# Synapsis Radar
# with Nautoscan NX Pedestal

**Operator Manual**

**GENERAL INFORMATION**

The present manual has been drawn up as a description and reference book. It will help to answer questions and to solve problems in the quickest possible manner.

Before operating the equipment read and follow the instructions in this manual.

For this purpose refer to the table of contents and read the corresponding chapters thoroughly.

If you have any further questions, please contact us on the following address:

RAYTHEON ANSCHÜTZ GMBH                    Tel. 0431 / 3019 - 0
Zeyestr. 16 - 24                          Fax 0431 / 3019 - 291
24106 Kiel
Germany

Since errors can hardly be avoided in the documentation in spite of all efforts, we should appreciate any remark and suggestion.

Subject to alterations.

## CHANGE HISTORY

| Date | Change |
|------|--------|
| July 2015 | Notes for FCC Rules inserted. |
| Aug 2015 | SP and M1 up to 24 NM possible now |
| Sep.2015 | Maximum distance extended to 6W/m$^2$ |

**TABLE OF CONTENTS**

**TABLE OF FIGURES**

## TABLE OF TABLES

# 0 General

## 0.1 Safety Regulations

The following safety symbols are used in this manual:

| WARNING | Warning statements indicate a hazardous situation that, if not avoided, could result in death or serious injury. |
|---|---|

| | Caution statements indicate a hazardous situation that, if not avoid, could result in minor or moderate injury. |
|---|---|

| | Notes indicate information considered important but not hazard related. |
|---|---|

## 0.2 Product and Performance Standards (if possible)

| Standards | Description |
|---|---|
| IEC 62388 | Maritime navigation and radio communication equipment and systems – Ship borne – Performance requirements, methods of testing and required test results. |
| IEC 60945 | Maritime navigation and radio communication equipment and system – General requirements- Methods of testing and required test results. |
| IEC 60945 | Maritime navigation and radio communication equipment and system – General requirements- Methods of testing and required test results. |
| IEC 61162 | Maritime navigation and radio communication equipment and systems - Digital interfaces. |
| IEC 61174 | Maritime navigation and radio communication equipment and systems – Electronic chart display and information systems (ECDIS) – Operational and performance requirements, methods of testing and required test results. |
| IEC 61924-2: 2012 | Maritime navigation and radio communication equipment and systems – Part 2 Modular Structure for INS – Operational and performance requirements, methods of testing and required test results. |
| IEC 61996-1: 2012 | Maritime navigation and radio communication equipment and systems – Ship borne voyage data recorder (VDR) – Part 1: Voyage data recorder (VDR) – Performance requirements – Methods of testing and required test results. |
| ITU-R Recommendation M.628 | Technical characteristics for search and rescue Radar transponders. |
| ITU-R Recommendation M.824 | Technical parameters of Radar beacons (racons). |
| ITU-R M.1176 | Technical parameters of Radar target enhancers. |
| IHO S-52 | Specifications for chart content and display aspects of ECDIS. |

| Standards | Description |
|---|---|
| IHO S52 Annex A | IHO ECDIS Presentation Library. |
| IMO Resolution A.424(XI) | Performance standards for Gyro-compasses. |
| IMO Resolution A.694(17) | General requirements for ship borne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids. |
| IMO Resolution A.821(19) | Performance standards of Gyro-compasses for High –Speed Craft. |
| IMO Resolution MSC.96(72) | Amendments to IMO Resolution A.824(19), Performance standards for devices to indicate speed and distance. |
| IMO Resolution MSC.116(73) | Performance standards for the marine transmitting heading devices (THDs). |
| IMO Resolution MSC.191(79) | Performance standards for the presentation of navigation related information on ship borne navigational displays. |
| IMO Resolution MSC.192(79) | Revised performance standards for Radar equipment. |
| IMO Resolution MSC.232(82) | Revised performance standards for electronic chart display and information system (ECDIS). |
| IMO Resolution MSC.302(87) | Performance standards for bridge alert management. |
| IMO MSC.1/Circ.1389 | Guidance on procedures for updating ship borne navigation and communication equipment. |
| VESA-2007-5:2007 | Industry standards and guidelines for computer display monitor timing (DMT). |
| DDWG DVI:1999, (DDWG) | Digital Visual Interface (DVI) Revision 1.0, Digital Display Working Group. |
| IEC 62288 | Maritime navigation and radio communication and systems – Presentation of navigation-related information on ship borne navigational displays – General requirements, methods of testing and required results. |

## 0.3      Further Documents

Additional documentations are dependent on the Radar System.
A single Radar System includes:

| Title | Documentation No. |
|---|---|
| Synapsis Radar Service Manual and Drawings | 4265 |
| Small Marine Computer Documentation | 4301 |
| Synapsis System Documentation | 4279 |
| Synapsis Service Tool for Nautoscan NX Documentation | 4280 |
| Radar Transmission Line Installation | 4235 |

A Multifunction System includes:

| Title | Documentation No. |
|---|---|
| Radar Service Manual and Drawings | 4265 |
| Small Marine Computer Documentation | 4301 |
| Synapsis ECDIS Operator Manual | 4276 |
| Synapsis Nautoconning Manual | 4278 |
| Synapsis HD Conning | 4285 |
| Synapsis System Documentation | 4279 |
| Synapsis Service Tool for Nautoscan NX Documentation | 4280 |
| Radar Transmission Line Installation | In preparation |

## 0.4 List of Abbreviation

| Term | Description |
| --- | --- |
| ACP | Azimuth Commit Point |
| ACQ | Automatic Acquisition |
| AIS | Automatic Identification System |
| APM | Active Performance Monitor |
| ARCP | Autopilot Remote Control Panel |
| ARPA | Automatic Radar Plotting Aid |
| ARP | Azimuth Reset Point |
| ASSOC | Association |
| ATON | Aids to Navigation |
| AUX | Auxiliary |
| | |
| BCR | Bow Crossing Range |
| BCT | Bow Crossing Time |
| BMP | Bitmap |
| BNC | Bayonet Neill Concelman |
| BRG | Bearing |
| BT | Bottom Track |
| | |
| CAN | Controller Area Network |
| CCRS | Consistent Common Reference System |
| CD | Compact Disk |
| CD- ROM | Compact Disk, Read- only Memory |

| Term | Description |
|------|-------------|
| CIL | Cross Index Lines and Clearing Ranges |
| COG | Course Over Ground |
| CP | Clearing Range |
| CPA | Closest Point of Approach |
| CPU | Central Processing Unit |
| CR | Clearing Range |
| CRP | Common Reference Point |
| CSE | Course |
|  |  |
| CUP | Course Up |
| CURS | Cursor |
|  |  |
| DB | Decibel |
| DC | Direct Current |
| DEL | Delete |
| DGPS | Differential Global Positioning System |
| DIP | Display |
| DNC | Distance to New Course |
| DR | Dead Range |
| DS | Deck Stand |
| DST | Distance |
| DVID | Digital Video Interface Digital |
| DVM | Digital Volt Meter |

| Term | Description |
|------|-------------|
| EBL | Electronic Bearing Line |
| EIA | Environmental Impact Assessment |
| EMI | Electromagnetic Induction |
| ENC | Electronic Navigational Chart |
| ETA | Estimated Time of Arrival |
| EXCL | Exclusion |
| EXP | Expansion |
| | |
| F | Floating |
| FCC | Federal Communications Commission |
| FET | Field Effect Transistor |
| FT | Foot/feet |
| FTC | Filtering of Rain Clutter |
| FTM | Fix True Motion |
| FUNC | Function |
| | |
| GND | Chassis Ground |
| GNU | General Public License |
| | |
| HDG | Heading |
| HL | Heading Line |
| HLT | Heading Line True |
| HP | Horse Power |
| HV | High Voltage |

| Term | Description |
|------|-------------|
| HUP | Head Up |
| HW | Hardware |
|  |  |
| ICU | Interface Control Unit |
| ID | Identification |
| IF | Intermediate Frequency |
| IHO | International Maritime Organization |
| INS | Integrated Navigation System |
| I/O | Input/Output |
| IP | Ingress Protection |
| IR | Interference Rejection |
|  |  |
| LAT | Latitude |
| LED | Light Emitting Diode |
| LNFE | Low Noise Front End |
| LON | Longitude |
| LP | Long Pulse |
|  |  |
| MAG | Magnetic |
| MAN | Manual |
| MDL | Modulator |
| MDS | Minimum Discernible Signal |
| Med | Medium Pulse |
| MFC | Multifunction Console |

| Term | Description |
| --- | --- |
| MTR | Modulator Transmitter Receiver |
| NAV | Navigation |
| NM | Nautical Miles |
| N-UP | North Up |
| | |
| OSHA | Occupational Safety and Health Administration |
| OSK | On Screen Keyboard |
| | |
| PCB | Printed Circuit Board |
| PCI | Peripheral Component Interconnect |
| PCP | Potential Collision Point |
| PI | Parallel Index |
| PIL | Parallel Index Line |
| PM | Performance Monitor |
| PMT | Per Metic Ton |
| PMU | Performance Monitor Unit |
| POS | Position |
| PPI | Plan Position Indicator |
| | |
| RACON | Receiver/Transmitter Transponder Devices used as a Navigation aid |
| RCSE | Relative course |
| RDP | Radar Data Processor |
| REF | Reference |

| Term | Description |
|------|-------------|
| RM (R) | Relative Motion and Relative Trails |
| RM (T) | Relative Motion and True Trails |
| RMT | Remote |
| RNC | Raster Nautical Chart |
| RR | Range Rings |
| RRB | Radar Radio Beacon |
| RSPD | Relative Speed |
| RTM | Receiver Transmitter Module |
| RTN | Return |
| RTX | Receiver Transmitter Plate |
| R UP | Repeater Up |
| RX | Receive |
|  |  |
| SART | Search and Rescue Transponder |
| SAT | Satellite |
| SCE | Scenario |
| SENC | System Electronic Navigation Chart |
| SERV | Service Mode |
| SHM | Ship Heading Marker |
| SOG | Speed Over Ground |
| SP | Short Pulse |
| SPD | Speed |
| STAT | Status |
| STBY | Standby |

| Term | Description |
|------|-------------|
| STD | Standard |
| STW | Speed True Water |
|  |  |
| TB | Transceiver Bridge |
| TBRG | True Bearing |
| TCM | Transceiver Control Module |
| TCPA | Time of Closest Point of Approach |
| TCSE | True Course |
| TCU | Transceiver Control Unit |
| TEMP | Temperature |
| TFT | Thin Film Transistor |
| TGT | Target |
| TM | True Motion |
| TN | Tune |
| TP | Test Point |
| TRG | Trigger |
| TRIG CONT | Trigger Control Switch |
| TRU | True |
| TSCE | Test Scenario |
| TT | Table Top |
| TTG | Time To Go |
| Tx | Transceiver ON |
| TXON | Transmit ON |
|  |  |

| Term | Description |
|------|-------------|
| USB | Universal Serial Bus |
| U.T.C. | Universal Time Coordinated |
|  |  |
| VAC | Voltage Alternating Current |
| VDR | Voyage Data Recorder VGA Video Graphic Adapter |
| VSWR | Voltage Standing Value Ratio |
|  |  |
| WDT | Watchdog timer |
| W/G | World Geodetic System |
| WPT | Waypoint |
| WRN | Warning |
| WT | Water Track |
|  |  |
| XCVR | Transceiver unit |
| XTD | Cross Track Distance |
| XTRIG | Transmit Trigger |

Intentionally left blank

# 1        BASIS SETTINGS TO USE THIS RADAR

After doing these settings the Radar is ready to work (pre-conditions, GPS sensor and GYRO sensor are available).

It is absolute necessary to read the following operator manual before you are working with this Radar.
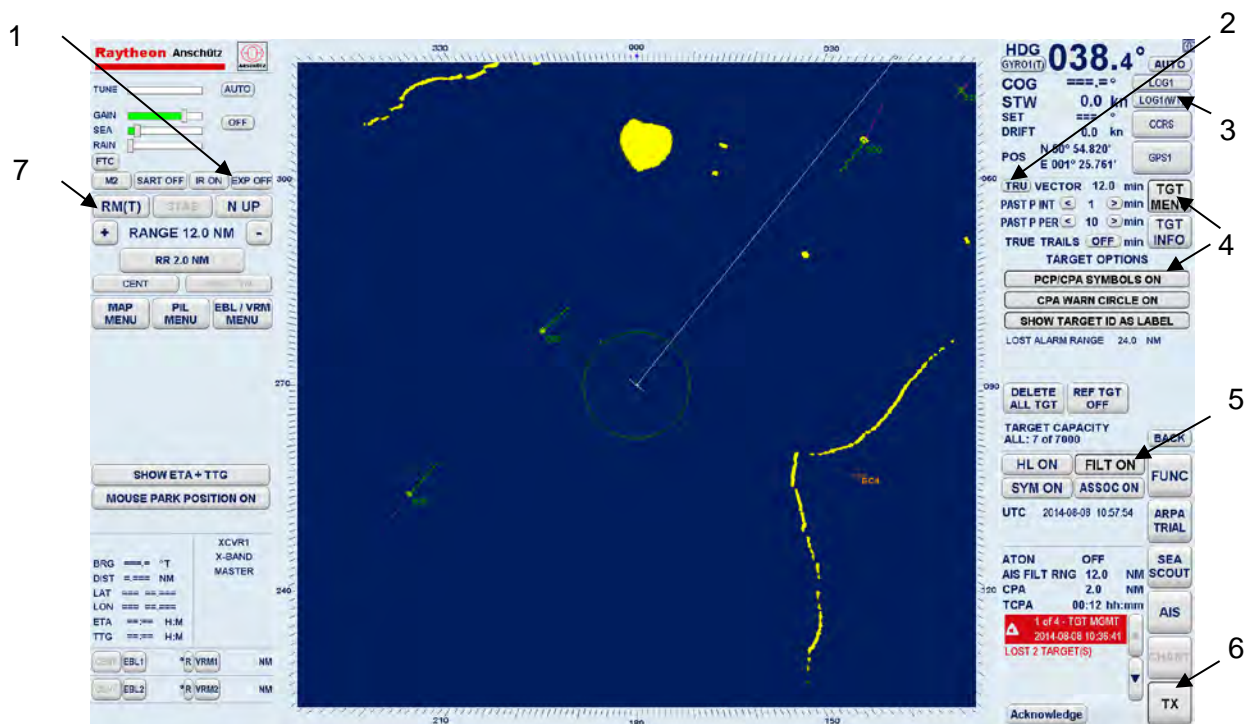


Figure 1-1        Basic Settings

Table 1-1        Basic Soft button Settings

| Pos. No. | Soft button settings |
| --- | --- |
| 1 | ECHO EXP **OFF** |
| 2 | VECTOR **TRUE** |
| 3 | SPD **LOG** (WT) |
| 5 | FILTER **ON** |
| 6 | TX |

| Pos. No. | Soft button settings |
|---|---|
| 7 | MODE **RM(T)** |

**COLLISION AVOIDANCE**

| Pos. No. | Soft button settings |
|---|---|
| 4 | TGT MENU<br><br>Then select soft button **PCP/CP SYMBOLS ON** and **CPA WRN CIRCLE ON**. |

## 1.1 Introduction

| | |
|---|---|
| ⓘ | This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.<br><br>These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.<br><br>This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, 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. |

| | |
|---|---|
| ⓘ | Installation, Maintenance and repairs must only be carried out by trained and qualified personal with knowledge of the national safety regulations for electrical devices.<br><br>Removal or insertion of a subgroup or printed wiring board with live voltage can lead to severe damage.<br>Never insert fuses with other values than those stipulated!<br><br>If acting without authority any modifications the Radar can be affects the functionality and lose the GUARANTY. |

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

| | This device complies with Part 15 of the FCC Rules [and with Industry Canada licence-exempt RSS standard(s)]. Operation is subject to the following two conditions: |
|---|---|
| | (1) this device may not cause harmful interference, and |
| | (2) this device must accept any interference received, including interference that may cause undesired operation. |
| | Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: |
| | (1) l'appareil ne doit pas produire de brouillage, et |
| | (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement. |

| | Changes or modifications made to this equipment not expressly approved by (manufacturer name) may void the FCC authorization to operate this equipment. |
|---|---|

| **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 observed. |
|---|---|

| WARNING | This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to IEC 60945 and IEC 62388. 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 Radar as High Speed Radar the Gyro Sensor must be a High Speed Gyro Sensor as well. |

| WARNING | **HIGH VOLTAGE** |
|---|---|
| | There is 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 **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 must be switched **OFF.** |

| WARNING | 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. |

| WARNING | **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. |

## MICROWAVE RADIATION LEVELS

The maximum distances from the antenna at which radio frequency radiation levels of 100 W/m2, 50 W/m2 and 10 W/m2 can be expected are included in the following table and diagram.

The table and diagram shows simulated results for the 6" and 8" X-Band Up System (25 kW) and for the 12" S-Band Up System (30 kW) for a none rotating transmitting antenna (worst case scenario).

