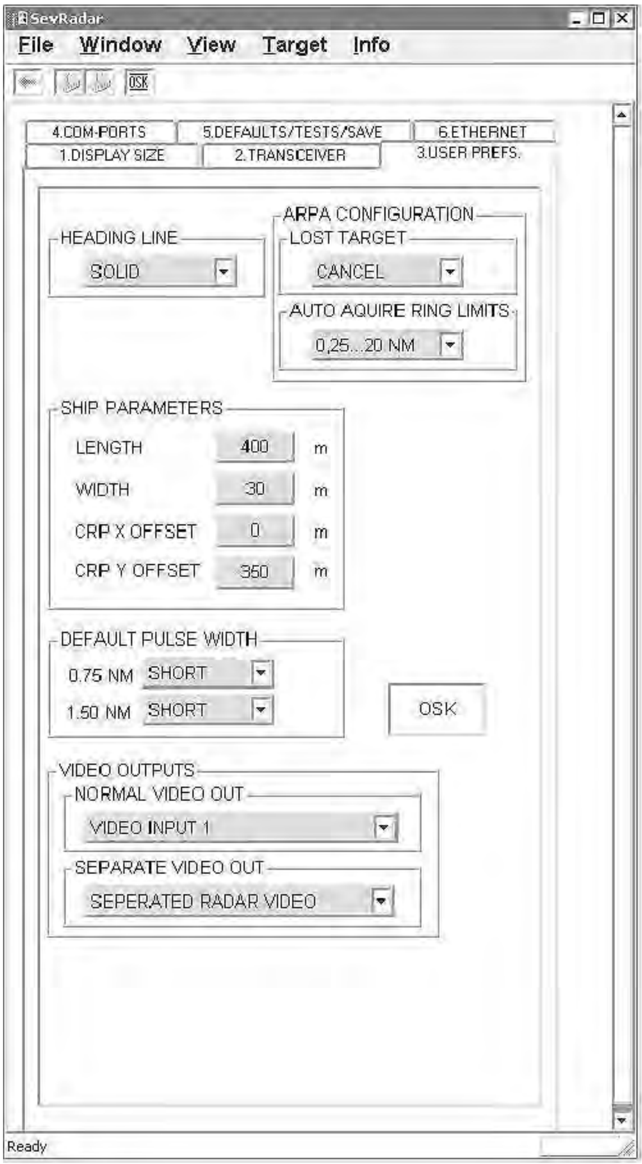


Figure: 3–34 Example ***CP 19.***

CP 19.

These preferences will affect this display only.

These preferences apply to any XCVR in use from this display.

- **DEFAULT PULSE WIDTH –** SHORT.
  Some users may prefer to begin these ranges in MED1 pulse.
  User change to SP is still possible in normal use.

NOTE

DEFAULT PULSE WIDTHS:
Will apply for all XCVRs the same, at this display. Other displays can have different defaults. The display which is MASTER controls the use.

HEADING LINE – Normally SOLID.
When a user requires to see video under the Heading Line, there is a key on the panel HL Off.

CURVED HEADING LINE: When autopilot data is available, using ARCP (Autopilot Remote Control Panel).
The radius and delay are automatically applied to the NSC radar curved heading line feature. At the first version of NSC there is no manual curved heading line feature when autopilot not connected.

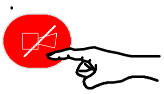
Refer to Figure: 3–34

CP 20.

- **ARPA CONFIGURATION**

  LOST TARGET:

  CANCEL means a lost track will be deleted automatically after acknowledging the alarm.
  After one scan a lost track will be cleared.



  COAST means a lost track will continue in dead reckoning at last known course and speed after a warning. The user must delete.
  A Coasting track will not be re–acquired.

Coasting assists the user to find a track that temporarily faded or moved through blank sectors. The disadvantage of COAST is that they continue tracking out to maximum range, even with no echo to follow.

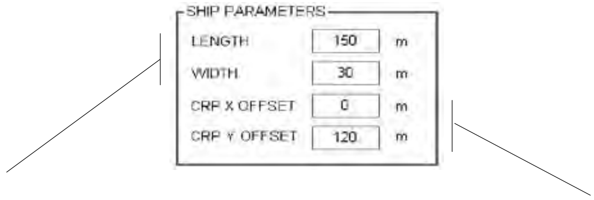
AUTO ACQUIRE RING LIMITS:

Some authorities required that auto acquire was limited to 3 – 6 Nm. Default is 0.25Nm to 20 Nm.

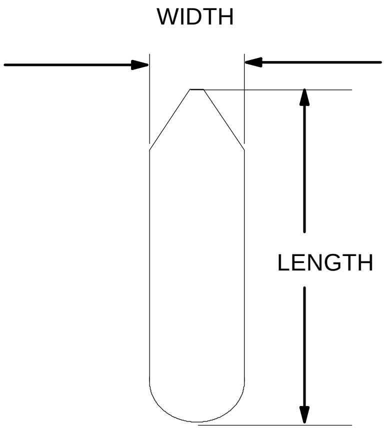
The NSC user has auto acquire zones, polygon, sectors, rings and without limits.

- **SHIPS PARAMETERS**

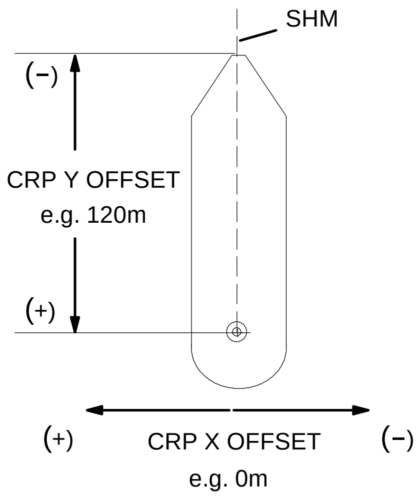
Refer to Figure: 3‑35



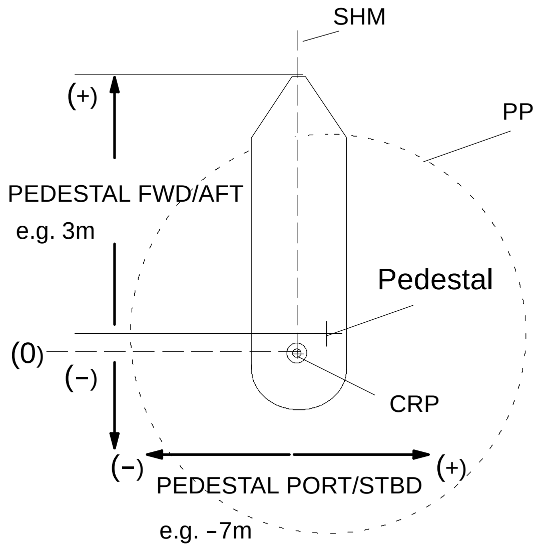
1) **Ships Hull**

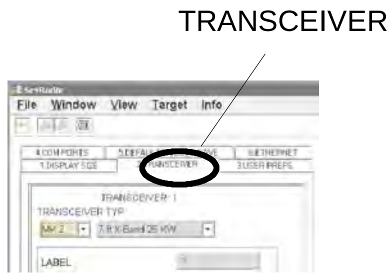


2) **Common Reference Point** (x / y) OFFSET



3) **Pedestal Position** FWD/AFT and PORT/STBD (menu register switch TRANSCEIVER see chapter 3.4.5)





◎ Common Reference Point (CRP)

┼ Pedestal Position

Figure: 3‑35 CRP (Common Reference Point)

- **VIDEO OUTPUTS**
  Special customer settings.

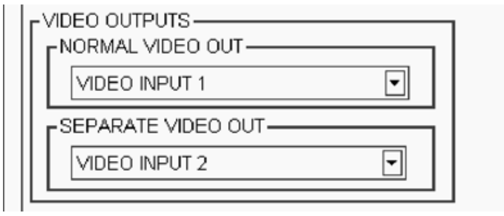


Figure: 3-36 Default factory settings

- **OSK**
  The On Screen Keyboard appears in the display.

Sequence of actions

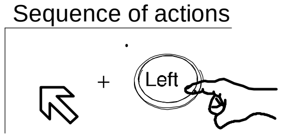


Figure: 3-37 On Screen Keyboard

3.7 CONFIGURATION – 4.COM–PORTS –

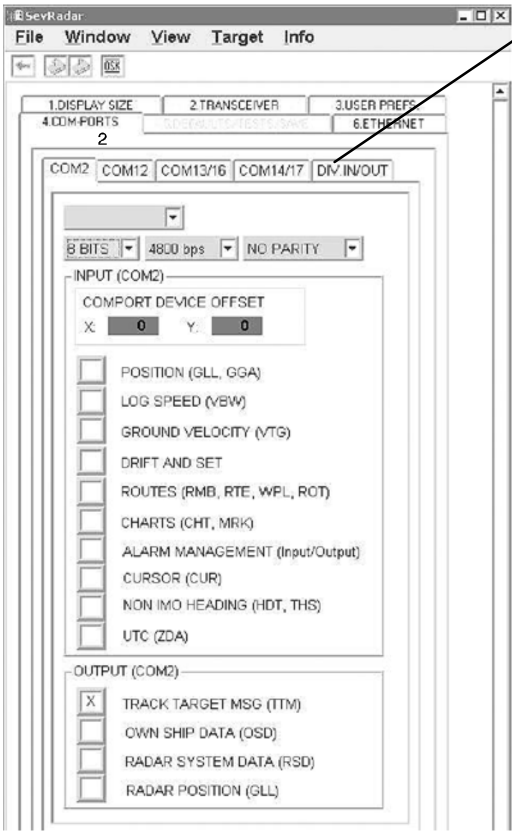
3.7.1 COM Ports

(see connection diagram 900–012.HP013)

5 INPUT, 3 OUTPUT.

Ports 1,11,12,13,14,15,16,17 RS422 Input and Output,

There are no ports 2,3,4,5,6,7,8,9,10



COM 2

INPUT COM 1	(NMEA/AIS)
OUTPUT COM 1	(NMEA)

COM 12

INPUT COM 12	(NMEA)

COM 13/16

INPUT COM 13	(NMEA)
OUTPUT COM 16	(NMEA)

COM 14/17

INPUT COM 14	(NMEA)
OUTPUT COM 17	(NMEA)

DIV.IN/OUT

INPUT COM 11	(GYRO)
INPUT PULSLOG	
OUTPUT COM 15	(XCVR Uplink 15)

Figure: 3–38 Example (***CP 21.***) (COM Ports)

CP 21.

COM PORT 11, 12, 13, 14 OUTPUT are not used, not accessible, not configurable except for loopback test programs.

COM PORT 15, 16, 17 INPUT are not used, not accessible, not configurable except for loopback test programs.

COM PORT 2 INPUT (Terminal module U13), 1+, 32–

Can be any input data, but is the only standard port possible for AIS @ 34800 baud.
AIS data can, as alternative, come from ECDIS or another NSC Radar Display using the LAN. ARCP data can be mixed with other data (e.g. with Nav. Manager) and is automatically accepted.

DIV.IN/OUT

HEADING (COURSEBUS OVER SERIAL I/O)
COM PORT 11 INPUT (Terminal module U13), 2 +, 33–
automatically reserved only for Raytheon Course Bus INPUT or Fast NMEA (GYRO).

COM PORT 15 OUTPUT (Terminal module U13), 30+, 61–
automatically reserved only for Mk2 Uplink Control cables OUTPUT for Mk2 pedestal XCVRs.

PULSLOG ON/OFF (Terminal U13), Status Input IN1, IN2, IN3

Examples:

SENSOR		LABEL (see Figure: 3–39)		PORT
1.	⇒	LOG	⇒	COM 2 RxD
2. AIS	⇒	ECDIS Server	⇒	ETHERNET
3. AUTOPILOT	⇒ ⇐	ARCP	⇒ ⇐	COM 13 RxD, 16 TxD or 14, 17 or COM 2
4. ROUTES	⇒ ⇐	ECDIS	⇒ ⇐	COM 14 RxD, 17 TxD or 13, 16 or COM 2
5. POSITION	⇒	GPS	⇒	COM 12
6. VDR	⇐		⇐	COM 2 TxD

NOTE

For ARCP bidirectional configuration, the label ARCP must be used.

CP 22. Examples

DIV.IN/OUT

COM11 can be selected as COURSEBUS OVER SERIAL I/O.

COURSE BUS is supplied by STD 20, STD22 or NDR

Non–Raytheon Digital Repeaters with synchronization functions (ADITEL products) make Course Bus. Raytheon Nav. Data Repeater (NDR) can also make coursebus.

FAST NMEA is an international standard. Normal connection is by SERIAL IO (COM11) (not used).

Special projects have internal connection to an RID pcb (normally only military).

SLOW NMEA

If one of the COM Ports NMEA is receiving HDT or VHW telegram and has been selected see chapter 3.7.3, and if <u>all</u> other gyro connections fail, or are not possible, then SLOW NMEA can be selected.

The tracker is, then not IMO ARPA and the radar filter will not function to best performance.

CP 23. Examples

DIV.IN/OUT

XCVR (COM15)	Unlike Mk2 RPU systems, the Uplink from NSC is not a paralleled system.
MK2 UPLINK	is a dedicated uplink stream that will transmit to one Mk2 pedestal when this display is Master. It is also used to link up to an ISU. Normally ON = X.

If this display is connected to more XCVRs using an ISU, its commands are made by CAN BUS to the ISU and converted there to Uplink. If the ISU goes power off, all the ISU relays switch the uplinks straight through, ISU 1 in to ISU 1 (A) out, ISU2 in to ISU 2 (B) out etc.

If this display is connected to another display without ISU,

and is set to Master of the other XCVR e.g. this display A controls XCVR 2, the

commands are sent by CAN BUS from display A to B and converted there into Uplink commands. Therefore COM15 is only hardwired once to one pedestal or the ISU.
The Uplink will only function in a connection to its primary XCVR whose downlink comes to its primary input port (via Interswitch ISU or direct connection).

CP 24.

COM2 (1+, 32–), COM12 (3+, 34–), COM13 (4+, 35–) and
COM14 (5+, 36–)

INPUT ports for normal NMEA and/or ARCP telegrams 4800, 8, 1, N or AIS 38400 baud COM 1 only.

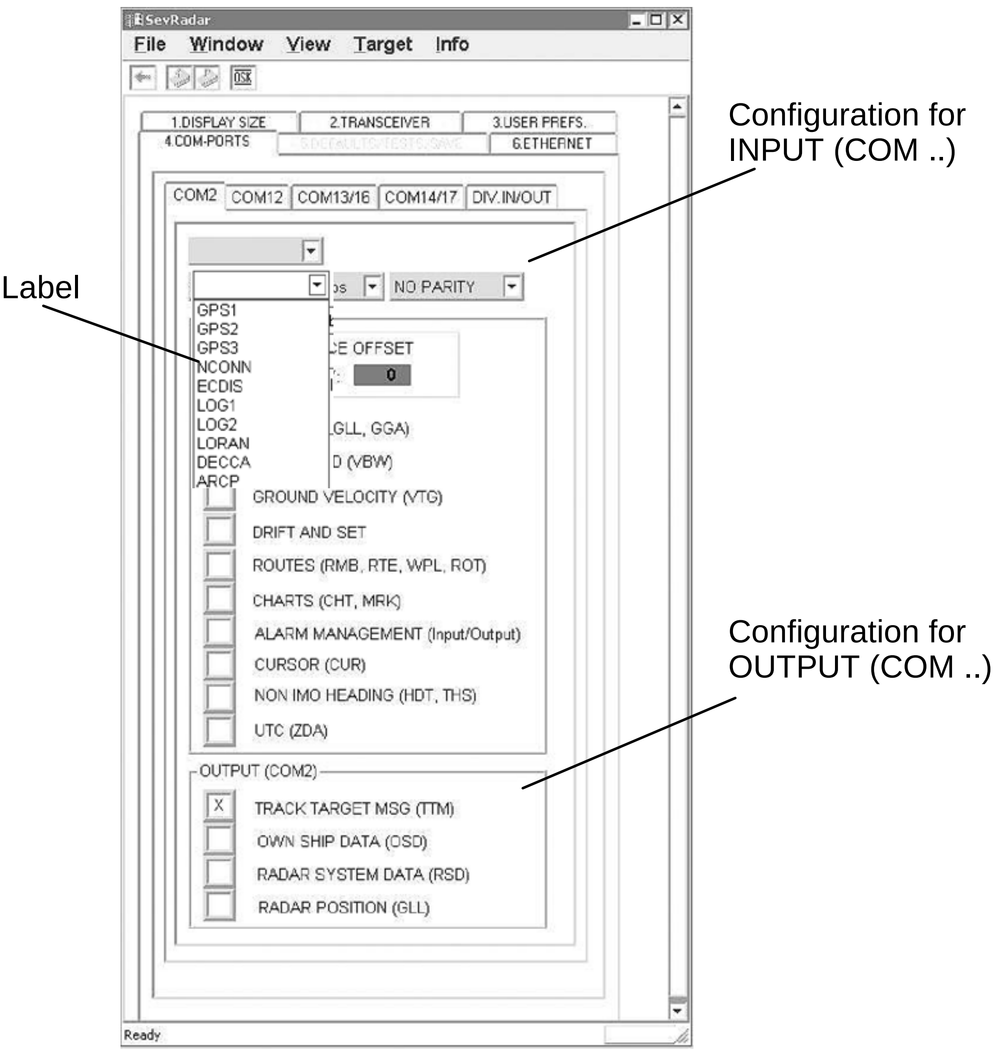


Figure: 3–39 Example (***CP 24.***)

3.7.2 Label

The label (see Figure: 3–39) at the top will appear in the User selection menus for LOG or POS.
There are defaults values if not using a keyboard.
5 Characters maximum.

NCONN = input from a Navigation Manager showing the Selected Sensor on the Nautoconning of an IBS.

ABCDE = Double clicking the label area with trackball and entering letters with USB keyboard e.g. AP10, SAGEM.

3.7.3 Configuration INPUT (COM ....)

COM PORT DEVICE OFFSET – The distance of the sensor from the Common Reference Point. The CRP can be chosen as the center of the bridge.
Distances are meters of the sensor from the CRP not from the radar, not from the display.
x= *********, y=**********
For ECDIS data, the data is already corrected for CRP, so the values are Zero.

POSITION (GGA or GLL):

> **NOTE**
> RMC sentence is not read by NSC

LOG SPEED (VBW): Speed through Water and/or over Bottom ahead/port/starboard.
NSC does not auto select. User must select.

GROUND VELOCITY (VTG): Normally from GPS. Bottom vector of Course Made Good and Speed Made Good.

DRIFT and SET: NSC offers the user Automatic (VBW Water data is subtracted from VTG Bottom data), or read NMEA, or enter Manually at the PPI.

ROUTES (RMB): This is the ”lollipop” symbol drawing a straight line from own ship to next waypoint. GPS data.

ROUTES (RTE, WPL): List of waypoint numbers in the actual route. Waypoints from either GPS or ECDIS

ROUTES (ROT): This is another alternative method for the list of waypoints in a route from GPS or ECDIS.

CHARTS (CHT; MRK): These are SENC functions coming from ECDIS

ALARM MANAGMENT (Input/Output): These are IBS system alarms from central alarm system and Navigation Manager

CURSOR (CUR): This is the ECDIS cursor position.

NON IMO HEADING (HDT): (ARPA requires Fast NMEA or Course Bus.)
This is slow NON IMO heading alternative.
Normally do not use this (see ***CP 23.***)

UTC (ZDA): Allows to receive a central time telegram (ZDA) from a central time station in the bridge system (Universal Time Coordinated)

NOTE

For ARCP (Autopilot Remote Control Panel) no data types need to be selected (the port is handled automatically).
But ARCP must be the label (chapter 3.7.1 ***CP 21.*** .)

3.7.4 Configuration OUTPUT (COM ....)

CP 25.

COM 1 (6+, 37–) COM 16 (8+, 39–) COM 17 (9+, 40–)

OUTPUT ports for normal NMEA and/or ARCP telegrams 4800, 8, 1, N

TRACK TARGET MSG (TTM) The track number as seen on the PPI with ARPA data.

OWN SHIP DATA (OSD): The Course and Speed of the vessel as displayed now by this Radar Display. For ships with NDR, and no other digital data, this can be used to forward data to ECDIS. However, with this method, the radar must always be ON for ECDIS to show HDG additional to GPS vector

RADAR SYSTEM DATA (RSD): The Range Scale in use, the Radar Cursor position.

RADAR POSITION (GLL): When Dead Reckon is in use, ARPA has an auto drift function for corrected/improved DR.

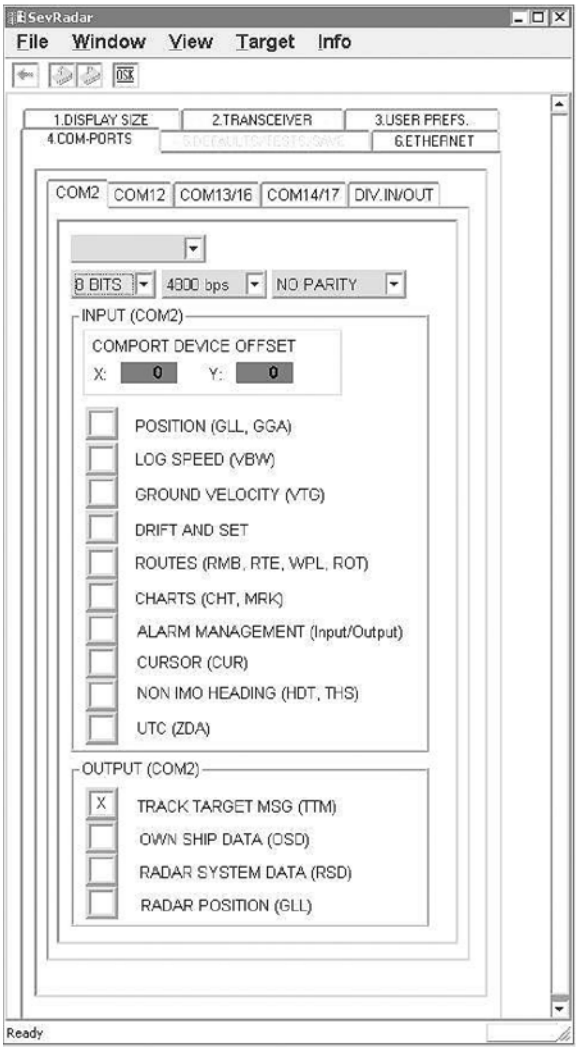


Figure: 3–40 Example (***CP 25.***)

3.8 CONFIGURATION – 6.ETHERNET –

3.8.1 Ethernet

LAN 1
LAN2
LAN3
Special
Projects only

Figure: 3–41 Example (ETHERNET –LAN)

CP 26.

The LAN connections are used in some systems to receive data

LAN 1, LAN 2, LAN 3 are not used in the Commercial Ship Installations.

Separate instruction are issued for special purpose.

No parameters necessary – skip to ***CP 27.***

3.8.2 Network configuration for NSC PC's

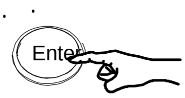
When a Radar takes a part in a network or connected to a hub, Raytheon do not know which computer will be A, B, or C etc..
Therefore use this sequence to SET the addresses correctly at each display.

This work has to be done before using the ETHERNET configuration.

For doing this follow the next steps:

EXIT RADAR

Pressing this softkey the RADAR Utility selector appears



Select **Service Network Display** in the RADAR Utility selector window and press the button from the trackball again.

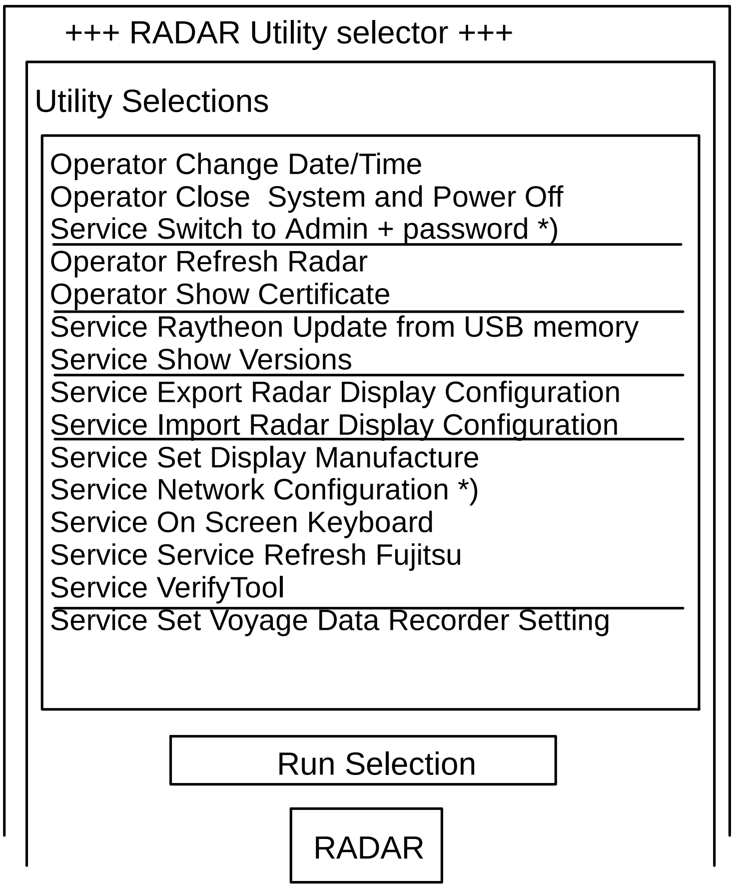


Figure: 3-42 RADAR Utility selector
-Service Network Display-

If you have no keyboard to do this configuration use the radar operator panel.

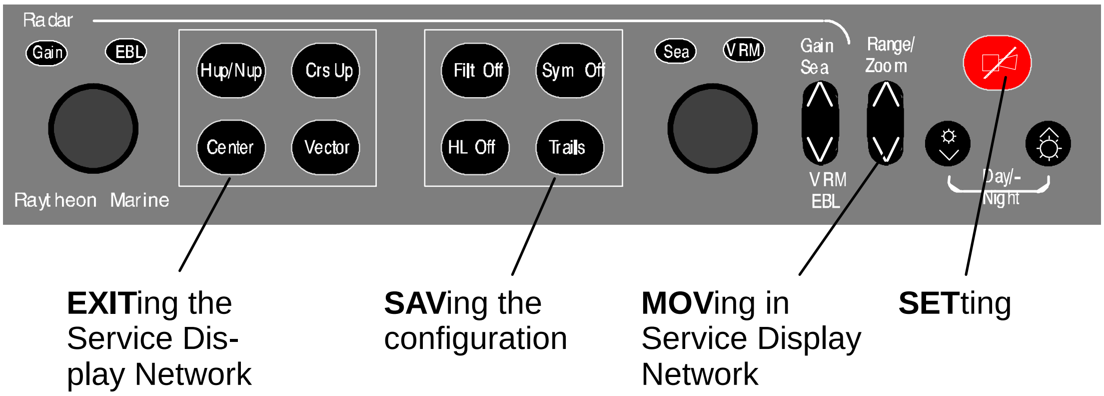


Figure: 3–43 Configuration settings with the radar operator panel

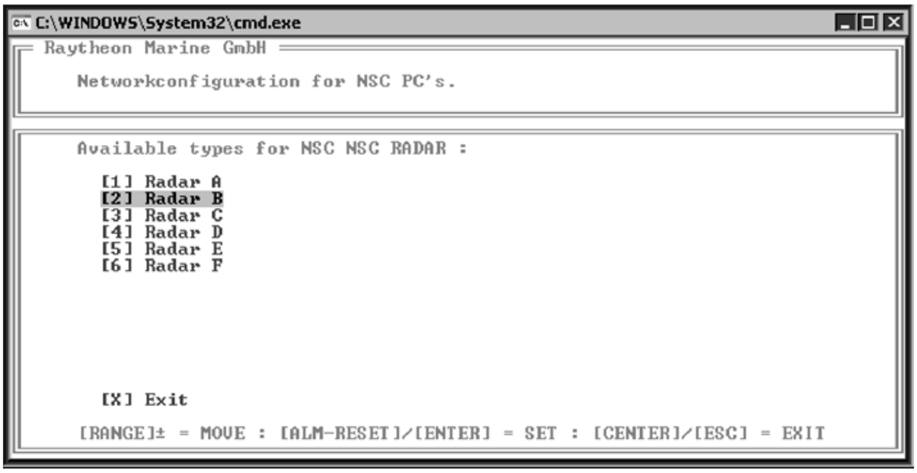


Figure: 3–44 Available types for NSC Radar

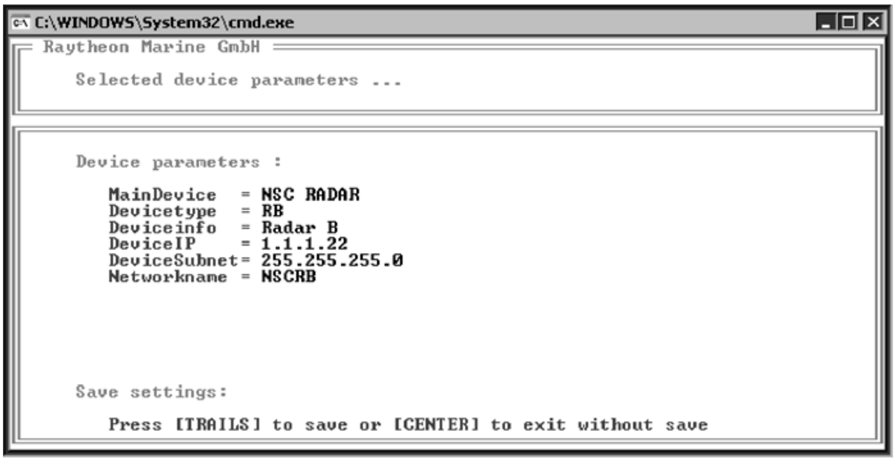


Figure: 3–45 Device parameter

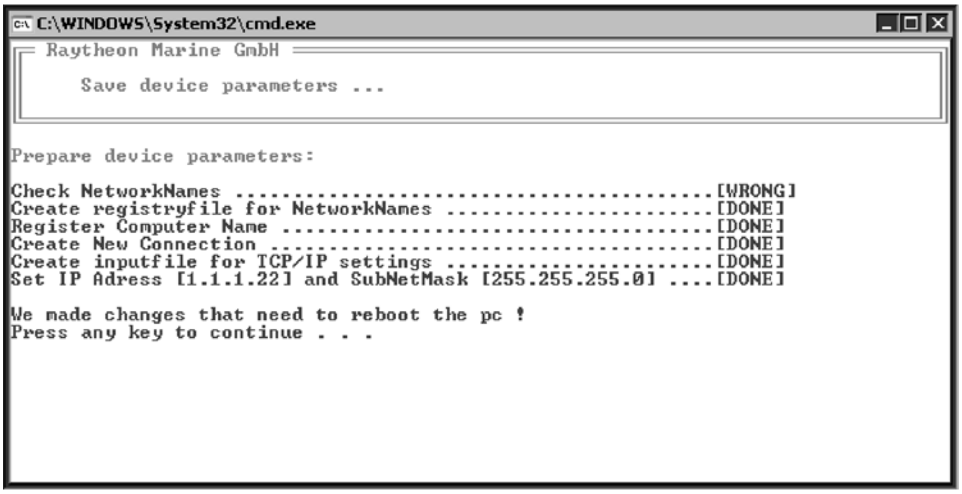


Figure: 3–46 Save device parameters

3.8.3 AIS Input to Radar using Ethernet

CP 27.

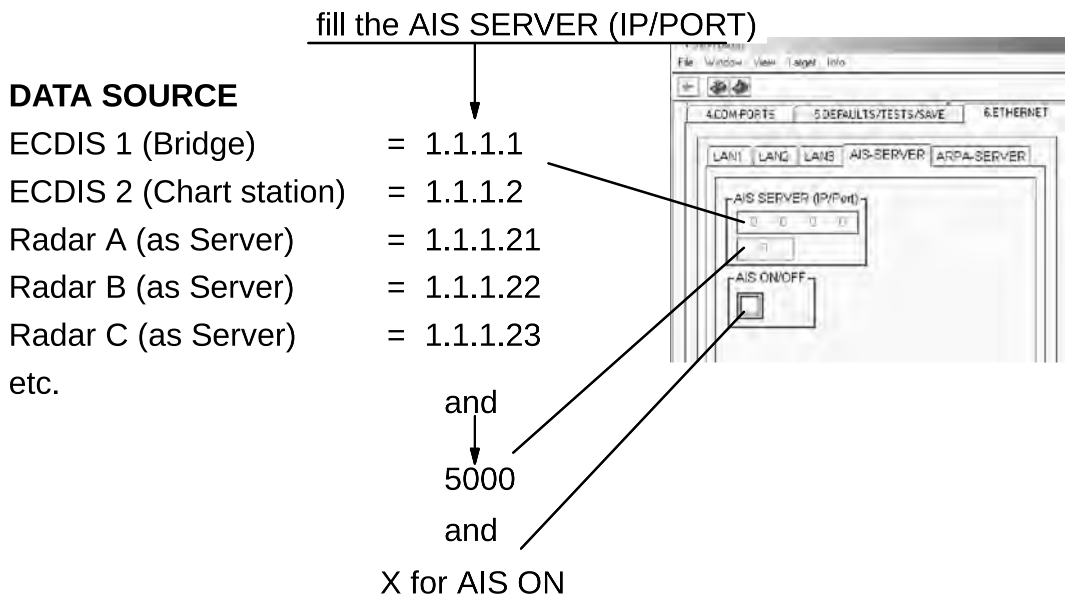


Figure: 3–47 AIS Input to RADAR

Example

Radar configuration for AIS and ECDIS combination

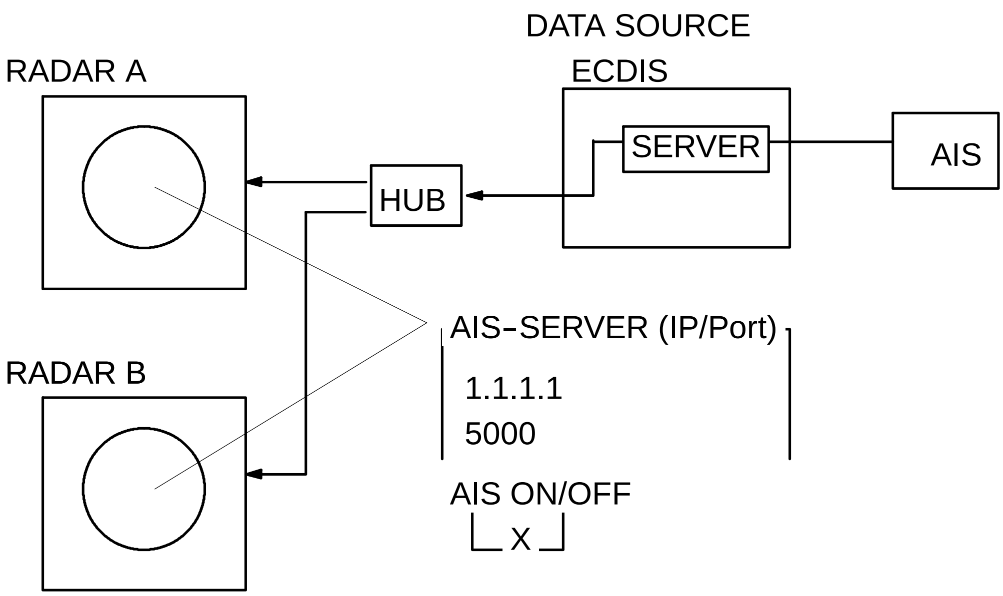


Figure: 3–48 Radar and ECDIS 1 configuration

3.8.4 AIS to Ethernet Output from Radar

CP 28.