Table 1-2    Maximum distance from the antenna.

| Radar System | Radiation Density 100 W/m$^2$ | Radiation Density 50 W/m$^2$ | Radiation Density 10 W/m$^2$ | Radiation Density 6 W/m$^2$ |
|---|---|---|---|---|
| 6" X-Band; Range | 0,7 m | 1,3 m | 6,0 m | 10m |
| 8" X-Band; Range | 0,5 m | 1,0 m | 4,7 m | 8m |
| 12" S-Band; Range | 0,3 m | 0,7 m | 3,5 m | 6m |
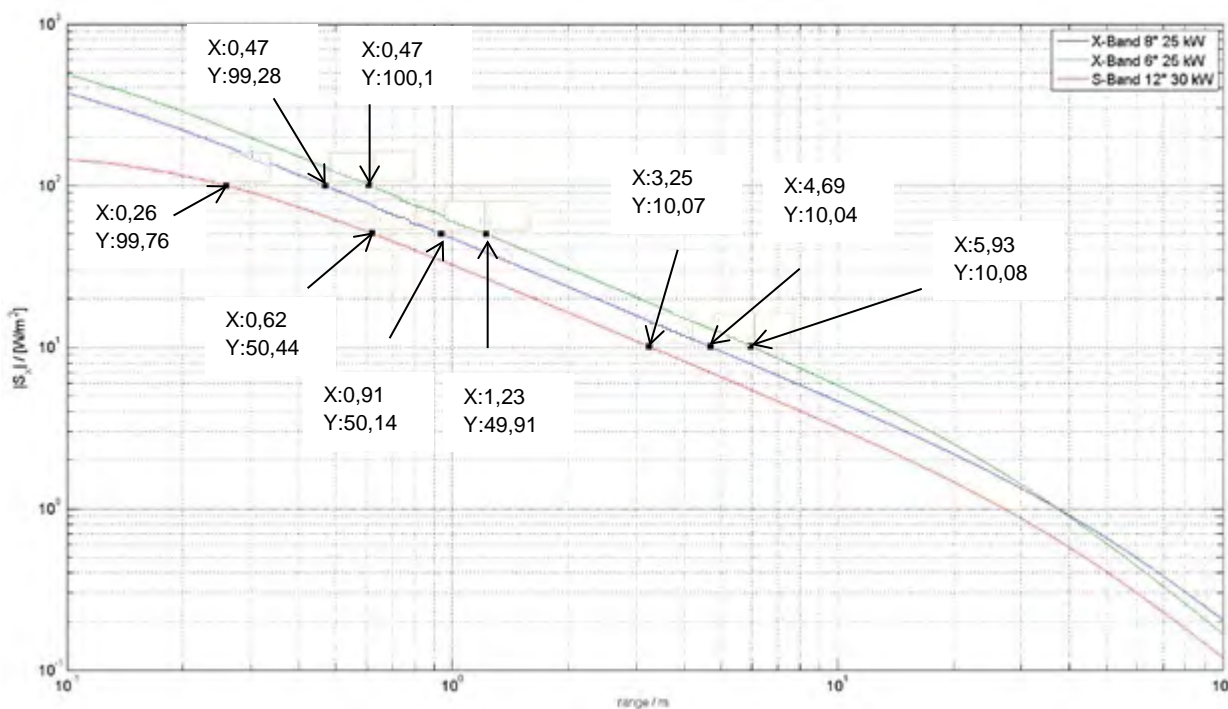
An operator should become familiar with the location of the display information and the control panel buttons.

Manual overview:

| | |
|---|---|
| *Chapter 1* | Important safety notes for the Radar System |
| *Chapter 2* | Operation and short operation |
| *Chapter 3* | Theory of operation |

The Radar is designed in accordance with the rules of the International Maritime Organization IMO*.

* The International Maritime Organization is the specialized agency of the United Nations which is responsible for safety and security at sea and the prevention of marine pollution from ships.

The Radar system supports the Categories of Ship according to CAT 1, CAT 2, CAT3 and for the options High Speed Radar (for example CAT 1H) and Chart Radar (for example CAT 1HC) depending on the used display size.

The main components of the Radar (Figure 1-1)

- the Flat Screen Display (TFT Technology)
- the trackball and the Radar Operator Panel or the Remote Panel (option)
- the Radar Processor
- Ethernet switch and Serial to Ethernet converter

Radar operation
The Radar can be completely operated via the trackball controlled cursor. The Radar Operator Panel is designed for the execution of certain Radar functions.

### 1.1.1 Radar System Overview

The Raytheon Anschütz Radar LAN technology enables a broadband Radar system configuration.

Each Radar system includes apart from the application software the SYNAPSIS administration and installation program (For detailed information see Synapsis System Documentation 4279)

The SYNAPSIS software is used for the following system areas.

- Adaption of the Radar system to the ship specific parameters (eg. length, beam, Common Reference Point (CRP))

- Sensor connection and administration

- Alert management

- System specific networking

### 1.1.1.1 Single Radar System

A Single System characterises the X- or S-Band Radar System (Figure 1-2 depicts a system overview)

The Radar system consists of the following parts:

- Pedestal (**Nautoscan NX**)
  The X-Band Pedestal is equipped with an 6ft or 8ft antenna
  The S-Band Pedestal is equipped with an 12ft antenna.
  Both variants Nautoscan NX UP and DOWN are available. A continuous PMU monitoring is included.

- Transceiver
  The transceiver represents the transmitter and receiver within the Radar signal transmission chain. Depending on the equipment type the transceiver is either located in the pedestal (UP Pedestal) or in a separate cabinet (DOWN Pedestal).

- Navigational Sensor Device Interface (**NautoPlex 8plus8**)
  The NautoPlex 8plus8 represents the central system interface for reading and writing the navigational sensor device information.
  All sensor data is read and transmitted via a LAN connection to the workstation.

- Operation
  The Radar is operated at a multifunction console (MFC). The MFC equipment features;
  a TFT display (19", 23.1", 26" or 27"), a trackball, a Radar operator panel, optional a remote panel NSC and the computer (Small Marine Computer).

Nautoscan NX X-band (UP Version)
with 6ft or 8ft antenna

Nautoscan NX X-band (DOWN Version)
with 6ft or 8ft antenna

3

Transceiver

1

2

1

WS 1
Radar / MFC

1

**Seriell** / Ethernet Converter
(NautoPlex 8plus8)

2

WIND | LOG | GPS1 | GYRO

The connected sensor equipment
must be approved in accordance with
the requirements of the IMO

**Cable legend**
1 LAN cable
2 Board cable
3 Wave guide
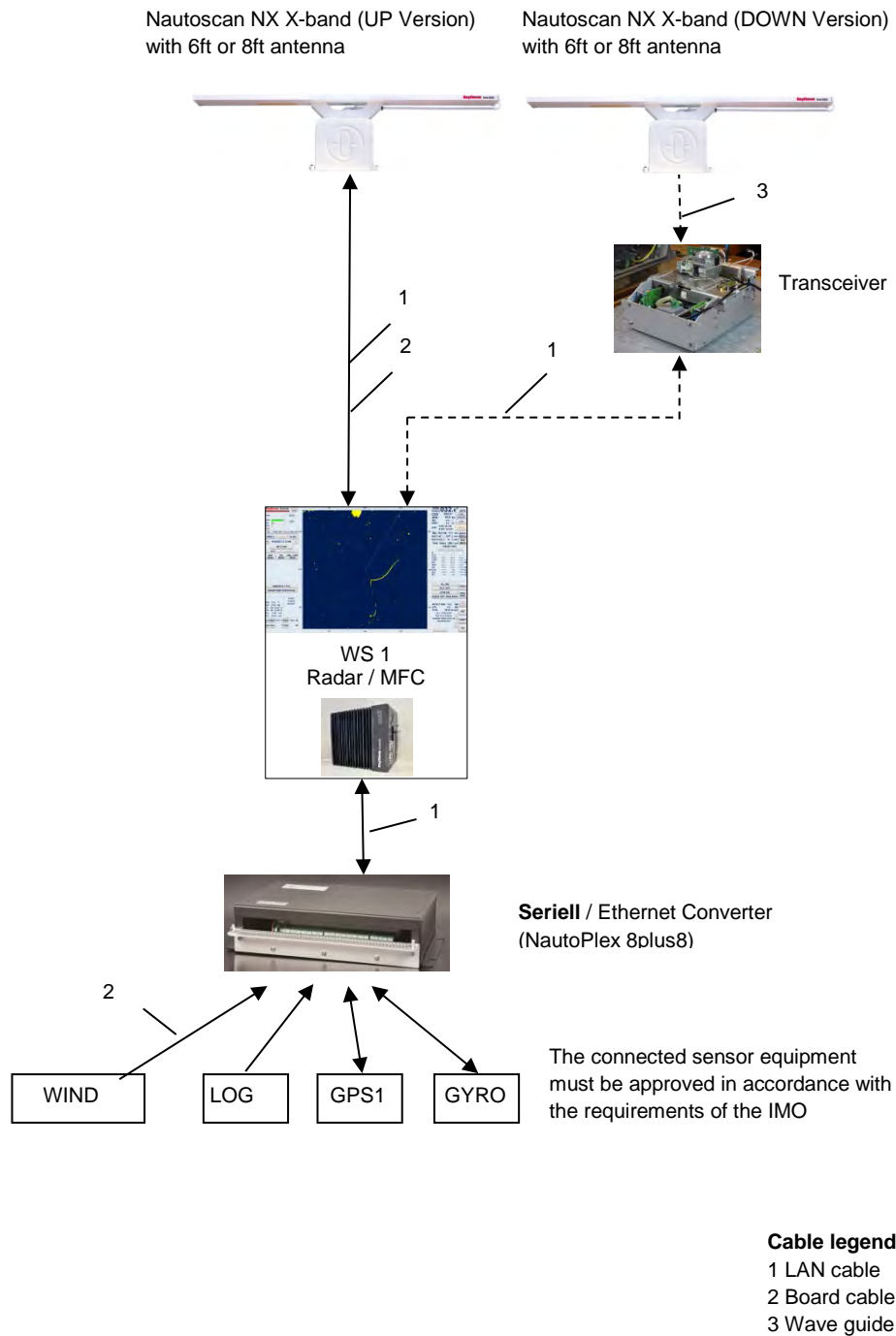
Figure 1-2    Single Radar System

**1.1.1.2    Double and Multiple Systems – System Redundancy -**
Double or multiple systems are configured as redundant systems.
Malfunctions or device failures are compensated via the redundant system
configuration (Figure 1-3 depicts a system overview).

The Radar system consists of the following parts

- Two Pedestals (**Nautoscan NX**)
  The X-Band Pedestal is equipped with an 6ft or 8ft antenna
  The S-Band Pedestal is equipped with an 12ft antenna.
  Both variants Nautoscan NX UP and DOWN are available. A continuous
  PMU monitoring is included.
- Two Transceivers
  The transceiver represents the transmitter and receiver within the Radar
  signal transmission chain. Depending on the equipment type the
  transceiver is either located in the Pedestal (UP Pedestal) or in a
  separate housing (DOWN Pedestal).
- Two Navigational Sensor Device Interfaces (**NautoPlex 8plus8**)
  The NautoPlex 8plus8 represents the central system interface for
  reading and writing the navigational sensor device information.
  All sensor data is read and transmitted to the system network.
- LAN (Local Area Network) and Data Distribution
  The system is equipped with a Local Area Network (LAN)
  The data distribution is made via two 24 Port Ethernet switches.
- Operation
  The Radar system is operated at two or more multifunction consoles
  (MFC). The MFC equipment features;
  a TFT display (19" or 26"), a trackball, a Radar operator panel, optional
  a remote panel NSC and the computer (Small Marine Computer).

Nautoscan NX X-Band (with 6ft or 8ft antenna)
and S-Band ((with 12ft) (UP Version))

Nautoscan NX X-Band (with 6ft or 8ft antenna) and
S-Band (with 12ft antenna) (DOWN Version)

3

4

1    1

2    2

Transceiver
X-Band

Transceiver
S-Band

1

Gateway
Gyro/Autopilot

Switch

Switch

1

1

WS 1
Radar / MFC

WS 2
Radar / MFC

1

1

The connected sensor equipment
must be approved in accordance
with the requirements of the IMO

**Seriell** / Ethernet Converter
(NautoPlex 8plus8)

2

AIS

LOG

GPS1

GYRO

GPS2

WIND

Cable legend
1 LAN cable
2 Board cable
3 Wave guide
4 Koax cable

Figure 1-3     Double Radar System

### 1.1.1.3 Chart Radar

The Chart Radar consists of a Single Radar and a Software extension called Chart Overlay.

This software extension allows a combination of a sea chart and the current Radar video.

The Chart Radar functionality is enabled via the soft button CHART.

### 1.1.1.4 Multifunction System

The Multifunction System contains beside the Radar application additional applications like the electronic sea chart ECDIS and the information platform Nautoconning or HD Conning.

The relevant application can be activated via a software switch (MFC switch) at any time.

## 2 OPERATING INSTRUCTION

> **i** This system should be used only by well-trained operator

### 2.1 Radar Operation

Four components are essential for operating the Synapsis Radar.

The operating structure corresponds to the IEC 60945 and IEC 61924-2 requirements.
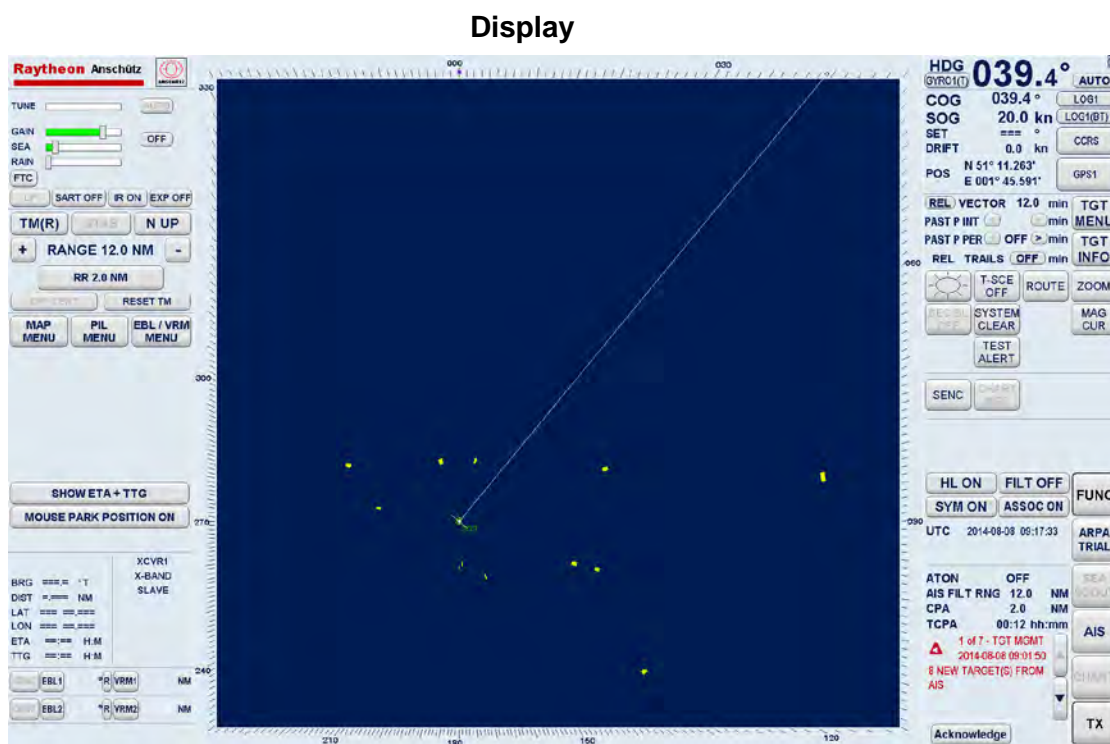
**Display**



**Remote Panel**          **Radar Operator Panel**          **Trackball**



Figure 2-1      Radar components

### 2.1.1  Display

The display is a high - resolution, TFT (Thin Film Transistor) flat screen, color monitor. It shows Radar targets and data as well as a number of menus and software buttons. The Radar system can be used with the display sizes of 19", 23.1", 26" and 27".

### 2.1.2  Trackball

When using the trackball, the cursor is moved by rolling the ball in the appropriate direction.
The trackball -guided cursor is the central control instrument for operating this Radar.



Figure 2-2      Trackball

| Pos. No. | Task |
|----------|------|
| 1 | The **left** trackball button is used as the **Enter** key. |
| | Using the trackball, place the cursor over a soft button from the menu and press the button. The soft button function is activated (chapter 0). |
| | Using the trackball, place the cursor over a text line (e.g. SET, DRIFT) or a toggle field with slider function. Press the **left** trackball button until the slider symbol appears (yellow rectangle) below the toggle field. Moving the trackball horizontally will adjust the slider below the text line and a value is displayed (chapter 2.1.4.1). |
| | Using the trackball, place the cursor over a slider (e.g. GAIN) press the **left** trackball button and move the trackball. The colored slider will follow the trackball to the left or the right. Pressing the **left** trackball button again the actual slider |

| Pos. No. | Task |
| --- | --- |
|  | position is activated. |
| 2 | This button has no function. |
| 3 | This button is used for **Pick up** and **drag** operations and for deleting ARPA or AIS targets and is used for the MFC Switch, opening the Context Menu.<br><br>Normally this button is used on the Radar video to pick up a symbol (e.g. EBL/VRM) and drag the symbol to a new position within the Radar video using the trackball.<br><br>Press the **left** trackball button to release the symbol.<br><br>Select a ARPA/AIS target;<br>Place the cursor over an ARPA target and press the right button.<br>In this case a context menu appears for approx. 10s. With pressing the right button again target is selected.<br><br>Delete a ARPA/AIS target;<br>Place the cursor over an ARPA target and press the right button. In this case a context menu appears for approx. 10s. Select "Delete Target (ID …) and press the right button.<br><br>This action is not possible when the AIS INFO display was selected before or when you are working with the ARPA ZONE functions or another FUNCtion sub menu.<br><br>MFC switch and Context Menu;<br>Call up the MFC Switch, place the cursor over the "Raytheon Anschütz" field and press the right button. |

**2.1.2.1     Cursor Symbols**

Figure 2-3 illustrates the various cursor symbols that will be seen when using the Radar display.

| Symbols | Text identifier |
|---|---|
| | **DEFAULT CURSOR** (outside the PPI) |
| | **DEFAULT CURSOR** (inside the PPI) |
| | **ACQUIRE TARGET** (inside the PPI, chapter 2.5.3.1) |
| | **OFFSET CURSOR** (inside the PPI, chapter 2.3.3.3) |
| Rotating | **EBL CURSOR** (Electronic Bearing Lines on the PPI, chapter 2.3.4.4),<br><br>**PI CURSOR** (Parallel Index Line on the PPI, chapter 2.3.4.2). |
| Moving parallel | **VRM CURSOR** (Variable Range Markers on the PPI chapter 2.3.4.4).<br><br>**PI CURSOR** (Parallel Index line on the PPI, chapter 2.3.4.2).<br><br>**EBL / VRM CURSOR** (Editing the group on the PPI chapter 2.3.4.6). |
| | **EBL / VRM CURSOR** (for FLOATING the group on the PPI chapter 2.3.4.5). |
| | second cursor symbol (in orange) appears on the Radar video if the Radar and the ECDIS are combined as a system |

Figure 2-3     Cursor Symbols

### 2.1.3 Radar Operator Panel

The Radar Operator Panel is designed to execute the most commonly used functions.