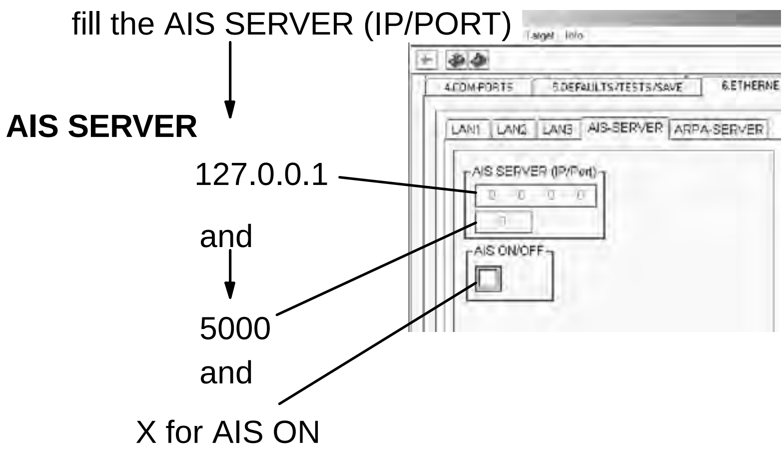


Figure: 3-49 AIS to Ethernet OUTPUT from Radar

Example

Radar configuration for AIS

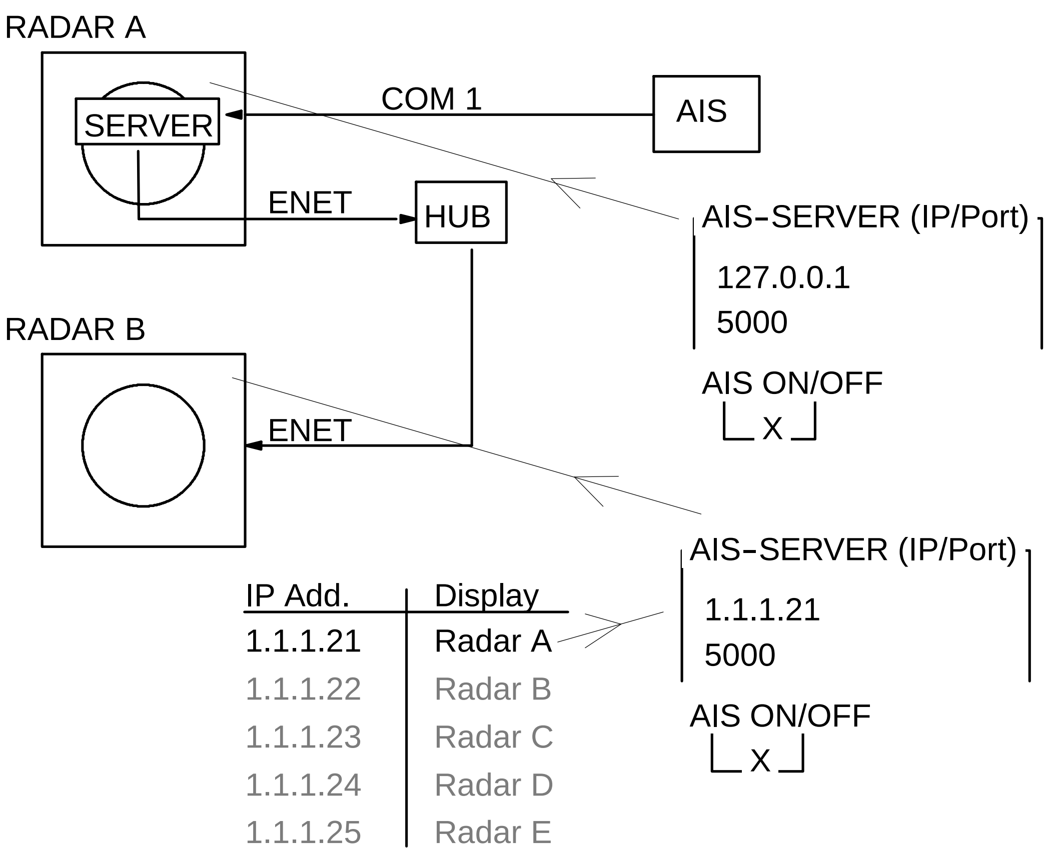


Figure: 3-50 Radar configuration for AIS

3.9 CONFIGURATION 5. DEFAULTS / TESTS / SAVE

CP 29.

Normally no tests are necessary for normal installation.

If use of the System indicates a video problem –

Check the TCM and TCU were all programmed correctly (see ***CP 7. CP 8. CP 9.***) and repeat the VIDEO SET/TEST.

Check the downlinks and the correct level for triggers (see ***CP 11.***).

If use of the System indicates a Course Bus problem,

Check the wiring,

Check that the Gyro Latitude and Speed corrections have been set at the Gyro Control Panel.

Use some other Course Bus receiver, such as a PC test program or Digital Repeater to test the signal.

NOTE

The GYRO STD20 / 22 must be fully warmed up for Radar.

3.9.1 Defaults / Tests / Save

(Figure: 3‑51)

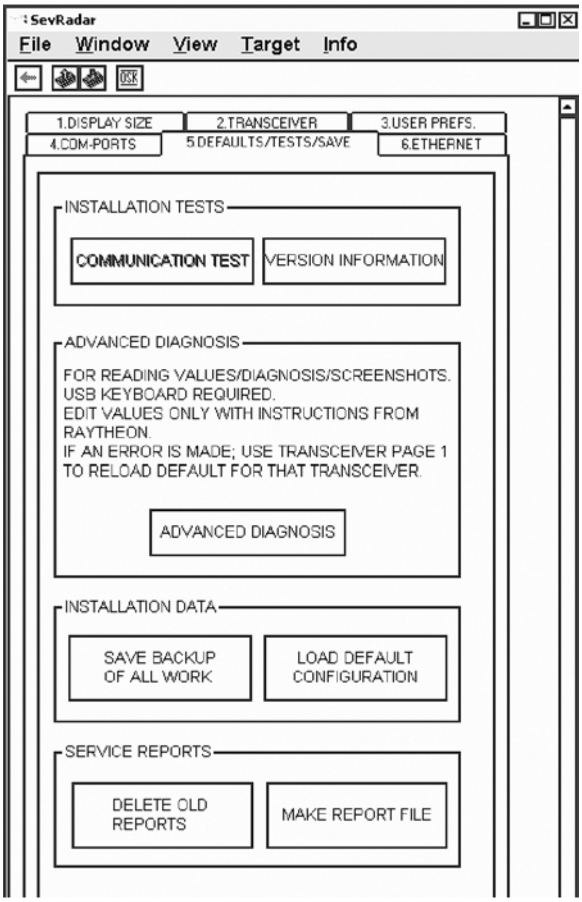


Figure: 3‑51 DEFAULTS / TEST / SAVE window

INSTALLATION TESTS

COMMUNICATION TEST
in the moment not available

VERSION INFORMATION
is an software development information window only

ADVANCED DIAGNOSIS

ADVANCED DIAGNOSIS (Password –call Raytheon Product Support)
If no video is seen on the system the ADVANCED DIAGNOSIS has to be used.

INSTALLATION DATA

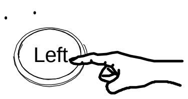
SAVE BACKUP OF ALL WORK
When Radar configuration is finished the SAVE BACKUP OF ALL WORK ***MUST*** be used.

Special link to the **RADAR Utility selector** window

When the ship has sailed, if the Deck Officer thinks some problem has occurred after some time he can press **Operator Refresh Radar**.
This will immediately set the radar again to the condition of the backup (except the Date / Time continue as normal).
In this way, the ship Captain or Service Engineer can always go back to a good configuration before running the Radar.

EXIT RADAR

For doing this follow the next steps:
Pressing this softkey the RADAR Utility selector appears



Select **Operator Refresh Radar** in the RADAR Utility selector window and press the button from the trackball again.

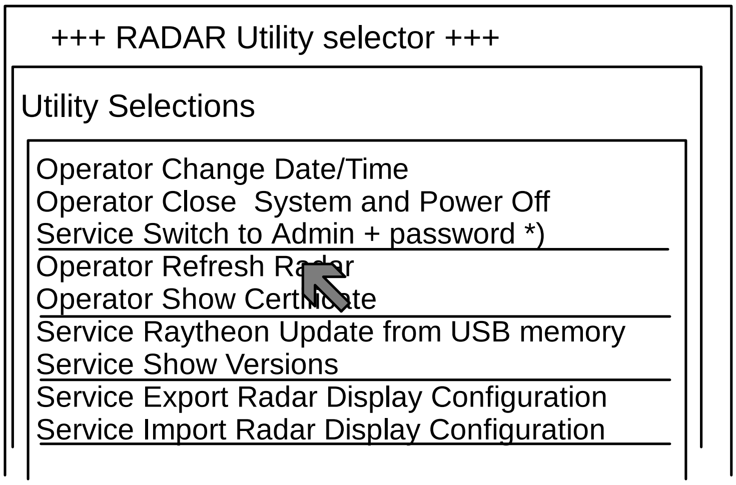


Figure: 3–52 RADAR Utility selector
–Operator Refresh Radar –

LOAD DEFAULT CONFIGURATION

The NSC is delivered with defaults already loaded. LOAD DEFAULTS is not necessary for normal installation.If installation is in error and needs to be corrected, this can be done using the normal menus above.

LOAD DEFAULTS is not necessary to correct things.If it is decided to begin again completely from fresh, or as part of a major overhaul, loading defaults can be used.

Pressing LOAD DEFAULTS will shut down NSC and load a completely new empty configuration file, as from factory.

NSC will reboot/restart or must be powered down and powered ON again by the engineer.

SERVICE REPORTS

DELETE OLD REPORTS

If you press this softbutton OLD REPORTS will be deleted.

MAKE REPORT FILE

If you press this softbutton the radar software creates a REPORT FILE from the current software situation. Its advantage is to send this REPORT FILE to the Raytheon SERVICE center by mail.

For reading out this file you have to change into RADAR Utility selector (see Figure: 3–52).
Prepare the USB stick on a PC with a directory **..\RAYTHEON**.
Insert a USB memory stick into the Radar USB connection and press **Service Report to USB**, as shown before.

3.10 SERVICE EXPORT/IMPORT RADAR DISPLAY CONFIGURATION

For reading out or in the Radar Display Configuration for one Display (A, B, C, etc.) you have to change into RADAR Utility selector.

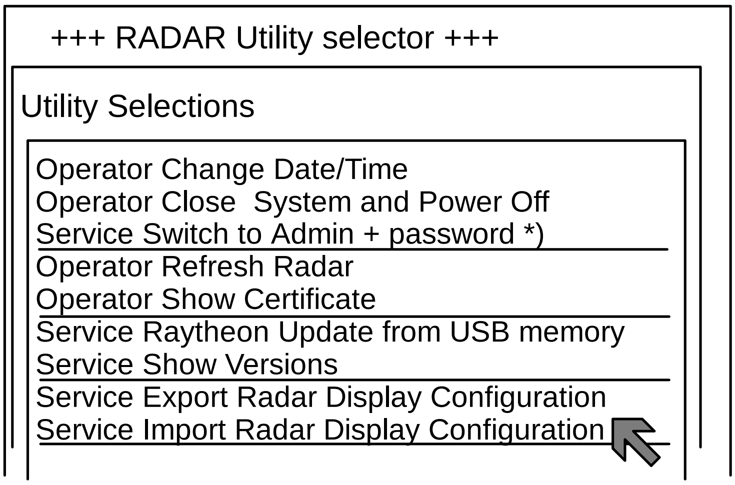


Figure: 40 RADAR Utility selector
-Service Export/Import Radar Display Configuration-

Prepare the USB stick on a PC with a directory **..\RAYTHEON**.
Insert a USB memory stick into the Radar USB connection and press **Service** ,**Export/ Radar Display Configuration**.

- Service ExportRadar Display Configuration dialog.

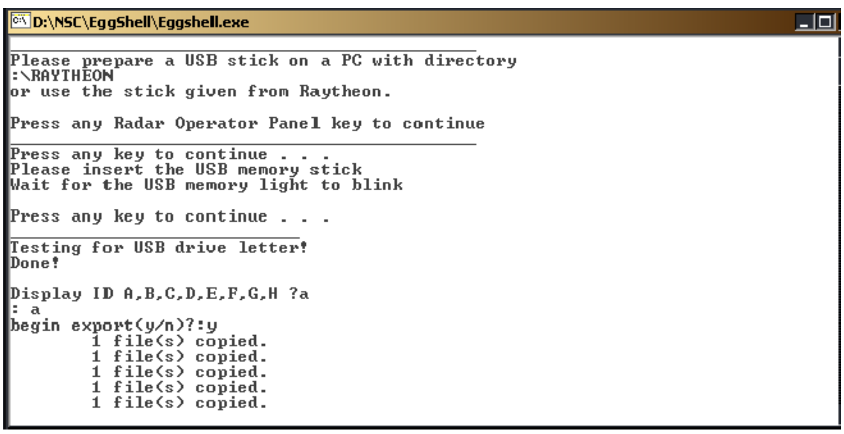


Figure: 41 Service Export Radar Display Configuration

This display shows a Radar Display Configuration example.

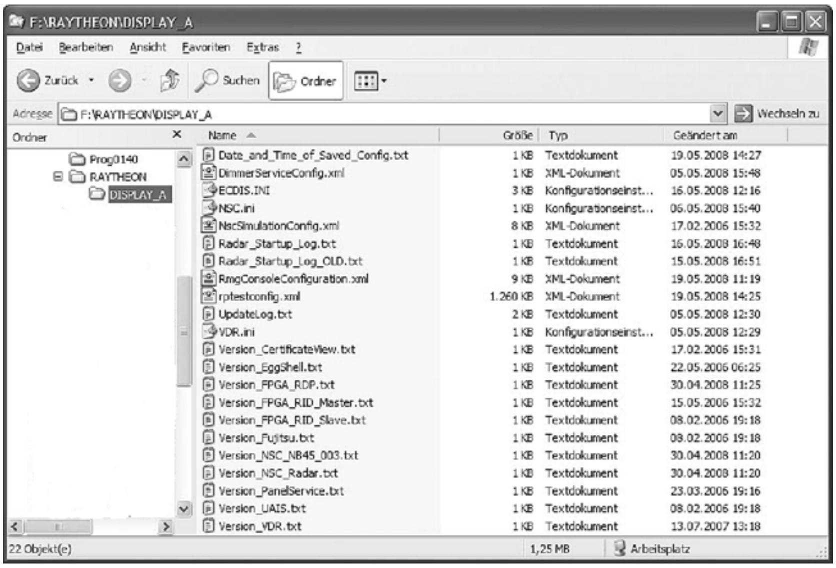


Figure: 42 Radar Display Configuration example

- Service Import Radar Display Configuration dialog.

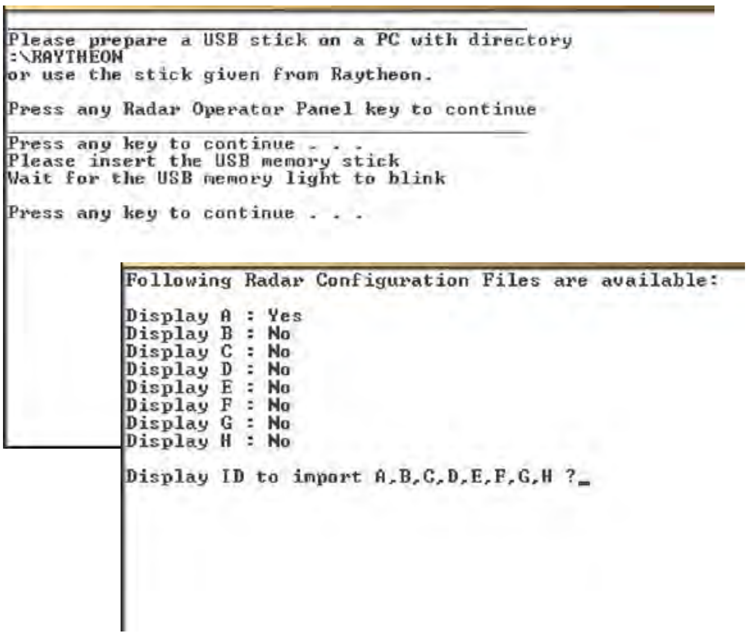
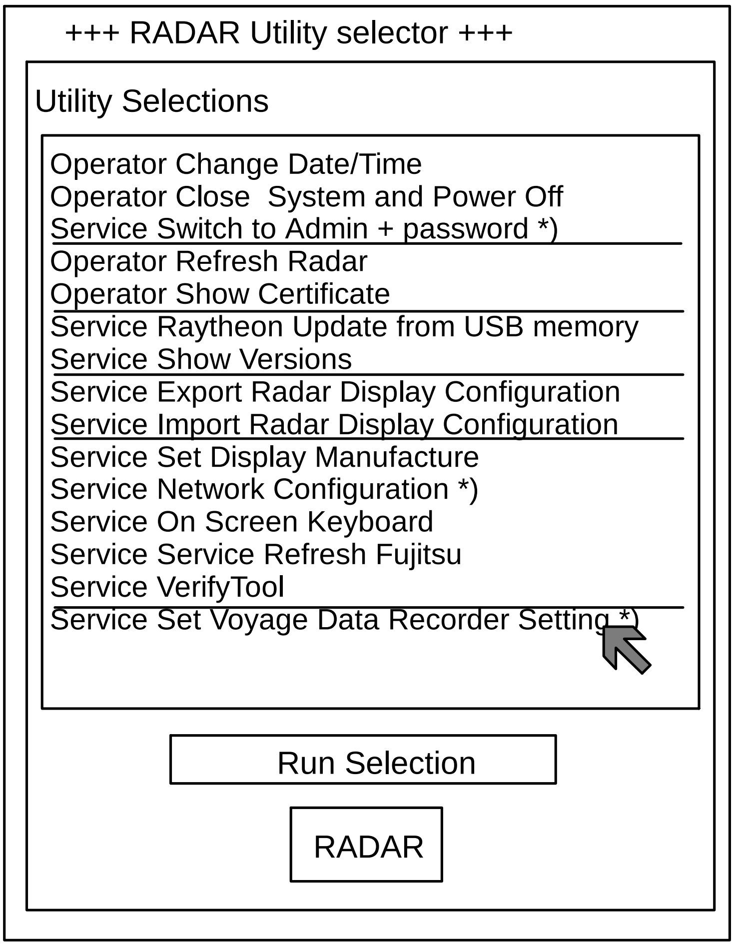


Figure: 43 Service Import Radar Display Configuration

3.11 VOYAGE DATA RECORDER INTERFACE SETTINGS

The VDR Radar Interface is used to adapt a Voyage Data Recorder to NSC.
The radar picture is transfer by ethernet technology.
The radar pictures will be generate in BMP format.
The pictures compressed in GNU-zip algorithms.

For starting the Service Set Voyage Data Record Settings you have to change into RADAR Utility selector (password protected).



*) password protected

Figure: 44 RADAR Utility selector
-Service Set Voyage Data Recorder Setting-

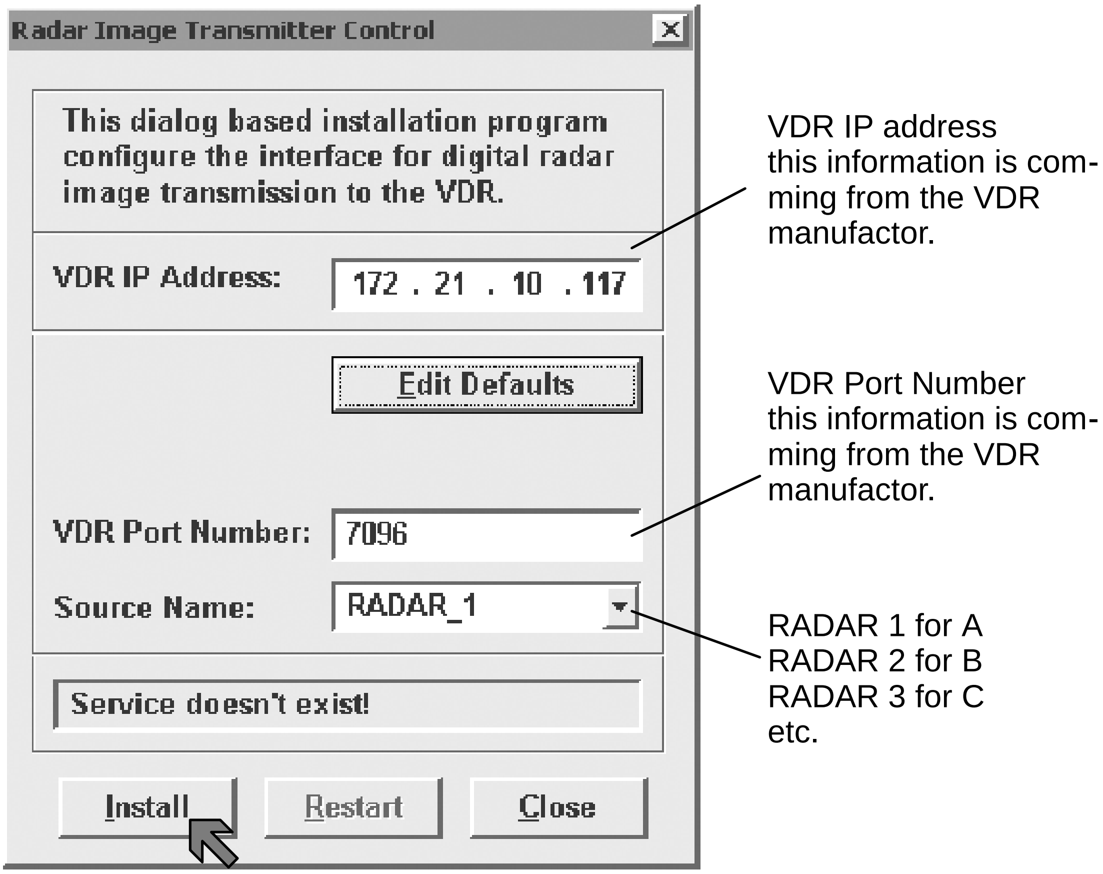


Figure: 45 Radar Image Transmitter Control

3.12 **COM PORT** (Test)

This procedure has to be select for testing the COM PORTS.

There are two tests possible:

- LOOP–AROUND test (see Figure: 3–54 ***step 1***)
  This test needs loopback links on all COM PORTS (RX / TX) to check the NSC hardware.

- NMEA test (see Figure: 3–54 ***step 2***)
  This test reads out the NMEA input data per PORT VIEWER.

After selection the Software–module the respective program has to be selected and started.

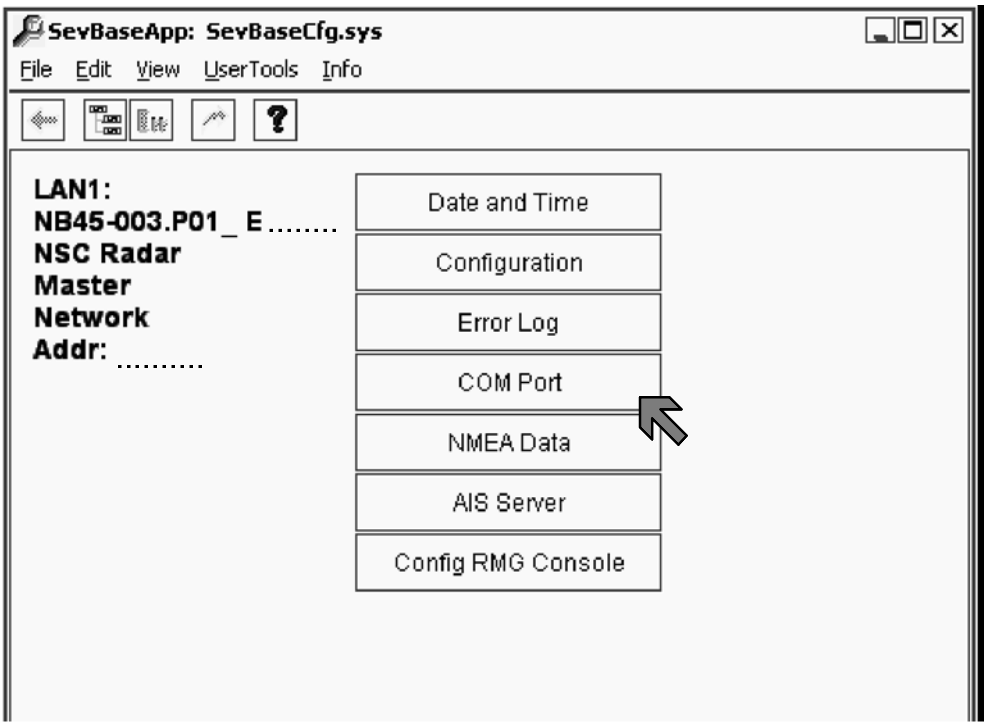
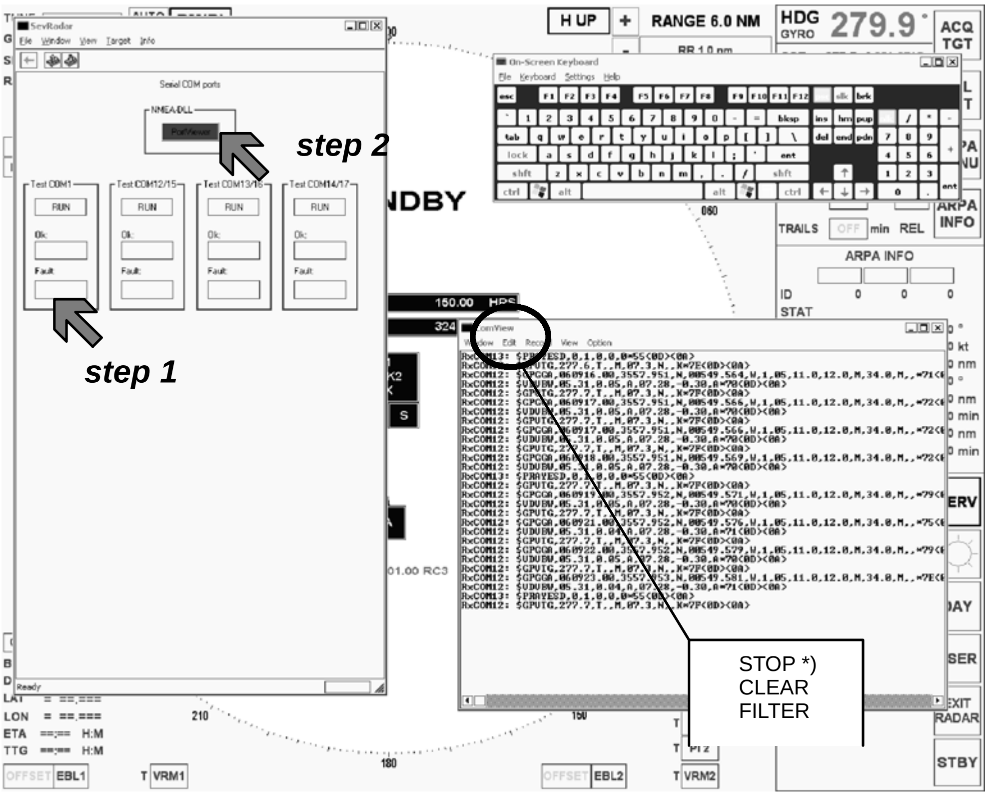


Figure: 3–53 Start program for COM PORT



*) STOP the running process
CLEAR the display
FILTER select the COM PORT

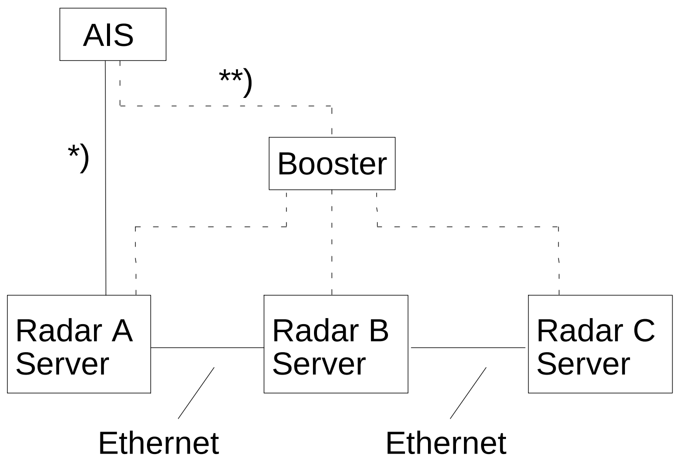
Figure: 3-54 COM PORT is running

3.13 CONFIGURATION AIS SERVER

The AIS system can be configurate via serial Com Port or via Ethernet (chapter 3.8.3 and 3.8.4).

3.13.1 AIS configuration via serial Com Port

The AIS server allocation depends from the project plan.



*) in this case Radar A should be used as server.
Radar B and C configured via Ethernet (chapter 3.8.4)

**) in this case Radar A, B, C should be used as server.

Figure: 3–55 AIS configuration (example)

After selection the Software–module the respective program has to be selected and started.

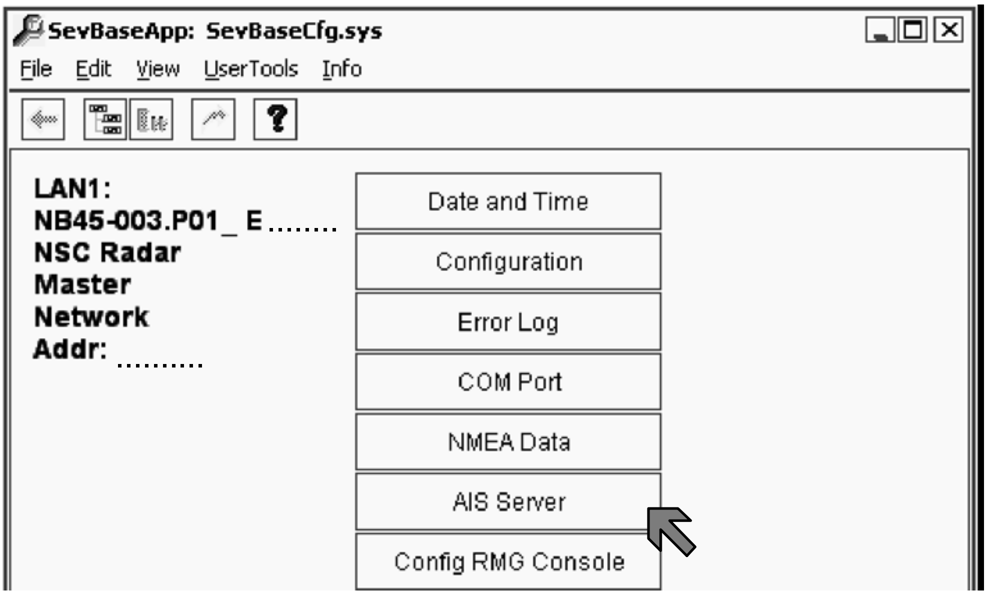


Figure: 3–56 Start program for AIS Server

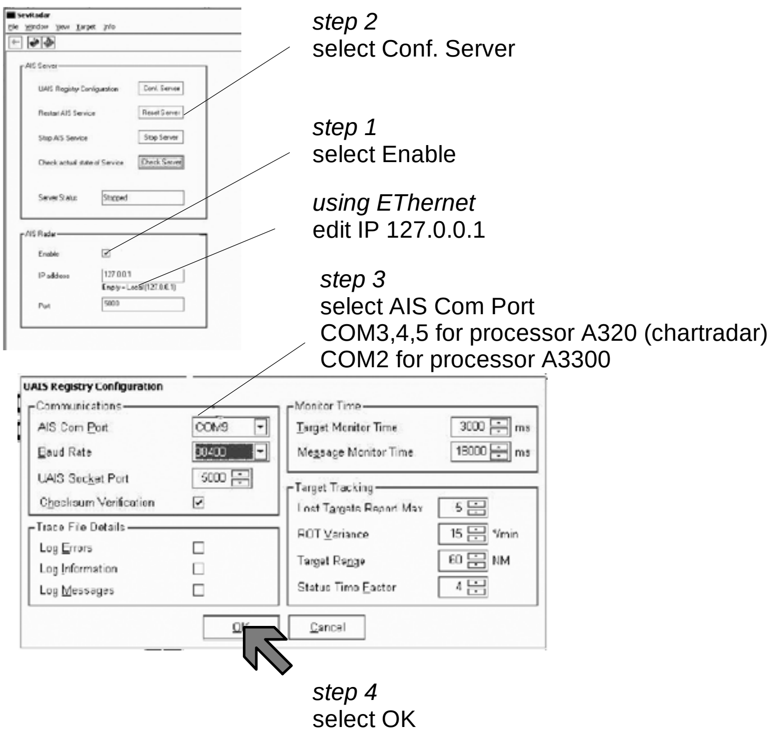
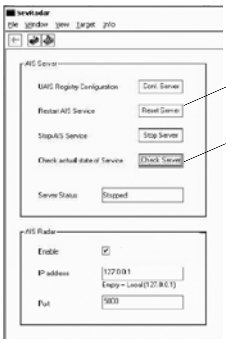


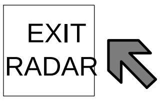
Figure: 3–57 AIS Server configuration (1)



step 5
select Reset Server

step 6
select Check Server

After doing all settings EXIT RADAR,
switch OFF .... ON the Radar.



step 7
select EXIT RADAR

Figure: 3–58 AIS Server configuration (2)

3.14 CONFIG RMG CONSOLE

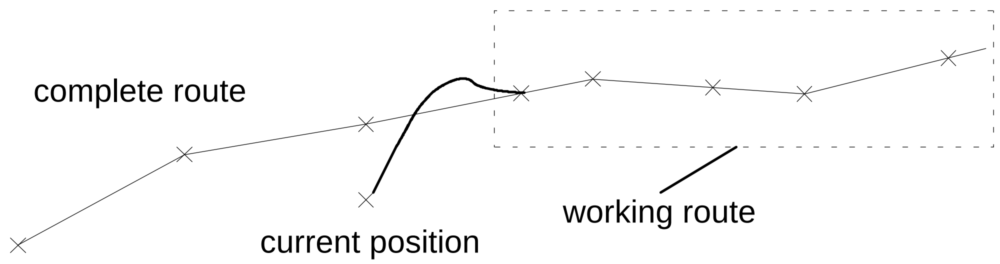
Special configuration to enable a SYSTEM MESSAGE OUTPUT and to configure the NMEA ROUTE Telegram (Figure: 3–59 and Figure: 3–60).

SYSTEM MESSAGE OUTPUT
The status telegram $PANZSYS is used as actual operating state information for external or combined units as e.g. Radar and Nautoconning or ECDIS.
Select the check box Enable (***step 1***), the telegram can be send after selecting the Port COM1 ...... LAN3.

NMEA Route Configuration
This configuration part permits the configuration from the RTE Message Mode and the RTE Timeout.

RTE Message Mode
The RTE Message Mode is used to configurate the NMEA route transfer from the position receiver (GPS) to this radar (***step 2***).
Telegram types $––RTE and $––WPL.

Auto identification means;
The radar receives the route telegram ($––RTE). It is possible to transfer the “working route” or the “complete route”.



Working route;
The radar receives only the “working route”.

NOTE
This configuration must be used for Furuno-GPS-Receiver.

Complete route;
The radar receives only the “complete route”.

RTE Timeout
The RTE Timeout configuration is used to check the complete route ($--RTE and $--WPL) dependency on the GPS activities.
Select the check box Enable (***step 3***), the GPS activities will be checked.
dependency on the RTE Timeout (default = 90s).
If the data transfer stops for longer than 90s the complete route will be deleted from the radar PPI.
Without this timeout routine the complete route will be display in the Radar PPI until a new route has been transmitted or until the Radar switches ON/ OFF.

After selection of the Software-module the respective program has to be selected and started.

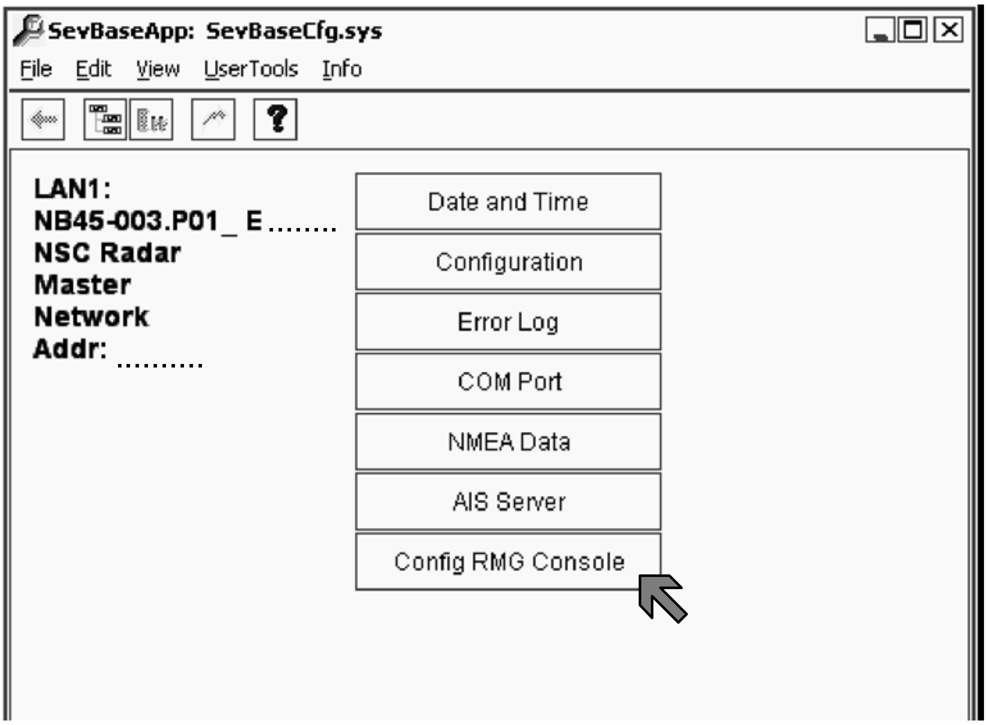


Figure: 3-59 Select Config RMG Console

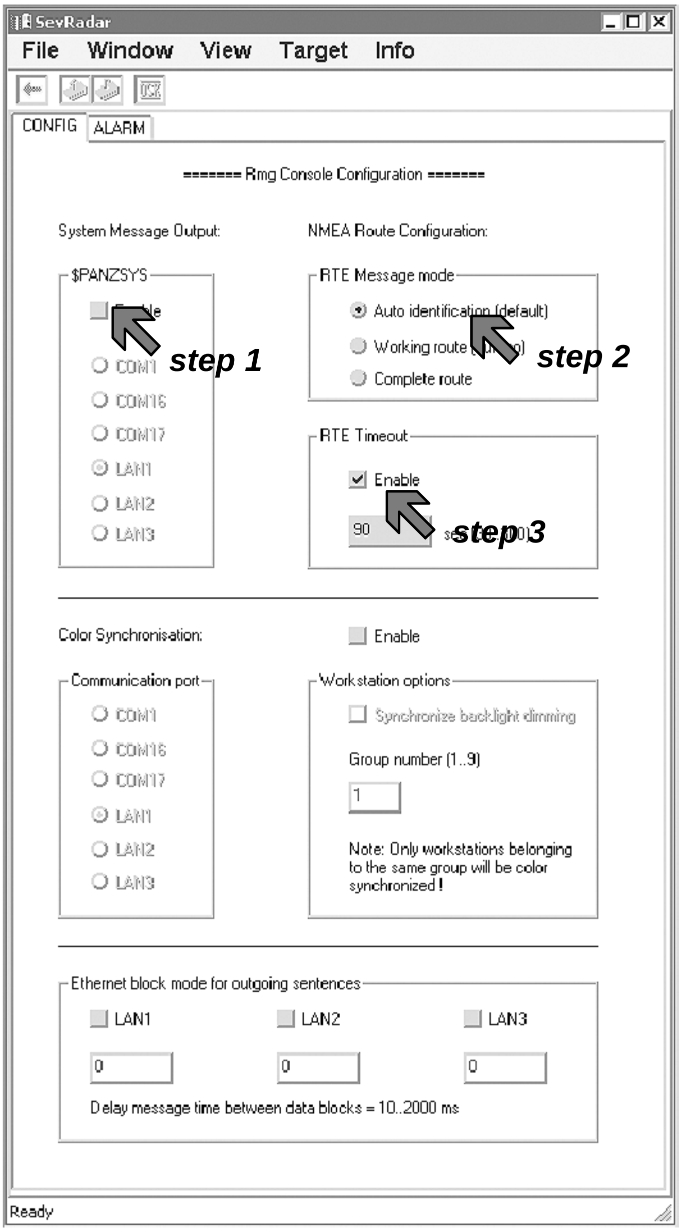


Figure: 3-60 RMG Console Console

3.14.1 Multifunctional Console MFC Configuration

All applications/ consoles can be color synchronized, i.e. if one console is changing form day to night colors all consoles will follow. The consoles can be grouped with the effect, that only consoles belonging to the same group will follow the synchronization.