Signaling:

Keys and Status indicators will illuminate when the relevant action is activated.

Figure 2-4    Radar Operator Panel

Table 2-1      Radar Operator Panel

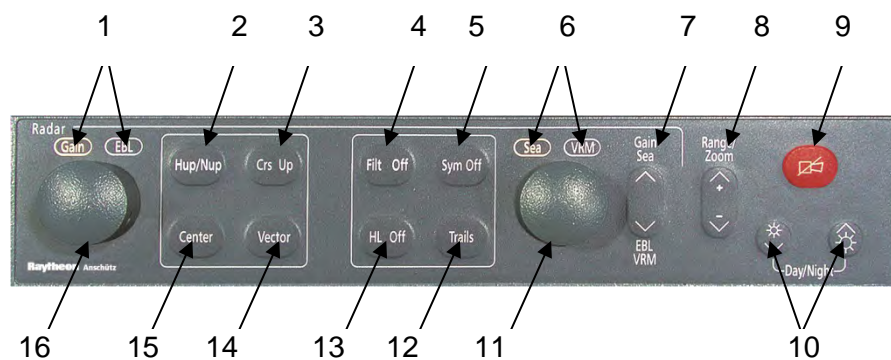| Pos. No. | Task |
|---|---|
| 1/6 | **Status indicators**, for showing the toggle switch (7) status in combination with the knob (11 and 16) control function.<br>If **Gain Sea** (7) is selected **knob** (11) is used to adjust the **Sea** control. **Knob** (16) is used to adjust the Gain control.<br>If **EBL VRM** (7) is selected **knob** (11) is used to adjust the VRM control. **Knob** (16) is used to adjust the **EBL** control. |
| 2 | **Radar Video display**, press button to use **Head up** or **North up**.<br>Head up means the ship's bow is at the top of the bearing scale.<br>North up means geographic north is at the top of the bearing scale. |
| 3 | **Radar Video display**, press button to use Course up.<br>The PPI orientation is Course up (the course of the own ship point upwards). |
| 4 | **Anti - clutter** filter **ON/OFF**, press the button.<br>In case of heavy clutter developing on the Radar Video, the Radar computer creates a profile of the echo. Within this profile, the received echoes are monitored for a certain period (Scan--to--scan method). False echoes are suppressed on the Radar Video. Real echoes are indicated on the Radar Video. |
| 5 | **Hides** the **symbols** on the Radar video.<br>Press the button and the artificial symbols will disappear.<br>Press again to **show** the symbols. Symbols are EBLs, VRMs, PL, ARPA zones, MAPs. |
| 6/1 | **Status indicators**, press toggle switch (7). The activated function is indicated. Use the **knob** (11) to adjust **EBL**. Use the **knob** (16) to adjust **VRM**. |
| 7 | **Toggle switch**. Can be switched between upper position, **Gain / Sea** and lower position, **VRM / EBL**. See **status indicators** (1/6) and use **knob** (16) or **knob** (11). |
| 8 | **Toggle switch**. Range selection, switches the Radar ranges up and down. |
| 9 | **Alarm indicator** (flashing) and **alarm acknowledgment**. |

| Pos. No. | Task |
|---|---|
| 10 | **Dimming** the display and the active keys. Pressing a button results in variation of brightness.<br>**Color palette** selection. The display color pallets can be changed between 4 color presentations. Press both buttons for selecting the requested display color pallet. |
| 11 | **Knob**, see 6/1.<br>Turn the knob slowly; the VRM range circle changes in 1° steps.<br>Turn the knob quickly; the VRM range circle changes in 10° steps. |
| 12 | Press button until the requested values are indicated. The **Trails Length indicator changes to the next higher mode**. The steps available are OFF, 1.0, 3.0, 6.0, OFF, see TRAILS toggle field in information panel |
| 13 | Press and hold the button. The **Heading Line** disappears during this time. |
| 14 | Press button to change **VECTOR LENGTH**. |
| 15 | **Center** to reset your own ship to the right of the PPI or to activate **OFF Center**. |
| 16 | **Knob**, see 1/6.<br>Turn the knob slowly; the EBL turns in 1° steps.<br>Turn the knob quickly; the EBL turns in 10° steps. |
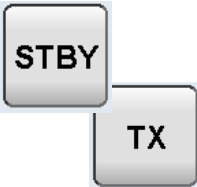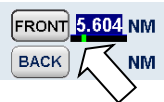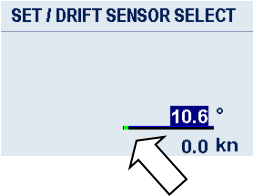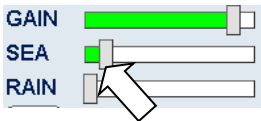
### 2.1.4       Operator Controls on the Radar Display and Soft Button
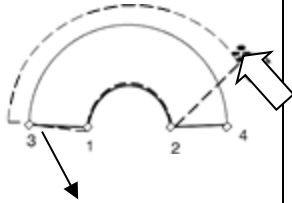
#### 2.1.4.1       Operator Controls on the Radar Display
To operate the Radar display, you need to use certain built-in operator controls.

Table 2-2       Operator Controls on the Radar Display

| Operator controls | Text identifier |
| --- | --- |
| **STBY** **TX** | Soft Button. The text on the soft button always describes the currently mode status. Example: **STBY** means that the Radar is in Standby mode. Clicking on the soft button changes the status in this case to **TX**. **TX** means that the Radar is in the Transmit mode. A selected soft button is distinguished from a non-selected soft button by its thick contours. |
| + RANGE 6.0 NM – / N UP / 1 of 4 - CCRS ALARM 2013-09-21 23:51:40 ROT: POOR INTEGRITY | Toggle fields. The toggle field functionalities are activate up by pressing the **left** trackball button or alternatively (partially) using the buttons on the Operator Panel. Toggle fields are used to increase or decrease values or used to switch over to another mode e.g. N UP to H UP or used to scroll through the alarm messages. |
| FRONT 5.604 NM / BACK NM | Toggle field with slider. Position the cursor on the toggle field, press and hold the **left** trackball button until the slider symbol appears (scroll bar) below the toggle field. The slider can be moved into the aimed direction using the trackball. In parallel, the numerical value above the slider changes. Press the **left** button again to complete the setting or wait for the time out. |

| Operator controls | Text identifier |
|---|---|
| SET / DRIFT SENSOR SELECT  10.6 °  0.0 kn | Text line with slider (used for SET and DRIFT values. Position the cursor on the text line value field, press and hold **left** trackball button until the slider symbol appears (yellow rectangle) below the toggle field. The slider can be moved into the aimed direction using the trackball. In parallel, the numerical value above the slider changes. Press the **left** button again to complete the setting or wait for the time out. |
| GAIN  SEA  RAIN | Sliders Position the cursor on the slider for the requested function (e.g. GAIN). Press the **left** button, move the trackball. The slider is moved to the right or the left, in response to the trackball command (the tuning bar display will automatically update the setting). The slider setting is immediately effecting the Radar video. Deselect the slider adjustment by pressing the **left** button again or wait for the time out (10s), then the slider adjustment will deselect automatically <br><br> **i** Slider treated as transient values. Transient values cease to be valid after switching to STBY or switching off the unit. When the unit is switched on again, the sliders are reset to their default values. |

| Operator controls | Text identifier |
|---|---|
|   Editing marks | Drag and drop. |
|  | Pick up: |
|  | Position the cursor on the zone and press the **right** trackball button. The zone is shown in a dotted form, editing markers are shown at the corners. Position the cursor on the desired marker. Press and hold the **right** trackball button. Drag the marker to the desired position. |
|  | Drop: |
|  | Press once the **right** trackball button. The change is completed; the zone switches from dotted to continuous form. |

**2.1.4.2    Soft Buttons**
This chapter describes the main soft button functions.



| | |
|---|---|
|  | Displays the active heading sensor, the color indicates the sensor quality. |
|  | RED for invalid, ORANGE for doubtful, BLACK for good (corresponding to IEC 62288 edition 1) or ORANGE for invalid, YELLOW for doubtful, BLACK for good (corresponding to IEC 62288 edition 2). |
|  | The BLACK color depends on the color palette selection. Pressing the soft button the function display shows the available heading sensors. |
|  | Displays the actual CCRS selection mode, Sensor Mode AUTO for automatic sensor selection, Sensor Mode MAN for manual sensor selection. |

| | |
|---|---|
|  | Displays the active course sensor, the color indicates the sensor quality. RED for invalid, ORANGE for doubtful, BLACK for good (corresponding to IEC 62288 edition 1) or ORANGE for invalid, YELLOW for doubtful, BLACK for good (corresponding to IEC 62288 edition 2). The BLACK color depends on the color palette selection. Pressing the soft button the function display lists the available course sensors. |
|  | Displays the actual speed sensor, the color indicates the sensor quality. . RED for invalid, ORANGE for doubtful, BLACK for good (corresponding to IEC 62288 edition 1) or ORANGE for invalid, YELLOW for doubtful, BLACK for good (corresponding to IEC 62288 edition 2). The BLACK color depends on the color palette selection. Pressing the soft button the function display displays the available speed sensors. |
|  | Displays the active SET and DRIFT sensor (e.g. CCRS), the color indicates the sensor quality. RED for invalid, ORANGE for doubtful, BLACK for good (corresponding to IEC 62288 edition 1) or ORANGE for invalid, YELLOW for doubtful, BLACK for good (corresponding to IEC 62288 edition 2). The BLACK color depends on the color palette selection. Pressing the soft button the function display displays the available manual DRIFT and SET selection (MAN MODE). |
|  | Displays the position sensor, the color indicates the sensor quality. RED for invalid, ORANGE for doubtful, BLACK for good (corresponding to IEC 62288 edition 1) or ORANGE for invalid, YELLOW for doubtful, BLACK for good (corresponding to IEC 62288 edition 2). The BLACK color depends on the color palette selection. Pressing the soft button the available position sensors display on the function display. |

REL VECTOR 12.0 min  TGT MENU
PAST P INT < > min
PAST P PER < OFF > min  TGT INFO
REL TRAILS OFF min
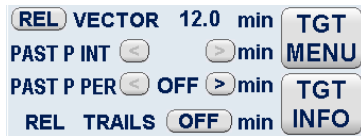
| | |
|---|---|
| TGT MENU | For the functions: TARGET MENU and ZONE MANAGEMENT. |
| TGT INFO | For current ARPA and AIS target information. |

HL ON | FILT OFF | FUNC
SYM ON | ASSOC ON
UTC 2014-08-08 08:35:01 | ARPA TRIAL
ATON OFF
AIS FILT RNG 12.0 NM | SEA SCOUT
CPA 2.0 NM
TCPA 00:12 hh:mm | AIS
1 of 7 - TGT MGMT
2014-08-08 08:34:59 | CHART
6 NEW TARGET(S) FROM AIS
Acknowledge | TX

| | |
|---|---|
| FUNC / SERV | Provides additional Radar functions.<br><br>While the Radar is in STANDBY mode, the soft button function FUNC changes to SERV (service mode). The service mode is used to configure the Radar system. |
| ARPA TRIAL | For TRIAL manoeuvre. This feature allows the operator to see the results of possible changes in their own speed and/or course, without actually committing their own ship to those changes. |

| | |
|---|---|
| SEA SCOUT | Special Radar function to display close range situations (option). In this case the Radar program acquires the target situations around the own position and calculates potentially close range situations. This close range situation is indicated by special collision areas enabling the operator to judge the situation and seize appropriate preventive measurements. |
| AIS USER | For current Automatic Identification System information. AIS targets appear on the PPI.<br><br>While the Radar is in STANDBY mode, the soft button function AIS changes to USER and allows to save USER SETTINGS.<br><br>The USER soft button allows the user to choose between following settings: USER 1 through USER 5 or DEFAULT SETTINGS (chapter 2.3.7.6). |
| CHART EXIT RADAR | Special Radar function to display a chart underlay on the PPI (chapter 2.8).<br><br>While the Radar is in STANDBY mode, pressing the soft button function CHART changes to EXIT RADAR and allows to exit the Radar application. |
| TX STBY | This soft button function allows the user to switch the Radar mode between STANDBY or TX ((transmit) (chapter 2.2.1)). |

**2.1.5** **Context Menu**

A Context Menu is designed to operate with ARPA/AIS targets or with EBL/VRM orientation lines. The Context Menu appears for 10s, and then the operator can call up it again. A progress indicator beside the EXIT soft button displays the time stream.

**ARPA/AIS targets**

The Context Menu can display up to 8 target options. A target option is graduated in following operation steps:

For ARPA Targets                    For AIS Targets

Select Target (ID …)               Select AIS Target (ID ….)
Set Target Label (ID ….)           Set AIS Target Active (ID ….)
Delete Target (ID ….)              Set AIS Target Sleeping (ID ….)
Exit ……                            Exit ……

**EBL/VRM**

If possible, the EBL/VRM option is placed underneath the target options.

Pick EBL/VRM1
Pick VRM1
Pick PIL

Table 2-3     Context Menu

| Operator controls | Text identifier |
|---|---|
|  <br><br>  | *Step 1* Select a target of interest via the **left** trackball button, and then press the **right** trackball button. The Context Menu appears. <br><br> *Step 2* Make a selection via the trackball and press the **right** trackball button. "Select Target (ID..)" means the target was selected. The navigational information are displayed in the Target Info function menu. <br> "Set Target Label (ID..)" means the operator wants to label this target. <br> In this case a soft button keyboard appears in the function menu for editing the label name. <br><br> <table><tr><td>**i**</td><td>The Target Label or the new edit ID no. are not displayed in the Target Info function menu.</td></tr></table> <br><br> "Delete Target (ID …)"means, the acquired target will be deleted. <br><br> "Set AIS Target Active (ID…)" and "Set Target Sleeping (ID)" are only available <br><br> • if the AIS target is not inside the activation range <br><br> • if the AIS target was activated because of an acquisition zone <br><br> • or because of a CPA/TCPA o guard zone violation. |

## 2.1.6 Global Settings and Displays in the INS System

Global settings and displays in the INS means that some operations will be transferred to all MFC consoles. See following overview in this case the global actions are labeled in this overview with (G):

**Via the TARGET MENU** (chapter 2.5)

TARGET OPTIONS

both info text entries (G)
DELETE ALL TGT actions (G)
REF TGT ON/OFF actions (G)

TRACKER OPTIONS (G)
AIS OPTIONS

LOST TARGET ALARM ON/OFF (G)
DEFAULT LABEL SHIP NAME (G)
ACTIVATE AT CPA/TCPA ON (G)
Info text entries (G)

ASSOCIATION SETTINGS (G)
ZONE MANAGEMENT (G)

**Via the FUNCtion MENU** (chapter 2.7)

BACKLIGHT MENU (G)
DIMMER MENU .. (G)
TEST ALERT ((constricted) (G))
SYSTEM CLEAR ((only Targets (G))

**2.1.7**      **MFC Switch**

If a Multifunction Console (MFC) is used for Radar, ECDIS and Conning the MFC Switcher allows the selection between these applications.
The MFC Switch is placed on the top right corner of the display.
After selection the MFC Switch changes to a column of small icons. The icon buttons refers to special Tasks. These Task buttons allow direct access to special ECDIS and Radar functions and CONNING pages.
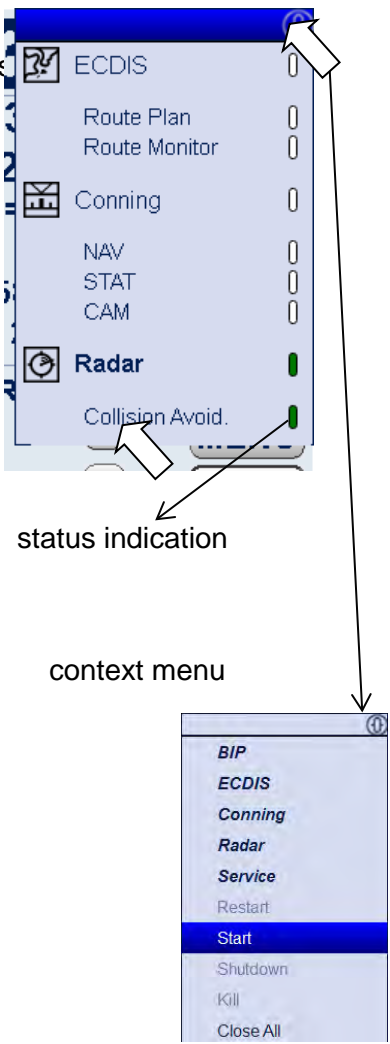
Status indication:

| Status color | Information |
|---|---|
| Green | The application is working correctly |
| White | The application does not work |
| yellow | The application is in the startup process |
| red | The application is disturbed |

The context menu is used to control the applications for Radar, ECDIS and Conning and the MFC processor.

| Control | Information |
|---|---|
| Conning | Calling up the Feature |
| Radar | Calling up the Feature |
| ECDIS | Calling up the Feature |
| **Feature** | **Information** |
| BIP | The application will be closed and restarted again |
| Service | The application will be terminated directly |
| Close All | All applications will be closed. The EggShell Utility Selection window appears after some seconds. |

Table 2-4        MFC Switch

| Operator controls | Text identifier |
|---|---|
| <br><br>status indication<br><br>context menu<br><br> | **ECDIS application** with e.g. a direct link to<br><br>ECDIS task Route Planning<br><br>ECDIS task Route Monitoring<br><br>**CONNING application** with e.g. a direct link to<br><br>Conning page NAVigation<br><br>Conning page STATus<br><br>Conning page CAMera<br><br>**Radar application** with e.g. a direct link to<br><br>Radar task Collision Avoid |

### 2.1.8    Remote Panel USB Port

The Remote Panel with USB Port is a special unit used for Black Box Radar equipment or in combination with a complete Bridge System.