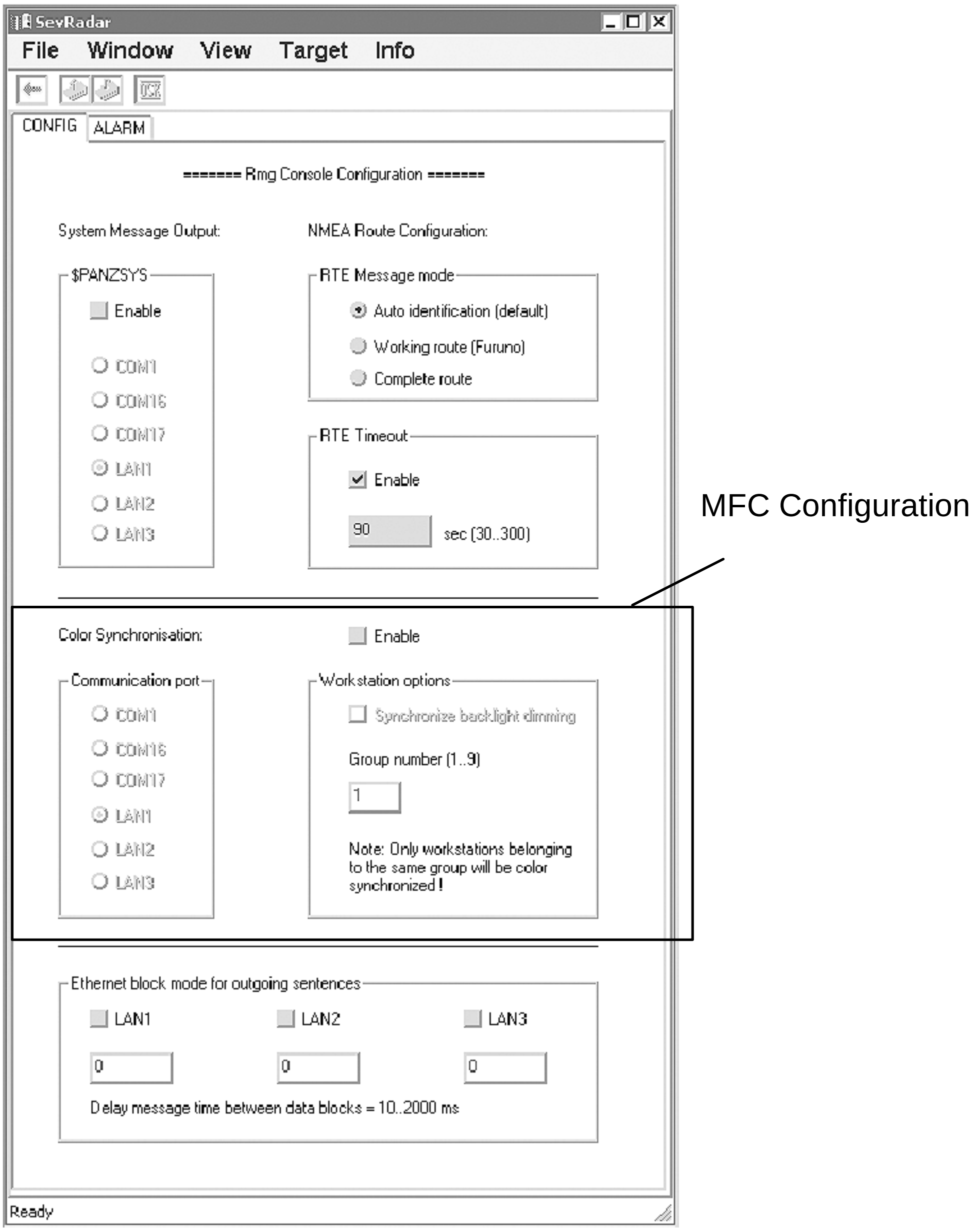


Figure: 3-61 MFC Configuration

4 SERVICE AND ALIGNMENT

4.1 PEDESTAL – X–BAND AND S–BAND – MTR UP

4.1.1 PCB Adjustments

4.1.1.1 Coarse Tune Adjustment (Controller PCB)

> **NOTE**
> The Coarse Tune adjustment is factory set and is normally not required unless a problem is suspected, or the Controller PCB, Receiver, LNFE or Magnetron have been replaced. If the tuning control is correct at the Display, it is NOT necessary to accomplish this procedure

(1) At the pedestal place the Antenna Safety switch to OFF to prevent accidental antenna rotation and transmission. Open the left access door using a 10mm socket to gain access to the Controller PCB mounted on the inside of the door.

(2) Locate JP3 on the Controller PCB and link JP3 2–3 to disable antenna rotation. Rotate the array away from personnel. Locate JP4 on the Controller PCB and remove the jumper.
Place the Antenna Safety switch to ON to enable the transmitter.

(3) Locate TP13 on the Controller PCB, see Figure: 4–1. Using a Oscilloscope, carefully place probe to TP13.

(4) Locate R4 (Coarse Tune) on the Controller PCB, Figure: 4–1, and adjust R4 fully CW, then rotate CCW for first video peak.

(5) Locate R12 (Tune Bar Deflection Adjustment) on the Receiver assembly and adjust R12 for a tune bar deflection of 5 to 7 divisions.

(6) No further adjustments are required, disconnect test leads from the Controller PCB.

(7) Place the Antenna Safety switch to OFF.

(8) Locate JP3 on the Controller PCB remove 2–3 (see step (2)) and link 1–2 to enable antenna rotation. Locate JP4 and link jumper again.

(9) Close the left access door of pedestal.

WARNING
ANTENNA WILL ROTATE WHEN THE ANTENNA SAFETY SWITCH IS TURNED ON.

(10) Placing the Antenna Safety switch to ON to enable antenna rotation and transmission.

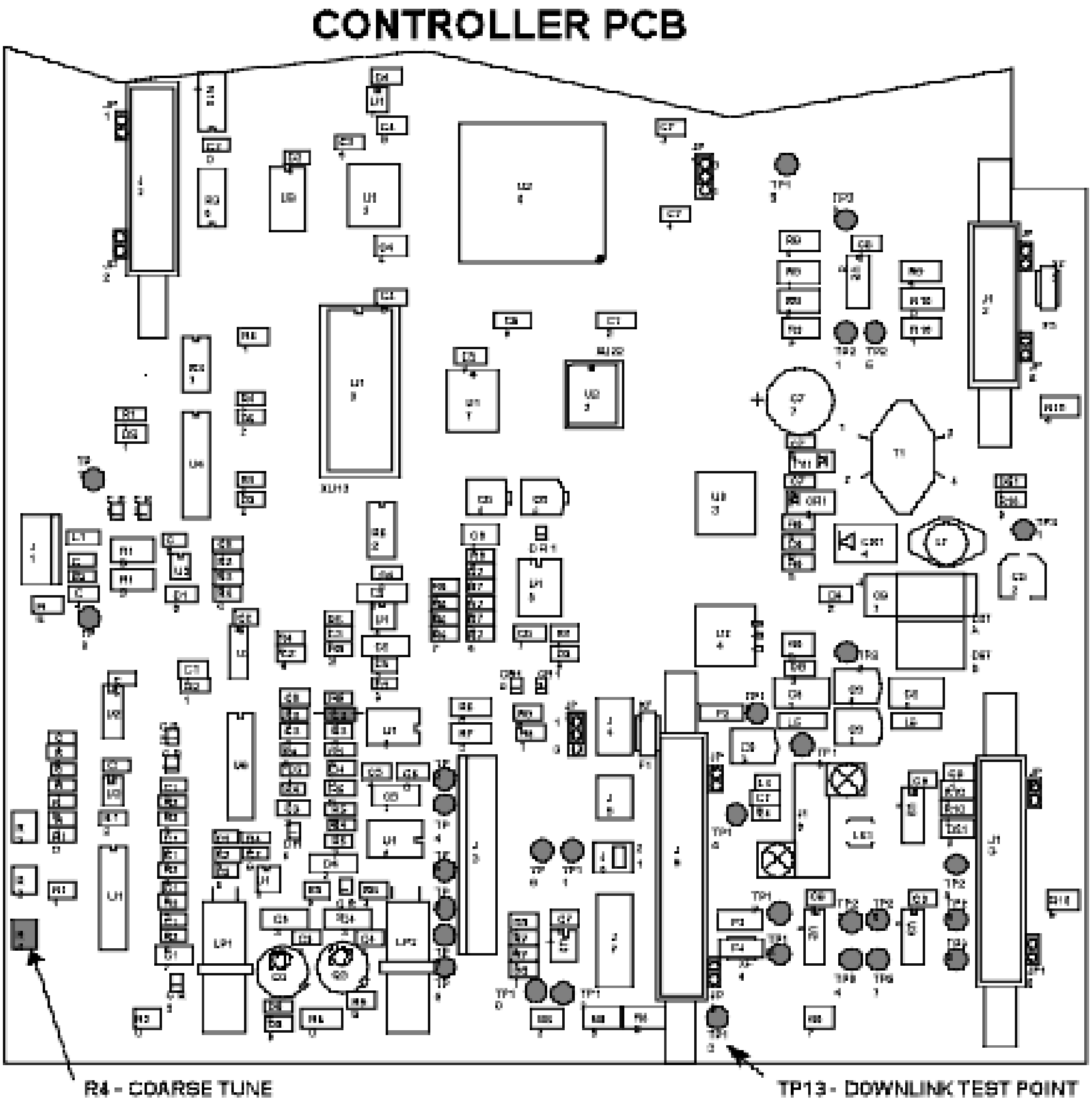


Figure: 4‑1   Controller PCB Coarse Tune Adjustment

4.1.1.2 Modulator PCB (Mag I) Adjustment for X-Band and S-Band

After changing the magnetron please follow these adjustment points.

> **NOTE**
> Before starting with the adjustment the magnetron has been preheating approx. 30 min. by switching the Radar System into the STAND BY MODE.

(1) At the MTR, place the Antenna Safety switch to OFF to prevent accidental antenna rotation and transmission. Open the right access door using a 10 mm socket to gain access to the Modulator PCB mounted on the inside of the door.

(2) Locate Link JP3 on the Controller PCB and link JP3 2-3 to disable antenna rotation. **Rotate the array away from personnel**. Place the Antenna Safety switch to ON to enable the transmitter.

(3) Place DVM positive lead to the U11 side of R62 or TP 1 on the Modulator PCB and negative lead to chassis ground, Figure: 4-2.

(4) On the Modulator PCB, locate and adjust R56 (MAG I ADJ) for 2.8V DC S-Band and 3.2V DC X-Band.

(5) Now turn the potentiometer on the Reference Adjust Board (Fig. 5) slowly to the left and watch the voltage level of TP 1. As soon as the voltage decreases markedly (2.75 V or 3.15 V), the potentiometer must be slightly turned back until the corresponding values (2.8 V DC for S-Band and 3.2 V DC for X-Band) re-adjust.

(6) Place the Antenna Safety switch to OFF.

(7) Locate Link JP3 on the Controller PCB and link JP3 1-2 to enable antenna rotation.

(8) Remove test leads and secure doors and access panels.

WARNING
ANTENNA WILL ROTATE WHEN THE ANTENNA SAFETY SWITCH IS TURNED ON.

(9) Place the Antenna Safety switch to ON.

This completes the MTR adjustments.

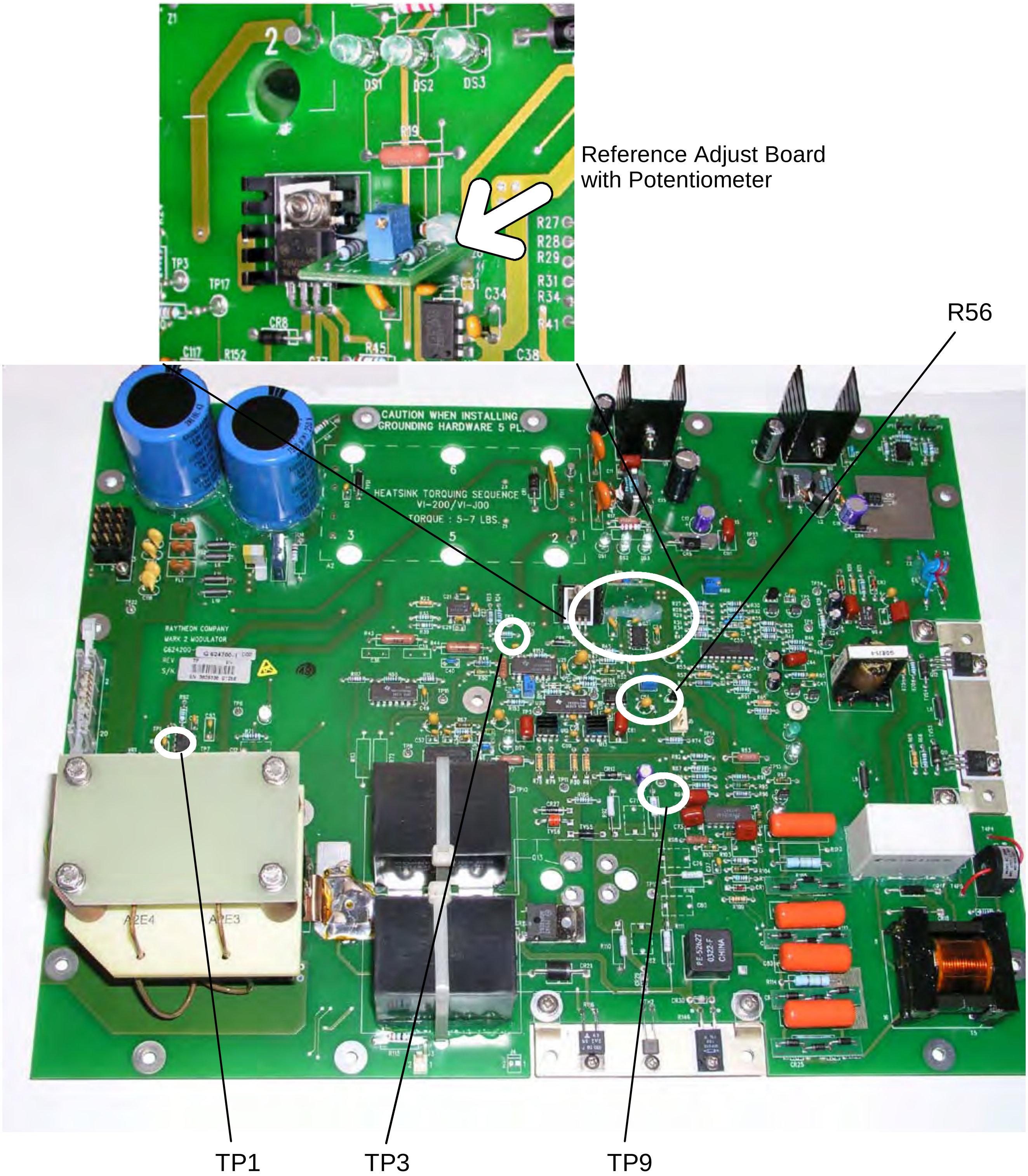


Figure: 4-2   Modulator PCB MAG I Adjustment and Reference Adjust Board

4.1.2 X/S-Band MTR Up Disassembly

Before replacing the assemblies or PCBs, it is necessary to set the power supply to OFF. The following procedures for removing and replacement of assemblies/ PCBs should be followed:

> **WARNING**
> BEFORE REPLACING THE ASSEMBLIES OF THE MTR, SET THE POWER TO OFF AND SECURE POWER TO THE MTR AT THE CIRCUIT BREAKERS.

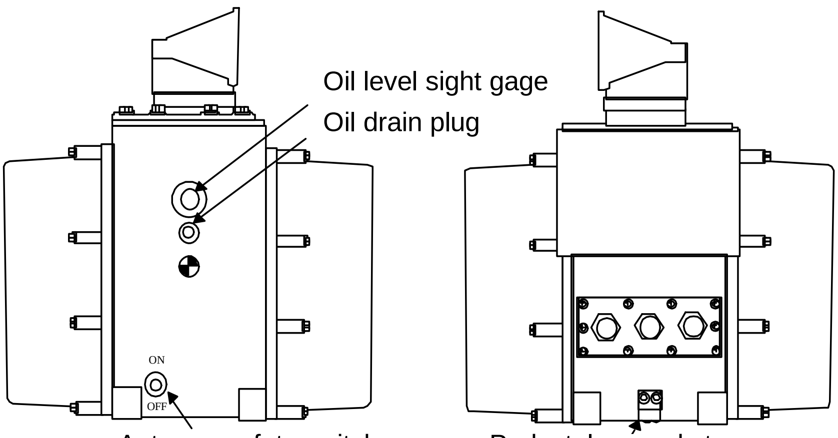


Figure: 4-3 Main Pedestal Views

4.1.3 X/S-Band Connector Bracket (A9), 1∅, Removal

(1) Release 12 captive screws and open the right-side pedestal cover. Power is present at MTR TB1-1,-2,-3 and Motor TB1-8,-9,-10.

(2) Identify, tag, and remove all lugs bringing in the AC Line Power for the MTR at TB1-1,-2,-3 and Motor, TB1-8,-9,-10.

(3) Loosen the two screws (a counter-sunk phillips on the left, a hex head holding the Power and I/O mounting bracket on the right) at the bottom of the Contactor Bracket.

(4) Remove two screws at the top of the Contactor Bracket.

(5) Lower the Contactor Bracket for access to the wires.

(6) Identify, tag, and remove the spade lugs from the following:

Rear of A9TB2 connected to yellow Motor circuit wires.

Rear of A9TB1-1 and -8 connected to the green ground wire.

Fuse wires (115 VAC) connected to the fuse holder collar lug on A9F1 (black) and A9F2 (white).

For 1/2 HP motor: Contactor Relay (A9K1) coil supply wires on the relay lug contacts 'A' (red) and 'B' (brown) leading from the Power I/O PCB (A1J8).

For 1 HP motor: Contactor Relay (A9K1) coil supply wires on the relay lug contacts '1' (red) and '2' (brown) leading from the Power I/O PCB (A1J8).

(7) Remove the Contactor Bracket.

(8) Install the Contactor Bracket by reversing the removal procedures.

WARNING

When replacing a Contactor Bracket check linking according to Motor Voltage, Power Phase and Horse Power installed.

4.1.4 X/S-Band Contactor Bracket (A9), 3Ø, Removal

(1) Release 12 captive screws and open the right-side pedestal cover.

(2) Identify, tag, and remove all lugs bringing in the AC Line Power for the MTR at TB1-1,-2,-3 and the Motor at Relay K1, lugs L1, L2, L3 and TB1-3 (GND).

(3) Loosen the two screws (counter-sunk phillips on left, hex head holding Power and I/O mounting bracket on right) at the bottom of the Contactor Bracket.

(4) Remove two screws at top of the Contactor Bracket.

(5) Lower the Contactor Bracket for access to the wires.

(6) Identify, tag, and remove the spade lugs from the following:

Rear of A9TB2 connected to yellow Motor circuit wires.

Rear of A9TB1-3 connected to the green ground wire.

Fuse wires (115 VAC) connected to the fuse holder collar lug on A9F1 (black) and A9F2 (white).

Contactor Relay (A9K1) coil supply wires on the relay lug contacts A1 (red) and A2 (brown) leading from the Power I/O PCB (A1J8).

(7) Remove the Contactor Bracket.

(8) Install the Contactor Bracket by reversing the removal procedures.

NOTE

When replacing a Contactor Bracket check linking according to Motor Voltage, Power Phase and Horse Power installed..

4.1.5 Power I/O PCB (A1) Removal

(1) Loosen 24 captive screws and open both pedestal covers.

(2) Identify, tag, and remove all connectors from the Power and I/O PCB.

(3) Lower the Contactor Bracket as detailed in Steps 1 through 5 of chapter 4.1.4 or chapter 4.1.4 to gain access to the left side of the Power and I/O PCB.

(4) Remove the two screws, lock washers, flat washers securing the right side of the PCB to the bracket.

(5) Loosen three screws (two of which also secure the P–clamps) on the left side of the PCB.

(6) Remove the PCB.

(7) Install the Power I/O PCB by reversing the removal procedures.

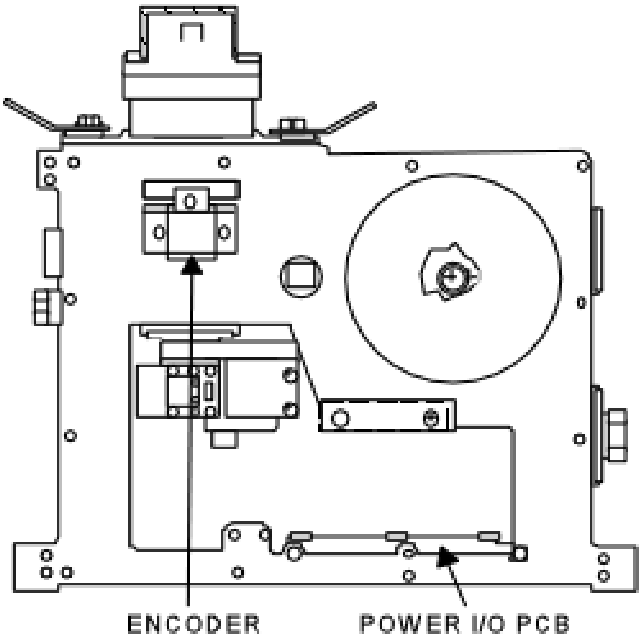


Figure: 4–4 Encoder and Power and I/O PCB Location

4.1.6 Encoder Assembly Removal

(1) Release 12 captive screws and open the right–side pedestal cover.

(2) Disconnect P12 of the encoder cable from J12 of the Controller PCB.

(3) Cut the ty–wraps holding the ribbon cable to the main cable run.

(4) Detach the Encoder assembly from the pedestal by removing two screws and lock washers. (Be careful not to detach the bottom plastic cover on the Encoder.)

(5) Loosen the Allen Set screw on the Encoder gear collar and remove the gear from the Encoder.

(6) Remove four screws, lock washers, and flat washers securing the Encoder carrier/mount to the Encoder. Remove Encoder.

(7) Install the Encoder assembly by reversing the removal procedures. When installing ensure the Encoder gear meshes properly to the pedestal gear by slowly turning the motor fan while tightening the Encoder carrier/mount screws.

NOTE

Ensure that the black plastic bottom cover is held in place by putting a dab of RTV on the outer surface where the plastic tabs meet the Encoder's metal casing.

4.1.7 AC Motor or Belt Removal

(1) Release 24 captive screws and open the pedestal's right and left side covers.

(2) Identify, tag, and remove the motor connections from TB2 on the Contactor Bracket.

(3) Identify, tag, and remove the connections from the motor capacitors located in the pedestal assembly.

(4) Drive Belt Removal :

Loosen four motor mounting plate bolts securing the motor to the pedestal case.

Back off jam nut and loosen the tension bolt.

Slide mount to provide slack in the belt. When there's enough slack remove the belt from the pulleys.

(5) Remove the top two bolts, lock washers, and flat washers securing the motor to its mounting plate.

(6) Screw in two lengths of threaded stock (12 inches long for X-Band and 14 inches long for an S-Band, matching the mounting bolt's threads) into the two top mounting bolt's holes.

(7) Remove the bottom two bolts, lock washers, and flat washers securing the motor to its mounting plate.

(8) Slide the motor through the pedestal's right side.

(9) Install motor and belt by reversing the removal procedures.

4.1.8 X–Band RF Assembly Update

4.1.8.1 HV Binding Post Removal

(1) Remove all power from the MTR Up and tag the display to indicate the system is not to be energized.

(2) Using a 10mm socket and ratchet, loosen 12 captive cover screws on the pedestal's left and right side covers of the pedestal and swing covers open.

(3) Locate and disconnect the green and yellow high voltage leads at E1 and E2 of the HV Binding Post Bracket, Figure: 4–5.

(4) Remove two screws, lock washers, and flat washers and the binding post bracket from the pedestal casing.

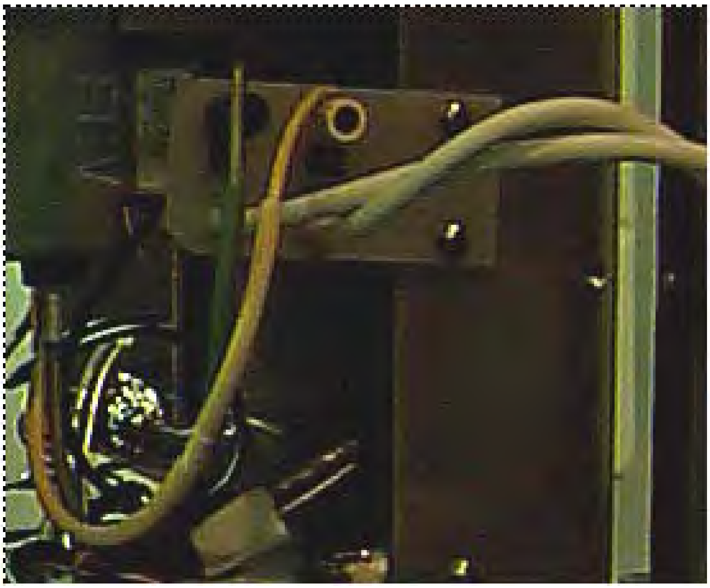


Figure: 4–5 HV Binding Post Removal

4.1.9 Magnetron or Front-End Removal

(1) Locate and disconnect the D-Connector attached to the IF Assembly.

(2) Disconnect the connector attached to the TR-Limiter. On some units it maybe necessary to cut the two STC leads at the TR Limiter, Figure: 4-6.

(3) Remove plug attached to J5 of the Controller PCB and remove cable from cable harness

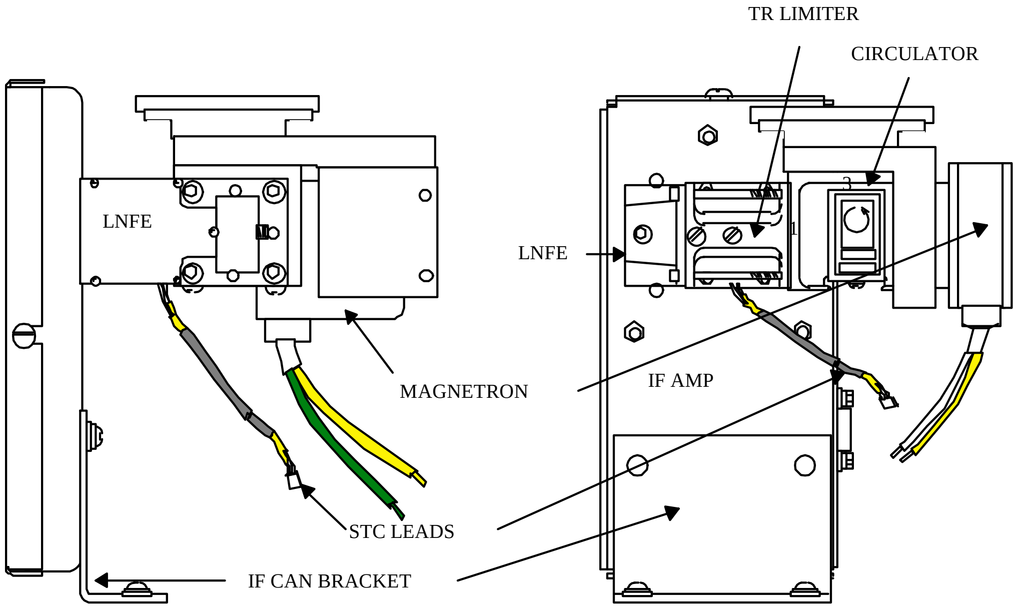


Figure: 4-6 X-Band RF Assembly Layout

CAUTION
THE MAGNETRON CONTAINS SENSITIVE AND MAGNETIC PARTS. PLACE THE MAGNETRON ON A NON-STEEL SURFACE AND AWAY FROM STEEL SURFACES AND OBJECTS.

(4) Using a screwdriver, remove the two screws attaching the IF can bracket to the IF Can, (do not discard screws).

(5) Using a screwdriver, remove the two screws attaching the IF can bracket to the MTR casing. The new bracket and screws are included in the Up–date Kit.

NOTE

Screws are installed using Locktite. Use care when removing screws so not to strip head of screw.

(6) Remove four 50mm, socket head screws using M3 Allen wrench from the LNFE (A4A2), TR limiter (A6) and circulator.

(7) Remove LNFE/IF Amplifier assembly and TR Limiter from the pedestal.

(8) Remove the four screws attaching the circulator to the rotary joint.

(9) Remove circulator, magnetron bracket, magnetron and ground strap.

(10) After Magnetron change and use SETUP TEST menu Calibration visual Adjustment to set the new Tune Preset. Also Magnetron send time hours can be reset.

4.1.9.1 Removal of LNFE SUB ASSY

Special information using X‑Band XCVR‑UP, see installation information as shown in Figure: 4‑7.

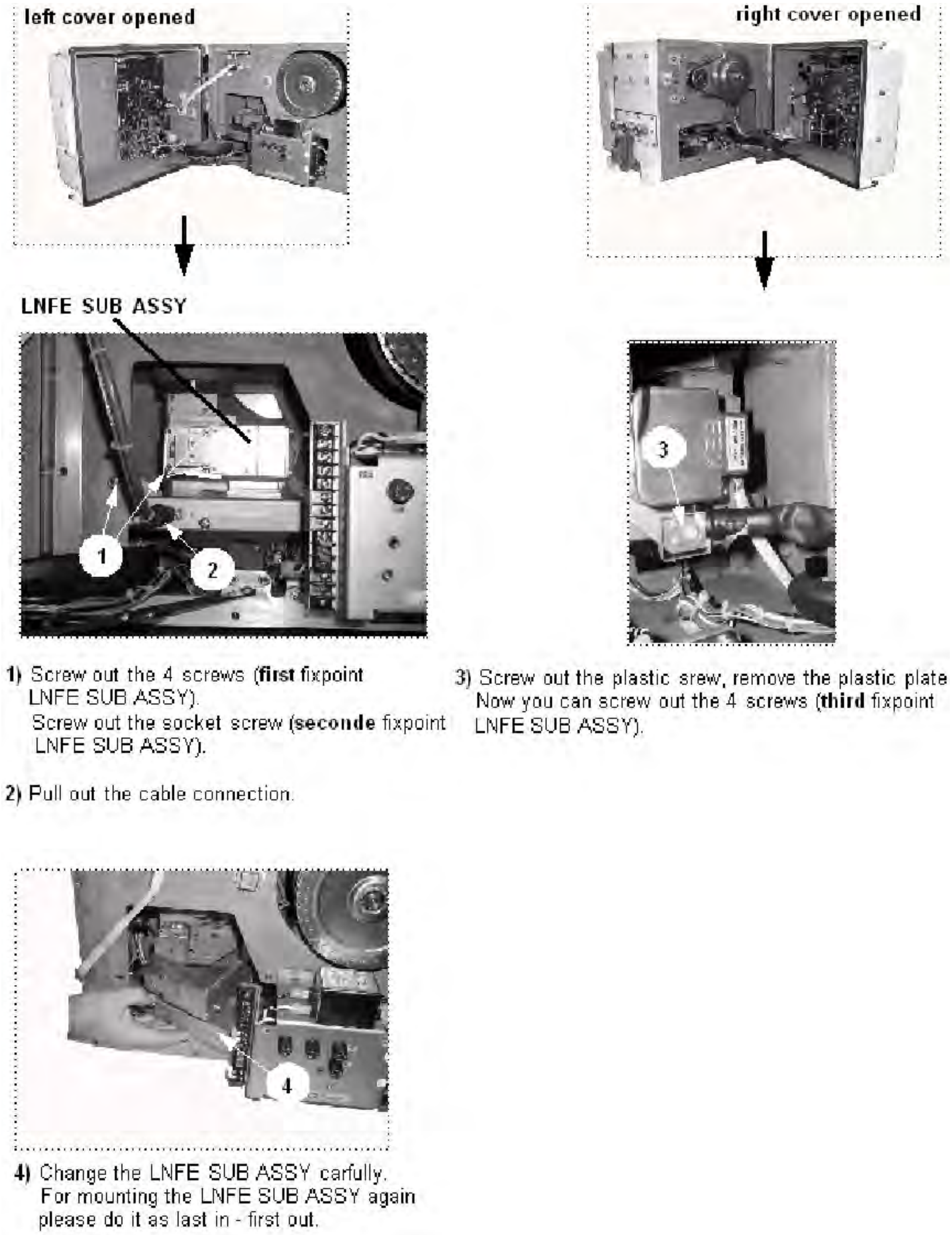


Figure: 4‑7 Removal of LNFE SUB ASSY

4.1.10 RF Installation

(1) Remove IF Can bracket from the assembly.

(2) Install the complete RF assembly to the rotary joint from the modulator door side of the MTR. Attach RF assembly to the rotary joint using four 65mm allen screws.

> **NOTE**
> The magnetron will be facing the rear inside pedestal wall as shown in Figure: 4–8.

(3) Connect the D–Connector to the IF Amplifier Assembly.

(4) Remove the two socket head screws at the door hinge on the Controller side of the pedestal. Discard screws.

(5) Cut cable ties and reroute cable harness to allow the new IF Can Bracket to be fitted in place and bolted to the door hinge. Secure bracket and door hinge in place using supplied longer hardware.

> **NOTE**
> INSURE THAT CABLE HARNESS IS DRESSED TO PREVENT CHAFING ON BRACKETS OR OTHER SHARP EDGES WHEN DOOR IS CLOSED.

(6) Attach IF Can Bracket to the IF Amplifier Assembly.

(7) Neatly lace cable harness using supplied cable ties.

IF Can Bracket Assembly

RF Assembly Installation

Figure: 4-8 RF Installation

4.1.11 S–Band MTR Up RF Assembly Removal

Removal and installation of the RF Assembly is restricted by its size. The S–Band MTR Up RF Assembly configuration can only be removed and installed within the pedestal by the disassembly or assembly of the individual components from the RF Assembly.

4.1.11.1 Magnetron (V1) Removal

CAUTION
THE MAGNETRON CONTAINS SENSITIVE AND MAGNETIC PARTS. ONCE REMOVED, PLACE THE MAGNETRON ON A NON–STEEL SURFACE AND AWAY FROM STEEL SURFACES AND OBJECTS.

(1) Loosen 12 captive cover screws on the pedestal s left side of the pedestal and swing open cover.

(2) Disconnect the Magnetron leads (green and yellow) from the binding posts, E1 and E2.

(3) Remove two screws, lock washers, and flat washers and the binding post bracket from the pedestal casing.

(4) Facing the back of the magnetron and using NON–Ferrous/NON–Magnetic hand tools remove four bolts, flat washers and lock washers where the magnetron meets the circulator and two screws, flat washers and lock washers where the magnetron's mounting bracket meets the pedestal casing.

(5) Remove magnetron from the RF assembly.

(6) Install magnetron by reversing the removal procedures.

(7) After Magnetron change and use SETUP TEST menu Calibration visual Adjustment to set the new Tune Preset. Also Magnetron send time hours can be reset.

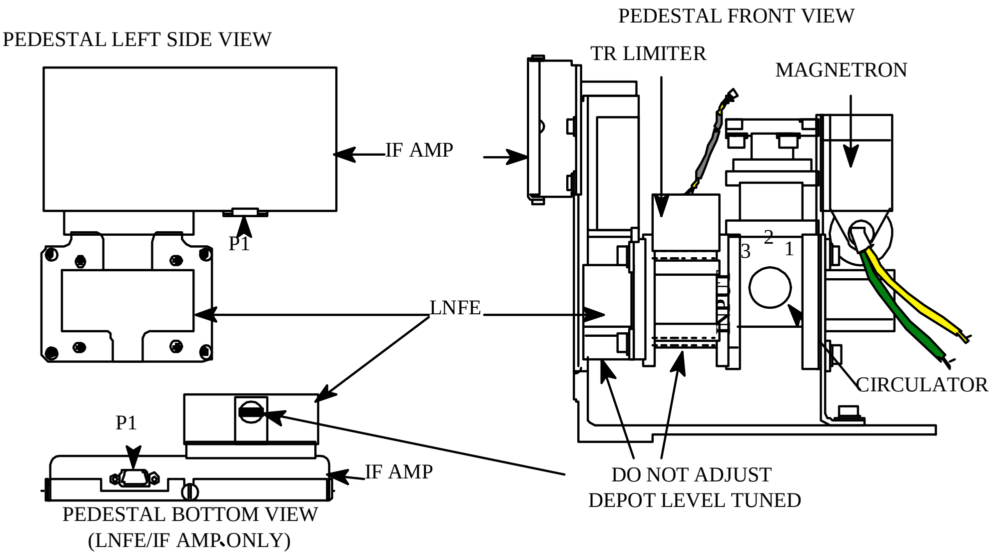


Figure: 4–9 S–Band RF Assembly Layout

4.1.11.2 LNFE/ IF Amp (A4) Assembly and TR Limiter (A6) Removal

NOTE

Refer to Figure: 4–9 during the LNFE/IF Amp and TR Limiter removal procedures.

(1) Loosen 12 captive cover screws on both sides of the pedestal and swing open the covers.

(2) Unplug the connector, P1, on the bottom of the LNFE/IF Amp. assembly.

(3) Cut the tie–wraps holding the TR Limiter coax cable, W1, to the main cable run.

(4) Unplug P5 from the Controller PCB (A3).

(5) Remove the two screws on the right side of the IF Amp. holding the LNFE/ IF Amp. mounting bracket to the pedestal case.

> **NOTE**
> CAREFUL – Hold the TR Limiter while completing Step #4.

(6) Remove the four Allen screws, flat washers and lock washers securing LNFE (A4A2) and the TR Limiter (A6) to the RF assembly.

(7) Remove the TR Limiter from the pedestal.

(8) Remove the LNFE/IF AMP assembly from the pedestal.

(9) Install LNFE/IF AMP assembly and TR Limiter by reversing the removal procedures.

> **NOTE**
> When replacing the TR Limiter reuse the coax cable assembly, W1. Identify position/orientation for installing of TR Limiter as shown in Figure: 4–9.

4.1.11.3 Circulator (A7) Removal

(1) Remove the Magnetron as detailed in chapter 4.1.11.1 .

(2) Remove the LNFE/IF Amp assembly and TR Limiter as detailed in chapter 4.1.11.2.

> **NOTE**
> Careful not remove rotary joint srews.

(3) Using a 3/16“ Allen Wrench cut on the short side to clear 3/4“, remove the three Allen screws and flat washers at positions #5, #6 and #7 holding the Circulator up to the Rotary Joint.

(4) Remove the Circulator from the pedestal.

(5) Install the Circulator by reversing the removal procedures.

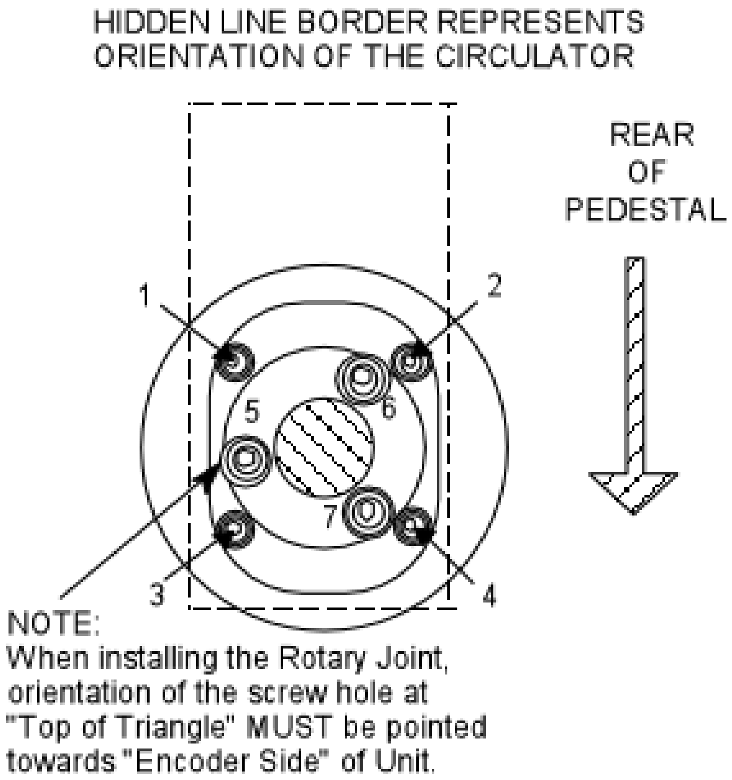


Figure: 4–10 Circulator – Rotary Joint Under View

4.1.12 X-Band MTR Up Worm Gear Shaft Removal

(1) Loosen 12 captive screws and open the left-side pedestal cover.

(2) Remove the Power I/O PCB, chapter 4.1.5.

(3) Remove the RF Assembly as detailed in chapter 4.1.8 for X-Band and chapter 4.1.11 for S-Band.

(4) Cover the inside pedestal case bottom and area adjacent to the pedestal with oil absorbent sheet product to prevent oil spillage.

(5) Drain the oil from the drive housing reservoir as detailed in chapter 5.2.2. Tilt the pedestal from the back by 1“ to insure complete oil drainage from the worm gear cavity as circumstances permit.

(6) Loosen the four motor mounting bolts and then loosen the drive belt tension bolt enough to remove the drive belt from pulleys.

(7) Remove the large pulley from the worm gear shaft by removing three bolts from the pulley hub. Secure two of the same bolts into the hub holes provided for backing the hub out of the pulley.

(8) Alternate the tightening the two bolts until the pulley can be easily removed from the worm gear shaft.

(9) Remove three screws from the worm gear shaft bearing clamps.

NOTE

.Do not remove the 1” Pipe Plug on the Pedestal’s right side. This plug provides access to the press fitted needle bearings that is not field serviceable.

(10) Pull gently on the worm gear shaft bearing clamp (being careful not to cut the shaft seal on the worm gear shaft keyway edges). Remove the bearing clamp.

(11) Remove the worm gear shaft by pulling it straight out from pedestal. If necessary, slightly move the T–Bar in a counter–clockwise direction to help loosen it.

CAUTION

CAREFULLY REPLACE THE WORM GEAR SHAFT AND BEARING CLAMP TO AVOID CUTTING THE SHAFT SEAL ON THE WORM GEAR SHAFT KEYWAY EDGES

NOTE

Coat all bearings with oil to aid in installation.

(12) Install worm gear shaft by reversing the removal procedures with the following difference.

When the worm gear in installed into the pedestal casing, feel for when the worm gear engages the drive gear.

Gently move the T–bar clockwise to pull the worm gear into place.

Carefully inspect the gasket for wear and damage and replace as needed.

4.1.13 S–Band MTR Up Worm Gear Shaft Removal

(1) Loosen 12 captive screws and open the left–side pedestal cover.

(2) Remove the Power I/O PCB, chapter 4.1.5.

(3) Remove the RF Assembly starting in chapter 4.1.11.

(4) Cover the inside pedestal case bottom and area adjacent to the pedestal with oil absorbent sheet product to prevent oil spillage.

(5) Drain the oil from the drive housing reservoir as detailed in chapter 5.2.3 Tilt the pedestal from the back by 1“ to insure complete oil drainage from the worm gear cavity as circumstances permit.

(6) Remove the Rotary Joint, chapter 4.1.22.3.

(7) Loosen the four motor mounting bolts and then loosen the drive belt tension bolt enough to remove the drive belt from pulleys.

(8) Remove the large pulley from the worm gear shaft by removing three bolts from the pulley hub. Secure two of the same bolts into the hub holes provided for backing the hub out of the pulley.

(9) Alternate the tightening the two bolts until the pulley can be easily removed from the worm gear shaft.

(10) Remove three screws from the worm gear shaft bearing clamps.

NOTE

Do not remove the 1–in Pipe Plug on the Pedestal’s right side. This plug provides access to the press fitted needle bearings that is not field serviceable.

(11) Pull gently on the worm gear shaft bearing clamp (being careful not to cut the shaft seal on the worm gear shaft keyway edges). Remove the bearing clamp.

(12) Remove the worm gear shaft by pulling it straight out from pedestal. (If necessary, slightly move the T–Bar in a counter–clockwise direction to help loosen it).

CAUTION

CAREFULLY REPLACE THE WORM GEAR SHAFT AND BEARING CLAMP TO AVOID CUTTING THE SHAFT SEAL ON THE WORM GEAR SHAFT KEYWAY EDGES

NOTE

Coat all bearings with oil to aid in installation.

(13) Install worm gear shaft by reversing the removal procedures with the following differences:

When the worm gear in installed into the pedestal casing, feel for when the worm gear engages the drive gear.

Gently move the T–bar clockwise to pull the worm gear into place.

Carefully inspect the gasket for wear and damage and replace as needed.

4.1.14 Motor Capacitors A10 C1 and A10 C2 Removal (Single Phase)

(1) Release 24 captive screws and open both pedestal covers.

(2) Discharge both capacitors to the pedestal case ground using the Contactor Bracket A9TB2–6, –7,–8, –10 and –11.

(3) Remove the four screws holding the Contactor Bracket and lower it to gain easier access.

(4) Carefully identify, tag and remove the motor wires from capacitors (SOME VOLTAGE MAY REMAIN). Again discharge each capacitor terminal after it is removed.

(5) Remove the two screws holding the Capacitor Bracket (A10) and remove it from inside the pedestal.

(6) Cut the tie–wraps securing the capacitors to the capacitor mounting bracket. Remove the capacitors.

(7) Install the capacitors by reversing the removal procedures. When reattaching the capacitors apply RTV–108, where the tie–wraps firmly meet the each capacitor.

4.1.15 Fan Wheel, Removal

(1) Release 12 captive screws and open the right–side pedestal cover.

(2) Insert a 1/8“ shaft screw driver into the hole opposite the set screw while the hole is at the 10 o’clock position. Place the tip of the screwdriver into the 1/8“ hole located in the motor s casing horizontally in line with the fan face’s hole. Use this screwdriver in place to steady the fan when loosening the set screw so as to keep from damaging the fan blades.

(3) Loosen the Allen screw securing the fan wheel by inserting a 3 1/2“ shaft, 4MM ball Tip wrench or drive through the fan blades to the fan collar’s set screw.

(4) Remove the fan wheel.

(5) Install the fan wheel by reversing the removal procedures.

4.1.16 X/S-Band MTR Up Modulator PCB Removal

NOTE
For locating Modulator hardware see Figure: 4-11.

(1) Disconnect the plugs attached to J1 and J2 of the Modulator PCB.

(2) Remove screws, lock washers, and flat washers #1, #2, #3 and #4 connecting Q13 to the Modulator.

(3) Remove screws, lock washers, and flat washers #5 through #22.

(4) Remove screw, lock washer, and flat washer #23.

(5) Carefully remove the Modulator PCB.

CAUTION
WHEN INSTALLING THE MODULATOR PCB, CAREFULLY ALIGN THE PCB WITH THE PINS OF THE POWER MODULE TO AVOID DAMAGE

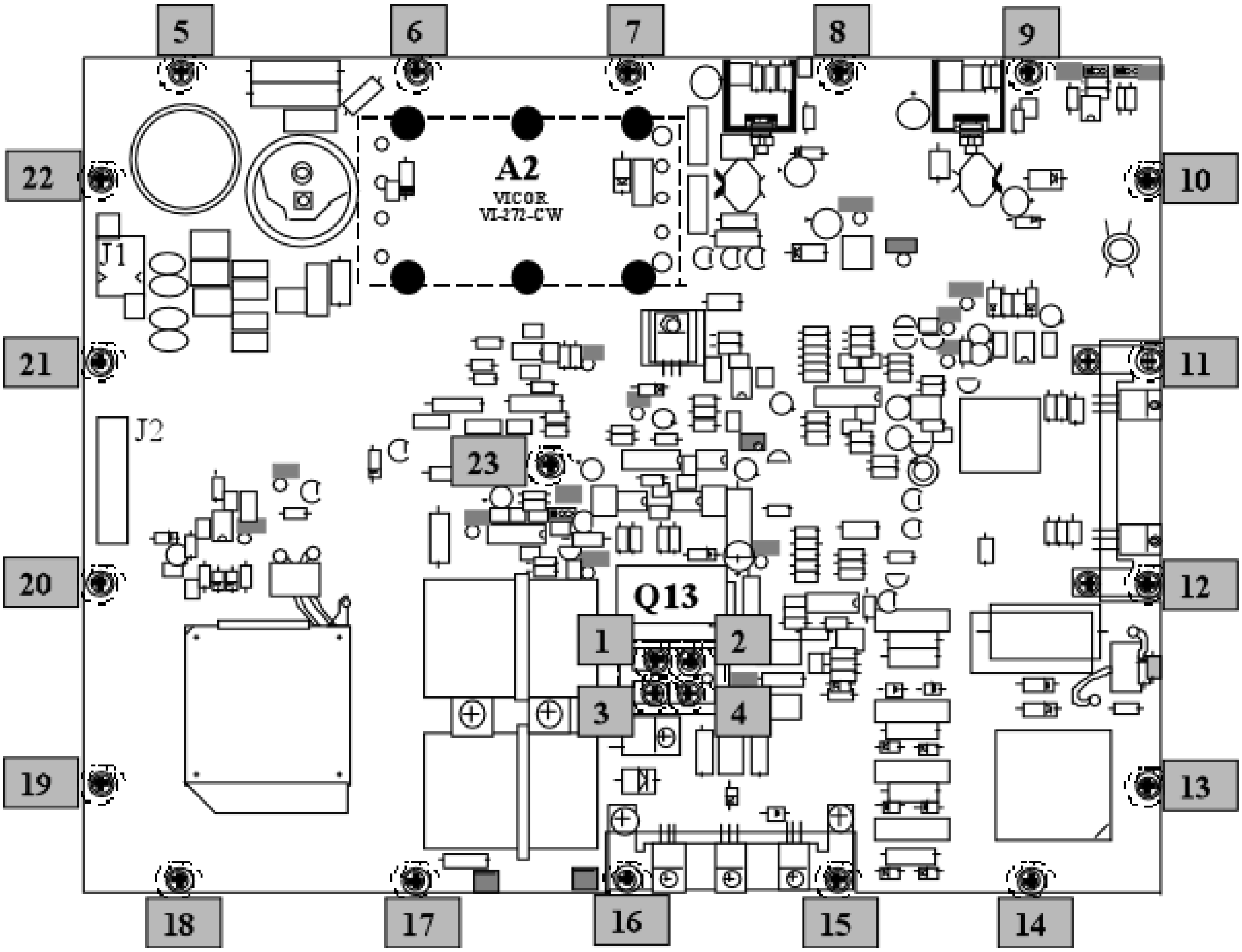


Figure: 4-11 Modulator PCB Hardware Location

4.1.17 Modulator MOSFET (A2Q13) Installation

(1) Locate the Modulator FET (A2Q13) mounted on the right-side pedestal door.

NOTE
Q13 is mounted to the MTR door under the Modulator PCB. Modulator PCB must be removed to gain access to Q13.

(2) If Q13 is installed without a MOSFET Housing, perform steps 3, 4, and 5 below. If MOSFET Housing is installed, proceed to step 6.

(3) Remove and discard Q13's two mounting screws.

(4) Remove the MOSFET and Heat Sink Sil Pad.

(5) Install MOSFET Housing assembly G627215-1 using the new supplied hardware.

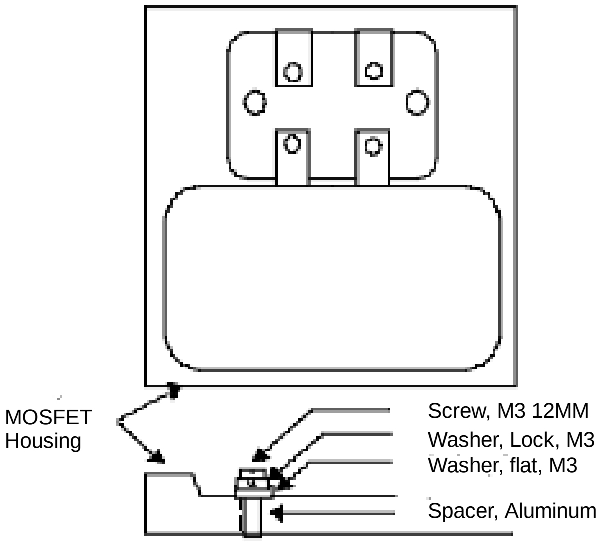
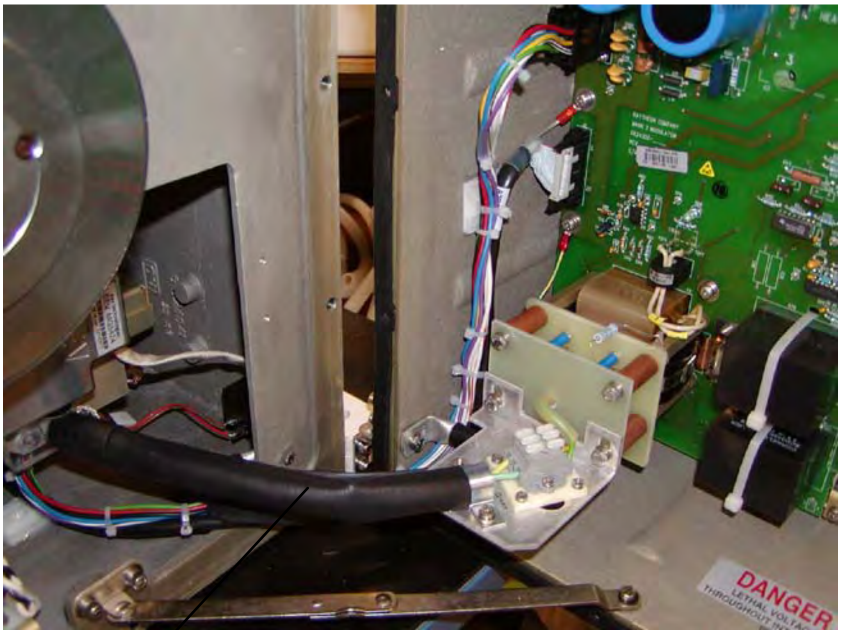


Figure: 4-12 MOSFET Installation

> **NOTE**
>
> Make sure the mounting bracket has a uniform layer of heat sink compound on its pedestal cover side. Replace the heatsink Sil Pad between the MOSFET housing assembly and the heat sink. Tighten down the mounting screws to 6–inch pounds**.**

(6) Install new Modulator PCB by reversing the removal procedures outline in chapter 4.1.16 (Figure: 4–13).



shielding hose

Figure: 4–13 Shielding hose installation

4.1.18 X/S‑Band Power Converter (A2A2) Module Removal

(1) Remove the Modulator PCB as detailed in chapter 4.1.16.

(2) Remove six screws, lock washers, and flat washers securing the Power Converter Module to the right‑side pedestal door.

(3) Remove Power Converter Module and heatsink SIL pad.

(4) Install Power Converter Module by reversing the removal procedures.

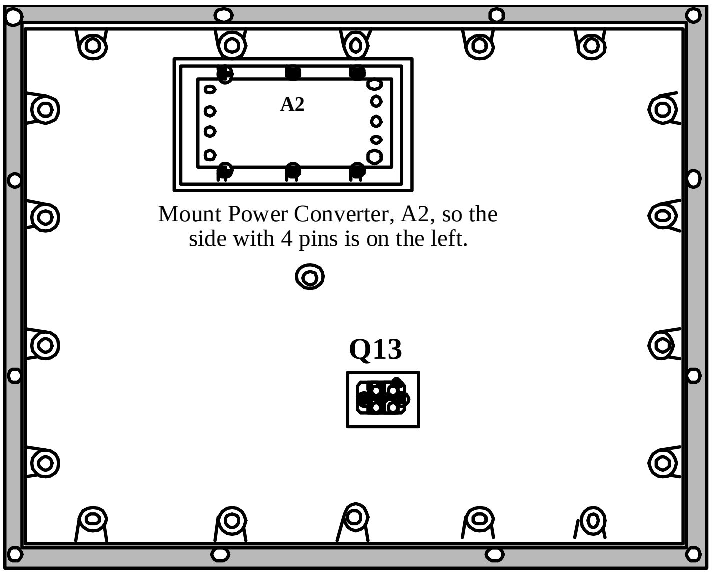


Figure: 4‑14 Power Converter (A2A2) Modul

4.1.19 X/S-Band Controller (A3) PCB Removal

(1) Loosen 12 captive screws and open right side pedestal cover.

(2) Remove all connectors, typically P3, P4, P5, P7,JP9, P10, P12, P13 and P8 (if PMU is installed) from the Controller PCB.

(3) Remove Controller PCB from right side pedestal cover.

(4) Install new Controller PCB by reversing the removal procedures.

(5) Secure covers, and perform operation checkout of the Radar System.

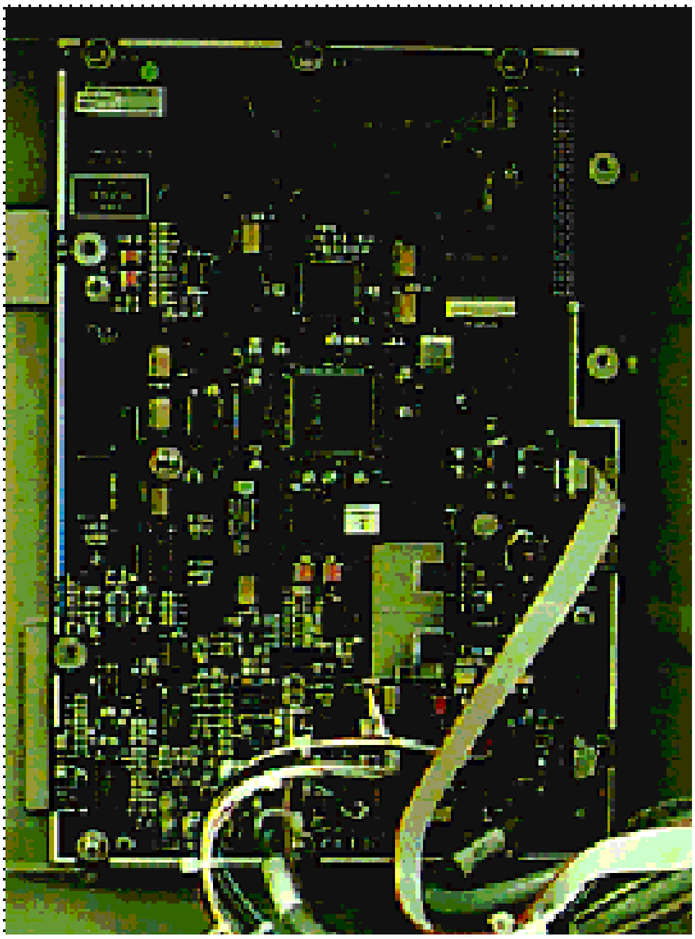


Figure: 4-15 Controller PCB Removal

4.1.20 Antenna Array Removal

4.1.20.1 X–Band Antenna Array Removal

(1) Rotate the Antenna Array by manually turning the motor fan wheel by hand to a position for safe removal.

(2) Remove four nuts, flat washers and lock washers from the mounting studs on the bottom of the Pedestal T–bar.

(3) Lift the Antenna Array strait up and remove.

(4) Cover the Pedestal RF fixture with plastic sheeting to prevent moisture and dirt contamination.

(5) Install the Antenna Array by reversing the removal procedures.

WARNING

When reinstalling an Antenna Array grease the O'ring gasket with Silicon grease.

4.1.20.2 S–Band Antenna Array Removal

(1) Rotate the Antenna Array by manually turning the motor fan wheel by hand to a position for safe removal.

(2) Disconnect the coax connector on the end of the Array and ensure the coax is not attached to the array by removing the necessary P–clamps and cutting the necessary ty–wraps.

(3) Remove 12 resp. 16 bolts, flat washers and lock washers from the bottom of the Pedestal T–bar.

(4) Lift the Antenna Array strait up and remove.

(5) Cover the open coax connectors with plastic sheeting to prevent moisture and dirt contamination.

(6) Install the Antenna Array see chapter 2.3.4.3 or 2.3.4.4.

WARNING

When reinstalling an Antenna Array coat the coax connector's threads with Silicon grease.

4.1.21 T-Bar and Drive Shaft Assembly Removal

4.1.21.1 X-Band MTR Up

(1) Remove the Array as detailed in chapter 4.1.20.1.

(2) Remove the Encoder Assembly as detailed in chapter 4.1.6.

(3) Remove the RF Assembly as detailed in chapter 4.1.8.

(4) Remove the Worm Gear Shaft as detailed in chapter 4.1.12.

(5) Remove eight mounting bolts, lock washers and flat washers. Remove the two hoisting plates.

(6) Pull the T-Bar and Drive Shaft assembly up and out of pedestal.

NOTE
Lubricate all bearings and gaskets when replacing T-Bar and Drive Shaft assembly.

(7) Install T-Bar and Drive Shaft Assembly by reversing the removal procedures with the following exceptions:

When lowering the Drive Shaft Assembly into place use centering guides. Screw two 8“ lengths of appropriate threaded stock (check the mounting bolt’s thread size) into opposing positions of the Drive Shaft Assembly’s mounting bolt holes.

As the Drive Shaft Assembly is lowered into place locate the three flat surfaces on the bottom plate. Align with the three flat edges on the pedestal casing and push assembly into place.

4.1.21.2 S-Band MTR Up

(1) Remove the Array as detailed in chapter 4.1.20.

(2) Remove the Encoder Assembly as detailed in chapter 4.1.5.

(3) Remove the RF Assembly starts with chapter 4.1.13.

(4) Remove the Worm Gear Shaft as detailed in chapter 4.1.12.

(5) Remove the to Rotary Joint Top Section, chapter 4.1.15.

(6) Remove eight mounting bolts, lock washers and flat washers. Remove the two hoisting plates.

(7) Pull the T-Bar and Drive Shaft assembly up and out of pedestal.

> **NOTE**
> Lubricate all bearings and gaskets when replacing T-Bar and Drive Shaft assembly.

(8) Install T-Bar and Drive Shaft Assembly by reversing the removal procedures with the following exceptions:

When lowering the Drive Shaft Assembly into place use centering guides. Screw two 8“ lengths of appropriate threaded stock (check the mounting bolt’s thread size) into opposing positions of the Drive Shaft Assembly’s mounting bolt holes.

As the Drive Shaft Assembly is lowered into place locate the three flat surfaces on the bottom plate. Align with the three flat edges on the pedestal casing and push assembly into place.

4.1.22 Rotary Joint Removal

4.1.22.1 X-Band MTR Up

(1) Remove the Antenna Array as detailed in chapter 4.1.20.1.

(2) Remove the Power I/O PCB, chapter 4.1.5.

(3) Remove the RF Assembly as detailed in chapter 4.1.8.

(4) Place oil absorbent towels in bottom of the Pedestal.

(5) Drain the oil from the drive housing reservoir as detailed in chapter 5.2.4.

(6) Remove Worm Gear as detailed in chapter 4.1.12.

(7) Remove the Drive Shaft Assembly as detailed in chapter 4.1.21.1.

(8) Remove the four screws from the bottom of the rotary joint.

(9) Check the rotary joint for free vertical travel in the housing.

(10) Place a piece of soft wood with a hole drilled for the RF probe on top of the rotary joint and GENTLY tap the rotary joint down.

(11) Turn and move the rotary joint base until free vertical travel is felt.

(12) Turn the rotary joint so the cut away on bottom mounting collar is facing the front of the pedestal.

(13) Pull the rotary joint down checking for significant horizontal movement as the rotary joint bottom is within 1 inch of the bottom of the pedestal inside casing.

(14) Move the rotary joint toward the rear of the pedestal as it is gently pulled down.

> **NOTE**
> When replacing the rotary joint, inspect and lubricate all bearings, gaskets, and add shims as necessary. Refer to chapter 4.1.22.2**.** for instructions on rotary joint shimming. Add approximately 1650 ML. of Mobil Synthetic Oil to oil reservoir when replacing oil. Check for proper oil level at site gage window.

(15) Remove rotary joint completely from drive housing and the pedestal.

(16) Install rotary joint by reversing the removal procedures to include the following.

4.1.22.2 X–Band MTR Up Rotary Joint Shimming (For Field Service)

> **NOTE**
> No shimming is required for an S–Band MTR Up.

(1) Apply a thin coat of grease to all O–rings found on the rotary joint.

(2) Place two 0.030 inch shims (opaque orange color) on the rotary joint mounting base and slide the rotary joint into the antenna drive housing.

(3) Install eight bolts, flat washers, and lock washers into the antenna drive housing and tighten.

(4) Install four screws to mount the rotary joint to the main pedestal casting.

(5) Place a straight edge across the top surface of the T–bar passing approximately 1/8–inch from the center probe of the rotary joint.

(6) Place a 0.005 inch shim (color blue) and a 0.002 inch shim (color red) together and slide between the straight edge and the annular ring around the center probe of the rotary joint. The fit should be neither tight nor loose.

(7) Add or subtract shims from the base of the rotary joint by removing the four screws and pulling rotary joint down enough to add shims or remove shims from base. Re–tighten screws and perform step 6 again. Repeat steps 6 and 7 until desired results are achieved.

4.1.22.3 S–Band MTR Up

(1) Remove the Antenna Array as detailed in chapter 4.1.20.

(2) Remove the coax assembly from the T–bar and Rotary Joint Top Connector.

(3) Remove the Power I/O PCB, chapter 4.1.5.

(4) Remove the RF Assembly start with chapter 4.1.11.

(5) Place oil absorbent towels in bottom of the Pedestal.

(6) Drain the oil from the drive housing reservoir as detailed in chapter 5.2.4.

NOTE

The S–Band Rotary Joint is in two sections, top and bottom. Removal of the bottom section is very difficult and should only be performed when the Rotary Joint is being completely replaced.

(7) Remove four screws, flat washers and lock washers from the top rotary joint section.

(8) Install a dummy 7/16–in DIN Connector on the Rotary Joint Top Connector to protect the threads.

(9) Carefully pull up on the Rotary Joint Top Section and remove from pedestal.

(10) Remove the four screws from the bottom section of the rotary joint.

(11) Check the rotary joint for free vertical travel in the housing.

(12) Place a piece wooden round stock, 1–1/8 inch diameter, with a hole drilled in the center on one end for the RF probe on top of the rotary joint and GENTLY tap the rotary joint down.

(13) Turn and move the rotary joint base until free vertical travel is felt.

(14) Pull the Rotary Joint Bottom Section down and remove from the pedestal.

NOTE

When replacing the rotary joint, inspect and lubricate all bearings, gaskets, and add shims as necessary. Refer to chapter 6.9.21 for instructions on rotary joint shimming. Add approximately 1650 ML. of Mobil Synthetic Oil to oil reservoir when replacing oil.
Check for proper oil level at site gage window.

(15) Install rotary joint by reversing the removal procedures.

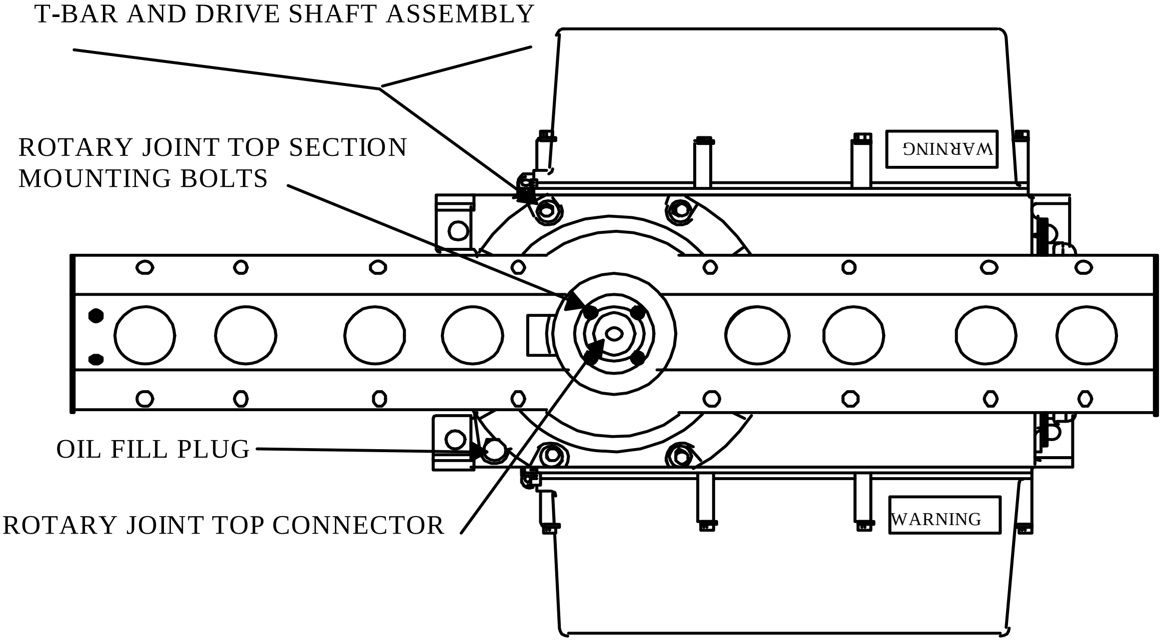


Figure: 4-16 S-Band MTR Up Rotary Joint and T-Bar Assembly Top View

4.1.23 Performance Monitor Unit (PMU) Removal

> **WARING**
> **DO NOT REMOVE PMU UNTIL ADEQUATE MEANS OF WEATHER PROOFING THE PEDESTAL CASING IS AVAILABLE. SEE STEP #5.**

(1) Release 12 captive screws and open the left-side pedestal cover.

(2) Remove the PMU connector, P8, from the Pedestal Controller PCB.

(3) Remove four screws, lock washers, and flat washers securing the PMU to the pedestal chassis.

(4) Carefully fish the Cable and plug through the Pedestal casing and remove the PMU.

> **NOTE**
> Return the entire failed PMU in its casing to Raytheon Marine for servicing. There are no field serviceable adjustments or parts.

(5) Until the PMU is reinstalled, cover the access hole in the Pedestal casing for weather protection with the PMU Pedestal Access Plate. This plate was removed when the PMU was installed.

4.2 10kW PEDESTAL – X-BAND (6 ft.)

4.2.1 Pedestal overview

The pedestal is connected to the NSC Display see Figure: 4–46, connection plan Figure: 4–63 and block diagram Figure: 4–47.