The Remote Panel consists of a Radar Power **ON** pushbutton and a protected USB port.

Figure 2-5    Remote Panel
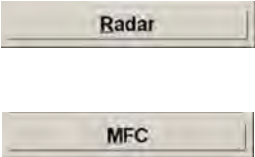
Table 2-5    Remote Panel
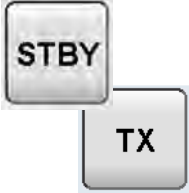
| Pos. No. | Task |
|----------|------|
| 1 | Radar Power **ON** switch. Use the Utility Selections window to switch **OFF** the System (chapter 2.2.2). |
| 2 | USB port with plastic protection plate.<br>The USB port is used to save or copy MAPS- or Route-Files per USB stick. |
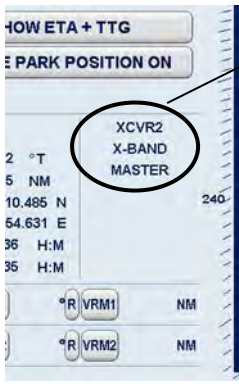
## 2.2 Set to Operation

The set to operation process will be finished after about 8 minutes. Then the Radar works completely and is ready to scan the sea area.

### 2.2.1 Switch ON

| Operator controls | Text identifier |
|---|---|
|  | At the Radar Console.<br>The Power button is positioned on the front of the Radar Console, lower left side. Press the Power Button to turn on the Radar.<br><br>At the Remote Panel.<br>Press the Power Button to turn on the Radar. |
| Radar<br><br>MFC | The Utility Selection window appears on the display (Figure 2-7). Select the RADAR soft button or the MFC soft button by pressing the **left** trackball button to start the Radar software. |
| Warm Up | After about 180 seconds, the message STANDBY appears on the center of the display. |
|  | The system configuration diagram appears on the center of the display area (Figure 2-6). The display is automatically connected as slave display.<br><br>Select the requested transceiver/display combination per cursor. Place the cursor at the M or S transceiver symbol and press the **left** trackball button.<br><br>The STANDBY message changes to WARM UP. |
| | After a 180 seconds (for X or S Band) the warm up period is complete and the WARM UP message changes back to STANDBY. |

| Operator controls | Text identifier |
|---|---|
|  | Radar is in STANDBY mode.<br><br>The Radar beeps when the Radar software detects an internal or external malfunction; a simultaneous alarm message is displayed.<br><br>Acknowledging the alarm message switches off the acoustic signal. The alarm message is hidden, but it can be called up again.<br><br>Radar in STANDBY is meaning:<br><br>The transceiver is not transmitting. The antenna is not rotating.<br><br>No Radar video on the PPI, STANDBY. Service and setup menu accessible.<br><br>The operating temperature is maintained by the magnetron. |
|  | Switching the Radar from standby mode to transmit mode.<br><br>The user can start the Radar with the saved setting from the previous operation or choose default settings (chapter 2.3.7.6).<br><br>Using the trackball, place the cursor on the STBY soft button and press the **left** trackball button. The name of the soft button changes to TX and is highlighted.<br><br>After 1 or 2 scans the Radar video displayed on the PPI area. All settings for optimization the system can be made by using the toggle fields and soft buttons that are constantly available. |

| Operator controls | Text identifier |
|---|---|
| HOW ETA + TTG<br>E PARK POSITION ON<br><br>XCVR2<br>X-BAND<br>MASTER<br>2 °T<br>5 NM<br>10.485 N  240<br>54.631 E<br>36 H:M<br>35 H:M<br>°R VRM1 NM<br>°R VRM2 NM | Radar Transceiver Status.<br><br>Example;<br><br>This Radar is connected to Transceiver **XCVR2**.<br><br>This Radar is used as **X-BAND** Radar.<br><br>This Radar is used as **MASTER** under **X-BAND** condition. |

### 2.2.1.1 System Configuration Diagram

The system configuration diagram displays the actual setup and can be used to connect the own Display (A, B, C..) to any Transceiver (1 MK2, 2 MK2 …..) as Master or Slave. The connection will be realized per link.

A line symbol between the display and the transceiver shows the link.

A dashed line indicates a connection link in progress.

A continuous line indicates an active link.

The operator can choose between the application Display (A, B, ... ) in Master mode or Slave mode. The Transceiver symbols are equipped with two connection points.

M for Master mode

S for Slave mode

Within a Radar system each Transceiver can only be controlled by one display in Master mode at the same time. The other display can control the transceiver in Slave Mode only.

Master control.

When M is selected, the transceiver will respond if no other display is already Master.
Master control allows Pulse length Control, PMU operation, and Sector Blanking Control.
Transceiver Warm Up time may appear, the total POWER ON time of the scanner, and MAG SEND TIME.

MAG SEND TIME displays the time of transmission (in hours) for this Magnetron since last exchange.

Slave control.
Slave operation allows the operator to monitor the Radar while it is controlled from another position. Gain and Sea controls are available on the slave in order to produce a clear display, but the pulse length is set by the master.
For example, it is possible to set the range of the slave display to 24 NM while the received picture is still operating from the Master in Short Pulse. Therefore, Slave operation is not preferred. The picture may appear weak on some long ranges, or have a rough resolution at short ranges because of the Master display settings.

Frequency range.

The X-Band antennas (3cm wave length) have a frequency range of 9.41GHz +/- 30MHz.
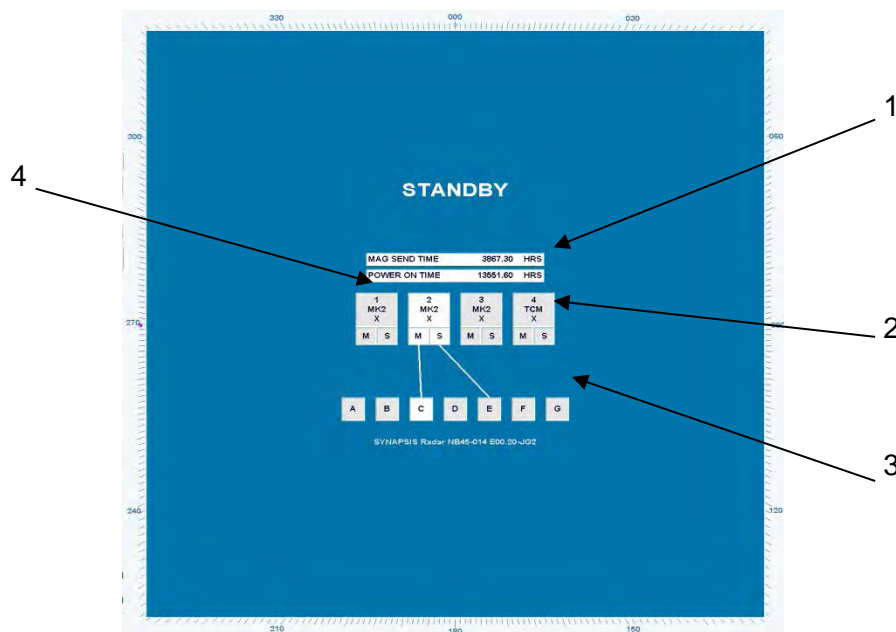The S-Band antennas (10cm wave length) have a frequency range of 3.05GHz +/- 30MHz.
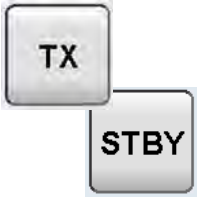


Figure 2-6    Radar in STANDBY mode – System configuration diagram –

| Pos. No. | Task |
| --- | --- |
| 1 | Operating hours counter. |
| 2 | **M** for Master configuration. <br><br> **S** for Slave configuration. |
| 3 | Radar display assignment. |
| 4 | Transceiver number, name and type. |

### 2.2.2 Switch OFF

The following procedure should be used to switch off the Radar system.

Table 2-6     Switch OFF

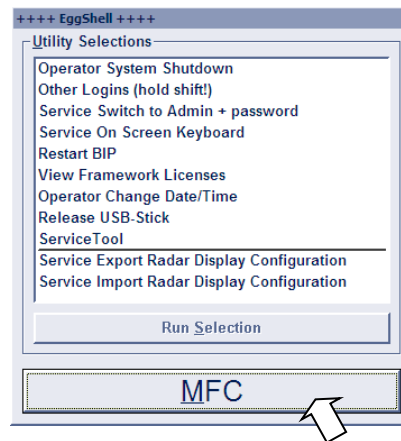| Operator controls | Text identifier |
|---|---|
| TX / STBY | Switching the Radar **OFF**.<br><br>Use the trackball to place the cursor on the **TX** soft button and press the **left** trackball button.<br><br>The designation of the soft button changes to **STBY** and is highlighted.<br><br>When the Display was used in Master mode.<br><br>   &minus;  Radar echo disappears.<br>   &minus;  The antenna stops, no transmission.<br>   &minus;  The name of the soft button **FUNC** changes to **SERV** (Service).<br>   &minus;  The soft button **USER** shows up.<br>   &minus;  The soft button **EXIT RADAR** shows up.<br><br>When the display was used in Slave mode.<br><br>   &minus;  Radar echo disappears<br>   &minus;  The name of the soft button **FUNC** changes to **SERV** (Service).<br>   &minus;  The soft button **USER** appears.<br>   &minus;  The soft button **EXIT RADAR** appears. |
| EXIT RADAR | Select the EXIT RADAR soft button for opening the Utility Selections (Figure 2-7). Depending on system configuration following types of utility selector are available. |
|  | Select **Operator System Shutdown** on the **Utility Selections** window. |
| (power button) | Press and hold the power button for approx. 4 s.<br>The Radar is now powered off. |

Figure 2-7       Radar Utility selector

### 2.2.3　System Reset

A WDT (watchdog timer) is a hardware mechanism resetting the system when the operating system or application is halted. A typical usage of WDT is to start the timers and periodically reset the timer, and when timer is expired, the system resets.

When a system reset is carried out, only the Radar software is re- initialized; the transceiver remains active.

The display turns dark briefly and the system is re- initialized. The Radar display appears with the following basic settings.

After any restart, the Radar display unit makes certain basic settings.

These include:

- TUNE　in AUTO mode
- GAIN　in center position
- SEA　　　in 0 position
- RAIN　　in 0 position
- FTC　　　in 0 position
- DIMMER　in max. position
- Range　　in 6 NM
- Vector　　at 6.0 min

### 2.2.4　Monitor Status Indicator

The Radar monitor is equipped with a status LED. The status LED is located in the lower right on the front of the monitor (Figure 2-8).

The status LED indicates that the monitor is operating.



1*) it depends on the console type which LED is incorporated

1Status LED*)

Figure 2-8　Monitor status LED

Depending on status the status LED can have the following colors:

GREEN          indicates monitor operating voltage is OK and the video signal
               transfer between monitor and processor is OK.

RED            indicates monitor operating voltage is OK but the video signal
               transfer between monitor and processor is disturbed.

No color       indicates that no operating voltage is applied.

## 2.3 Display Organization and Submenu Structure

This chapter describes the function sections of the Radar display (Figure 2-9).

**Antenna** sensitivity controls, chapter 2.3.1

Radar compass rose with NORTH MARKER

Information Panel chapter 2.3.7

**Radar video** displays , chapter 2.3.2.

**NAV** elements chapter 2.3.4.

**Cursor** readout, chapter 2.3.6.

**Video** information per Cursor, chapter 2.3.5.

**Navigation** Tools, chapter .2.3.4.4
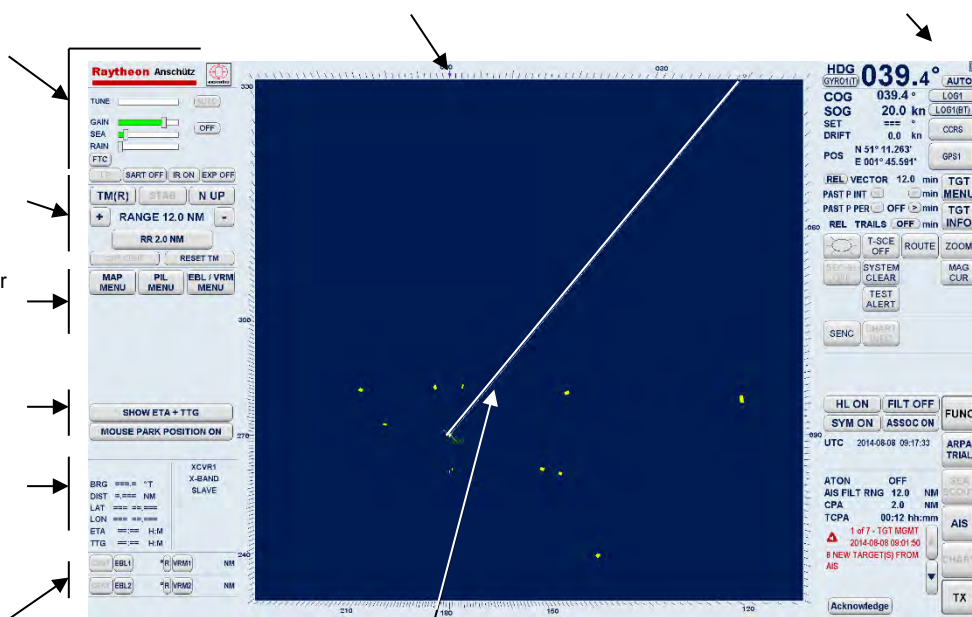
SHM, chapter 2.3.2.1

Figure 2-9    Display organization

Intentionally left blank
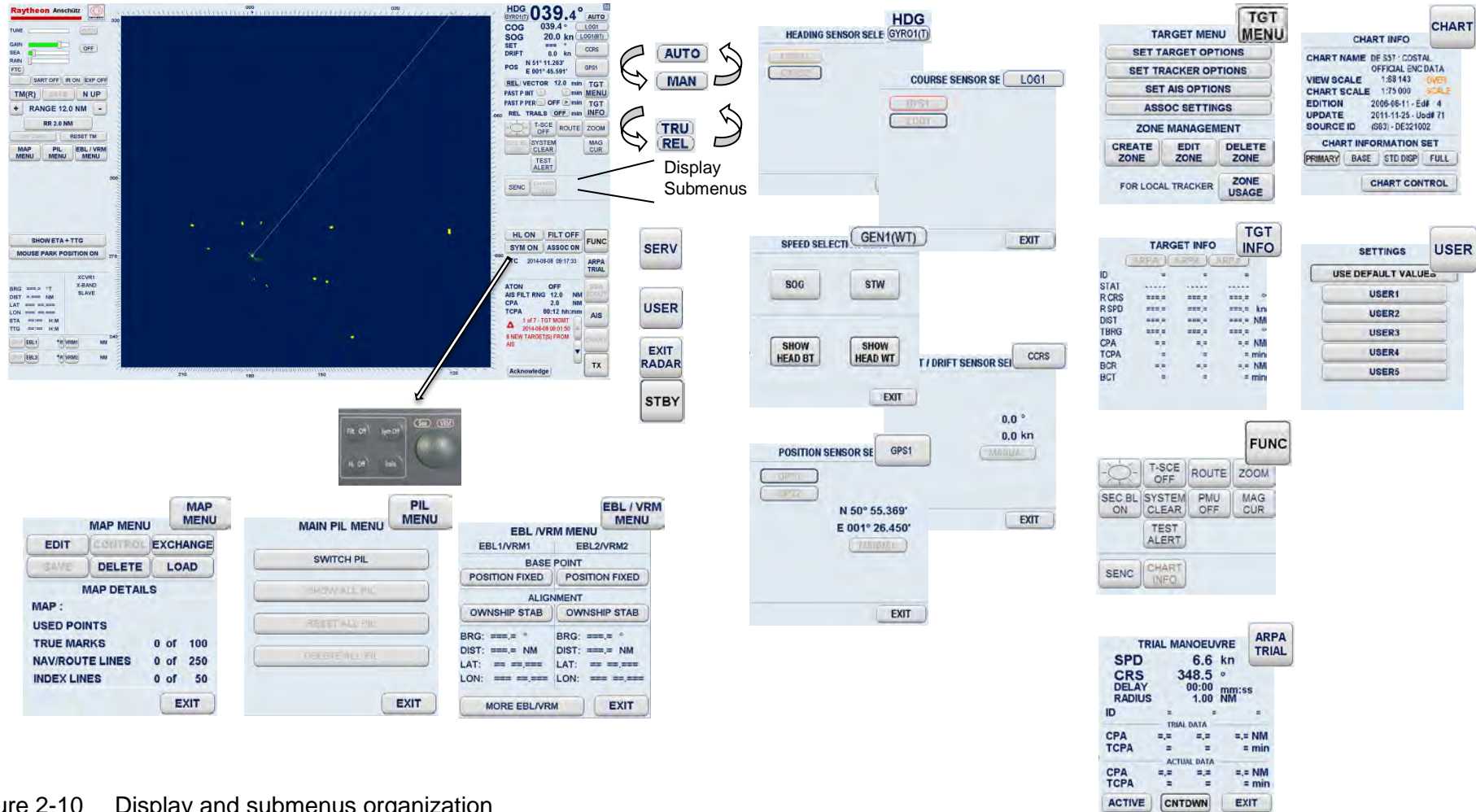
Figure 2-10     Display and submenus organization