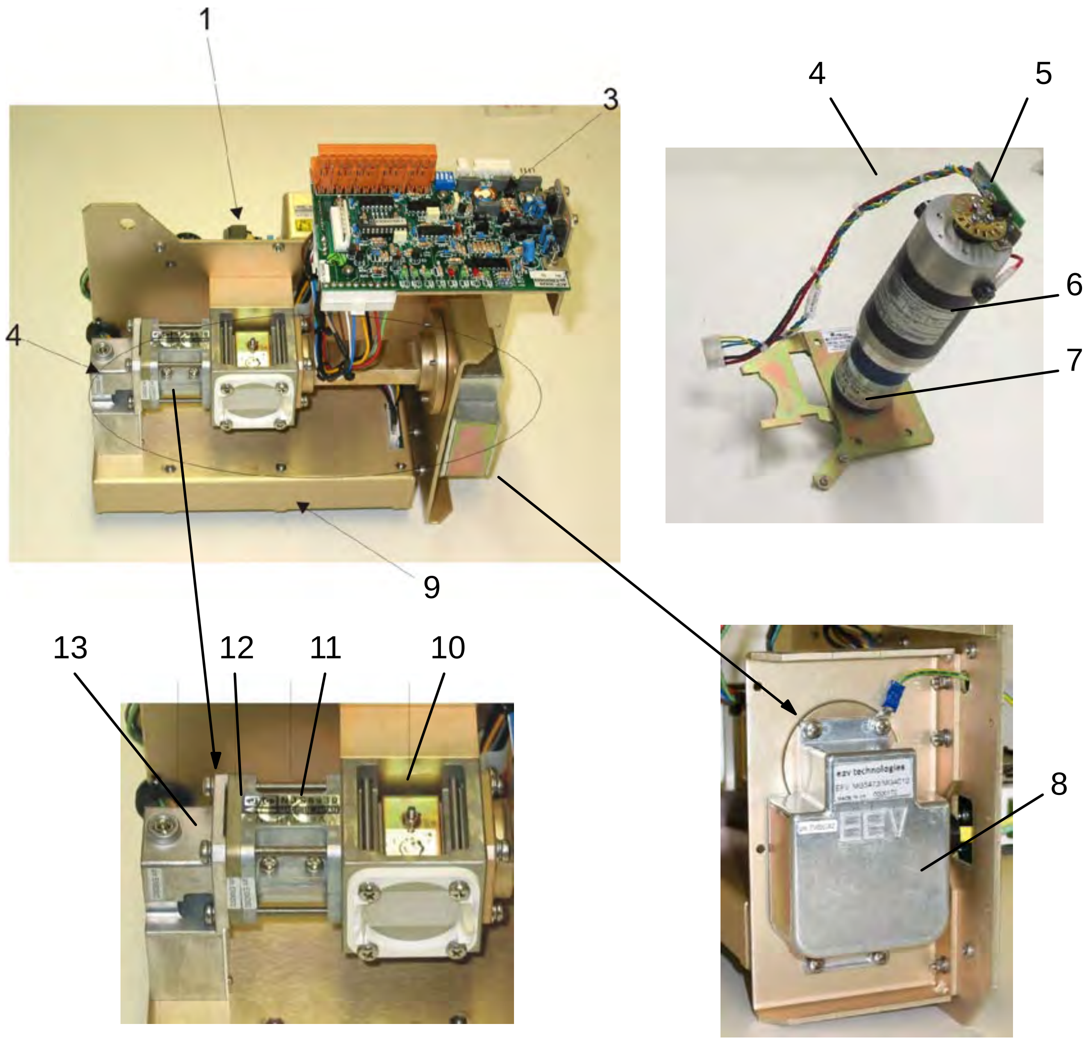


Figure: 4–46 Pedestal – sub assemblies –

1	MDL–301 modulator PCB	8	Magnetron
2	IFB–200 IF – Amplifier	9	Microwave assembly
3	ACP30020 motor control PCB	10	Circulator
4	GM–046 motor group	11	Limiter
5	HTL 12000	12	Filter
6	Motor	13	Front end
7	Gear Box		

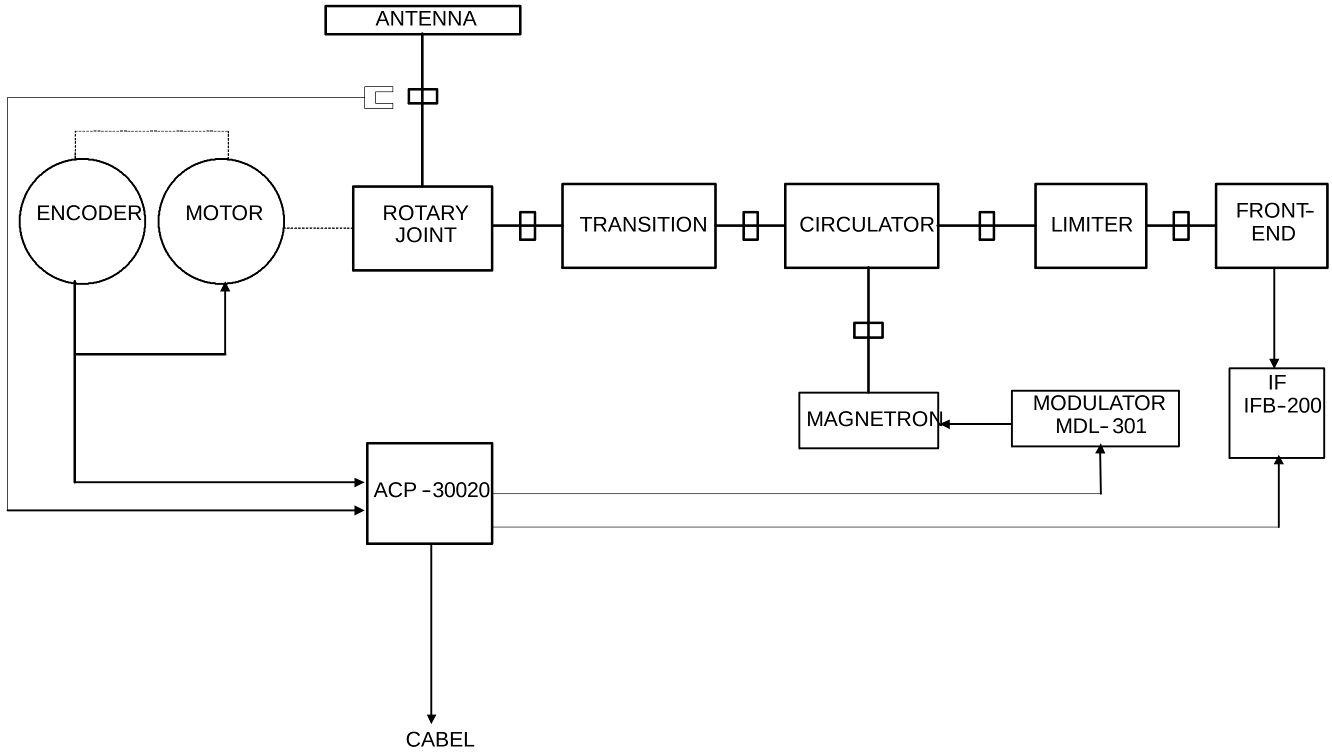


Figure: 4-47 Pedestal blockdiagram

4.2.2 Pedestal Replacement Procedure

Special tools:
- Socket wrench 13 mm.

To have access to the pedestal, proceed in the following mode:
- loosen 4 M8 screws with a socket wrench 13 mm;
- open the pedestal.

4.2.2.1 ACP-30020 motor control board replacement

Special tools:
- Philips screw driver 3 mm;
- Socket wrench 13 mm.

ACP-30020 board replacement procedure:
- Refer to the pedestal access procedure;
- disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- take off the 4 nuts M8, remove washers and take out the RTX plate;
- disconnect J1, J5 and J6 connectors of the ACP 30020.
- loosen the 6 M3 x 12 TC screws and replace the ACP 30020.

To reassemble the new ACP-30020 board, reverse the above procedure.

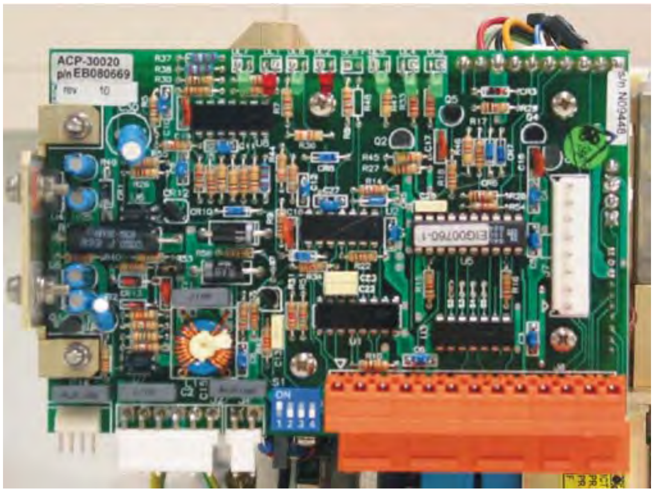


Figure: 4-48 ACP-30020 motor control board

4.2.2.2 MDL-301 modulator board replacement

Special tools:
- Philips screw driver 3 mm.
- Socket wrench 13 mm.

MDL 301 board replacement procedure
- Refer to the pedestal access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off 4 M8 nuts, remove washers and take out the RTX plate;
- Disconnect J1 and J2 connectors;
- Remove the modulator cover, unscrewing 10 M3 x10 TC screws;
- Disconnect J3 connector;
- Take off the yellow- green ground wire; unscrewing 1 M3 x 12 TC screw connecting the wire lug to the magnetron;
- Unsolder the yellow/ green magnetron wires;
- Loosen the 4 M3 X 12 TC screws and replace the MDL 301.

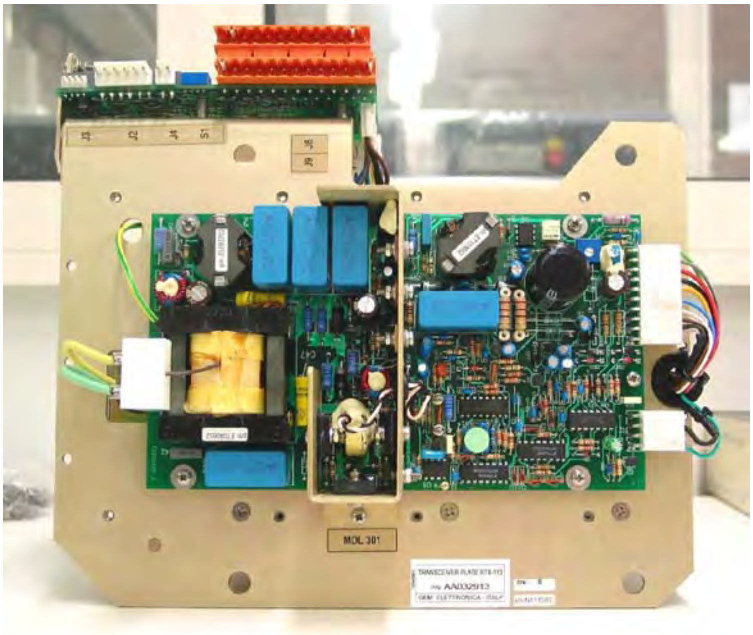


Figure: 4-49 MDL-301 modulator board

- Reassemble and connected the MDL-301 on the plate and perform the following adjustment:

  - Execute the Warm up;
  - On the ACP-30020 board, set dip-switch 4 of S1 to ON.
  - Set Radar to extra long pulse and use VR1 on modulator MDL- 301 to adjust the magnetron current until DL8 on the ACP-30020 board is lit.
  - Switch off the equipment, on the ACP-30020 board set dip-switch 4 of S1 to OFF.

4.2.2.3 Magnetron replacement

CAUTION	
	The magnetron contains sensitive and magnetic parts. Once removed, place the magnetron on a non-steel surface and away from magnetizable objects

Special tools (NON-Ferrous/NON-Magnetic tools):
- Phillips screw driver 3 mm;
- Socket wrench 13 mm.

Magnetron replacement procedure:
- Refer to the pedestal access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M10, the washers and take out the RTX plate;
- Remove the MDL 301 cover, unscrewing the 10 M3 x 10 TC screws;
- Unsolder 2 wires (yellow and green) of the pulses transformer;
- Unscrew the 4 M4 x 12 screws holding the magnetron.

To reassemble the new magnetron, reverse the procedure.
For the adjustment procedure refer to the MDL-301 modulator board procedure.

Figure: 4-50 Magnetron

4.2.2.4 Front-end replacement

Special tools:
- Phillips screw driver 3 mm;
- Socket wrench 13 mm.

LNFE replacement procedure:
- Refer to the pedestal unit access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M10, the washers and take out the RTX plate;
- Remove the IFB-200 cover unscrewing the 6 M3 X 10 TC screws
- Disconnect J1 connector;
- Unscrew the 4 M4 x 8 TC screws fixing the front-end to the IF holder.
- Unscrew the 4 M4 x 50 TC screws fixing the front-end to the limiter and circulator.

To reassemble the new front-end, reverse the procedure.

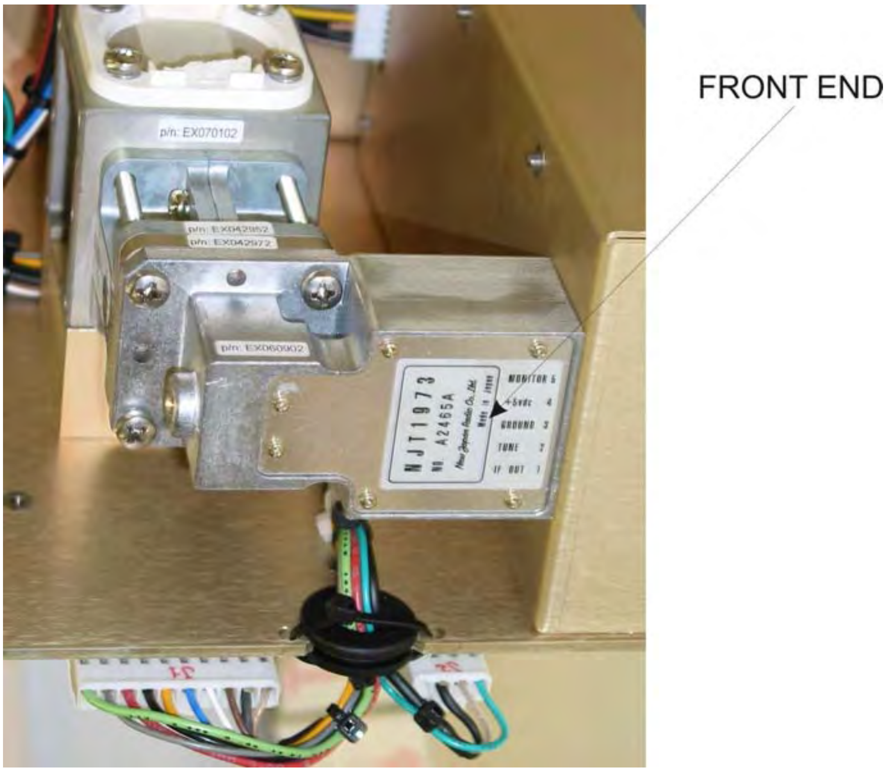


Figure: 4-51 Front end

4.2.2.5 Antenna Motor Group replacement

Special tools:
- Philips screw driver 3 mm;
- Socket wrench 13 mm.

Antenna motor replacement procedure:
- Refer to the pedestal access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M8, the washers and take out the RTX plate;
- Unscrew the 4 M5x16 TE screws fixing the motor group to the scanner unit;

To reassemble the new motor group, reverse the procedure.

Figure: 4–52 Antenna motor group

4.2.2.6 RTM Plate replacement

Special tools:
- Philips screw driver 3 mm;
- Socket wrench 13 mm.

To replace RTM plate, proceed in the following mode:
- Refer to the scanner unit access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M8, the washers and take out the RTX plate.

To reassemble the new RTM plate, reverse the procedure.

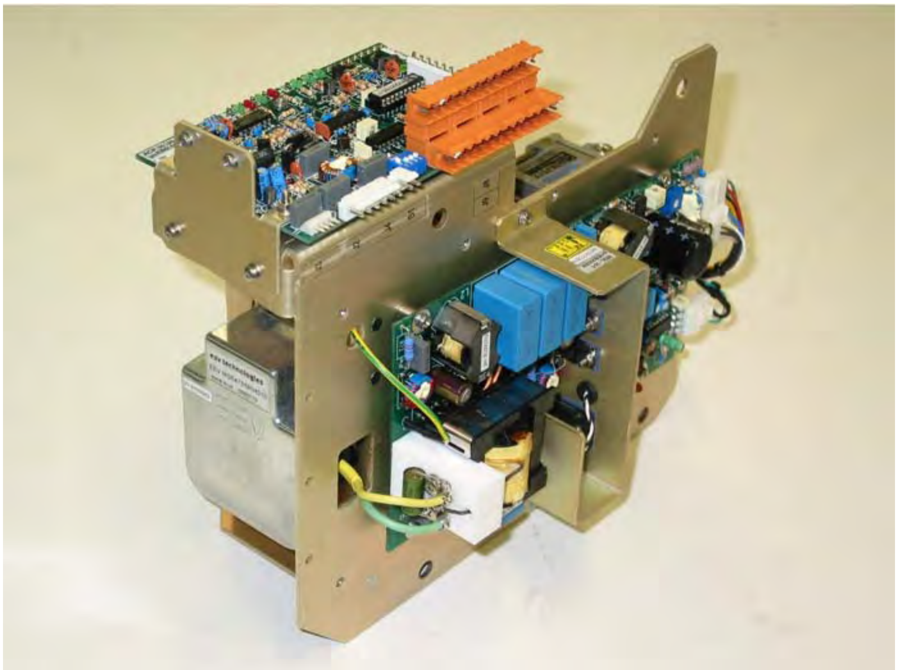


Figure: 4–53 RTM plate

4.2.2.7 Circulator replacement

Special tools:
- Philips screw driver 4 mm;
- Socket wrench 13 mm.

Circulator replacement procedure:
- Refer to the pedestal access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M8, the washers and take out the RTX plate;
- Unscrew the 4 M4x12 TC screws fixing the magnetron spacer to the circulator;
- Unscrew the 4 M4x50 TC screws fixing the front end and limiter to the circulator;
- Unscrew the 4 M4x60 TC screws fixing the circulator to the RTM plate.

To reassemble the new circulator, reverse the procedure observing the direction of the circulator.

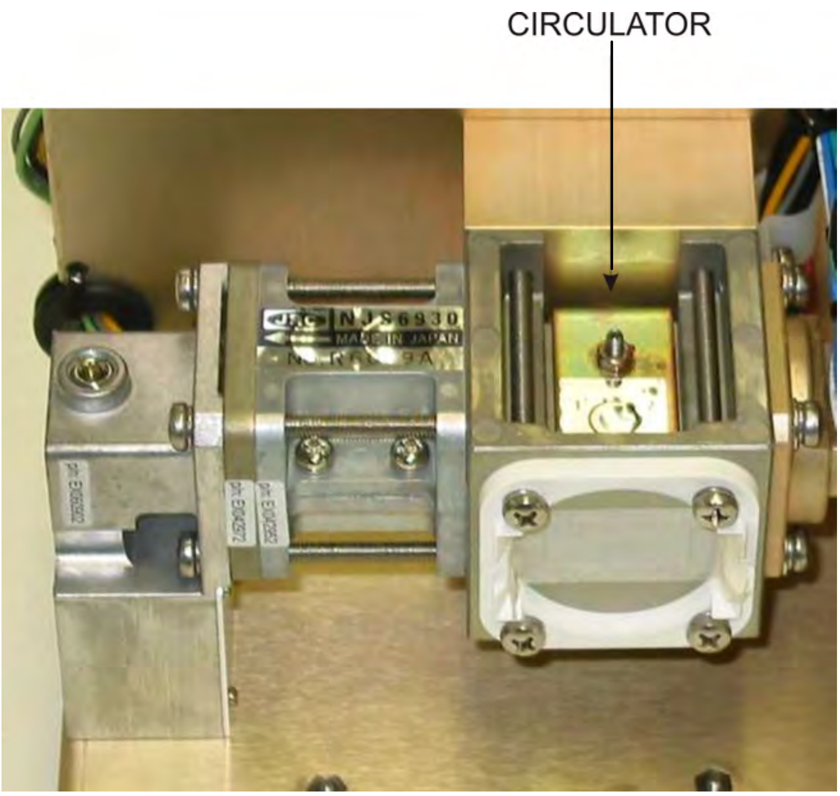


Figure: 4-54 Circulator

4.2.2.8 Limiter replacement

Special tools:
- Philips screw driver 4 mm;
- Socket wrench 13 mm.

Limiter replacement procedure:
- Refer to the pedestal access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M8, the washers and take out the RTX plate;
- Unscrew the 4 M4x50 TC screws fixing the front end to the limiter;
- Remove the limiter between the circulator and the front end with filter.

To reassemble the new limiter, reverse the procedure observing the direction of the limiter and of the filter.

Figure: 4–55 Limiter

4.2.2.9 Filter replacement

Special tools:

- Philips screw driver 4 mm;
- Socket wrench 13 mm.

Filter replacement procedure:

- Refer to the pedestal access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M8, the washers and take out the RTX plate;
- Unscrew the 4 M4x50 TC screws fixing the front end to the limiter;
- Remove the front end with filter.

To reassemble the new filter, reverse the procedure observing the direction of the filter.

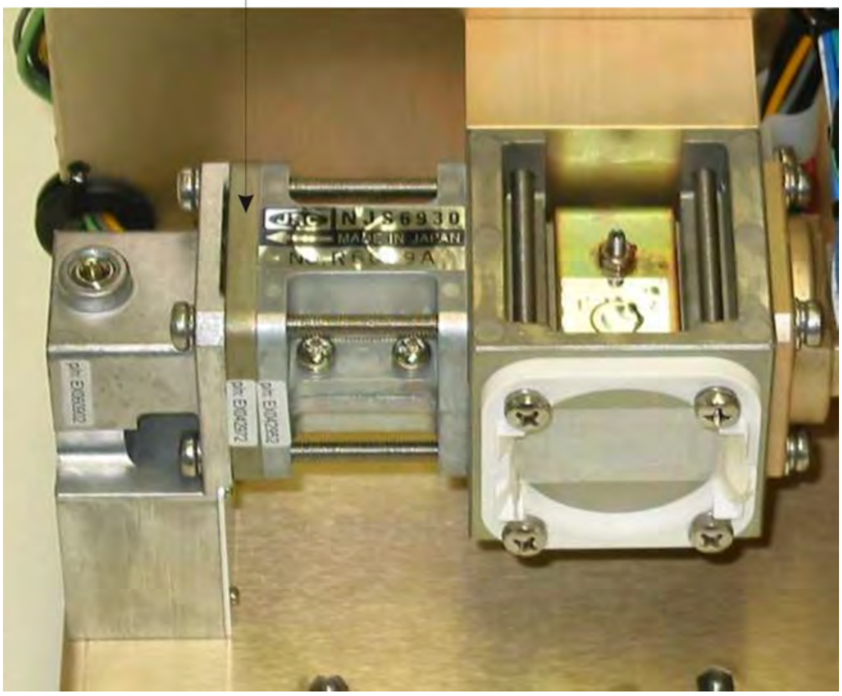


Figure: 4–56 Filter

4.2.2.10 IFB–200 receiver board

Special tools:

- Philips screw driver 3 mm;
- Socket wrench 13 mm.

IFB–200 receiver board replacement procedure:

- Refer to the pedestal access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M8, the washers and take out the RTX plate;
- Unscrew the 6 M3x12 TC screws and remove the cover of the receiver module;
- Disconnect all connectors;
- Unscrew the 6 M3x12 TC and take off the receiver module.

To reassemble the new receiver module, reverse the procedure.

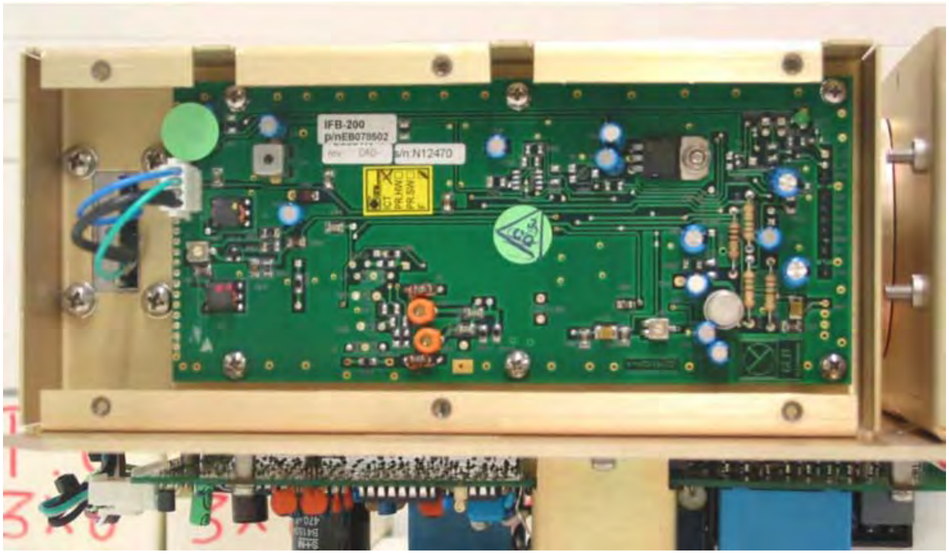


Figure: 4–57 IFB–200 receiver board

4.2.2.11 HLT-11000 HL board replacement

Special tools:
- Philips screw driver 4 mm;
- Socket wrench 13 mm.

HLT-11000 HL board replacement procedure:
- Refer to the pedestal access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M8, the washers and take out the RTX plate;
- In the upper side of the pedestal unscrew the 2 M4x10 TC screws fixing the HLT-11000 board to the pedestal.

To reassemble the new module, reverse the procedure.

Figure: 4-58 HLT-11000 HL board

4.2.2.12 Antenna Rotation Motor replacement

Special tools:

- Philips screw driver 3 mm;
- Socket wrench 13 mm.

Antenna motor group replacement:

- Refer to the pedestal access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M8, the washers and take out the RTX plate;
- Unscrew the 4 M5x16 TE screws fixing the motor group to the scanner unit;
- Cut the cable ties of the J2 cable, J2 is located on the board ACP-30020;
- Separate the power supply wires of the motor group from the wires connected to the HLT-12000 board;
- Unplug the RED and BLACK wires from the J2 connector;
- Unscrew the 2 M4x10 TC screws fixing the board to the motor group;
- Unscrew the 4 M4x12 TE screws (point 1 fig. 5-12) fixing the mounting plate to the motor;
- Unscrew the 1 M4x12 TE screw (point 2 fig. 5-12) fixing the gear to the motor;

To reassemble the new motor,reverse the procedure.

Figure: 4-59 Antenna rotation motor

4.2.2.13 HLT–12000 encoder board replacement

Special tools:
- Philips screw driver 3 mm;
- Socket wrench 13 mm;
- Cutters.

HLT–12000 encoder board replacement:
- Refer to the pedestal access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M8, the washers and take out the RTX plate;
- Cut the cable ties of the J2 cable, J2 is located on the board ACP–30020;
- Separate the power supply wires of the motor group from the wires connect to the board HLT–12000;
- Unplug the wires RED and BLACK from the J2 connector;
- Unscrew the 2 M4x10 TC screws fixing the board to the motor group;

To reassemble the new encoder module,reverse the procedure.

Figure: 4–60 HLT–12000 encoder board

4.2.2.14 Brushes replacement

Special tools:
- Philips screw driver 3 mm;
- Socket wrench 13 mm;
- Screw driver flat tip 4 mm.

Motor brushes replacement:
- Refer to the pedestal access procedure;
- Disconnect J2, J3, J8 and J9 connectors of the ACP 30020;
- Take off the 4 nuts M8, the washers and take out the RTX plate;
- Unscrew the 4 M5x16 TE screws fixing the motor group to the scanner unit;
- Unscrew the 2 plastic screws of the motor group;
- Extract the 2 connectors with the brushes;
- Remove the brushes from the fasten connectors.

To reassemble the new brushes,reverse the procedure.

Figure: 4–61 Brushes

4.2.3 6 Foot X-Band Array replacement

Special tools:
- Hexagonal wrench 13 mm.

Array replacement procedure:
- Unscrew the 4 M8x35 TE screws fixing the array to the scanner unit.
- Apply a thin layer of silicon grease to all surfaces;

To reassemble the new array,reverse the procedure.

Figure: 4-62 6 foot X-band array

4.2.4 Interconnecting Diagram

The interconnecting diagram of the pedestal to refer Figure: 4-63.

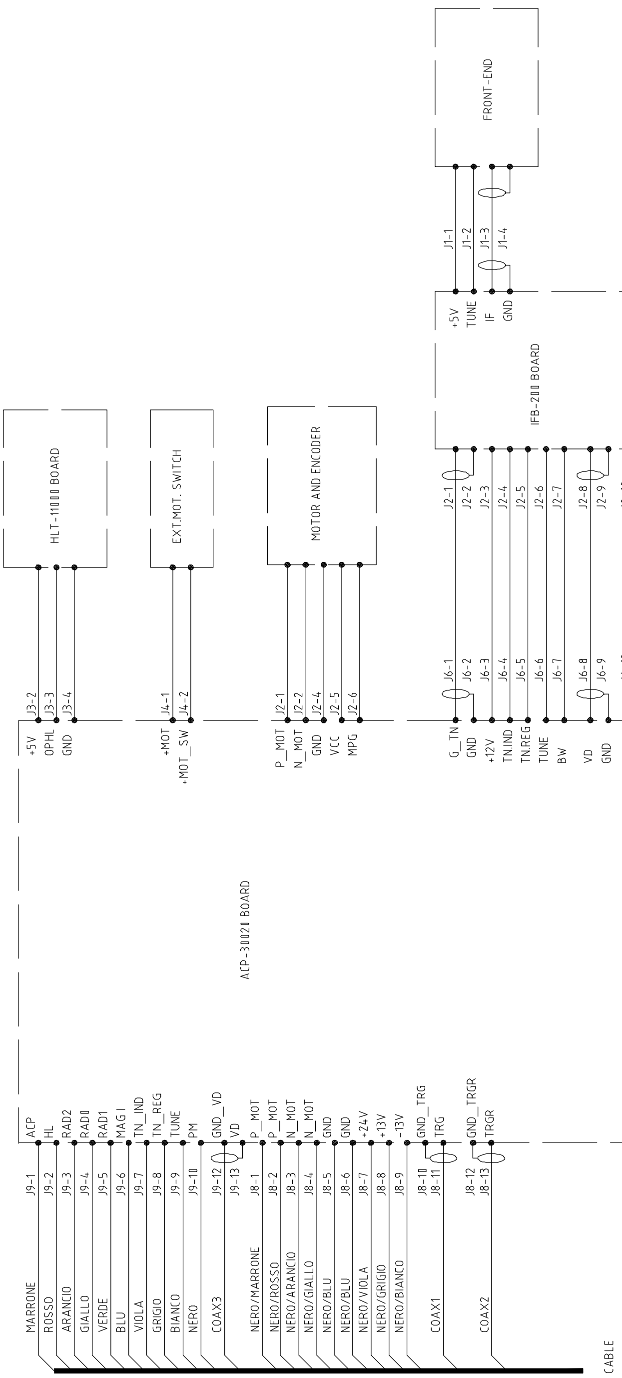
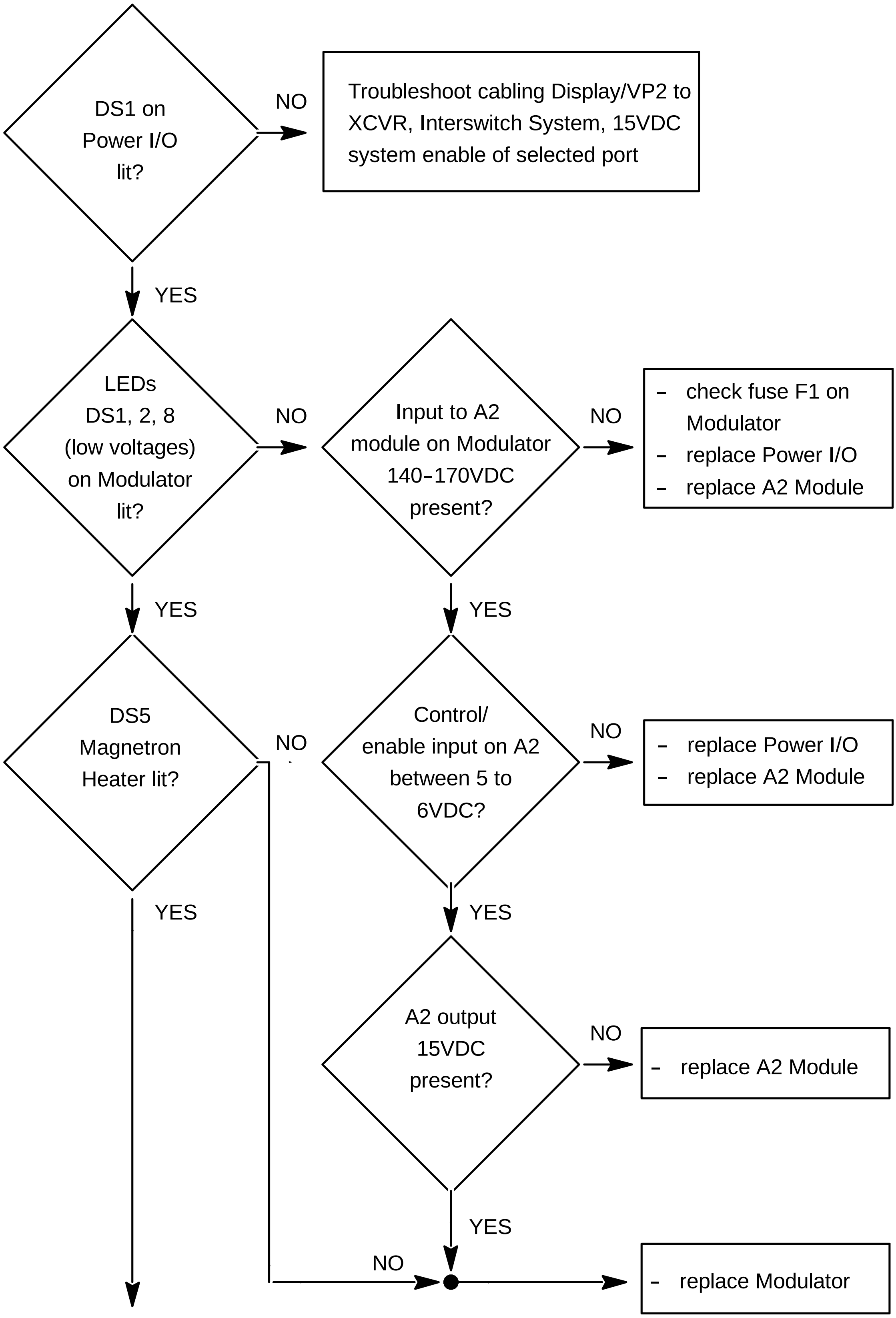
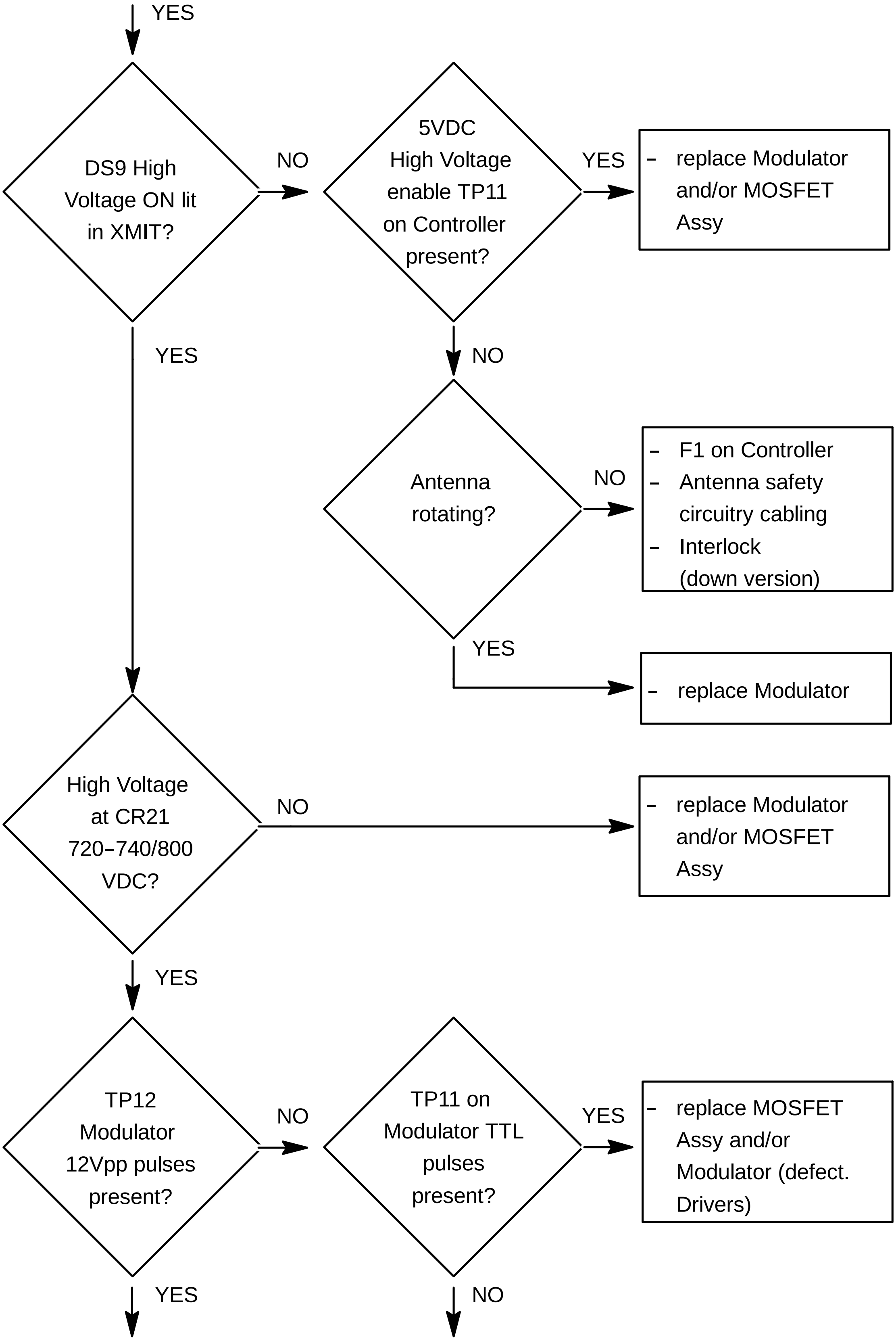
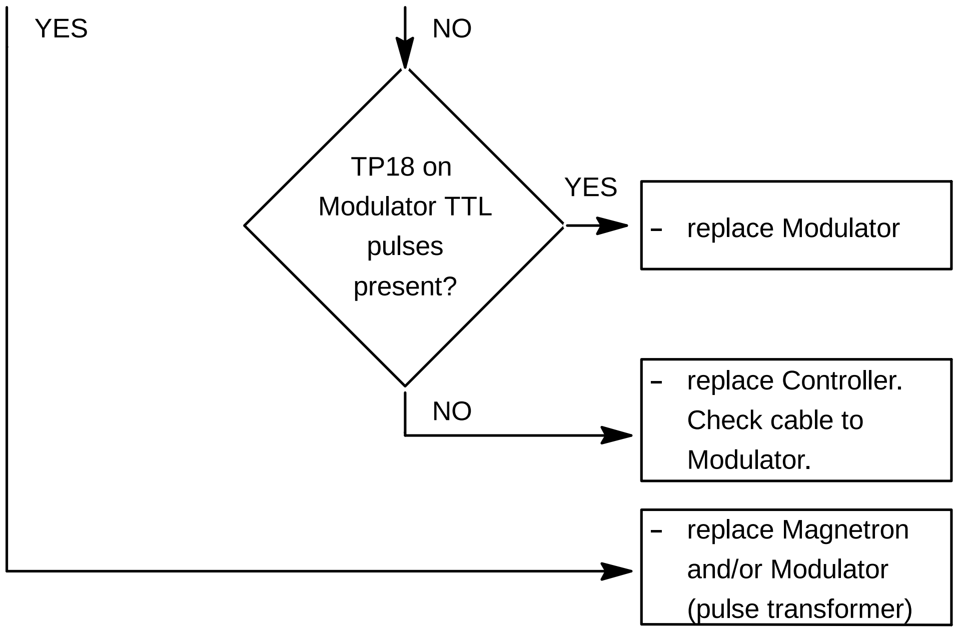