chapter 2.5.1



chapter 2.5.2                                         chapter 2.5.3



chapter 2.5.4                                         chapter 2.5.5
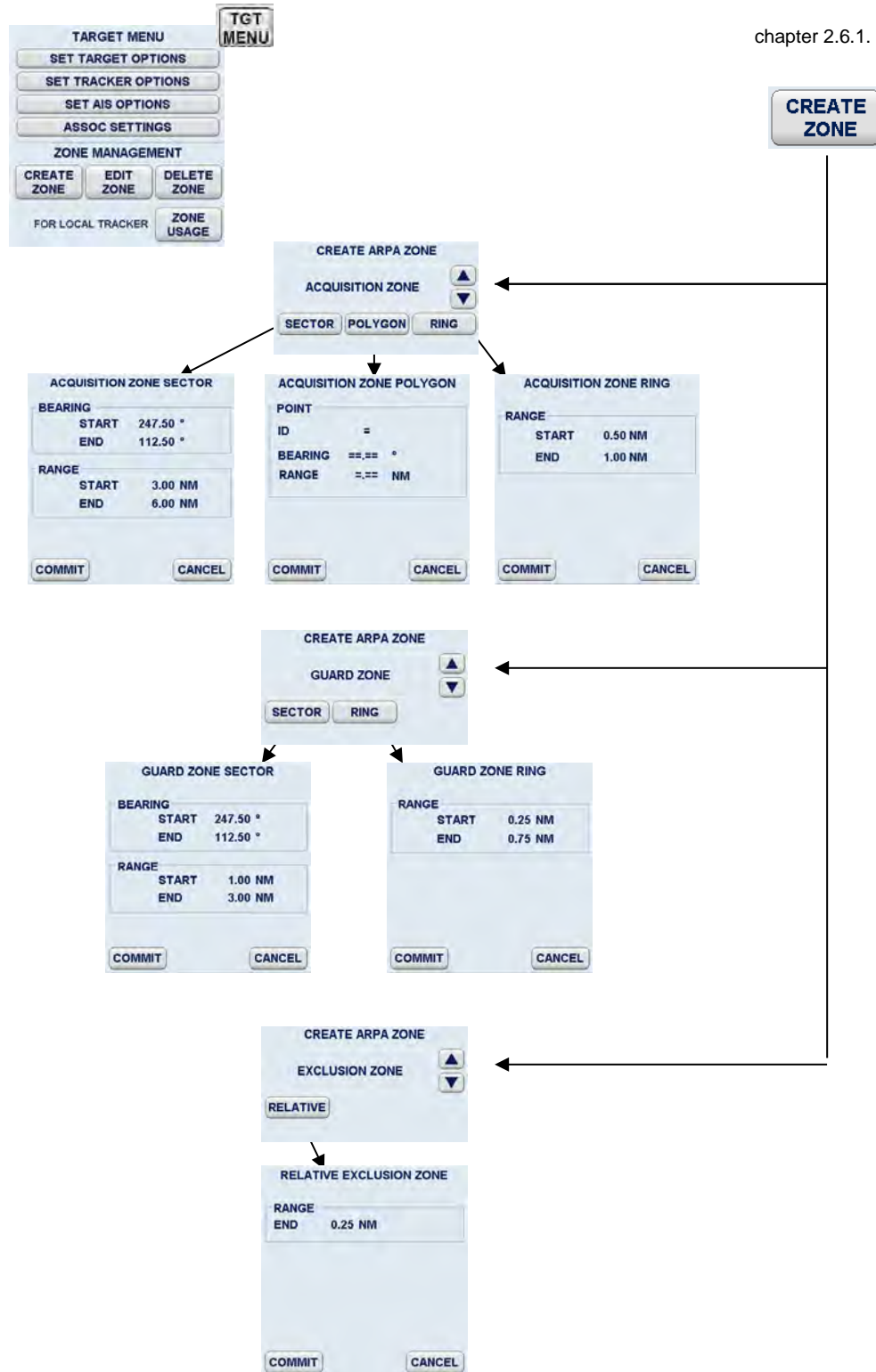
Figure 2-11    Display and organization of AIS INFO and ARPA MENUs

chapter 2.6.2.                    chapter 2.6.3.
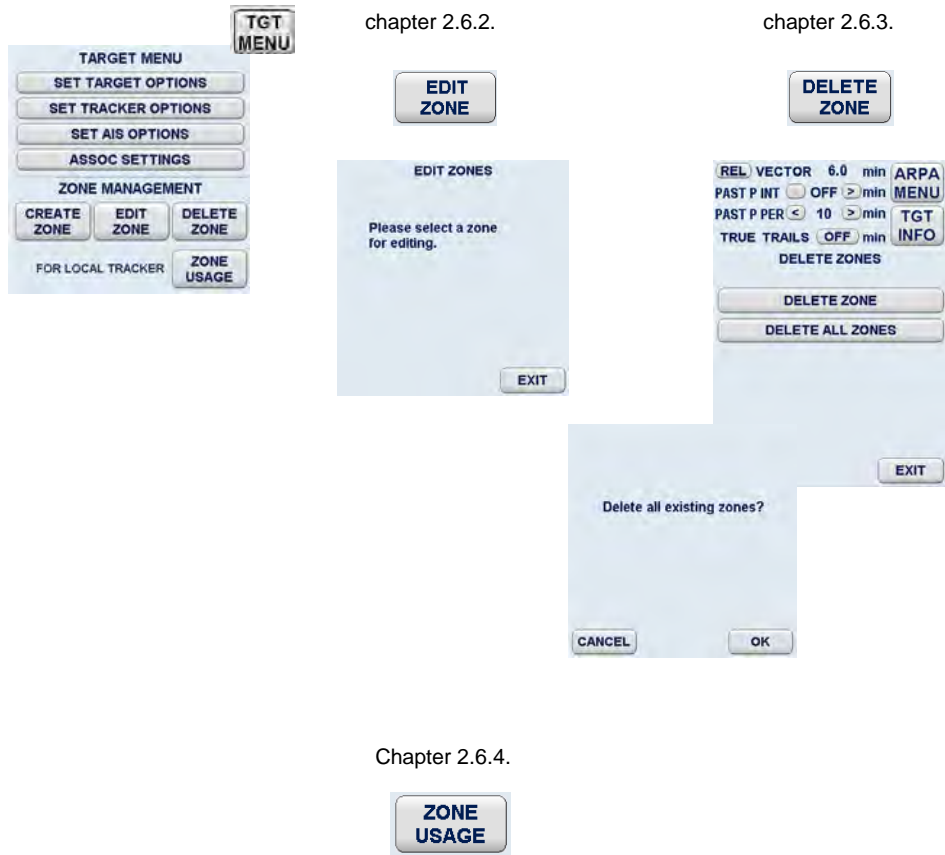
Figure 2-12     Display of ARPA submenus and selected functions

chapter 2.7.1.

chapter 2.7.2.

chapter 2.7.5.

chapter 2.7.3.            chapter 2.7.4.            chapter 2.7.6



Figure 2-13    Display of FUNCtion submenus and selected functions (part 1)

chapter2.7.7.          chapter 2.7.8.          chapter 2.7.9

chapter 2.7.10.                                    chapter 2.7.11

Figure 2-14    Display of FUNCtion submenus and selected functions (part 2)

chapter 2.3.4.1

chapter 2.3.4.1.(1)

chapter 2.3.4.1.(2)

chapter 2.3.4.1.(3)

chapter 2.3.4.1.(4)

chapter 2.3.4.1.(5)

chapter 2.3.4.1.(6)
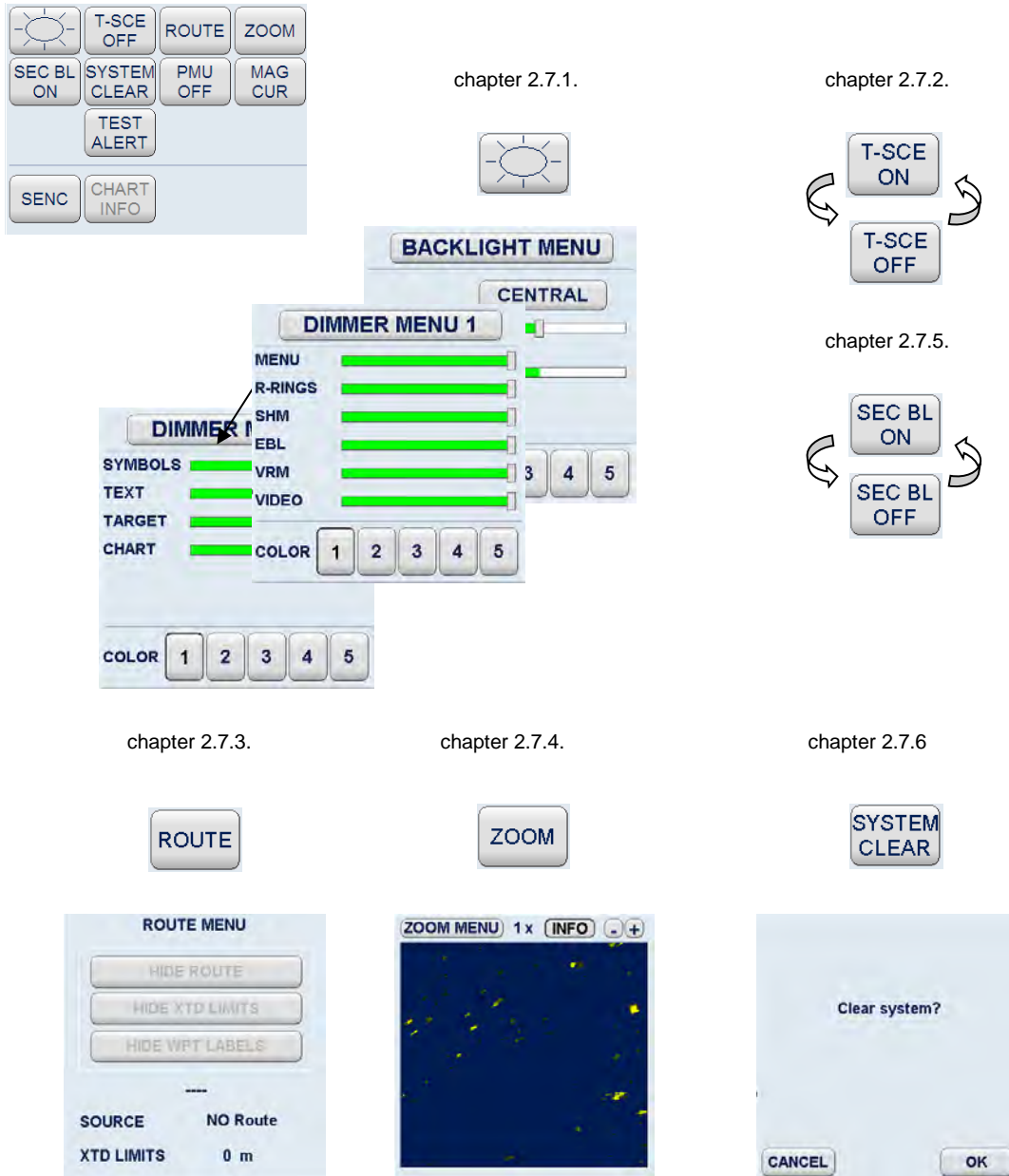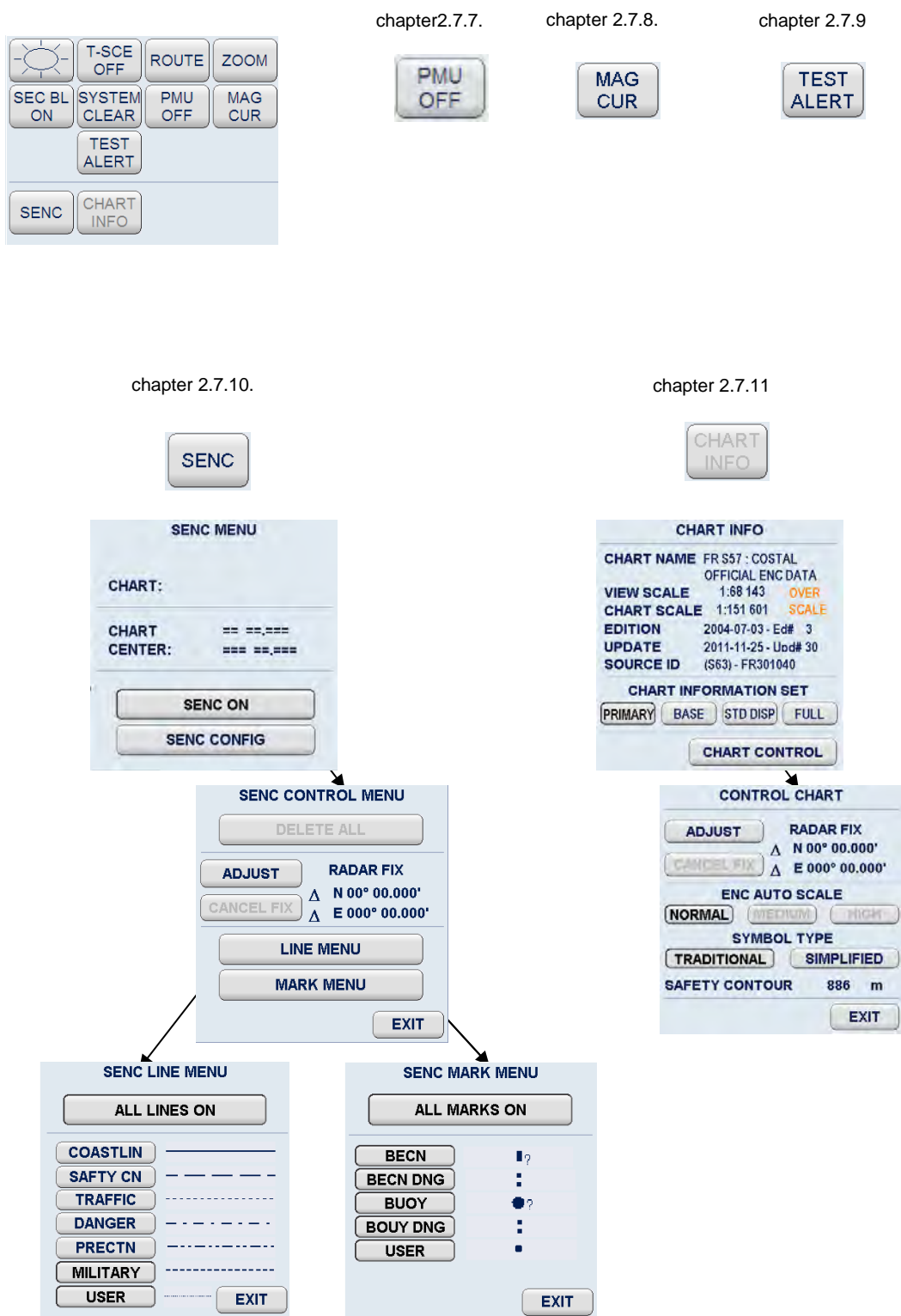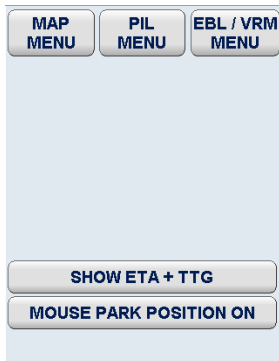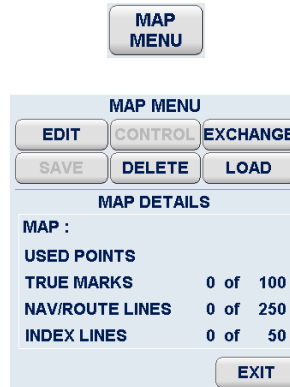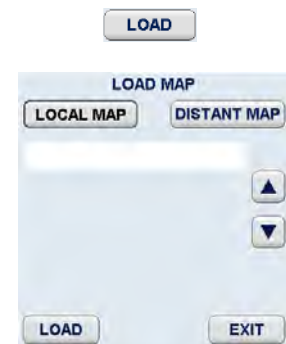
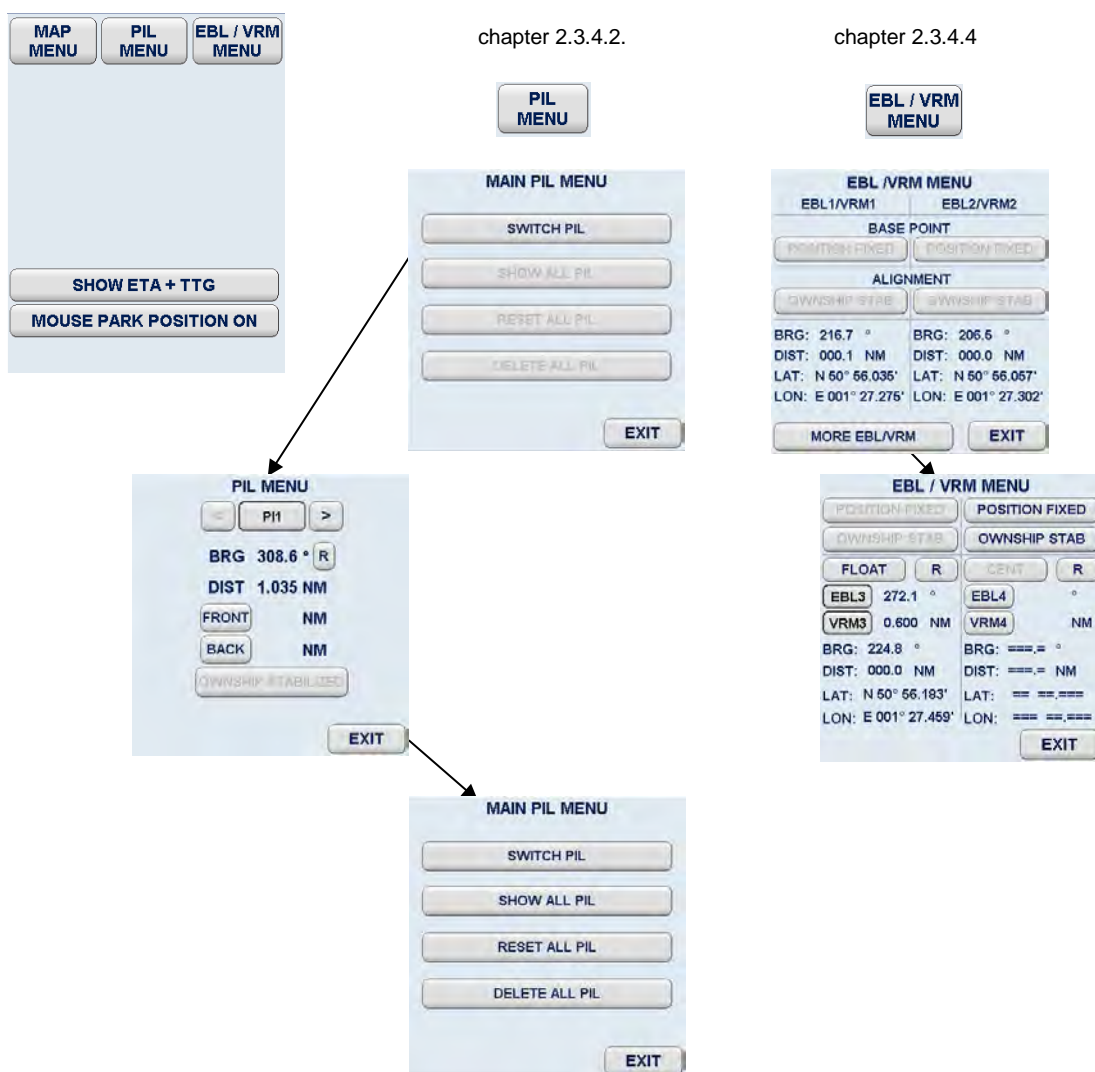Figure 2-15    Display of navigational submenus and selected functions (part 1)

Figure 2-16    Display of navigational submenus and selected functions (part 2)

### 2.3.1 Sensitivity Controls

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

The sensitivity controls describe all adjustments to find the best video performance.

The video performance depends from the current weather conditions, Radar sensitivity adjustments, magnetron performance, pedestal and array conditions and transfer line conditions (coax cable and wave guide).

Radar in Slave mode:

If the Radar is working in slave mode the sensitivity controls AUTO Tune and Pulse width selection are not possible.

### 2.3.1.1 Gain and Clutter Processing

The Radar uses a digital video processing technique called Scan to Scan integration or field processing. This process requires 3 complete antenna rotations or scans of the antenna in order to build up or decay detected targets.

To the operator, this means that when a target is first detected, it appears dim. If, on the next scan, it is still present at the same location, it appears at medium brightness and on the third scan, it appears at full brightness. As long as the target is present, it will appear at full brightness.

If the target fades in and out, then it will remain on the screen, dropping from full brightness to medium and back to full brightness.

If the target is lost altogether, then it will take three scans before it completely disappears.

It is essential to understand that this 3 scan integration is crucial for operation of the **Gain**, **Sea** and **Rain** clutter controls, because if an adjustment is made to any of these controls, *it requires 3 complete scans to properly observe the results of the adjustment*. The same applies if a Radar target is used as a tuning indicator when manually tuning the Radar.

### 2.3.1.2 Tune
MANual TUNE

The tune function uses the trackball to control tuning of the receiver frequency to match that of the transmitter.

Recommendation before using the tuning control.

To improve a good target reception and a minimal clutter effect we advise to switch the pulse width selection to medium pulse (M2) or to long pulse (LP).

| Operator controls | Task |
| --- | --- |
| TUNE [____] (AUTO)  GAIN [green] (OFF)  SEA  RAIN  FTC  M2  SART OFF  IR ON  EXP OFF | For a preliminary manual setting:<br><br>Switch first to manual tune by clicking on the AUTO soft button.<br><br>Use the trackball to place the cursor on the TUNE slider then press the **left** trackball button.<br><br>Rotate the trackball for maximum deflection of the slider.<br><br>As this setting must be averaged over a complete antenna revolution, a peak detector is included for operator convenience.<br><br>The tip of the tuning bar remains at the peak signal detected during one complete revolution of the antenna. |

| | Bear in mind the fact that the transmitter frequency will drift for the first thirty (30) minutes of operation from a cold start due to inherent magnetron characteristics. As a result of this, the receiver tuning will change during this time and a final tuning adjustment should be made after approximately thirty (30) minutes of operation. The tuning should also be checked at every four hours thereafter. |
| --- | --- |

**AUTO TUNE (only available in Master mode)**

When auto tuning is activated, manual tuning is not available. The slider symbol is hidden.

| | |
|---|---|
| ⓘ | With automatic receiver adjustment, the tendency indicator adjusts itself to the maximum value. |
| | If the magnetron is at the end of its service life and the transmission spectrum has become abnormal, select manual tuning. |

**2.3.1.3    Gain**

The GAIN control adjusts the sensitivity of the Radar video. If properly adjusted, the GAIN control results in noise appearing as a light speckle at the dim level. This light speckle setting results in maximum detectability of targets against background noise. If GAIN is set too low, weak or distant targets could be missed. Excessive gain increases background noise and could make target detection more difficult. A gain slider is provided to indicate the GAIN control setting.

Once the GAIN control has been set, it will automatically maintain the same setting for all ranges. It is not necessary to readjust whenever a new range scale is selected. However, it should be adjusted to optimize the Radar video as clutter (sea and/or rain) conditions change.

The gain control function is active over its entire rotation range.

| Operator controls | Task |
|---|---|
|  | Use the trackball to place the cursor on the GAIN slider then press the **left** trackball button. |
| | Rotate the trackball to adjust the optimal GAIN value. |

**2.3.1.4**      **Sea**

The Sea control is used to suppress Radar returns which are the result of Radar signals reflected from waves. This effect is commonly known as sea clutter.

The effects of sea clutter are greater (more reflected energy) at close range and vary with wave height and wind. It should also be noted that sea clutter is reduced on the leeward side of the ship as the retreating wave fronts do not provide as many Radar returns as oncoming waves.

Small targets (buoys, etc.) often return nearly the same energy as do the waves and can, therefore, be lost in the clutter. However, since sea clutter is random in nature, the gain and clutter processing circuitry together with the SEA control allow the operator to reduce the sea returns to a light background speckle at low brightness level while maintaining targets in the sea clutter at full brightness.

The effect of the Sea control is greatest at short range. Its effect reduces progressively as the range increases. At a range determined by the height of the Radar antenna above the water (and other factors), the effect of the SEA control ceases altogether. This is typically about 8- 10 NM.

The ideal sea control setting will reduce sea returns to a light speckle. Scan- to-scan integration will keep the sea returns at a low brightness level, while targets in the sea clutter will be shown at full brightness.

The sea clutter control should be adjusted in small increments, with pauses to observe 3 scans for the results.

In heavy sea clutter, some clutter peaks may come through at brighter levels, especially rollers, so an average setting should be chosen. It is important to note that if the Sea Clutter control is adjusted to completely remove all clutter, then some targets may not be detected.

| | |
|---|---|
| **i** | The Radar uses gyro and speed information as part of the clutter removal process. It is therefore highly recommended that you use gyro stabilization and ensure that the manual speed or speed log input is accurate. |

In heavy wind driven seas where more sea clutter appears on the windward side of the ship, a slight amount of FTC can balance the clutter (chapter 2.3.1.7) before adjusting the SEA control. If too much SEA is applied during periods of light clutter, then a band of noise could appear on the edges of the sea clutter.

| Operator controls | Task |
|---|---|
|  | Use the trackball to place the cursor on the SEA slider then press the **left** trackball button.<br><br>Rotate the trackball to adjust the optimal SEA clutter value. |

### 2.3.1.5 Rain Rate

The function of the RAIN control is to enable the operator to suppress Radar returns which are the result of Radar signals reflected from rain drops.

This effect is commonly known as rain clutter. As with sea clutter, the rain clutter tends to mask small targets (or large targets if the rain is intense).

When heavy rain is falling in the vicinity of the operator's ship (up to 6- 10 NM) and the resulting rain clutter is obscuring nearby targets, then the rain rate slider should be used. Advance the rain rate control slightly and observe the results (wait 3 scans).

The ultimate goal is to reduce the nearby rain clutter until it is a very light speckle at the dim level. This setting will reduce the rain returns and will have little effect on strong constant target video returns. Weaker targets (usually appear where rain returns are less intense) may be suppressed along with the rain.

Most of these weaker targets can be restored by making a FTC adjustment (chapter 2.3.1.7).

| Operator controls | Task |
|---|---|
|  | Use the trackball to place the cursor on the RAIN slider then press the **left** trackball button.<br><br>Rotate the trackball to adjust the optimal RAIN clutter value |

**2.3.1.6**      **Automatic Clutter Reduction**

When AUTO is activated FTC are hidden.

This AUTO mode describes a control algorithm, which uses the evaluation of echoes to calculate statistical average values for SEA and RAIN. These average values are used for optimization of the Radar video.
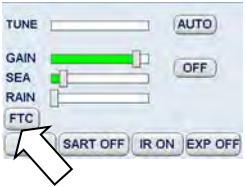
Adjust the GAIN slider to control the sensitivity of the Radar.

| Operator controls | Task |
|---|---|
|  | Switch over to AUTOmatic clutter reduction.<br><br>Use the trackball to place the cursor on the GAIN slider then press the **left** trackball button.<br><br>Rotate the trackball to adjust the sensitivity of the Radar. |

| | |
|---|---|
|  | Use of AUTO simplifies Radar video optimization. However, depending on the weather conditions misinterpretations are possible.<br><br>The algorithms for Automatic Sea Clutter suppression (AUTO) have been developed based on data recorded on several sea trials. As this functionality has been optimized applying it to these scenarios sea states and environmental conditions might be encountered where these anti- clutter algorithms do not result in a Radar video presentation satisfying the expectations of the user.<br><br>If you find yourself in a situation where the Radar presentation does not correspond to the information you receive from other equipment or your own observations it is highly recommended to switch to manual sea clutter suppression to achieve the optimum presentation of the sea area.<br><br>It will be highly appreciated if you will inform Raytheon Anschuetz in case of such an experience so that appropriate measures could be taken to improve the automatic sea clutter suppression function. |

#### 2.3.1.7 Filtering Rain Clouds FTC

FTC is responsible for differentiation or removing the mean clutter level of rain clouds. Adjusting the FTC will also reduce the land echoes and thin out larger targets in range.

| Operator controls | Task |
|---|---|
| TUNE AUTO GAIN SEA RAIN FTC SART OFF IR ON EXP OFF | *Step 1* Select FTC |
| | Advance the FTC control slowly (remember the 3 scans) until only the leading edges of the rain clutter are visible. As the FTC is increased, weaker returns will reappear. |
| | Stronger returns will begin to reduce in the visible area. |
| | Too much FTC will shorten or delete RACON responses. |
| | *Step 2* For fine adjustment use the RAIN slider |
| | The best setting will be a balance between restoration of weaker returns and adequate size of the stronger returns. |
| | Noising effect by maximum GAIN control |
| | With FTC ON a false noise ring may be displayed. This effect can be compensating by reducing the GAIN control. |

### 2.3.1.8 Search and Rescue Transponder SART ON/OFF
The SART functionality is only working for X-band.

| Operator controls | Task |
|---|---|
|  | The SART ON/OFF does not activate the ship's SART facility. It changes receiver bandwidth to improve SART detection by this Radar. |

**Information about the SART transponder**

The purpose of the SART is to trigger a secondary alarm when search and rescue units are searching for a life raft/lifeboat in distress. The SART will help the units to pinpoint exactly where the distressed boats are located in a large area. This is done with the help of the Radar on the search ship or helicopter. When the SART is interrogated (hit) by a Radar signal, it will immediately start to transmit a number of sweeps covering the complete maritime 3 cm Radars. These sweeps are detected on the Radar screen and used to navigate directly towards the distressed life raft. The maximum detectable distance to a ship will normally be about 10 NM or approximately 30 NM to a helicopter, depending on the helicopter's altitude. The transponder will not give any alarms further away than this.

**How is this situation displayed on the Radar?**

This situation appears automatically on the Radar video. The echo display on the Radar video depends on the distance of the transponder from your own ship and can be interpreted as follows.
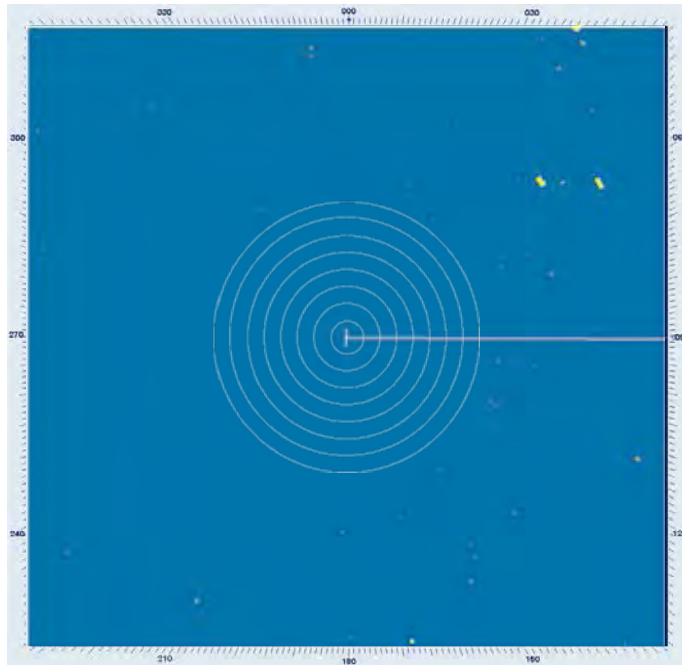
The SART transponderis in immediate vicinity.



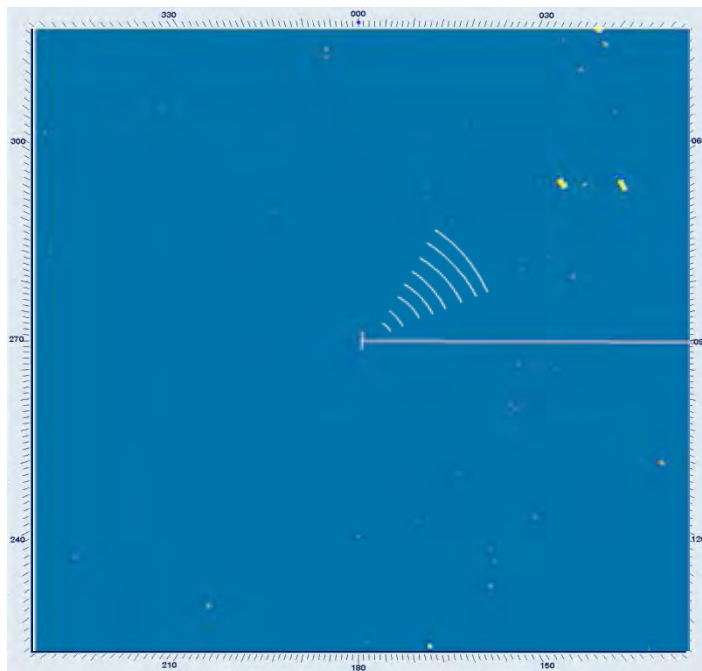Figure 2-17    SART transponder < 0,2NM

The SART transponder is in vicinity



Figure 2-18    SART transponder  ~1NM

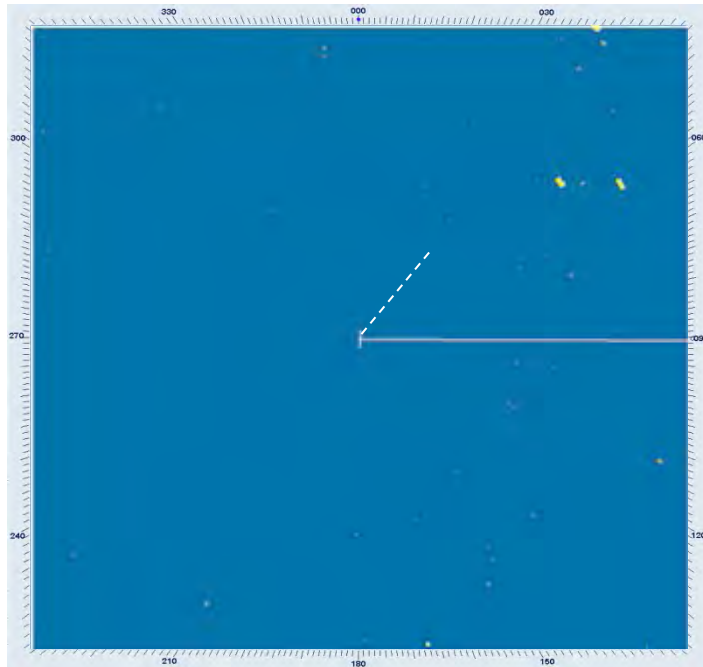The SART transponder is a long distance away.