Figure: 4-63 Pedestal block diagram

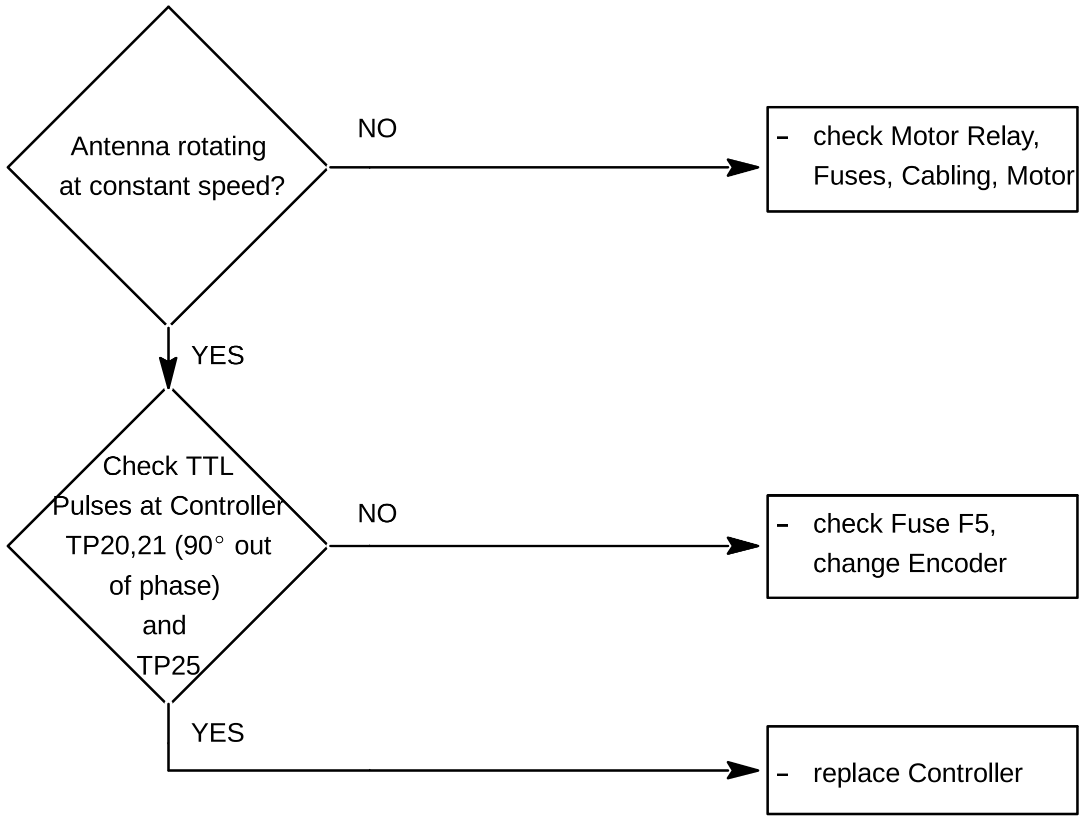
4.3 XCVR TROUBLESHOOTING GUIDE (X-BAND, S-BAND)



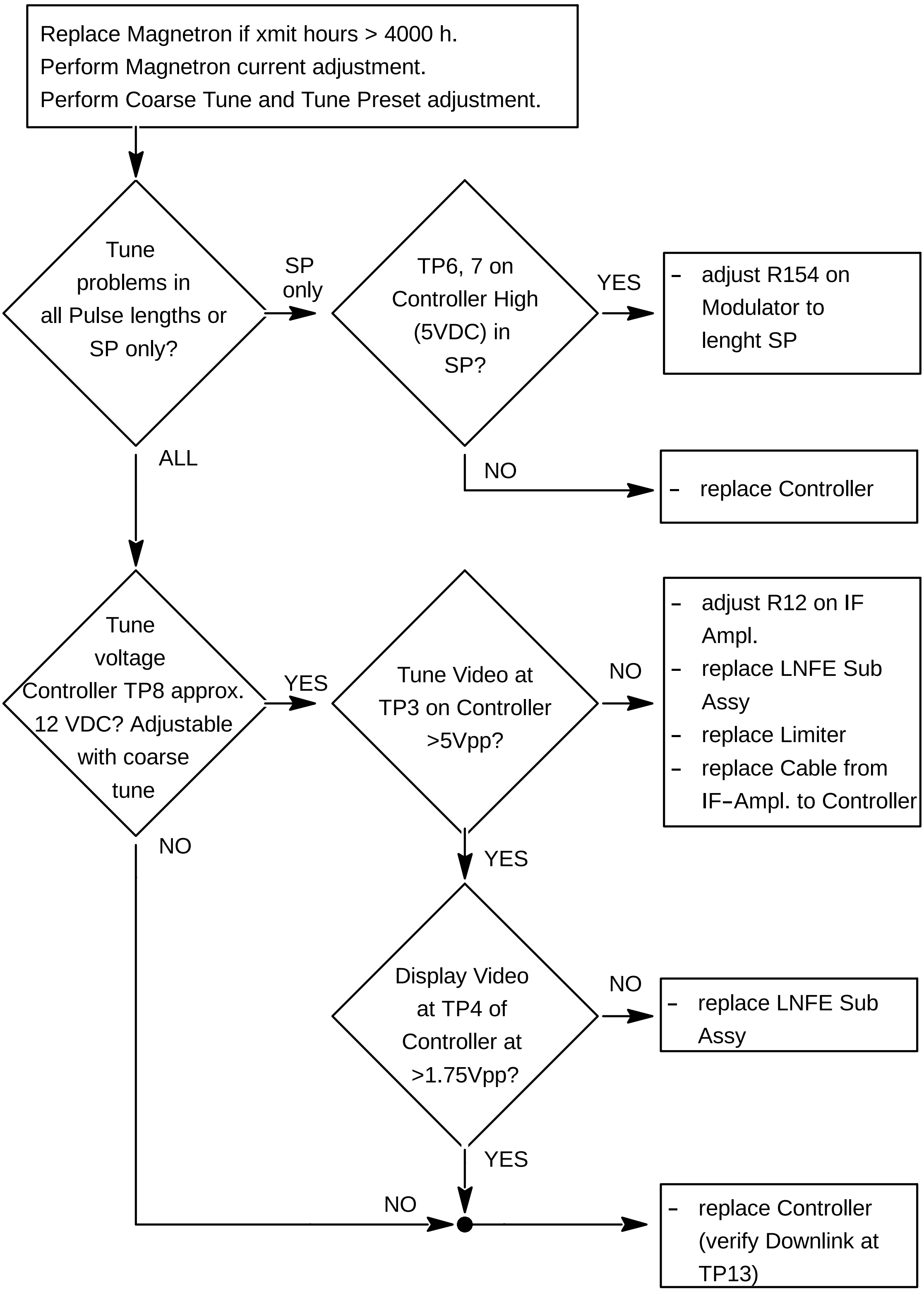

YES
DS9 High Voltage ON lit in XMIT?
NO
5VDC High Voltage enable TP11 on Controller present?
YES
– replace Modulator and/or MOSFET Assy
YES
NO
Antenna rotating?
NO
– F1 on Controller
– Antenna safety circuitry cabling
– Interlock (down version)
YES
– replace Modulator
High Voltage at CR21 720–740/800 VDC?
NO
– replace Modulator and/or MOSFET Assy
YES
TP12 Modulator 12Vpp pulses present?
NO
TP11 on Modulator TTL pulses present?
YES
– replace MOSFET Assy and/or Modulator (defect. Drivers)
YES
NO



Picture not stable,turning erratically, wedges missing (Gyro Input stable)



Tune Problems no Display Video



4.3.1 LED’s and Test Points

LEDs and Test Points assist maintenance personnel in isolating malfunctions to a faulty PCB. LEDs and/or Test Points are used on the MTR and Display Power and I/O PCB, on the MTR Controller PCB and the MTR Modulator PCB.
A layout drawing or a portion of the drawing of the PCB with LEDs and Test Points high lighted are provided along with a table discussing the function of the LED or describing the signal seen at the test point.

4.3.1.1 MTR Power and I/O PCB LED

LED	Description
DS1	+15V SYSTEM ENABLE FROM THE RADAR PROCESSOR VP2 PCB IS PRESENT.

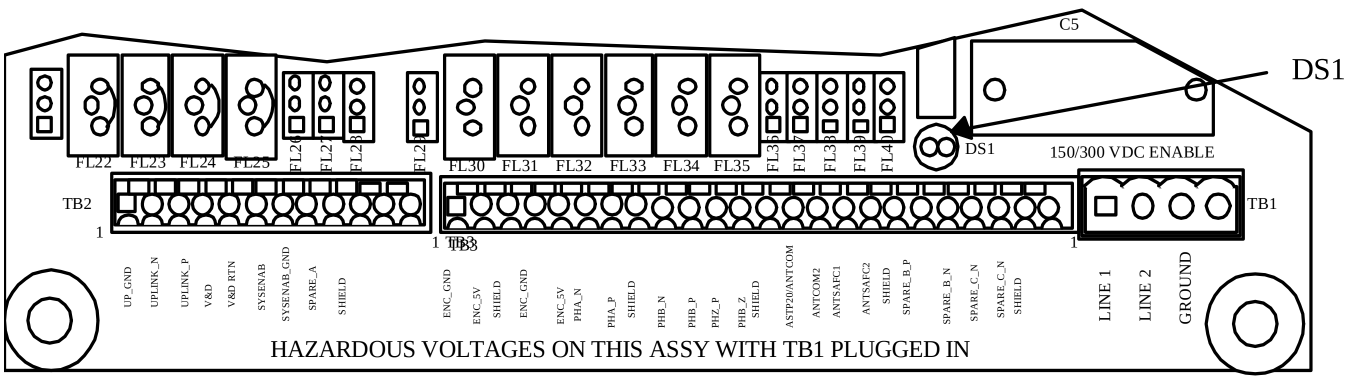


Figure: 4-17 MTR Power and I/O LED Location

4.3.1.2 MTR Controller PCB LED and Test Points

- MTR Controller PCB LEDs

LED	Description
DS1	MAGI OK – MAGNETRON CURRENT IS WITHIN SPECIFICATIONS.
DS2	SELF TEST IN PROCESS (RED FOR 2–3 SECONDS WHEN FIRST TURNED ON)
DS3	HIGH VOLTAGE IS ENABLED ON MODULATOR
DS4	VIDEO AND/OR TRIGGERS ARE PRESENT ON DOWNLINK (DIM IN STBY/TXON).
DS5	DATA IS PRESENT ON DOWNLINK (VERY DIM IN STBY/TXON).
DS6	DATA BEING RECEIVED ON DISPLAY COMM PORT (UPLINK)
DS7	DATA BEING SENT OUT TO DISPLAY COMM PORT (FUTURE USE)
DS8	LOW VOLTAGES ARE IN SPECIFICATIONS AND O.K. (+5V, +15V, –15V, +24V)
DS9	– 15V (GENERATED FROM –17V ON CONTROLLER)
DS10	TRIGGERS FROM PMU ARE OCCURRING (ON IN STBY/TXON).
DS11	+5V (GENERATED FROM +15V ON CONTROLLER) (ON IN STBY/TXON)

- MTR Controller PCB Test Points

Test Point	Description
TP1	EXTERNAL TRIGGER
TP2	EXTERNAL TUNE
TP3	TUNE SOURCE – VOLTAGE PULSE FROM IF AMPLIFIER TO INDICATE REL TUNE LEVEL.
TP4	VIDEO FROM RECEIVER
TP5	GND
TP6	LP LINE TO RECEIVER
TP7	MP LINE TO RECEIVER
TP8	TUNE VOLTAGE – VOLTAGE SENT TO LOCAL OSCILLATOR
TP9	TRANSMIT/RECEIVE MODE FOR CONNECTION TO DISPLAY, 0 = PORT IS RECEIVING.
TP10	RECEIVE LINE FROM DISPLAY PORT.

Test Point	Description
TP11	MODULATOR INTERLOCK SIGNAL FROM DOOR SWITCH
TP12	TRANSMIT LINE TO DISPLAY PORT.
TP13	VIDEO AND DATA (DOWNLINK) TO THE DISPLAY (PRIOR TO BACK TERMINATOR).
TP14	+24V FROM MODULATOR.
TP15	–15V CREATED ON CONTROLLER FROM –17V SENT BY THE MODULATOR.
TP16	+15V FROM MODULATOR.
TP17	UP / DOWN SIGNAL TO PMU PORT.
TP18	INCREMENT SIGNAL TO PMU PORT
TP19	INCREMENT SIGNAL TO PMU PORT
TP20	PHASE A FROM ENCODER PORT.
TP21	PHASE B FROM ENCODER PORT.
TP22	–17V FROM MODULATOR.
TP23	RECEIVER CAL SIGNAL TO PMU PORT.
TP24	TRANSMITTER CAL SIGNAL TO PMU PORT.
TP25	PHASE Z (0 – INDEX) FROM ENCODER PORT.
TP26	MODULATOR TRIGGER SIGNAL.
TP27	SHORT PULSE COMMAND SIGNAL SENT TO MODULATOR.
TP28	MAGI SIGNAL FROM MODULATOR.
TP29	CALIBRATION STORE SIGNAL TO PMU PORT
TP30	PMU ON/OFF SIGNAL SENT TO PMU PORT.
TP31	+5V CREATED ON CONTROLLER FROM +15V SENT BY THE MODULATOR.

4.3.1.3 MTR Modulator PCB LEDs and Test Points

- MTR Modulator PCB LEDs

LED	Description
DS1	+24VDC IS PRESENT
DS2	–17VDC IS PRESENT
DS3	+15VDC IS PRESENT
DS4	TAILBITER ACTIVE (NOT USED)
DS5	FILAMENT SUPPLY OK
DS6	HIGH VOLTAGE IS PRESENT
DS7	MAGNETRON HEATER IS SCHEDULED BACK (DECREASED)
DS8	MODULATOR +5VDC IS PRESENT
DS9	HIGH VOLTAGE IS ON AND IN SPECIFICATION

- MTR Modulator Test Points

Test Point	Description
TP1	MAGNETRON CURRENT 0.4/A
TP2	PWM OUTPUT FOR HIGH VOLTAGE.
TP3	VOLTAGE REFERENCE.
TP4	VOLTAGE REFERENCE FOR PWM OF HIGH VOLTAGE POWER SUPPLY.
TP5	INPUT TRIGGER (RECEIVED FROM CONTROLLER) ON NON ADJUSTABLE SHORT PULSE MODULATOR. MODIFIED TRIGGER FROM CONTROLLER THROUGH ADJUST-ABLE SHORT PULSE CIRCUIT ON NEW ADJUSTABLE SHORT PULSE MODULATOR.
TP6	HEATER DRIVE VOLTAGE.
TP7	MAG I OUTPUT VOLTAGE.
TP8	1ST STAGE PULSE WIDTH DETECTOR OUTPUT.
TP9	MAIN FET DRIVE LEVEL. USED TO SET MAG I.
TP10	HEATER SCHEDULING ON (’1’)/OFF (’0’) SIGNAL.
TP11	MAIN FET DRIVE PULSE.
TP12	MAIN FET SOURCE VOLTAGE.
TP13	VCC (+5V) ON ADJUSTABLE SHORT PULSE MODULATOR.

Test Point	Description
TP14	VOLTAGE REFERENCE ON ADJUSTABLE SHORT PULSE MODULATOR.
TP15	GROUND ON ADJUSTABLE SHORT PULSE MODULATOR.
TP16	MODIFIED TRIGGER FROM CONTROLLER THROUGH ADJUSTABLE SHORT PULSE CIRCUIT PRIOR TO HOLD OFF ON NEW ADJUSTABLE SHORT PULSE MODULATOR.
TP17	OUPUT OF ONE–SHOT FOR MOD)FIED CONTROLLER TRIGGER ON NEW ADJUSTABLE SHORT PULSE MODULATOR.
TP18	INPUT TRIGGER (RECEIVED FROM CONTROLLER) ON ADJUSTABLE SHORT PULSEMODULATOR.
TP22	DC RETURN FOR H.V. ON ADJUSTABLE SHORT PULSE MODULATOR.
TP23	–17V ON ADJUSTABLE SHORT PULSE MODULATOR.
TP24	+24V ON ADJUSTABLE SHORT PULSE MODULATOR.
R62	BOTTOM OF R62 FOR MAGNATRON CURRENT VERIFICATION/ ADJUSTMENT

5 MAINTENANCE

5.1 GENERAL

Periodic preventive maintenance will contribute significantly to the service life of the radar systems. Under normal operating conditions, cleaning and inspection are required and are considered separately below.

WARNING

BEFORE PERFORMING MAINTENANCE WORK ON A RADAR SYSTEM, REMOVE INPUT POWER.

CAUTION

THE RADAR SYSTEMS CONTAINS CMOS DEVICES. REMOVE POWER BEFORE DISCONNECTING PLUGS OR REMOVING PCBS. USE WRIST STRAPS AND GRASP ONLY BOARD EDGES WHEN HANDLING PCBS. WHEN TRANSPORTING OR STORING PCBS, USE STATIC PROTECTIVE CONTAINERS.

WARNING

HIGH VOLTAGES ARE PRESENT IN EACH UNIT OF RADAR SYSTEMS. DO NOT WORK ON THESE UNITS UNLESS ANOTHER INDIVIDUAL IS NEARBY WHO IS FAMILIAR WITH THE ELECTRICAL HAZARDS OF THE EQUIPMENT AND WHO IS COMPETENT IN ADMINISTERING FIRST AID.

TURN PRIME POWER OFF TO ALL UNITS BEFORE BEGINNING ANY MAINTENANCE PROCEDURES. LABEL CIRCUIT BREAKERS AND/OR SWITCHES TO AVOID ACCIDENTAL ENERGIZING OF CIRCUITS.

GROUND CAPACITORS WHICH ARE LIKELY TO HOLD DANGEROUS POTENTIALS. BE AWARE OF THE LOCATIONS OF HIGH VOLTAGE CONNECTIONS AND/OR HIGH VOLTAGE INPUT CONNECTIONS.

IN CASE OF AN EMERGENCY, CALL FOR HELP FIRST, THEN ATTEND TO THE CASUALTY.

When operating, the radar system contains voltages hazardous to life. Hazardous AC input voltage is present even when the equipment is de-energized, unless the circuit breaker associated with the unit has been turned off. Maintenance personnel are cautioned to exercise extreme care and use common sense when servicing the equipment. The following safety precautions must always be observed:

(1) Whenever possible, de-energize equipment and turn off associated circuit breakers before servicing.

(2) When it is necessary to make adjustments inside equipment that is operating, do so using one hand, keeping the other hand clear of equipment chassis.

(3) De-energize equipment before removing plug-in printed circuit boards and assemblies.

(4) Become familiar with artificial respiration techniques.

(5) Ad here to the safety notices that appear at the front of the manual.

5.2 PREVENTIVE MAINTENANCE - X-BAND AND S-BAND

The MTR Up and Antenna Array is primarily a mechanical assembly and, as such, requires regular preventive maintenance to assure long service life. The following preventive maintenance schedule is recommended.

WARNING

WHEN PERFORMING MAINTENANCE ON THE DOWN SYSTEM, THE RADAR SYSTEM WILL BE DOWN.

WARNING

REMOVE POWER FROM THE DOWN PEDESTAL AND SET THE ANTENNA SAFETY SWITCH TO OFF PRIOR TO PERFORMING MAINTENANCE ON THE ANTENNA ARRAY OR DOWN PEDESTAL.

5.2.1 Cleaning and Inspection

> **CAUTION**
> THE ANTENNA UNIT IS COVERED BY A FIBERGLASS WINDOW WHICH MUST NOT BE PAINTED. METAL–BASED PAINT WILL CONSIDERABLY DISTORT THE RADIATION PATTERN, AND WILL ABSORB PART OF THE RADIATED ENERGY. EXTERNAL SURFACES OF THE EQUIPMENT HAVE BEEN EPOXY–PAINT SPRAYED, AND SHOULD REQUIRE ONLY CLEANING IN NORMAL USE.

> **CAUTION**
> DON'T PRESS GREASE IN THE GREASE NIPPLE UNDER X/S BAND ARRAY. THE GEAR BOX WAS GREASED IN THE FACTORY WITH DEFINED MOUNT.

5.2.1.1 Cleaning (Yearly)

(1) Remove power from MTR Up and place Antenna Safety Switch to OFF.

(2) The antenna array and MTR Up exterior should be washed with fresh water. Clean or repair as necessary.

(3) Remove MTR Up covers and clean internal components and connections as necessary.

5.2.1.2 Inspection (Yearly)

(1) Remove power from MTR Up and place Antenna Safety Switch to OFF.

(2) Inspect mechanical mounting hardware for mechanical integrity of the installation. Tighten mounting hardware as required (torque 15Nm).

(3) Check for corrosion–free contact of the copper bonding strap. Repair or replace as necessary.

(4) Inspect internal cable connections for loose or corroded terminal screws and lugs. Repair or replace as necessary.

5.2.2 X–Band Pedestal Lubrication (Yearly)

(1) Remove power from MTR Up and place Antenna Safety Switch to OFF.

(2) Check the gear box assembly lubricant level and use lubricants as using the oil level sight gage, Figure: 5–1. The oil level should be seen 1/2 way Down the oil sight gage. Gear box assembly lubricant capacity is 1.8 quarts, (1700 ML.). Use Mobile Synthetic oil.

USE CAUTION, DO NOT OVER FILL.

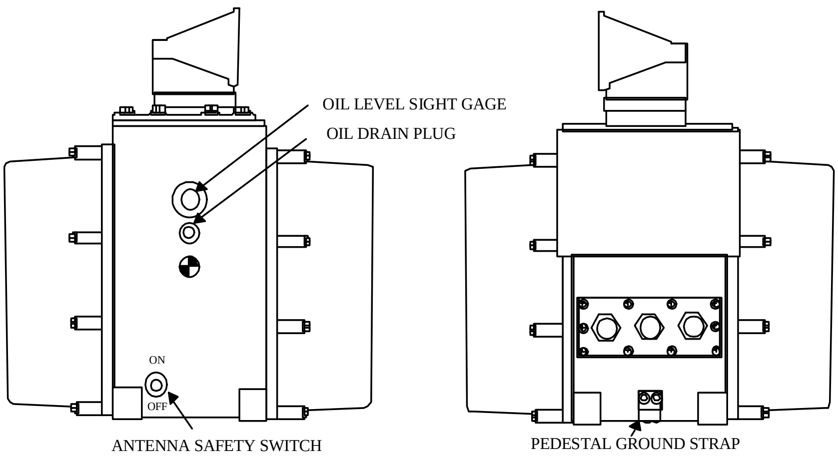


Figure: 5–1 X–Band MTR Up Oil Check.

5.2.3 S-Band Pedestal Lubrication (Yearly)

(1) Remove power from MTR Up and place Antenna Safety Switch to OFF.

(2) Check the gear box assembly lubricant level using the oil level sight gage, Figure: 5-2. The oil level should be seen 1/2 way up the oil sight gage. Gear box assembly lubricant capacity is 2.11 quarts, (2000 ML). Use Mobile synthetic oil.

USE CAUTION, DO NOT OVER FILL.

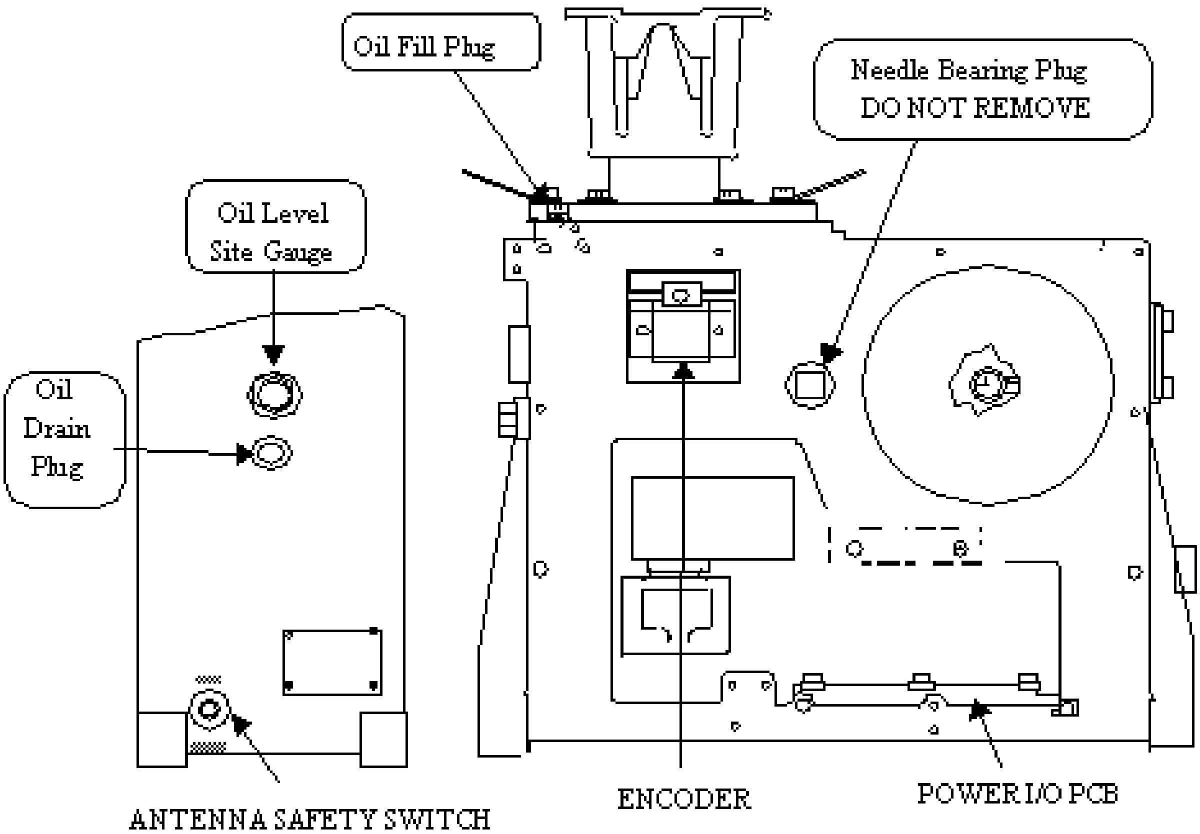


Figure: 5-2 S-Band Oil Check

5.2.4 X/S–Band Pedestal Lubricant Draining (30 Months)

(1) Lay down oil absorbent towels around the base of pedestal to catch oil spillage and prevent unwanted release of oil.

> **NOTE**
> Release of oil into waterways may be a violation of local environmental laws.

(2) Place a container capable of holding 3 Liters of oil and a funnel with hose under the drain spout.

(3) Remove fill plug from upper right of pedestal as shown in Figure: 5–3.

(4) Remove drain plug from the middle of the pedestal front as shown in Figure: 5–3. Approximately 1.8 quarts, (1700 ML) of Oil will drain out for an X–Band and approximately 2.11 quarts, (2000 ML) of oil will drain out for an S–Band.

(5) After all the oil is drained return the drain plugs to the fill hole and the drain hole.

(6) Refill the oil as detailed in chapter 5.2.2 for X–Band and chapter 5.2.3 for an S–Band.

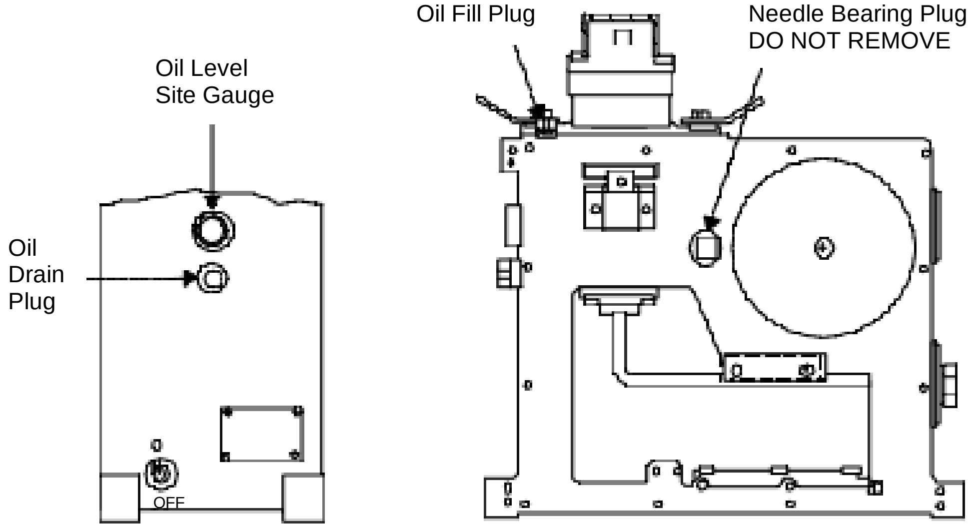


Figure: 5-3 X-Band Pedestal Oil Plugs

5.2.5 Drive System Inspection (Yearly)

(1) Remove power from MTR Up and place Antenna Safety Switch to OFF.

(2) Open the access covers on the MTR Up.

WARNING
BE AWARE OF THE ANTENNA POSITION AT ALL TIMES WHILE PERFORMING THE FOLLOWING STEPS.

(3) Manually rotating the antenna, check for smoothness of rotation (no binding or roughness); inspect gear box for signs of oil leaks and drive motor for evidence of excessive heating.

5.2.6 Access Cover Gasket Inspection (Yearly)

(1) Remove power from MTR Up and place Antenna Safety Switch to OFF.

(2) Open cover of MTR Up.

(3) Inspect cover gaskets for deterioration.

5.3 PREVENTIVE MAINTENANCE 10kW – X–BAND 6ft. SYSTEM

This chapter describes the preventive maintenance action to be performed at scheduled intervals in order to guarantee continuous and maximum availability of the pedestal.

Table 5–1 contains step–by–step description of the procedure, time required to perform the operation, tools and instruments necessary to accomplish the task and safety precautions.

Time intervals for maintenance are marked as listed below.

> **NOTE**
>
> During normal operating conditions as well as maintenance the antenna rotation can be stopped by setting the safety switch to the **OFF** position.

5.3.1 Maintenance Pre–condition

> **NOTE**
>
> Before attempting any operations listed in Table 5–1, mains must be disconnected from the pedestal.

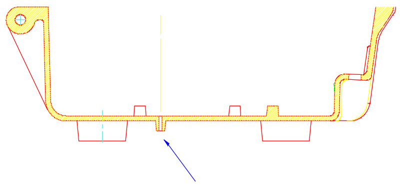
5.3.2 List Instrumentation and Tools for Maintenance

Special Tools;

- silicone grease
- metallic brush
- metal wire with section 2 mm^2
- Socket wrench 13 mm

5.3.3 Preventive Maintenance

The Table 5-1 lists all maintenance operations, periodicity, qualified personal skill for maintenance operation, time required to perform maintenance operation and notes.

Location	Periodicity	Procedure
Pedestal screws tightening	2 years	Check that nr. 4 M10 screws of pedestal and nr. 4 M8 screws closing cover are well tightened. If not, tighten them with socket wrench 13 mm.
Pedestal inside	annually	Check that anti-condensing hole is open. If it is clogged, clean it with a 2mm^2 metal wire. 
	2years	Check that M8 bolts of RTM plate are tightened. If not, tighten them with a socket wrench 13 mm
	4years	Lubricate pedestal hinges, seal and antenna mounting base with silicon grease using a brush.

Location	Periodicity	Procedure
	3years	Inspect gear for clearance and abrasion
Motor brushes	annually	Check motor brushes, if less than 4 mm in length replace them ((chapter 4.2.2.14) (new brush thickness is 10 mm.)).
Antenna and pedestal exterior	annually	The antenna and the pedestal exterior should be washed with fresh water.

Table 5–1 Scheduled maintenance operations

5.4 PREVENTIVE MAINTENANCE – PROCESSOR UNIT –

This chapter describes the preventive maintenance action to be performed at scheduled intervals in order to guarantee continuous and maximum availability of the NSC Display.

5.4.1 Cleaning the NSC Display

Clean the exterior of the Display, using a soft dampened with a mild cleaning solution such as dish–washing detergent.

5.4.2 Changing the air filter

The front fan filter consists of a filter frame with a felt filter. This should regulary (every 3 months) be cleaned.
To clean the filter, remove the filter cover by removing the four screws.

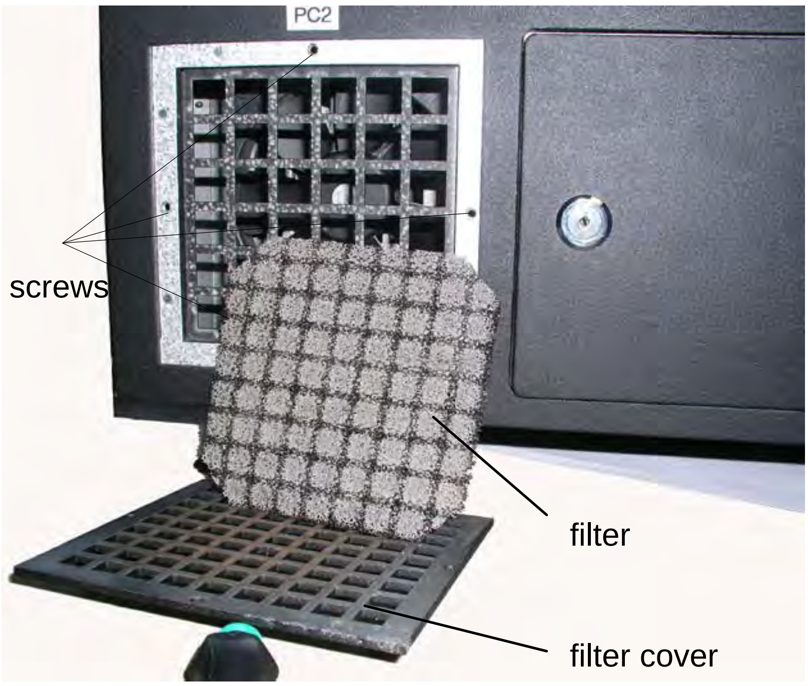


Figure: 64 Processor Unit – front side –

5.5 PROCESSOR UNIT REMOVING AND CABLING

Cables routed to the processor unit and other units, must be properly supported (see Connection Diagram 950–012.HP013).

NOTE

BEFORE ATTEMPTING TO CONNECT ANY SYSTEM CABLES OR LINES, VERIFY THAT ALL POWER HAS BEEN TURNED OFF. REMOVE ANY FUSES AND/OR TAPE CIRCUIT BREAKERS TO AVOID ACCIDENTAL TURN ON. PLACE A SIGN ON THE POWER PANEL TO INFORM OTHERS THAT YOU ARE CONNECTING A SYSTEM.

CAUTION

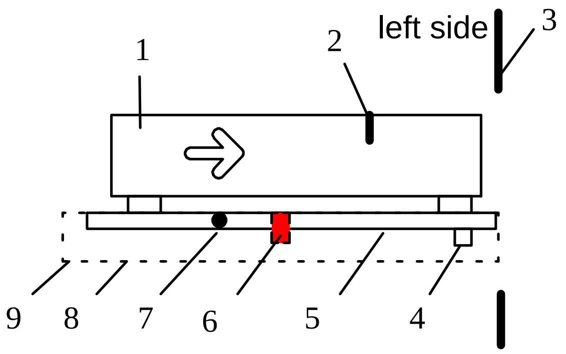
ENSURE THAT THE CABLES ARE NOT CRIMPED OR DAMAGED DURING INSTALLATION.

NOTE

Strip 30 inches of the outer insulation of the cables, and ground the shields and drains to the clamps according to the interconnect diagram.

The processor unit has to be connect with an external cable set (board cable) and with an internal cable set (computer cable set).
Before you start with this work, you have to remove the processor unit out of the housing. Please follow the working steps (below).

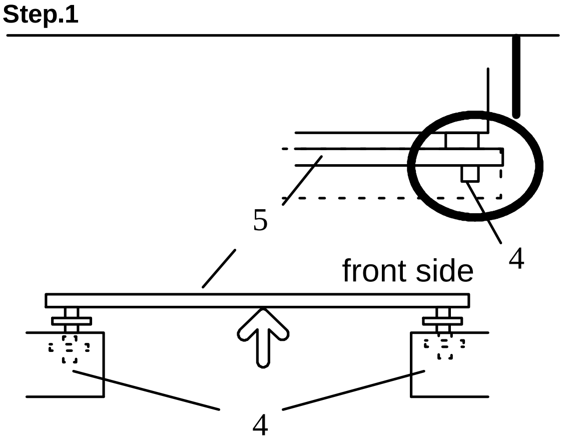
1. Remove the processor unit



Situation

1	Processor unit
2	MARK
3	Housing edge
4	Mounting nut 10mm (width across), 2 pcs
5	Sliding plate
6	Opening in guide rail
7	Guide pin, 2 pcs
8	Guide rail
9	**GND** connection

Step.1

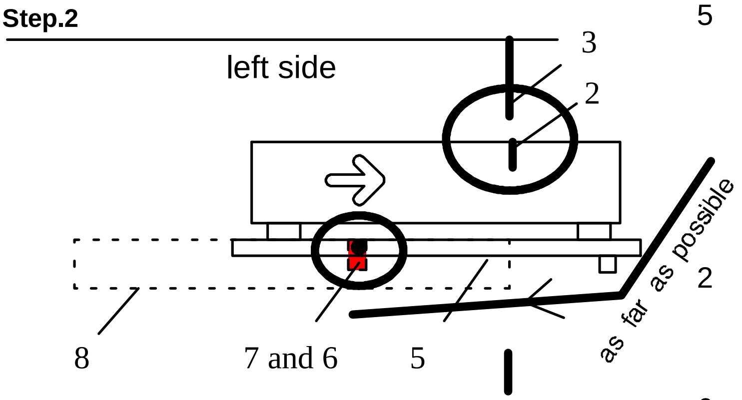


Step.1

4 Loosen mounting nut 10mm (width across) (do not unscrew)

5 Pull sliding plate FORWARD by abt. 2,5cm until sliding plate can be lifted to the TOP.

Step.2



Step.2

5 Take sliding plate as far as possible (see drawing), lift slightly and pull it out of the Radar housing until the MARK (**2**) is reached.

2 Make sure that MARK and HOUSING EDGE are congruent.

6 and 7

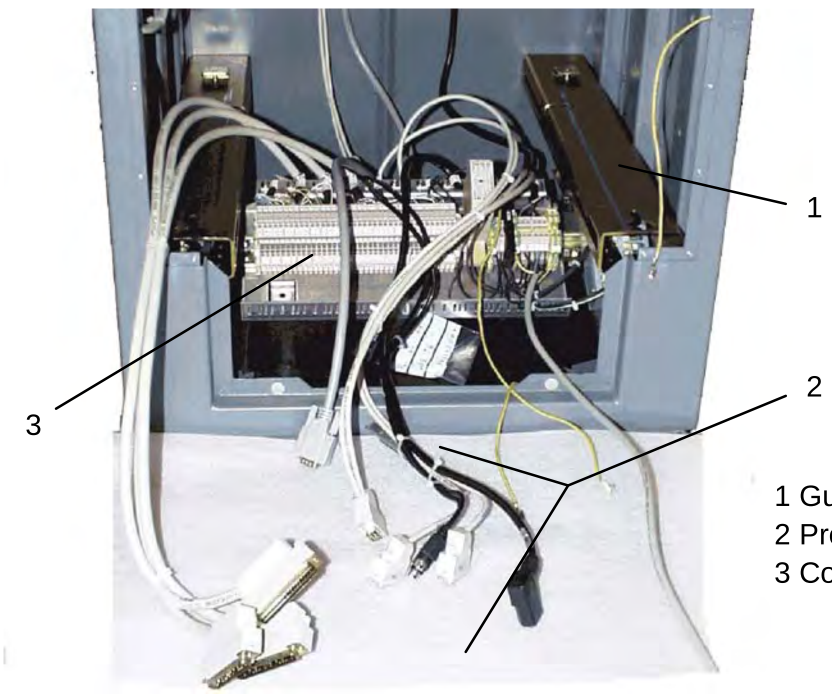
The opening of the guide rail and the guide pins (**7**) are now congruent.
Now the sliding plate can be lifted and taken out of the housing.

Step.3

Step.3

Connect the external board cable.

See CONNECTION DIAGRAM 950–012.HP013

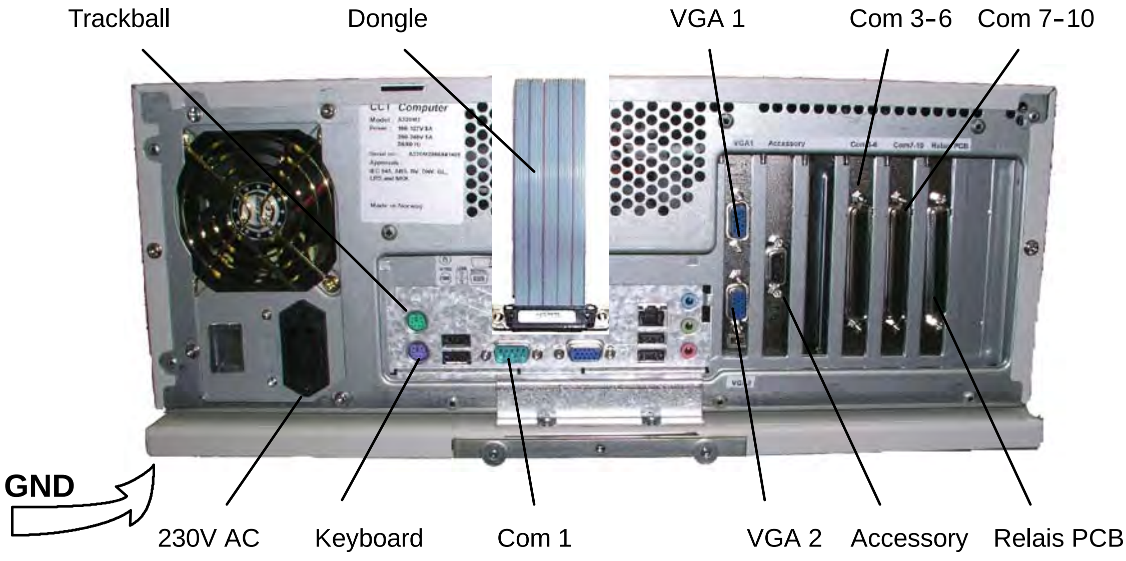


1 Guide rail
2 Processor unit cable set
3 Connection unit

(the picture can differ from the deliveries)

Figure: 65 Radar housing, open

Step.4



Step.4 Connect the computer cable set

Figure: 66 Processor unit, connection side

Step.5

Step.5
DON'T FORGET THE **GND** CONNETION
Place the sliding plate with the Processor unit into the Radar housing in the reverse order.
Fasten mounting nuts (**4**).

5.6 CHARTRADAR AND C–MAP eTOKEN REPLACING

The eToken is a special License Dongle for C–MAP chart data access.
The License Dongle is integrated in the computer (delivery status).

NOTE

The eToken from the defective computer has to be inserted into the replaced one.
The eToken Setup has to be executed after the new computer or a new hard disk has been installed.
Do not plug in the eToken until you are prompted to insert the eToken during the Setup.

Fig eToken muß noch gemacht werden.

5.6.1 C-MAP License Data

The C-Map 93/3 charts still need licenses for all machine individually!
This license is generated from the primary ID only!

The Alt Sys ID is the one from the chart server!

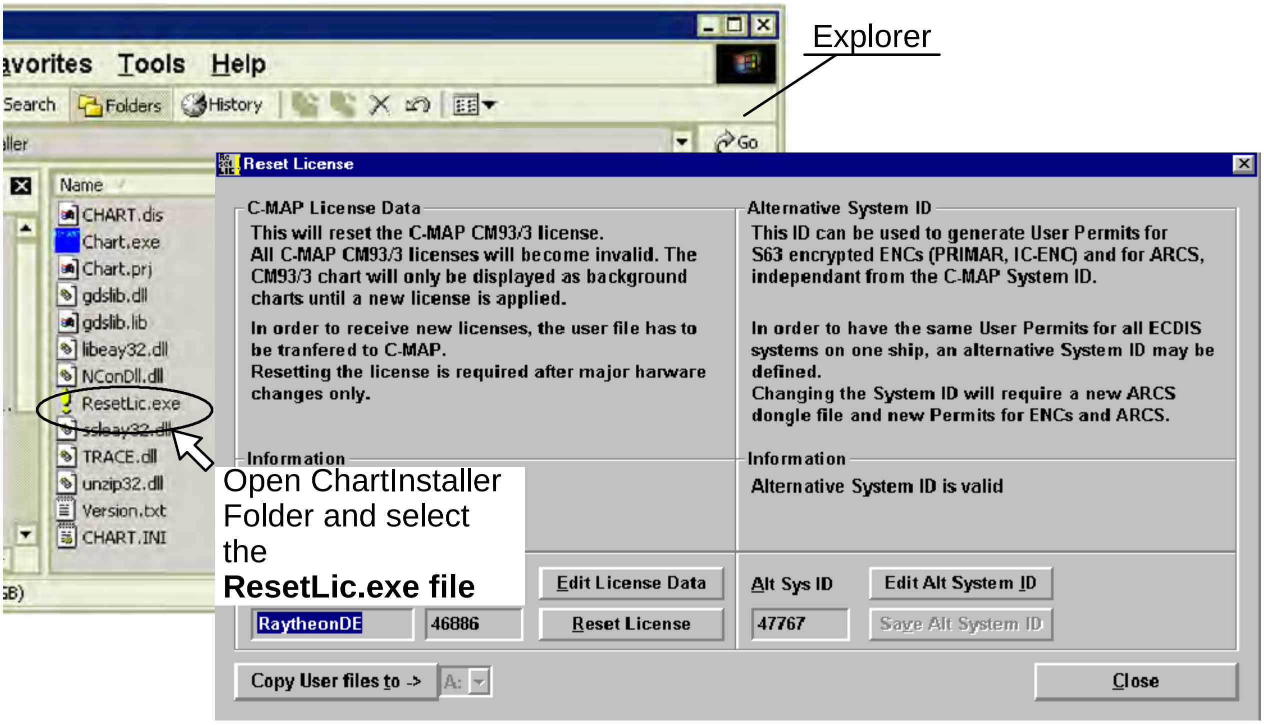


Figure: 67 Select the Reset License

5.6.2 C–MAP eToken C–Setup

NOTE

The eToken Setup has to be executed after the new computer or a new hard disk has been installed.

Do not plug in the eToken until you are prompted to insert the eToken during the Setup.

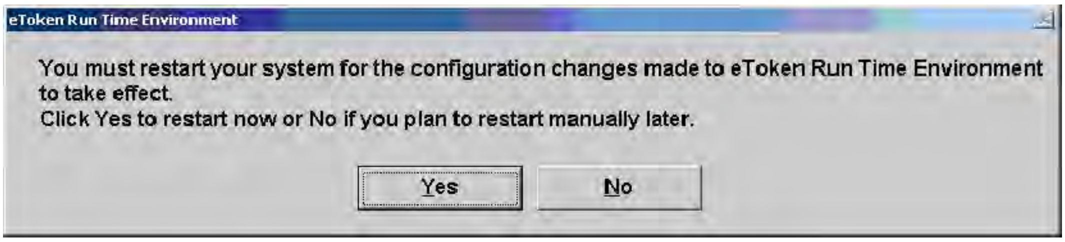
1 **Required Software**
Windows 2000 Professionel Service Pack 4.
The PROG0136 ”C–MAP ETOKEN SETUP” contains all necessary drivers and software modules.

2 **BIOS Settings**
Enter the BIOS setup and ensure that the on board USB controller are enabled.

3 **Windows Hardware detection and Driver Setup**
After enabling the USB ports in the BIOS, Windows 2000 will detect the USB controller as new hardware. Insert the CD containing PROG0136 and follow the instructions to install the driver. Specify to search for drivers on the W2000_USB directory of the CD.

4 **eToken Setup**
After the driver setup completed run the ETSetup.exe application from the eT Setup directory of the CD. This program will install the specific drivers for the eToken.

Ensure that **no** eToken is plugged into the system.
It might be necessary to reboot the system to complete the installation.



Press to *Yes* to reboot.
After the reboot the ETSetup.exe has to be started again in order to complete the setup.

Wait until you are prompted to insert the eToken.

and then plug the eToken into an USB port.

Wait until Windows indicates that the new hardware ”eToken Pro 4254” has been found.

Proceed with *OK*.
If the eToken Setup detects a previous C MAP SDK installation the following message will be displayed.

Press *Yes* to reinitialize the licenses. All existing C–MAP licenses will become invalid and have to be renewed.

5 Changing the eToken

If the eToken has to been changed after the installation, the eTSetup has to be run again in order to reinitialize. The eTSetup can be run from the ECDIS directory.

6 Uninstalling the eToken

Run the ResetLic.exe from the ChartInstaller directory and edit the Company Name in the License Data to Raytheon DE and System ID to the original 5–digit C–MAP ID of the system. Press Reset License to commit the changes.

The newly created user.usr file has to be sent to C–MAP in order to receive new licenses.

5.7 SPARE PARTS

5.7.1 Note on Ordering

To ensure fast processing of replacement parts orders the following details are required:

1. Name the ship
2. Device type (refer to type label)
3. Exact designation of the replacement part from the specifications given in the replacement parts catalogue.
4. Required number of part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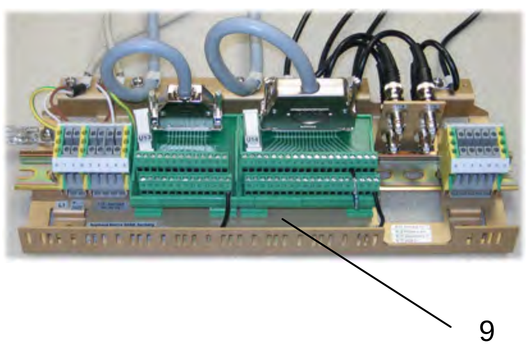
Raytheon
Marine


9

Pos.	Lager-Nr. Stock-No.	Benennung	Designation	Zeichnungs-Nr. Part-No.	Stck. Qty.	Herst.-Code MFRC	Versorgungs-Nr. NSN
1[1]	4001665	NSC-Processor Radar	NSC-Processor Radar	900-018.NG001	1	D2865	
	4002093	NSC-Processor Radar, AT	NSC-Processor Radar, reconditioned	900-018.NG001 AT		D2865	
2	3608223	Spare Parts TFT	Spare Parts TFT	900-015.X01	1	D2865	
3	1721163	Taster	Pusbutton Switch	49-59111	1	C6913	
4	1721220	Drucktaster Subminiatur	Reset Pusbutton Switch	9533CD-0	1	C7249	
5	1791302	Hupenmodul	Buzzer Module	00990213	1	D2865	
6	1791301	VGA Splitter	VGA Splitter	00109091	1	D2865	
7	1505333	Trackball 50mm NSC	Trackball 50mm NSC	948-001.NG004	1	D2865	
8	1503909	Radar Operator Panel	Radar Operator Panel	948-002.NG001 E05	1	D2865	
9	4001855	Radar Anschlußmodul NSC	Radar Connection Module NSC	948-008.NG001	1	D2865	
10	1505496	Lüfter	Fan	NB 24-021.00-016	2	D2865	

[1] für weitere Details: siehe separaten Ersatzteilkatalog
for further details see separate spare parts catalogue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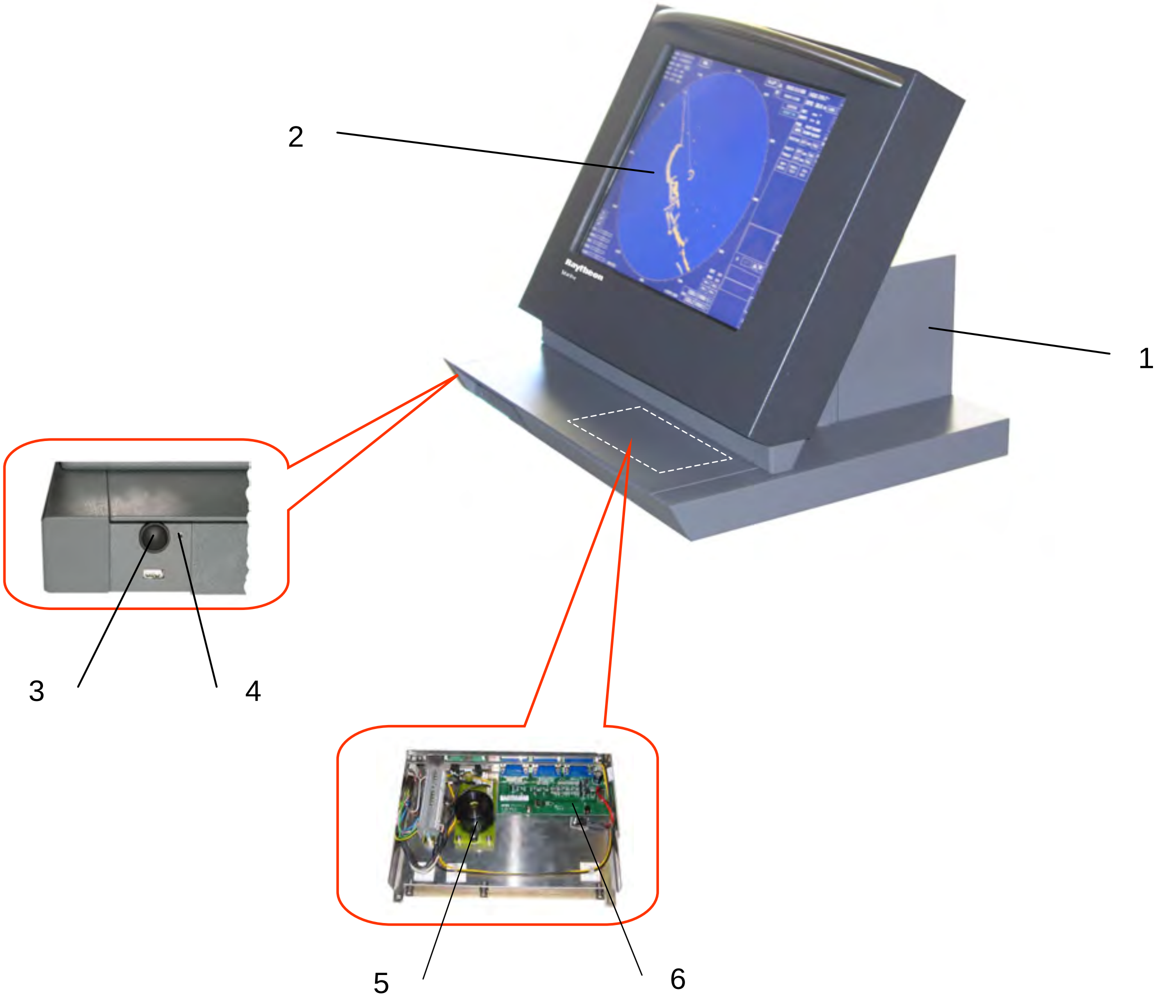
Pos.	Lager-Nr. Stock-No.	Benennung	Designation	Zeichnungs-Nr. Part-No.	Stck. Qty.	Herst.-Code MFRC	Versorgungs-Nr. NSN
1[1]	4001665	NSC-Processor Radar	NSC-Processor Radar	900-018.NG001	1	D2865	
	4002093	NSC-Processor Radar, AT	NSC-Processor Radar, reconditioned	900-018.NG001 AT		D2865	
2	3608277	Spare Parts TFT	Spare Parts TFT	900-021.X01	1	D2865	
3	1721163	Taster	Pushbutton Switch	49-59111	1	C6913	
4	1721220	Drucktaster Subminiatur	Reset Pushbutton Switch	9533CD-0	1	C7249	
5	1791302	Hupenmodul	Buzzer Module	00990213	1	D2865	
6	1791301	VGA Splitter	VGA Splitter	00109091	1	D2865	
7	1505333	Trackball 50mm NSC	Trackball 50mm NSC	948-001.NG004	1	D2865	
8	1503909	Radar Operator Panel	Radar Operator Panel	948-002.NG001 E05	1	D2865	
9	4001855	Radar Anschlußmodul NSC	Radar Connection Module NSC	948-008.NG001	1	D2865	

[1] für weitere Details: siehe separaten Ersatzteilkatalog
for further details see separate spare parts catalogue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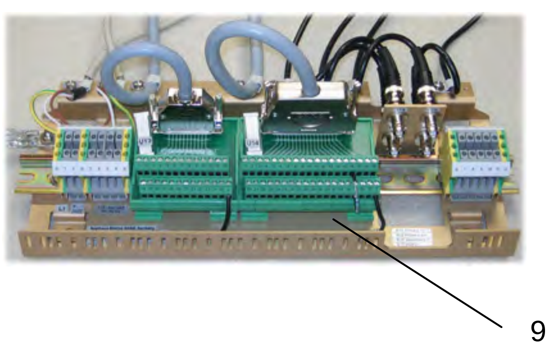
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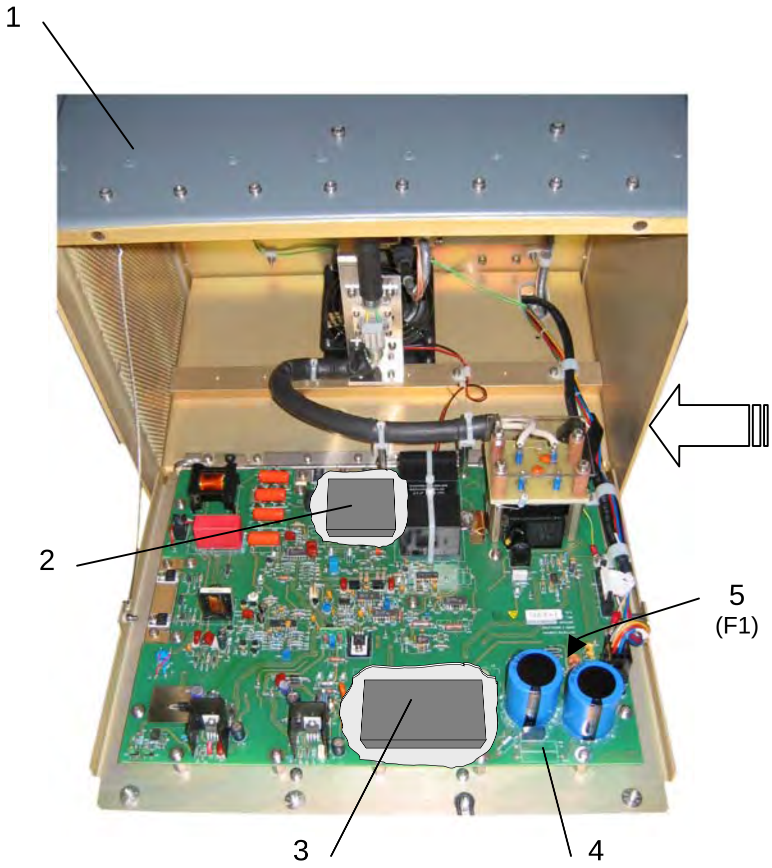
Pos.	Lager-Nr. Stock-No.	Benennung	Designation	Zeichnungs-Nr. Part-No.	Stck. Qty.	Herst.-Code MFRC	Versorgungs-Nr. NSN
1[1]	4001665	NSC-Processor Radar	NSC-Processor Radar	900-018.NG001	1	D2865	
	4002093	NSC-Processor Radar, AT	NSC-Processor Radar, reconditioned	900-018.NG001 AT		D2865	
2	3608277	Spare Parts TFT	Spare Parts TFT	900-021.X01	1	D2865	
3	1721163	Taster	Pushbutton Switch	49-59111	1	C6913	
4	1721220	Drucktaster Subminiatur	Reset Pusbutton Switch	9533CD-0	1	C7249	
5	1791302	Hupenmodul	Buzzer Module	00990213	1	D2865	
6	1791301	VGA Splitter	VGA Splitter	00109091	1	D2865	
7	1505333	Trackball 50mm NSC	Trackball 50mm NSC	948-001.NG004	1	D2865	
8	1503909	Radar Operator Panel	Radar Operator Panel	948-002.NG001 E05	1	D2865	
9	4001855	Radar Anschlußmodul NSC	Radar Connection Module NSC	948-008.NG001	1	D2865	

[1] für weitere Details: siehe separaten Ersatzteilkatalog
for further details see separate spare parts catalogue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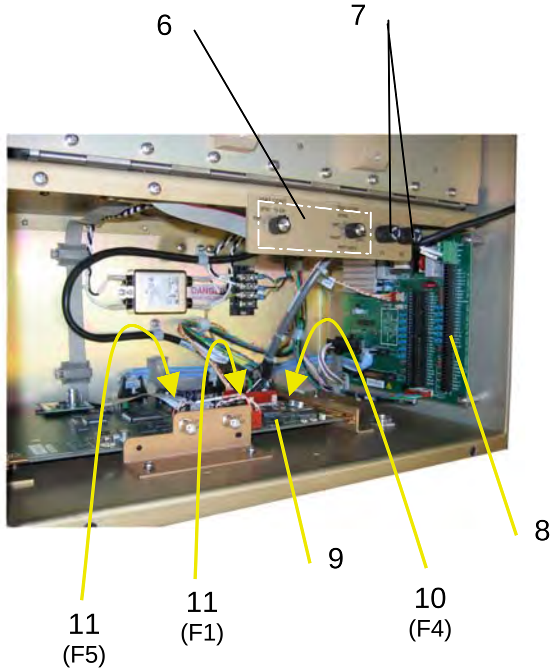
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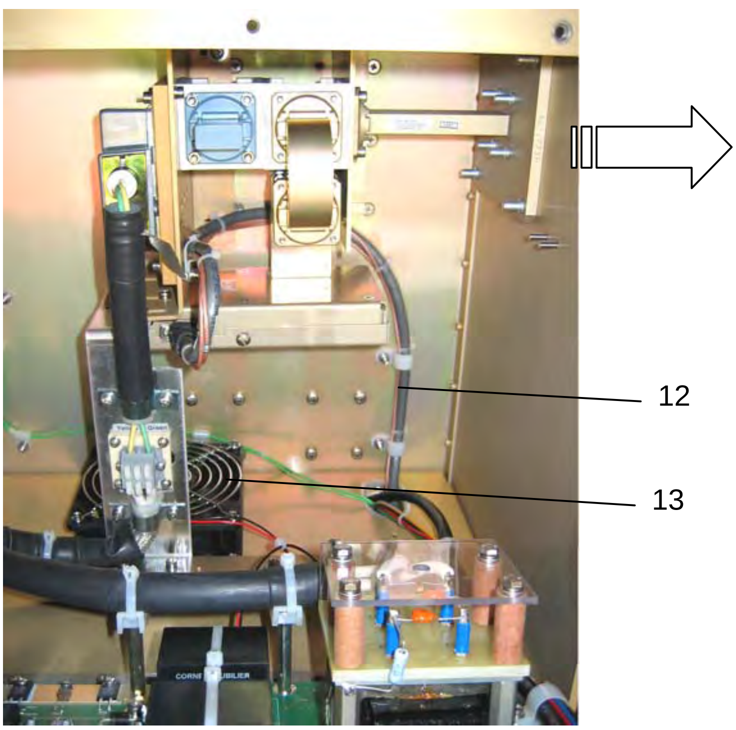
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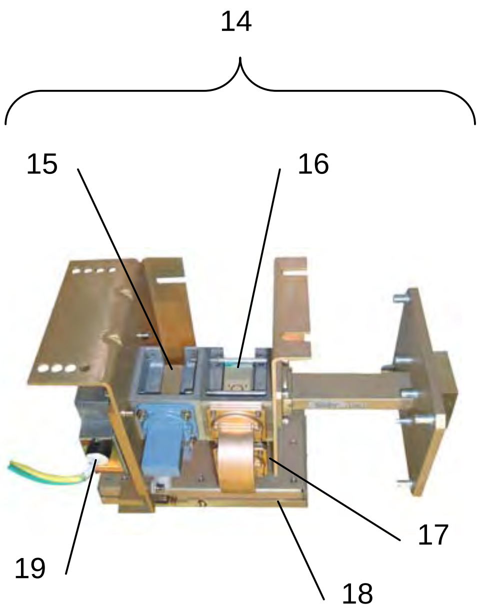
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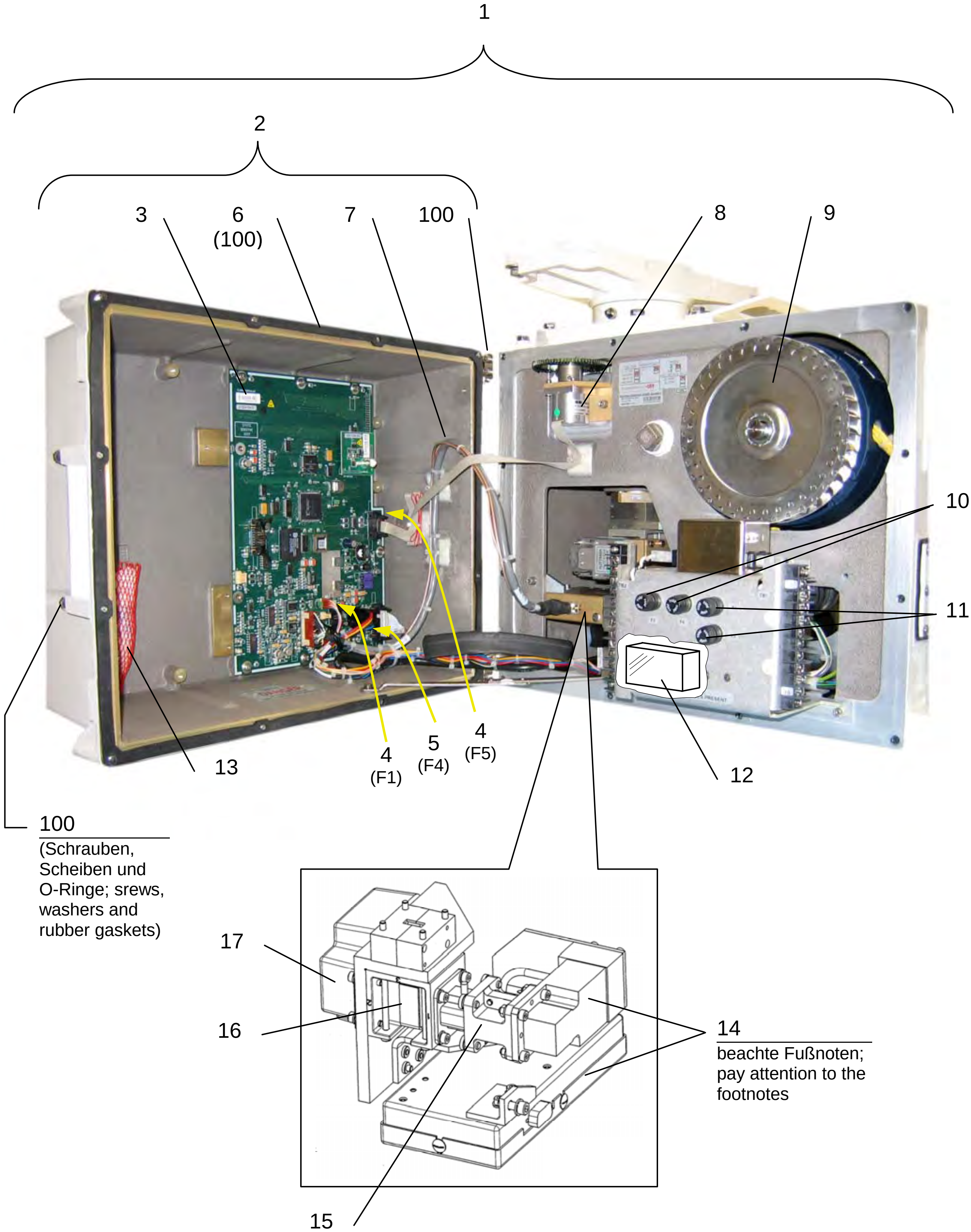
Pos.	Lager-Nr. Stock-No.	Benennung	Designation	Zeichnungs-Nr. Part-No.	Stck. Qty.	Herst.-Code MFRC	Versorgungs-Nr. NSN
1	4001704	MK2 X-MTR down 25 kW 115/230V 1 Ph, neu	MK2 X-MTR down 25 kW 115/230 1Ph, brandnew	G624938-1 E01		D2865	
	4001920	MK2 X-MTR down 25 kW 115/230 1Ph, AT	MK2 X-MTR down 25 kW 115/230 1Ph, reconditioned	G624938-1 E01 AT		D2865	
2[1]	3610092	Service Mosfet Housing Assy	Service Mosfet Housing Assy	G627215.X01	1	D2865	
3[1]	1790618	DC/DC Wandler 150/300V 20A 100W	DC/DC Converter 150/300V 20A 100W	VI-272-CW G626035-1	1	D2865	5840-01-454-6947
4	3609990	MK2-Modulator PCB, neu	MK2-Modulator PCB, brandnew	G624200-1 E03 ET	1	D2865	
	3610135	MK2-Modulator PCB, AT	MK2-Modulator PCB, reconditioned	G624200-1 E03 AT		D2865	
5	1760024	Sub-Miniatursicherung 2,5A 250V	Sub-Miniature Fuse 2,5A 250V	PCC-2 1/2 G623510-6	1	D2865	
6	3601131	MK2 Local Control PCB Assy	MK2 Local Control PCB Assy	G624241-1	1	D2865	
7	1760041	G-Sicherungseinsatz F7A 250V	Fuse F7A 250V	312007	2		5920-00-884-2724
8	3603628	MK2 Power Input & I/O PCB, neu	MK2 Power Input & I/O PCB, brandnew	G624197-1ET	1	D2865	
	3605133	MK2 Power Input & I/O PCB, AT	MK2 Power Input & I/O PCB, reconditioned	G624197-1AT		D2865	
9	3605199	MK2 Controller PCB, neu	MK2 Controller PCB, brandnew	G624194-3ET	1	D2865	
	3609608	MK2 Controller PCB, AT	MK2 Controller PCB, reconditioned	G624194-3 AT		D2865	
10	1760022	Sub-Miniatursicherung 1A 250V	Sub-Miniature Fuse 1A 250V	PCC-1 G623510-3	1	D2865	
11	1760021	Sub-Miniatursicherung 0,5A 250V	Sub-Miniature Fuse 0,5A 250V	PCC-1/2 G623510-1	2	D2865	
12	1503051	C/A Cont to I/F PCB	C/A Cont to I/F PCB	G624682-2	1	D2865	
13	3601960	Lüfter, kompl.	Fan, compl.	G623588-1	1	D2865	
14	3609956	X-Band RF MTR Assembly	X-Band RF MTR Assembly	G625145-1 E01 ET	1	D2865	
15	1790939	3 Port Circulator, X-Band	3 Port Circulator, X-Band	B3JC1649 G624373-1	1	D2865	
16	1502768	Circulator, 3 Port	Circulator, 3 Port	G261088-2	1	D2865	
17	1791666	Limiter, two Stage, X-Band	Limiter, two Stage, X-Band	TL 393	1	D2865	
18[2]	3604956	LNFE Sub Assy, X-Pedestal, neu	LNFE Sub Assy, X-Pedestal, brandnew	G624499-1 ET	1	D2865	
	3603870	LNFE Sub Assy, X-Pedestal, AT	LNFE Sub Assy, X-Pedestal, recond.	G624499-1 AT		D2865	
19	1730480	Magnetron, X-Band, 9410MHz, 25kW	Magnetron, X-Band, 9410MHz, 25kW	MG5424 G624375-3	1	D2865	5960-99-327-4144

[1] hinter der Modulator PCB montiert
mounted behind the Modulator PCB

[2] bei Austausch eines LNFE Sub Assembly muss unbedingt auch der Limiter getauscht werden
if a LNFE Sub Assembly has to be replaced it is mandatory to change the limiter too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washers and
rubber gaskets)
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pay attention to the
footnotes
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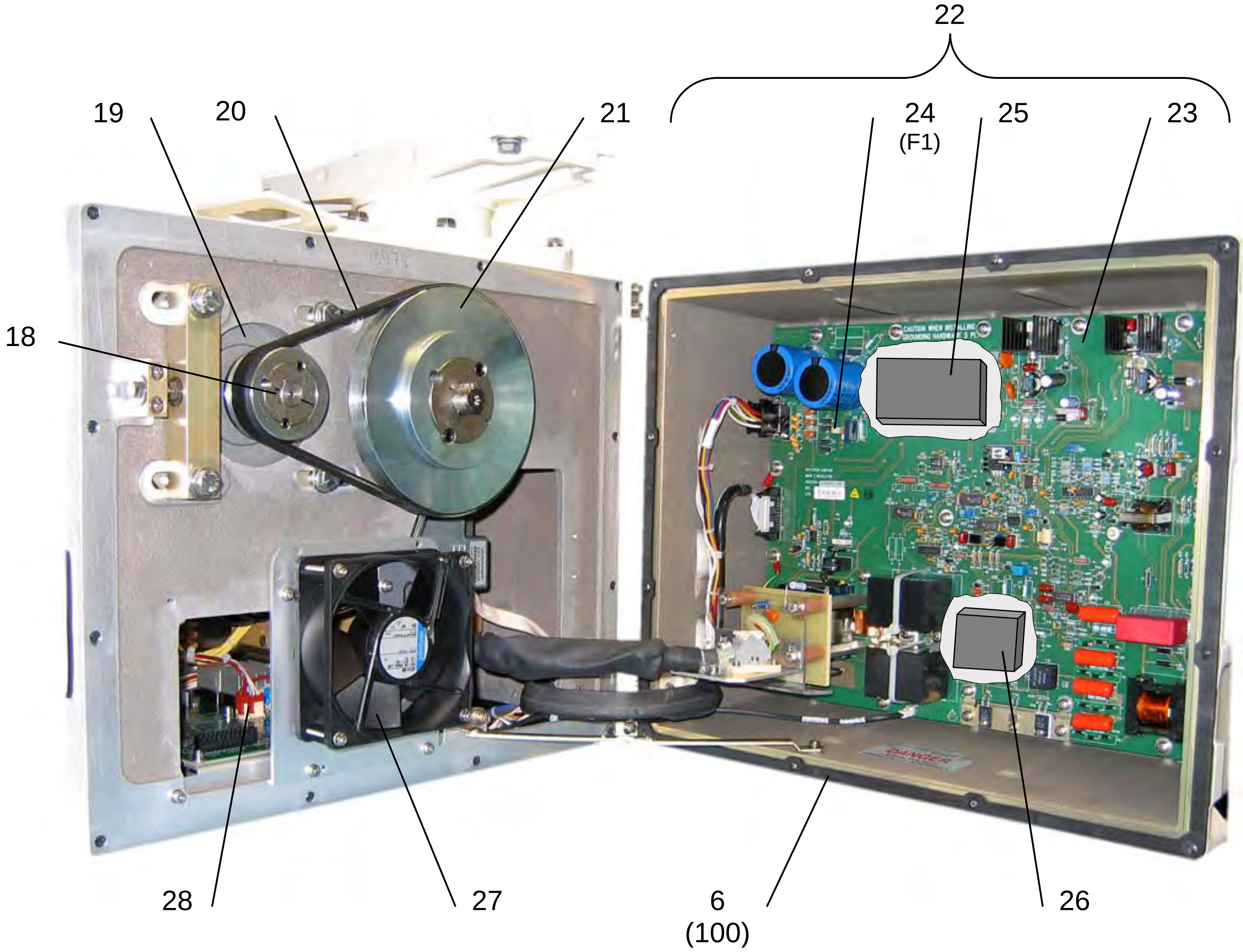
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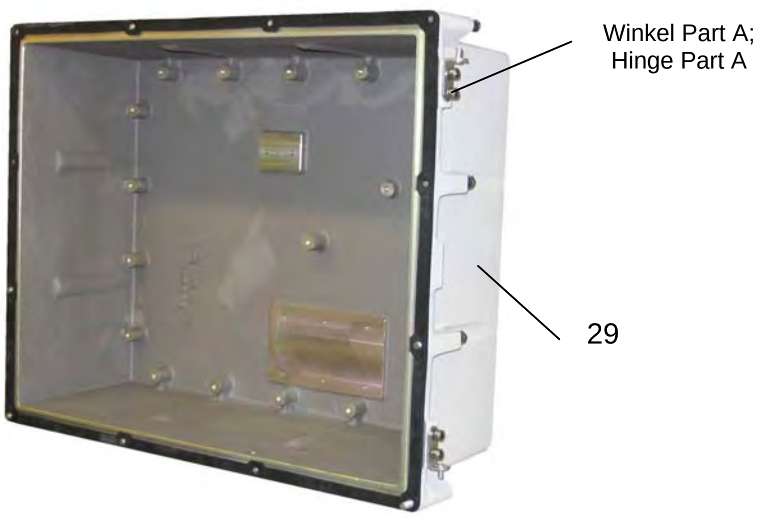
Winkel Part A;
Hinge Part A
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MK2 X-MTR Pedestal 25kW 115/230V 1Ph
Type G624364-1 E01 (M28347 E01)