Figure 2-19    SART transponder > 2NM

### 2.3.1.9 Pulse Width Selection (only available in Master mode)

The pulse width toggle field allows selection of the desired transmitter pulse width for the current range scale selected. If there is no pulse width toggle field, this indicates that it is not available for the range currently being used.

| Operator controls | Task |
|---|---|
| TUNE [____] (AUTO)<br>GAIN [███▌__] (OFF)<br>SEA [█▌____]<br>RAIN [_____]<br>(FTC)<br>(M2) (SART OFF) (IR ON) (EXP OFF) | Selecting this toggle field allows the pulse length to be switched e.g. from short pulse to medium pulse and vice versa to optimize target discrimination with respect to the selected range. |

| | |
|---|---|
| **!** | Use of a longer pulse improves target reception but, at the same time, increases clutter returns.<br><br>When using longer pulses it may be difficult to differentiate very close targets.<br><br>When a shorter pulse is used, reception of some weaker targets will decrease, but clutter will also decrease, resulting in better target detection. |

The available pulse width selections for the Radar displays and the Radar MTRs are illustrated in Table 2-7.

Table 2-7    Pulse width selection on dependency the current range scale

| Selected Range Scale in NM | Default Pulse width | Manual Set Pulse width |
|---|---|---|
| 0.125 | SP | M1 |
| 0.25 | SP | M1 |
| 0.5 | SP | M1 |
| 0.75 | SP | M1 |
| 1.5 | SP | M1<br>M2 |

| Selected Range Scale in NM | Default Pulse width | Manual Set Pulse width |
|---|---|---|
| 3.0 | M1 | M2<br>SP |
| 6.0 | M2 | M1<br>LP |
| 12.0 | M2 | M1<br>LP |
| 24.0 | SP<br>LP | M1<br>M2 |
| 48.0 | LP | M2 |
| 96.0 | LP | |

**MASTER configuration**

If the display is configured as the master, the available pulse width selections are illustrated in Figure 2-20.

The pulse width toggle fields have no effect if the display is configured as a slave display; they cannot be selected.
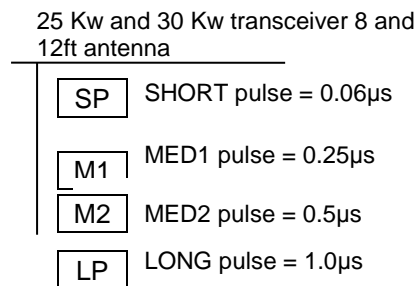
25 Kw and 30 Kw transceiver 8 and
12ft antenna

| SP | SHORT pulse = 0.06µs |
| M1 | MED1 pulse = 0.25µs |
| M2 | MED2 pulse = 0.5µs |
| LP | LONG pulse = 1.0µs |

Figure 2-20    Radar pulse width

Information

A longer pulse width means;

More power, stronger target returns, but also more disturbances.

Long pulses are necessary at high ranges to detect small targets more effectively.
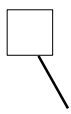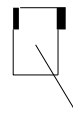
### 2.3.1.10 Interference Selection IR ON/OFF

Interference rejection is activated to eliminate echo effects caused by other Radar system from ships nearby.

| Operator controls | Task |
|---|---|
|  | The interference toggle field allows selection of the function interference ON or OFF. |

### 2.3.1.11 Echo Expansion EXP. ON/OFF

By selecting this toggle field, echo expansion is activated to magnify small Radar echoes.
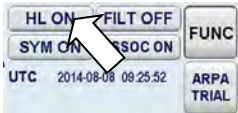
| Operator controls | Task |
|---|---|
|  | The EXP toggle field allows selection of the function echo expansion ON or OFF.<br><br>The target echo got an additional digital symbol. The symbol is directly placed behind the target.<br><br><br><br>Target echo with EXP.OFF selection     Target echo with EXP.ON selection |

### 2.3.2 Radar Video Displays

### 2.3.2.1 Ship Heading Marker

It is possible to switch OFF the ship heading marker to view a target that is obscured by the heading line.

The ships heading marker can be switched OFF using the Operator Panel or by using a soft button.

| Operator controls | Task |
|---|---|
|  | At the Operator Panel.<br><br>After pressing the button the heading marker is turned OFF.<br><br>After releasing the button the heading marker is turned ON. |
|  | At the Radar display.<br><br>After pressing the soft button the heading marker is turned OFF.<br><br>After releasing the soft button the heading marker is turned ON. |

**2.3.2.2    Relative Motion or True Motion**

The RM (R), RM (T), TM (R), TM (T), legend in the upper left of the display shows the current mode for Radar video presentation.

| Operator controls | Task |
|---|---|
| RM(R)  N UP  +  NGE 6.0 NM  −  RR 1.0 NM  CENT  RESET TM | Position the cursor on the toggle field and press the trackball button to select the preferred motion. |
| REL VECTOR  6.0  min  TGT MENU  PAS  1/4  min  PAST P  10  min  TGT INFO  TRUE TRAILS  OFF  min | The preferred motion is linked with the TRAILS character. |

**General**

If Relative Motion is selected, your own ship is stationary and all other objects, including land mass, buoys, ships at anchor and ships in motion, move with the correct **relative** speed and course.

In this case Relative Motion provides two special settings linked to the TRAILS toggle field (chapter 2.3.7.2).

The following figures show the differences on the Radar video.

Relative Motion

    RM (R)              for relative motion and relative trails

    RM (T)              for relative motion and true trails

### Relative Motion without TRAILS

If no trails are activated, the RM (R) and RM (T) are identical.

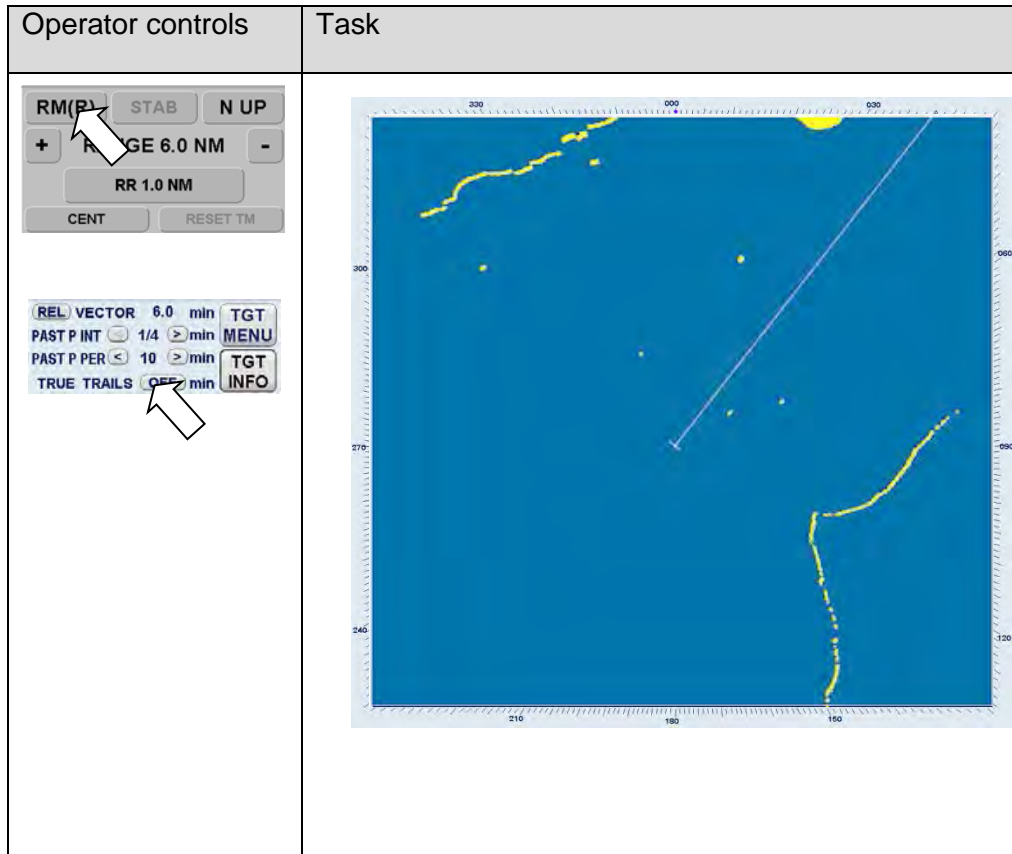| Operator controls | Task |
|---|---|
|  |  |

Figure 2-21     Relative Motion without TRAILS

**Relative Motion (R) with relative TRAILS**

A ship in motion at the same speed and heading (e.g. shipping lane) is displayed with no afterglow on the Radar video.

Relative trails is the original Radar method to view plot history to quickly see what is approaching the ship. In Figure 2-22 the other ships are all heading west (ARPA data). Relative Trails information is an option for experienced Radar operators.
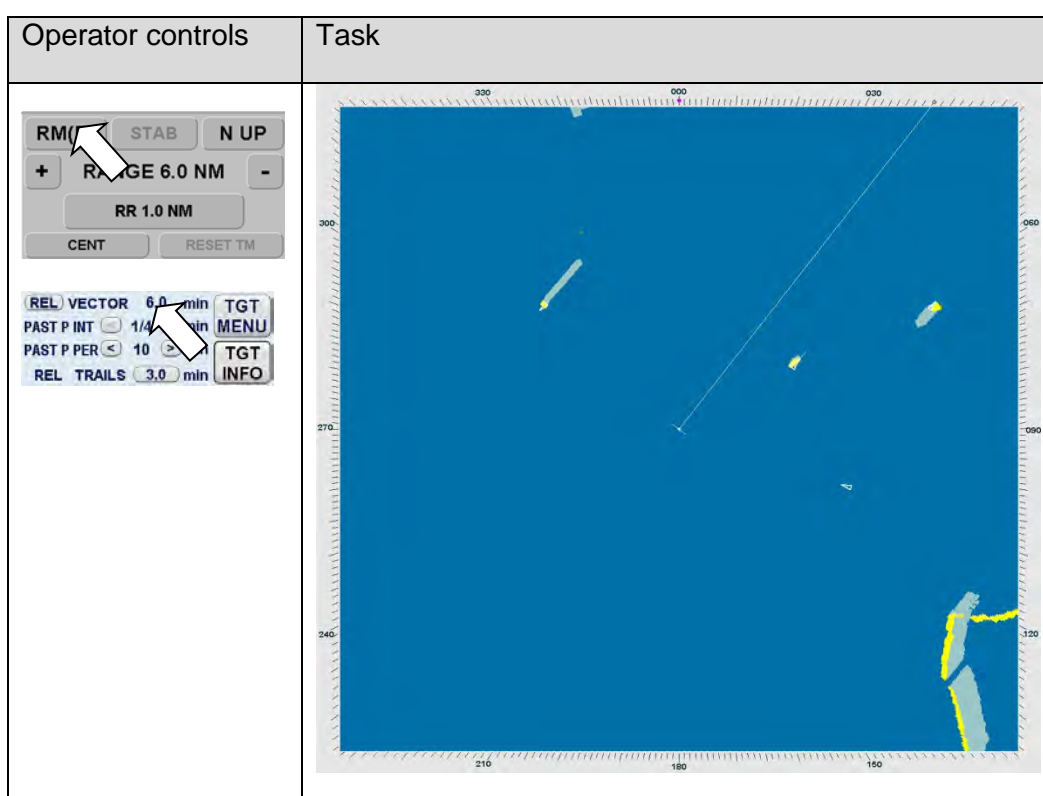
| Operator controls | Task |
|---|---|
|  |  |

Figure 2-22    Relative Motion (R) with relative TRAIL

### Relative Motion (T) with true TRAILS

In this case, land masses, buoys, ships at anchor, etc. appear exactly as they are, as stationary objects. Objects in motion move across the Radar video with the correct true speed and course. The trail afterglow displays the track. The own ships position is fixed.
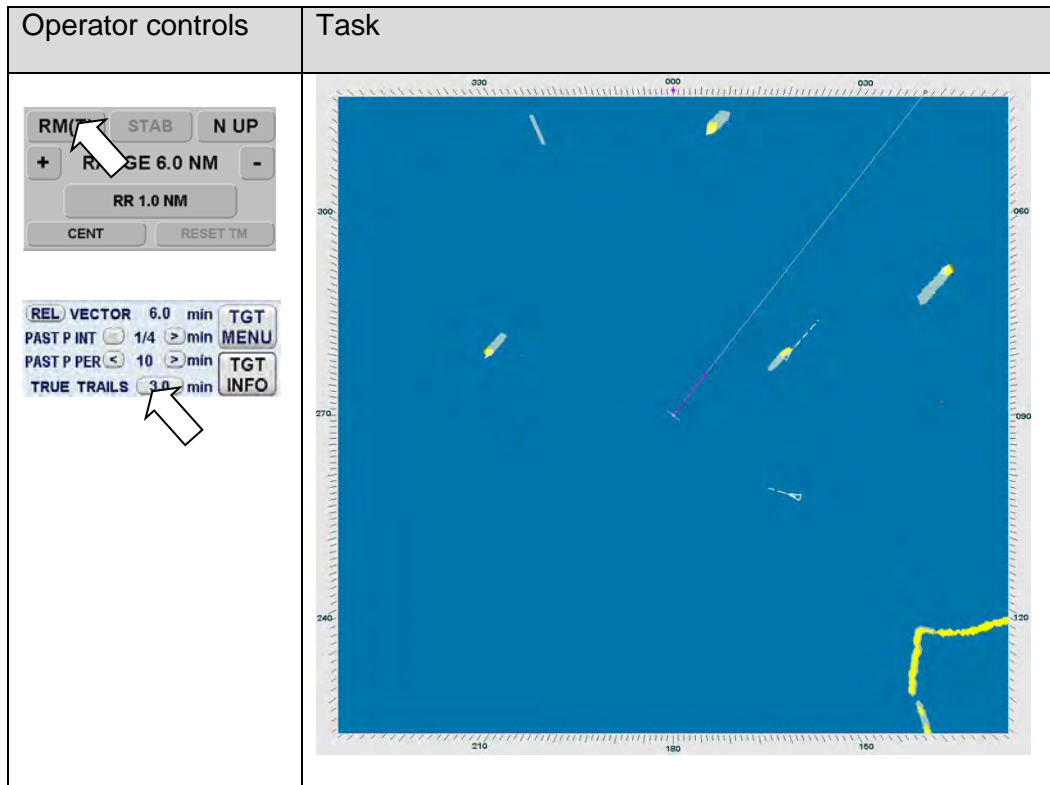
| Operator controls | Task |
|---|---|
|  |  |

Figure 2-23     Relative Motion (T) with true TRAILS

**TRUE MOTION**

If True Motion

is selected, land masses, buoys, ships at anchor, etc. appear exactly as they are, as stationary objects, while objects in motion, including your own ship, move across the operating screen with the correct true speed and course.

True Motion mode is available in N- UP or C- UP mode for all ranges except for 96NM. If the range moves above 96NM, the location of your own ship is centered.

In this case True Motion provides two special settings linked to the TRAILS toggle field (chapter 2.3.7.2).

The following figures show the differences on the Radar video.

True Motion

> TM (R)        for true motion and relative trails
>
> TM (T)        for true motion and true trails

**True Motion without TRAILS**

If no trails are activated, the TM (R) and TM (T) are identical.

| Operator controls | Task |
|---|---|
|  | Position the cursor on the toggle field and press the trackball button to select the preferred motion.<br><br><br>The preferred motion is linked with the TRAILS character. |

Figure 2-24     True Motion without TRAILS

**True Motion (R) with relative TRAILS**

A ship in motion in the same speed and heading (e.g. shipping lane) is displayed without an afterglow on the Radar video.