ANSCHÜTZ

Ersatzteilkatalog
SPARE PARTS
CATALOGUE

Pos.	Lager-Nr. Stock-No.	Benennung	Designation	Zeichnungs-Nr. Part-No.	Stck. Qty.	Herst.-Code MFRC	Versorgungs-Nr. NSN
1	4001708	MK2 X_MTR Pedestal 25 kW 115/220 1Ph, neu	MK2 X_MTR Pedestal 25 kW 115/220 1Ph, brandnew	G624364-1 E01		D2865	
	4001918	MK2 X_MTR Pedestal 25 kW 115/220 1Ph, AT	MK2 X_MTR Pedestal 25 kW 115/220 1Ph, reconditioned	G624364-1 E01 AT		D2865	
2	3610139	Tür, Controller PCB	Door with controller PCB	148-500.52 ET	1	D2865	
3	3605199	MK2 Controller PCB, neu	MK2 Controller PCB, brandnew	G624194-3ET	1	D2865	
	3609608	MK2 Controller PCB, AT	MK2 Controller PCB, reconditioned	G624194-3 AT		D2865	
4	1760021	Sub-Miniatursicherung 0,5A 250V	Sub-Miniature Fuse 0,5A 250V	PCC-1/2 G623510-1	2	D2865	
5	1760022	Sub-Miniatursicherung 1A 250V	Sub-Miniature Fuse 1A 250V	PCC-1 G623510-3	1	D2865	
6	1502441	Gasket-Side Cover Ped.	Gasket-Side Cover Ped.	G624045-1	2	D2865	
7	1503064	C/A Cont to I/F PCB	C/A Cont to I/F PCB	G624682-1	1	D2865	
8	1791529	Encoder	Encoder	ITD 11B10Y4	1	D2865	
9	1502720	Lüfterrad d=156,4mm	Fanwheel d=156,4mm	167279-1	1	D2865	
10	1760037	G-Sicherungseinsatz 8A 250V	Fuse 8A 250V	MDA 8	2	D2865	
11	1760041	G-Sicherungseinsatz F7A 250V	Fuse F7A 250V	312007	2	D2865	5920-00-884-2724
12	1780389	Power-Relais 12V DC 2 Wechsler	Relay 12V DC	KUHP-11D51-12 G625460-11	1	D2865	
13	1990061	Trockenbeutel	Air drying bag	NFH 00321	1	D2865	
14[1,2]	3604960	LNFE Sub Assy, X-Pedestal, neu	LNFE Sub Assy, X-Pedestal, brandnew	148-500.45 ET	1	D2865	
	3609384	LNFE Sub Assy, X-Pedestal, AT	LNFE Sub Assy, X-Pedestal, recond.	148-500.45 AT		D2865	
14[1,3]	3604956	LNFE Sub Assy, X-Pedestal, neu	LNFE Sub Assy, X-Pedestal, brandnew	G624499-1 ET	1	D2865	
	3603870	LNFE Sub Assy, X-Pedestal, AT	LNFE Sub Assy, X-Pedestal, recond.	G624499-1 AT		D2865	
15	1791666	Limiter, two Stage, X-Band	Limiter, two Stage, X-Band	TL 393	1	D2865	
16	1790939	3 Port Circulator, X-Band	3 Port Circulator, X-Band	B3JC1649 G624373-1	1	D2865	
17	1730480	Magnetron, X-Band, 9410MHz, 25kW	Magnetron, X-Band, 9410MHz, 25kW	MG5424 G624375-3	1	D2865	5960-99-327-4144
18	1670153	Zahnriemenscheibe 2	Toothed belt disk 2	7813-0224 G626119-66	1	D2865	
19	1790932	Motor 115/208-220V AC	Motor 115/208-220V AC	114885.00 G624189-1	1	D2865	
20	1670151	Zahnriemen 24“	Toothed Belt 24”	240J6 G626119-115	1	D2865	3030-01-163-8587

[1] bei Austausch eines LNFE Sub Assembly muss unbedingt auch der Limiter getauscht werden
if a LNFE Sub Assembly has to be replaced it is mandatory to change the limiter too

[2] in Pedestal G624364-1 **E01**

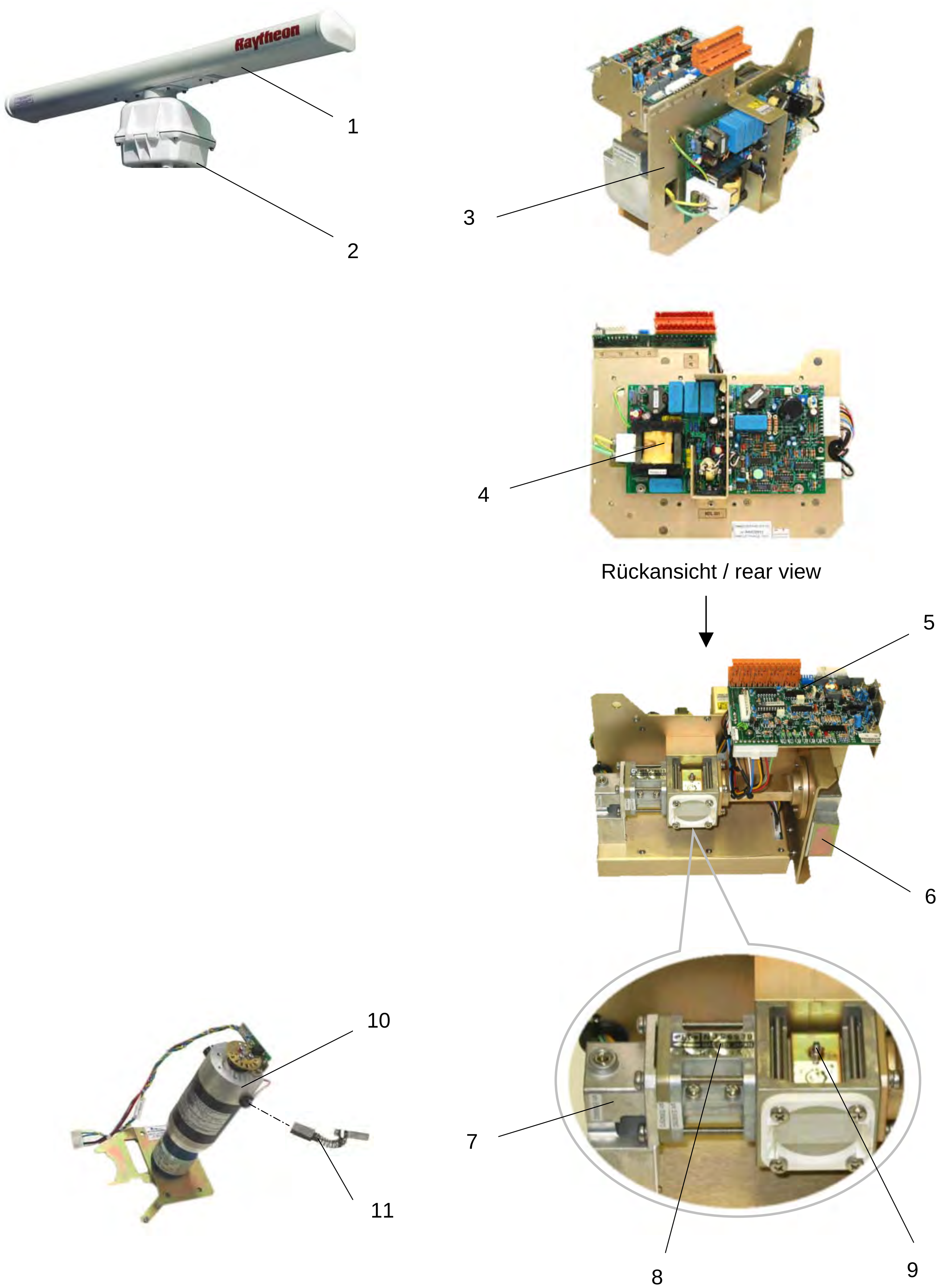
[3] in Pedestal G624364-1 **E00**

Pos.	Lager-Nr. Stock-No.	Benennung	Designation	Zeichnungs-Nr. Part-No.	Stck. Qty.	Herst.-Code MFRC	Versorgungs-Nr. NSN
21	1670152	Zahnriemenscheibe 6”	Toothed belt disk 6“	7813-6600 G626119-83	1	D2865	
22	3609540	Tür, Modulator PCB	Door with Modulator PCB	148-500.51 ET	1	D2865	
23	3609990	MK2-Modulator PCB, neu	MK2-Modulator PCB, brandnew	G624200-1 E03 ET	1	D2865	
	3610135	MK2-Modulator PCB, AT	MK2-Modulator PCB, reconditioned	G624200-1 E03 AT		D2865	
24	1760024	Sub-Miniatursicherung 2,5A 250V	Sub-Miniature Fuse 2,5A 250V	PCC-2 1/2 G623510-6	1	D2865	
25[4]	1790618	DC/DC Wandler 150/300V 20A 100W	DC/DC Converter 150/300V 20A 100W	VI-272-CW G626035-1	1	D2865	5840-01-454-6947
26[4]	3610092	Service Mosfet Housing Assy	Service Mosfet Housing Assy	G627215.X01	1	D2865	
27	3604763	Zusatzlüfter, Modulator X-Band	Fan, Modulator X-Band	148-500.47	1	D2865	
28	3603628	MK2 Power Input & I/O PCB, neu	MK2 Power Input & I/O PCB, brandnew	G624197-1ET	1	D2865	
	3605133	MK2 Power Input & I/O PCB, AT	MK2 Power Input & I/O PCB, reconditioned	G624197-1AT		D2865	
29[5]	3604978	Tür, leer	Door, empty	148-500.53		D2865	
100[6]	3610200	Satz Kleinteile für Tür MK2	Set of small parts for door MK2	148-500.X52		D2865	

[4] hinter der Modulator PCB montiert
mounted behind the Modulator PCB

[5] ohne PCB´s, jedoch mit Schrauben, Scheiben, Türdichtung und Winkel Part A
without PCB´s, but incl. Screws, washers, gasket und hinge part A

[6] bestehend aus: Schrauben, Scheiben, O-Ringen, Türdichtungen und Winkel Part A und Part B für zwei Türen
consisting of: screws, washers, rubber gaskets, gaskets for the doors and hinges part A and part B for 2 doors.


Raytheon
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Rückansicht / rear view
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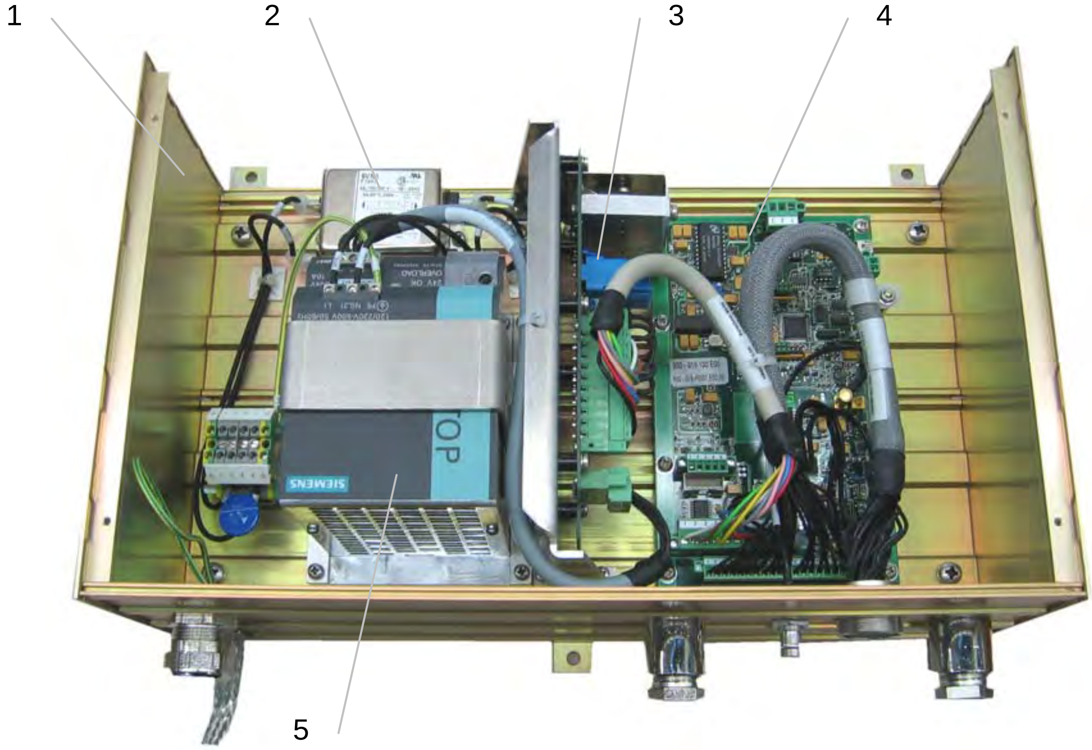
Pos.	Lager-Nr. Stock-No.	Benennung	Designation	Zeichnungs-Nr. Part-No.	Stck. Qty.	Herst.-Code MFRC	Versorgungs-Nr. NSN
1	2808251	Radar Antenne 6ft X-Band	6ft X-Band Antenna array	AU11-U6NR	1	D2865	
2	2808250	Pedestal 10kW X-Band, 22RPM, neu	Pedestal 10kW X-Band, 22RPM, new	SU70-10NR	1	D2865	
	2808417	Pedestal 10kW X-Band, 22RPM, AT	Pedestal 10kW X-Band, 22RPM, reconditioned	SU70-10NR AT		D2865	
3	2808390	RTM Plate, neu	RTM Plate, new	AA032913	1	D2865	
	2808391	RTM Plate, AT	RTM Plate, reconditioned	AA032913		D2865	
4	1791423	Modulator Module	Modulator Module	MDL-301	1	D2865	
5	1730654	Motor Control Module	Motor Control Module	ACP-30020	1	D2865	
6	1730655	Magnetron	Magnetron	EV055062	1	D2865	
7	1791426	Front End	Front End	EX060902	1	D2865	
8	1791424	Limiter	Limiter	EX042952	1	D2865	
9	1791428	Circulator	Circulator	EX070102	1	D2865	
10	1730653	Antenna Motor Group	Antenna Motor Group	GM046	1	D2865	
11	1791429	Bürste	Brush	EE 181702	2	D2865	



Pos.	Lager-Nr. Stock-No.	Benennung	Designation	Zeichnungs-Nr. Part-No.	Stck. Qty.	Herst.-Code MFRC	Versorgungs-Nr. NSN
1	4001700	NSC Transceiver Control Unit, neu	NSC Transceiver Control Unit, new	900-019.NG001		D2865	
1	4002227	NSC Transceiver Control Unit, AT	NSC Transceiver Control Unit, recond.	900-019.NG001 AT		D2865	
2	1730493	Netzfilter	Filter	6A 250V AC / 50Hz 6VN1	1	D2865	
3	3609787	DC/DC Wandler 24V / ±12V	DC/DC Converter 24V / ±12V	900-019.21 ET	1	D2865	
4	3609785	Transceiver Control Module PCB	Transceiver Control Module PCB	900-019.100 ET	1	D2865	
5	1791446	AC/DC Wandler 10A	AC/DC Converter 10A	6EP1 334-3BA	1	00P62	

NSC Radar

Service and Installation Manual

Raytheon
Raytheon Anschütz GmbH
Germany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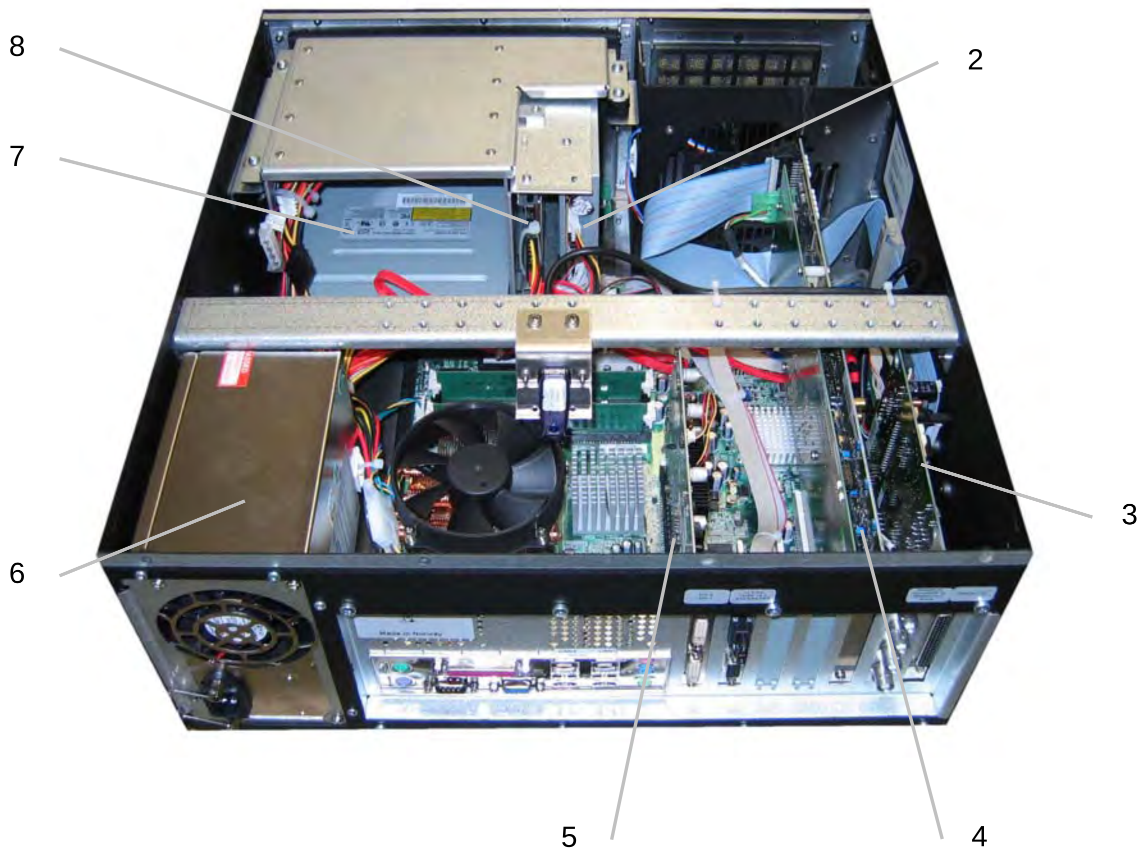
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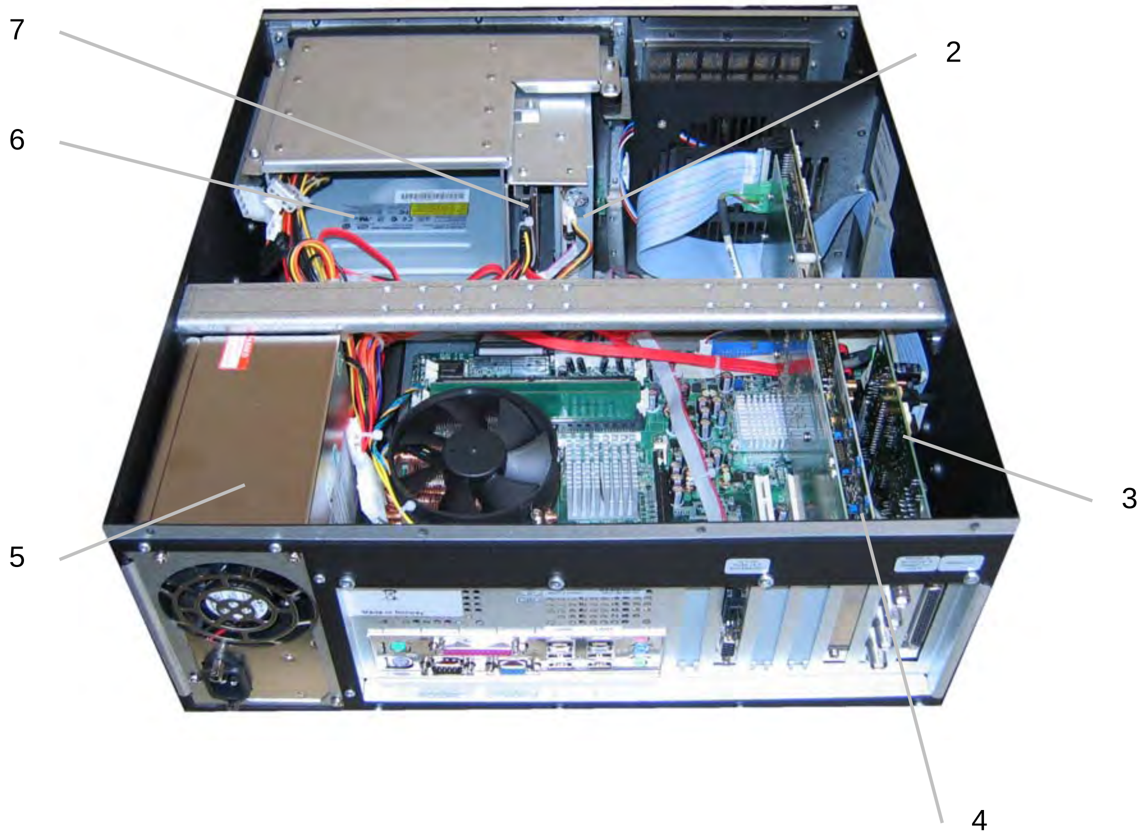
Pos.	Lager-Nr. Stock-No.	Benennung	Designation	Zeichnungs-Nr. Part-No.	Stck. Qty.	Herst.-Code MFRC	Versorgungs-Nr. NSN
1	3610192	Radar Computer	Radar Computer	950-012.NG006	1	D2865	
2	2600133	Floppy 1,44 MB	Floppy 1,44 MB	FD235HF-D291	1	D2865	
3	3609923	Serial I/O-PCB	Serial I/O-PCB	900-010.22 E01 ET	1	D2865	7025-12-374-1583
4	3610267	Radar-Interface Chart	Radar-Interface Chart	900-014.117 E01 AT	1	D2865	
5	1791916	Grafikkarte Matrox P650	Graphic PCB Matrox P650	150009	1	D2865	
6	1791914	Netzteil	Power Supply	1000955	1	D2865	
7	1791919	DVD-Laufwerk	DVD Drive	1000648	1	D2865	
8	3610432	Hard Drive Kit	Hard Drive Kit	950-012.X01	1	D2865	


1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Pos.	Lager-Nr. Stock-No.	Benennung	Designation	Zeichnungs-Nr. Part-No.	Stck. Qty.	Herst.-Code MFRC	Versorgungs-Nr. NSN
1	3610193	Radar Computer	Radar Computer	950-012.NG007	1	D2865	
2	2600133	Floppy 1,44 MB	Floppy 1,44 MB	FD235HF-D291	1	D2865	
3	3609923	Serial I/O-PCB	Serial I/O-PCB	900-010.22 E01 ET	1	D2865	7025-12-374-1583
4	3610103	Radar-Interface	Radar-Interface	900-014.114 E02 AT	1	D2865	
5	1791914	Netzteil	Power Supply	1000955	1	D2865	
6	1791919	DVD-Laufwerk	DVD Drive	1000648	1	D2865	
7	3610432	Hard Drive Kit	Hard Drive Kit	950-012.X01	1	D2865	

Installation Protocol (see CP... in chapter 3)

o.k.	CP. /	WORK	Example	Display		Display	
	chap.			A/C		B/D	
				XCVR1	XCVR2	XCVR1	XCVR2
		RADAR UTILITY					
	26	Display Network	1.1.1.21				
	3.10	Display Resolution	1024x 768				
		Gyro Data Baud Rate	38400				
		RADAR					
		SERV Configuration, Password "test"	Done				
		Keyboard, Standard	Done				
	3	Transceiver quantity	Two				
	4	Transceiver Port IN	Primary				
	1	Display quantity	Two				
	2	Display ID	A				
	5	Interswitch used for this XCVR?	Yes/No				
	5	Interswitch Unit Port IN ISU	Primary				
		File Exit					
		EXIT RADAR					
		RADAR	Done				
		SERV, Configuration, Password "test"	Done				
		User Select M (Master) or S (Slave)	M				
	6	TRANSCEIVER TYP	MK2/NSC				
	6	TRANSCEIVER TYP SCANNER	TCM + 10kW				
	6	MK2 PMU INSTALLED	Yes/No				
	7,8,9	FOR TCM/TCU SET ID 2,3,4	2				
	6	EXENDED GAIN	No				
	6	RRB AVAILABLE	No				
	10	FINISHED	Done				

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Installation Protocol (see CP... in chapter 3)

o.k.	*CP. /*	WORK	Example	Display		Display	
	chap.			A/C		B/D	
				XCVR1	XCVR2	XCVR1	XCVR2
		File Exit					
		EXIT RADAR					
		RADAR	Done				
		SERV, Configuration, Password ”test”	Done				
		User Select M (Master) or S	M				
		VIDEO LEVELS					
	11	Level	408				
		SERV, Configuration, Password ”test”					
	12	LABEL (optional 7 letter for User)	Helicop				
	12	ANTENNA HEIGHT	34				
	12	PEDESTAL FWD/AFT POSITION	4				
	12	TRANSMISSION LINE LENGTH	−6				
	12	TRANSMISSION LINE LENGTH	22				
	12	ANTENNA RATE	21				
	14	ZERO RANGE	1.46				
	15	ANTENNA AZIMUTH OFFSET	1657				
	16	TUNING PRESET	128				
	17	NOISE LEVELS	Done				
	18	SECTOR BLANKING	Done				
		PMU CALIBRATION	Done				
		PMU REVIEW VALUES	TX4,RX15				
		FINISHED					
		Notes					

Installation Protocol (see CP... in chapter 3)

o.k.	*CP. /*	WORK	Example	Display		Display	
	chap.			A/C		B/D	
				XCVR1	XCVR2	XCVR1	XCVR2
		USER PREFS					
	19	DEFAULT PULSE WIDTH 0.75	SHORT				
	19	DEFAULT PULSE WIDTH 1.50	SHORT				
	19	HEADING LINE	SOLID				
	19	CURVED HEADING LINE	DISABLE				
	20	LOST TARGET	CANCEL				
	20	AUTO ACQUIRE	0.25 20NM				
	20	LENGTH	150				
	20	WIDTH	25				
	20	(BOW FROM) CRP X OFFSET)	0				
	20	(BOW FROM) CRP Y OFFSET)	125				
	20	CFAR ENABLED	Yes E0010				
		SHADOW SECTORS RECORDED	Yes				
		REFLECTION SECTORS RECORDED	Yes				
		CALIBRATION PMU RECORDED	Yes				
		File Exit	Done				
		EXIT RADAR	Done				
		RADAR	Done				
		SERV, Configuration, Password ”test”	Done				

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o.k.	*CP. /*	WORK	Example	Display	Display	
	chap.			A/C	B/D	
		COM_PORTS				
	21, 23	COM1 Device type	AIS (Auto)			
	24	COM1 LABEL	n/a			
	24	COM1 BITS bps PARITY	8,38400,N			
	24	POS OFFSET FROM CRP X,Y	0,0			
	24	INPUT SENTENCES	n/a			
	21, 23	COM12 Device type	DGPS			
	24	COM12 LABEL	AP12			
	24	COM12 BITS bps PARITY	8,4800,N			
	24	POS OFFSET FROM CRP X,Y	–5,3			
	24	INPUT SENTENCES	GLL, VTG, ROUTE			
	21, 23	COM13/16 Device type	LOG & VDR out			
	24	COM13/16 LABEL	SAL			
	24	COM13/16 BITS bps PARITY	8,4800,N			
	24	POS OFFSET FROM CRP X,Y	0,120			
	24	INPUT SENTENCES	VBW			
	25	OUTPUT SENTENCES	TTM,OSD, RSD			
	21, 23	COM14/17 Device type	ARCP (Auto)			
	24	COM14/17 LABEL	ARCP			
	24	COM14/17 BITS bps PARITY	8,4800,N			
	24	POS OFFSET FROM CRP X,Y	n/a			
	24	INPUT SENTENCES	n/a			
	25	OUTPUT SENTENCES	n/a			

Installation Protocol (see CP... in chapter 3)

o.k.	*CP. /*	WORK	Example	Display		Display	
	chap.			**A/C**		**B/D**	
		DIV IN/OUT					
	22	GYRO COM 11	Course Bus				
	22	UPLINK COM 15	Yes				
	22	PULSE LOG	OFF				
		ETHERNET					
	27, 28	AIS Server	This Dis- play				
	27, 28	IP Address	127.0.0.1				
	27, 28	IP Port	5000				
	27	AIS ON/OFF	ON				
		LAN1					
		Other Device Type	Raytheon ECDIS1				
		TRANSMIT IP (Other De- vice listen)	1.1.1.1				
		TRANSMIT IP Port (Other Device)	5101 (disp A)				
		RECEIVE from other IP Address	1.1.1.1				
		RECEIVE from other IP Port	5001				
		INPUT SENTENCES	POS,ROU TE,CHT				
		OUTPUT SENTENCES	TTM,OSD,				

o.k.	*CP. /*	**WORK**	**Example**	**Display**	**Display**
	chap.			**A/C**	**B/D**
		LAN2			
		Other Device Type	Raytheon ECDIS2		
		TRANSMIT IP (Other Device listen)	1.1.1.2		
		TRANSMIT IP Port (Other Device)	5101 (for disp A)		
		RECEIVE from other IP Address	1.1.1.2		
		RECEIVE from other IP Port	5001		
		INPUT SENTENCES	CURSOR		
		OUTPUT SENTENCES	CURSOR		
		LAN3			
		Other Device Type			
		TRANSMIT IP (Other Device listen)			
		TRANSMIT IP Port (Other Device)			
		RECEIVE from other IP Address			
		RECEIVE from other IP Port			
		INPUT SENTENCES			
		OUTPUT SENTENCES			
		File Exit			
		EXIT RADAR			
		RADAR			
		*****OPERATE ALL INTERFACES****	OK		
		SERV, Configuration, Password ”test”			
	29	5. SAVE			
	29	SAVE BACKUP OF ALL WORK	26 Jan 05		

Installation Protocol (see CP... in chapter 3)

o.k.	CP. /	WORK	Example	Display	Display
	chap.			A/C	B/D
	29	YES–NOW	Your Signatur		

Date: ____________

Name: ________________________________

Service Support Company: ___________________________

o.k.	CP.	WORK	Example	Display	Display
	chap.			A/C	B/D
		Make USB stick with :\RAYTHEON	Done		
		RADAR UTILITY			
	3.9.1	Service Report Export to USB	Done		
		Copy to PC before making another	wehresmann @ray-kiel.com		

Installation Protocol (see CP... in chapter 3)

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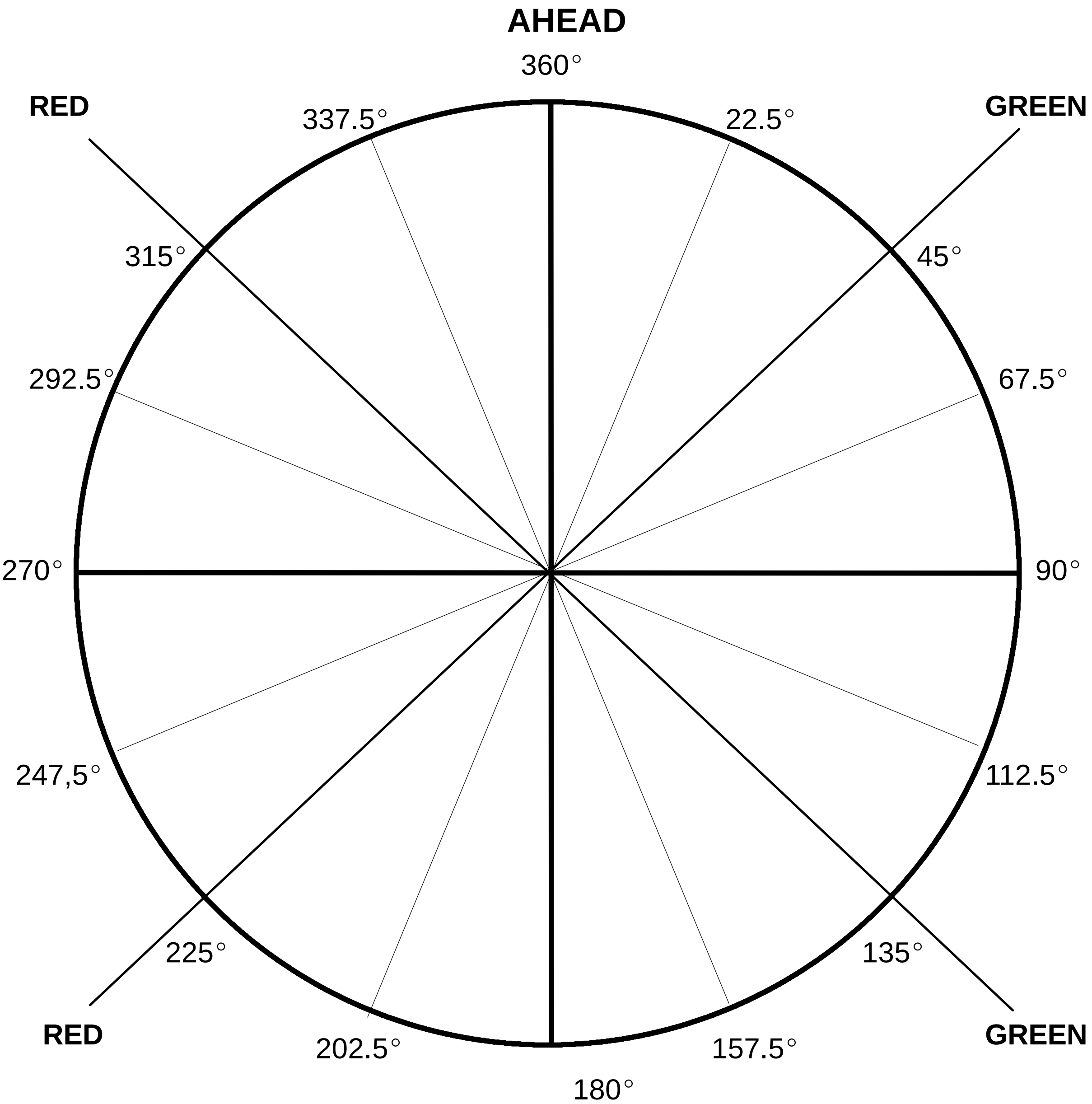

Blank Sectors (not transmitted)

Sector Start				
Sector End				

Reflector Sectors (mast, funnel, w'house)

Sector Start				
Sector End				

PMU calibration Sector

New Magnetron Date				
GAIN full, start echo				
GAIN full, end echo				

Service and Installation Manual

Maintenance Plan for Radar and Chartradar NSC

Procedure	all 3 Months	all 12 Months	all 30 Months	Remarks
Processor Unit & TFT Display				
Cleaning the NSC Display	X			
Cleaning/Changing the air filter – Processor unit (chapter 5.4.2) – A320 processor see appendix doc. No. 3790		 X X		
Function test fan	X			
Check all plug–in –, bolted–connections and clamped cables		X		
Visual cable check (damaged cables ?)		X		
Trackball & Operator Panel				
Cleaning	X			
MK2 Pedestal 25/30KW (X/S) & Array				
X/S–Band cleaning and inspection (chapter 5.2.1)		X		
Change the Air Drying Bag		X		Change the Air Drying Bag every time after opening the pedestal.
Pedestal screws tightening		X		
X/S–Band check the gear box assembly lubricant level and use lubricants as using the oil level sight gage (chapter 5.2.2)		X		
X/S–Band pedestal lubricant draining (chapter 5.2.4)			X	
X/S–Band drive system inspection (chapter 5.2.5)		X		

Check ground connection		x		
Access cover gasket inspection (chapter 5.2.6)		x		