Relative trails is the original Radar method to view plot history (also with EBL) to quickly see what is approaching the ship. In Figure 2-25 the other ships are all heading west (ARPA data). Relative Trails information is an option for experienced Radar operators.
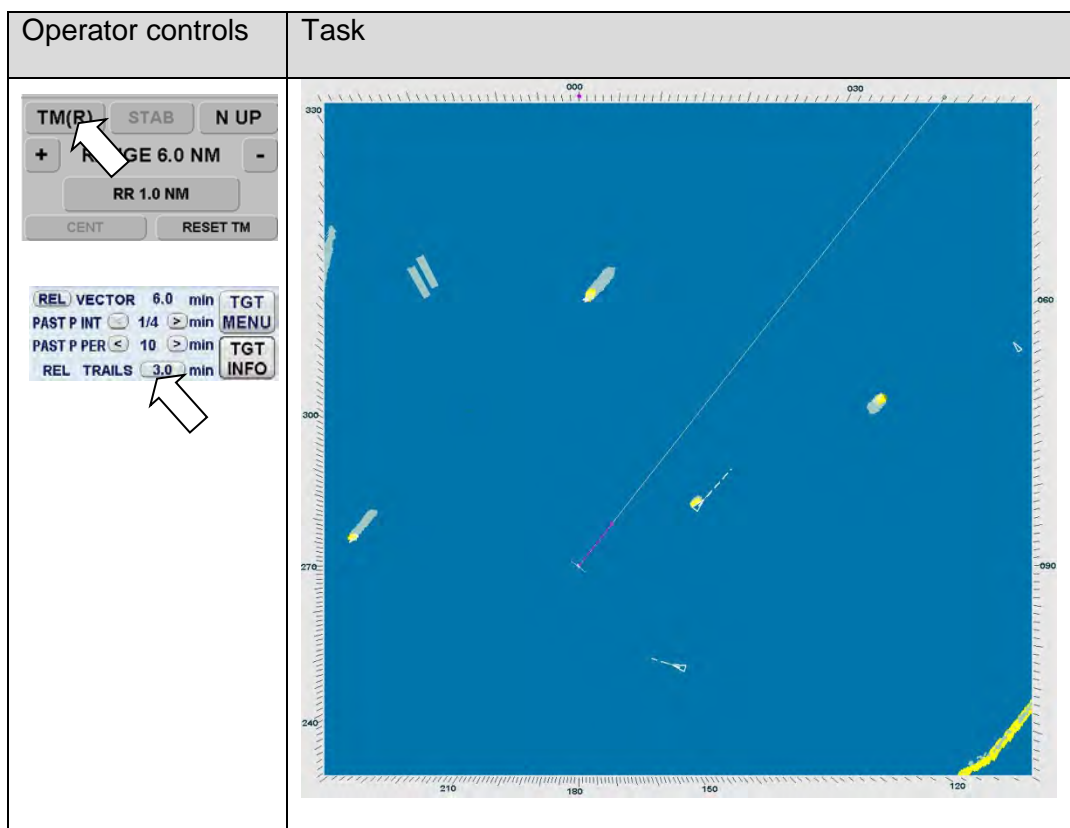
| Operator controls | Task |
|---|---|
|  |  |

Figure 2-25    True Motion (R) with relative TRAILS

**True Motion (T) with true TRAILS**

In this case, land masses, buoys, ships at anchor, etc. appear exactly as they are, as stationary objects. Objects in motion, including your own ship, move across the Radar video with the correct true speed and course. The trail afterglow displays the track.
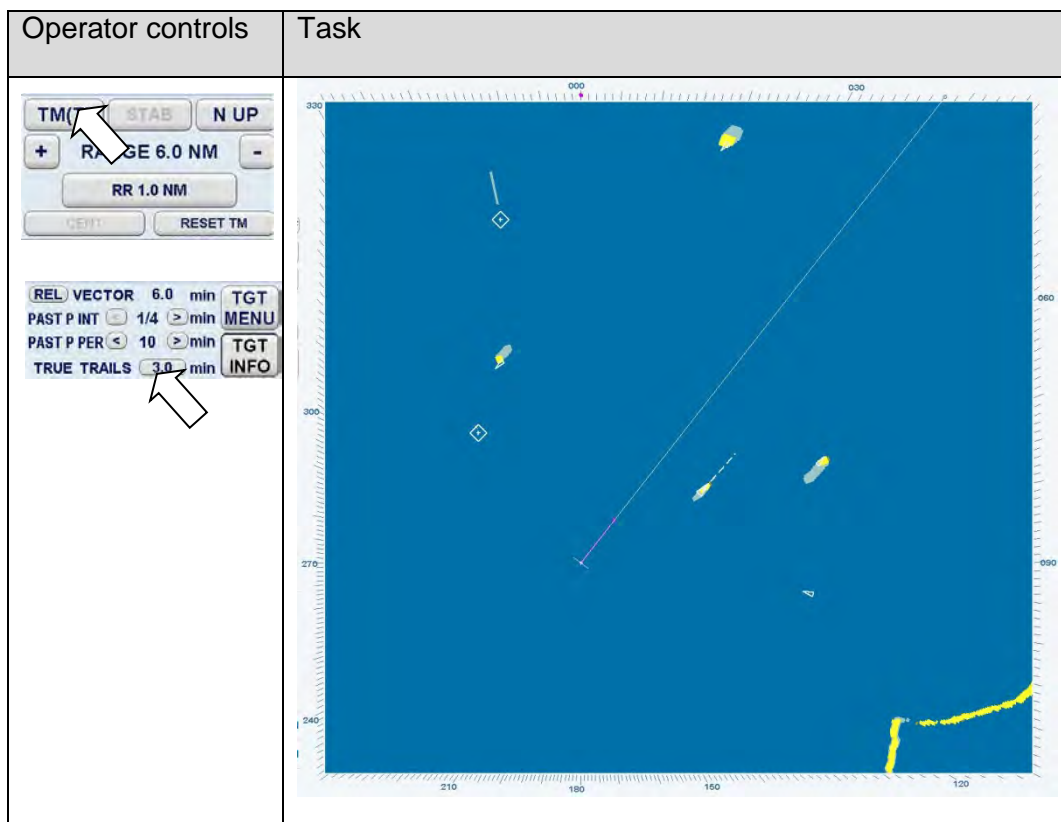
| Operator controls | Task |
|---|---|
|  |  |

Figure 2-26    True Motion (T) with true TRAILS

### 2.3.2.3 North UP, Head UP, Course UP and Repeater UP

This toggle field is used to select either North UP (N UP), Head UP stabilized (H STB) or un stabilized (H UNSTAB), Course UP (C UP) or Repeater UP (R UP) as the orientation of the PPI.

The N UP, H XX, C UP and R UP legend in the upper left of the display shows the current orientation mode of the PPI, Radar rose and SHM display.

To change the display orientation, select a corresponding button at the Operator Panel or by positioning the cursor on the toggle field at the Radar display.

| Operator controls | Task |
|---|---|
| 000 | At the Radar Display Rose.<br><br>The **North Marker** continues to mark geographic north on the Radar rose (blue filled circle). |
| Hup/Nup  Crs Up<br>Center  Vector | At the Operator Panel.<br><br>After pressing the preferred button (Hup/Nup, Crs Up) the orientation of the PPI will be changed accordingly. |
| RM(T)  STAB  N<br>+  RANGE 12.0 NM<br>RR 2.0 NM<br>CENT  RESET TM | At the Radar Display.<br><br>After pressing the button (toggle switch) the preferred orientation mode can be selected. |

**2.3.2.3.(1)** **North UP**
**North UP** means that geographic north is upwards

- Stabilized operation -

Gyro information is required for the N UP operation. When the unit is switched on, N UP is selected automatically. If the gyro is inoperative, an audible alarm sounds and the alert GYRO OUT appears in the WARNING MESSAGES area. When the gyro ceases operation, the ARPA functions are disabled and H UP mode is automatically selected.

If N UP mode is selected, the value 000° represents compass North (Figure 2-27).

*Visual impression*

The Radar video is rotated to a northerly direction. North is at the top (000°). This effect is comparable with an ordinary sea chart on which North is at the top. The SHM shows the ship's correct compass heading.

*Response to a change of course*

The SHM rotates in line with the change of course. The Radar video remains stationary.

*Relative or true*

The Radar video can be presented in Relative Motion (RM (..)) or True Motion (TM(..)).
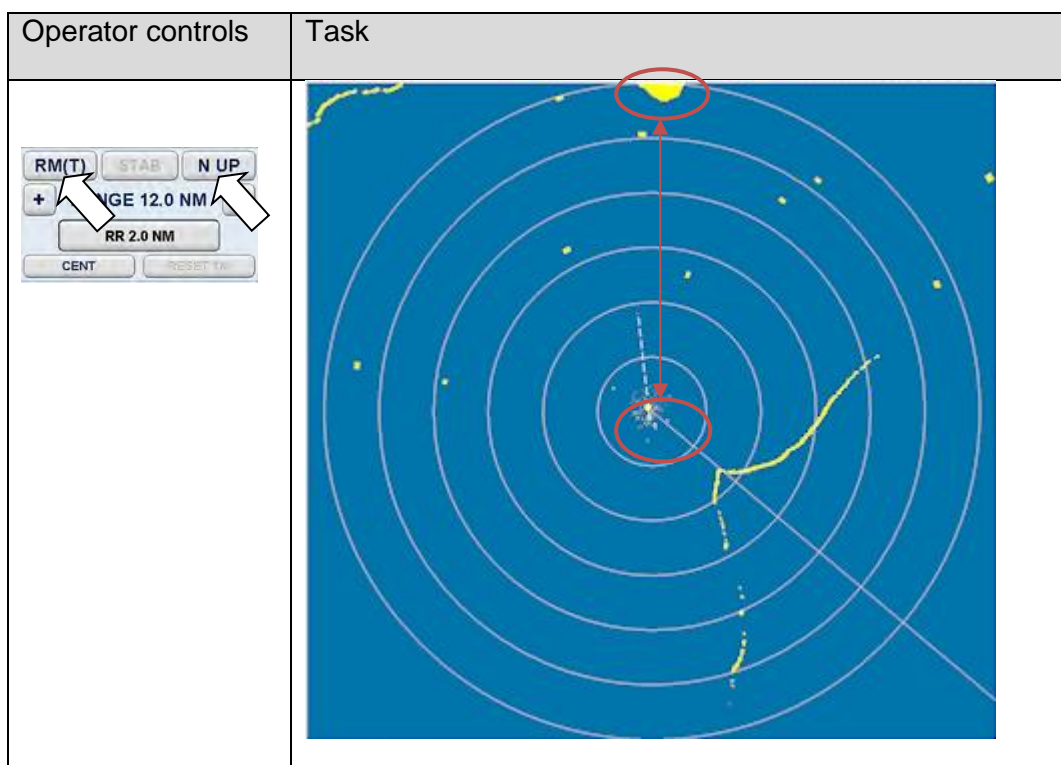
| Operator controls | Task |
|---|---|
|  |  |

Figure 2-27    North UP in RM (R) or RM (T)

**2.3.2.3.(2)**   **Head UP**

**Head UP** means the heading line shows upwards to the heading marker. The Head UP orientation can be used as Head UP stabilized or un stabilized.

*Visual impression*

Head UP corresponds to the line of vision "ship's head up".

*Change of course*

The Radar video rotates in line with the change of course. The SHM remains at heading upwards ((relative) (000°)).

*Relative or true*

The Radar video can only be presented in Relative Motion (RM (R)).

*No Gyro compass*

If the gyro compass heading is not available, the Radar will switch to **Head UP UNSTAB** mode automatically.

### Head UP stabilized (STAB) or unstabilized (UNSTAB)

| Operator controls | Task |
|---|---|
| | Pre-conditions. |
| | H UP is selected |
| | RM (R) is selected. |
| | *Manual* |
| | The Head UP type is selectable by pressing the STAB soft button. The soft button labeling indicates the Head UP type. |
| | The Head UP type STAB or UNSTAB effects the general Radar operating functions see Table 2-8: |
| | *Automatic* |
| | If the gyro compass heading is not available, the Radar will switch to **Head UP UNSTAB** mode automatically. |

Table 2-8       Reduced Radar Functions

| Radar Functions | Head UP UNSTAB | Head UP STAB |
|---|---|---|
| The Radar video is not stabilized by the gyro compass | X | |
| Filter and True Trails are not possible | X | |
| Navigational element, PIL is not possible. EBL only relative to own ship | X | |
| Radar bearings are relative bearings (lateral) | X | |
| TRUE MOTION is not possible | X | |
| ARPA function is not possible | X | |
| TARGET INFO are not possible | X | |
| AIS OPTIONS are not possible | X | |

| Radar Functions | Head UP UNSTAB | Head UP STAB |
|---|---|---|
| SENC function is not possible | X | |
| CHART RADAR is not possible | X | X |
| SEA SCOUT is not possible | X | |
| Radar Maps are not possible | X | |

**2.3.2.3.(3)** **Course UP**
**Course UP** means the course is upwards.

*Visual impression*
Course UP corresponds to the line of vision "in course direction".
The SHM remains on course.

*Change of course*
The SHM indicates the change of course. The Radar video remains unchanged.

| Operator controls | Task |
|---|---|
|  | Switch button, Course UP corresponds to the line of vision "in course direction". |

*Relative or true*
The Radar video can be presented in Relative Motion (RM (..)) or True Motion (TM (..)).

**2.3.2.3.(4)    Repeater UP**
**Repeater Up** means the repeater indicator is upwards

- Stabilized operation -

| | |
|---|---|
| **i** | The Filter selection and the Trail selection are not possible in the **Repeater UP** mode. |

Repeater UP is a special feature of the Radar. In this display mode, the bearing scale behaves like a compass rose where the ship heading marker (SHM) acts as the lubber line.

*Visual impression*
Repeater UP corresponds to the line of vision "ship's head up".

*Response to a change of course*
The Radar video rotates in line with the change of course. The Radar rose rotates in line with the change of course. SHM remains unchanged.

*Relative or true*
The Radar video can only be presented in Relative Motion (RM (..)).

### 2.3.2.4    Reduced Video Display

In a special system combination between the Radar Transceiver built in place (Antenna Offset) and the ships length the Radar Video displays in a reduced form on the PPI. This effect can occur in a selected Range Area between 0,125NM and 1,5NM see Figure 2-28.
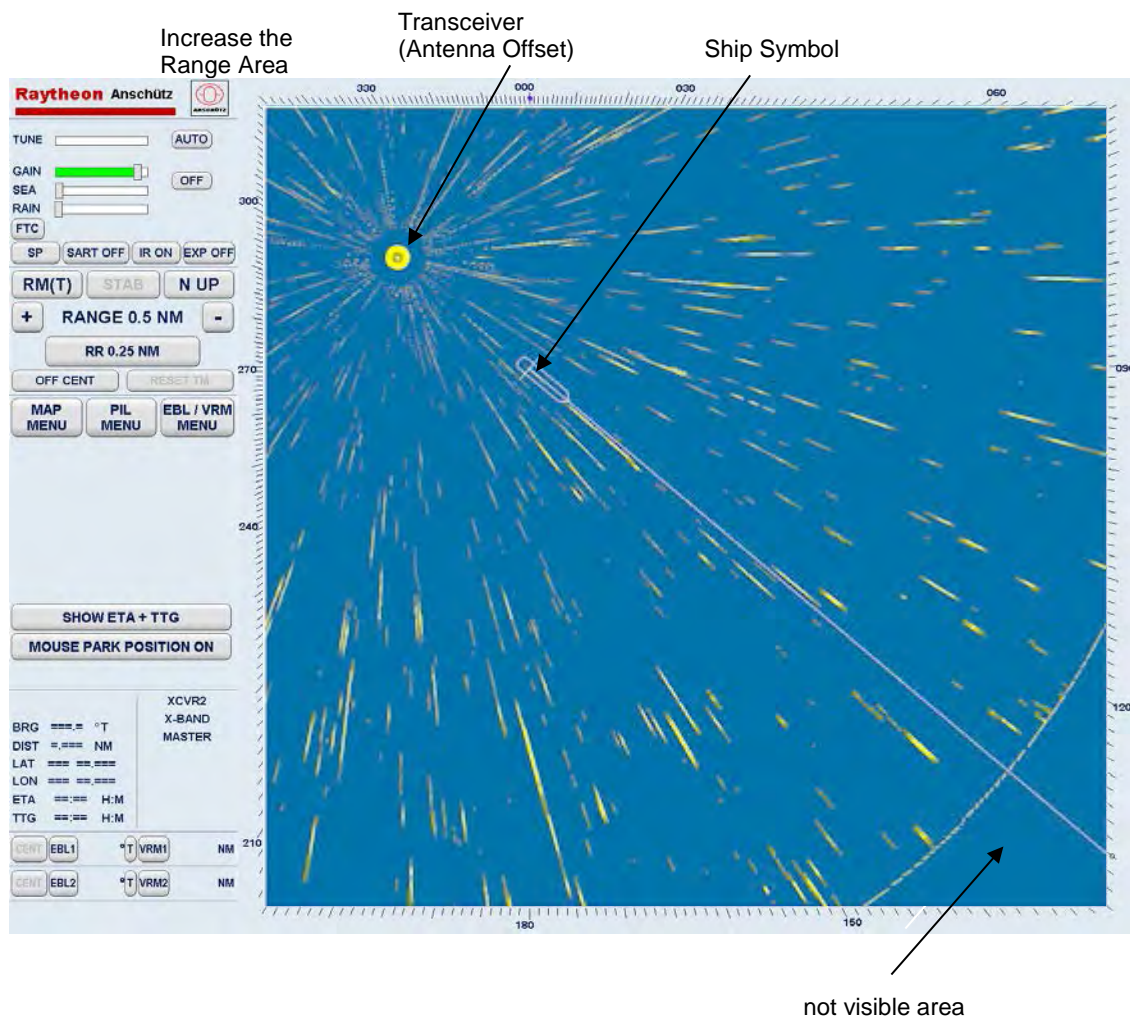


Figure 2-28    Reduced Video Display

Corrective:
Increase the Range Area step by step if this reduced Video Display appears in the Range Area, until the complete Radar Video displays on the PPI.

### 2.3.3 Radar Video Settings

### 2.3.3.1 Range

Range (RNG) shows the selected range area in NM.

| Operator controls | Task |
|---|---|
|  | At the Operator Panel<br><br>The Radar allows up to 11 range settings.<br><br>By pressing the "+" or "-" button the selected range can be adjusted from 0,125 NM to 96.0 NM according to the step listed in Table 2-9.<br><br><br><br>At the Radar Display<br><br>By pressing the "+" or "-" button the selected range can be adjusted from 0,125 NM to 96.0 NM according to the step listed in Table 2-9. |

Table 2-9     Overview range and rings

| Range RNG in NM | Range ring distance in NM | Range rings RR |
|---|---|---|
| 0.125 | 0.0625 | 2 |
| 0.25 | 0.125 | 2 |
| 0.5 | 0.25 | 2 |
| 0.75 | 0.25 | 3 |
| 1.5 | 0.25 | 6 |
| 3.0 | 0.5 | 6 |
| 6.0 | 1.0 | 6 |
| 12.0 | 2.0 | 6 |
| 24.0 | 4.0 | 6 |
| 48.0 | 8.0 | 6 |

| Range RNG in NM | Range ring distance in NM | Range rings RR |
|:---:|:---:|:---:|
| 96.0 | 16.0 | 6 |

**2.3.3.2** **Range Rings**

The spacing between the rings is defined by the selected range see Table 2-9. The Range Rings toggle field is also used to turn range rings ON/OFF on the PPI.

| Operator controls | Task |
|---|---|
| RM(T) STAB N UP<br>+ RANGE 12.0 NM -<br>RR 2.0 NM<br>OFF CENT | This toggle field automatically shows the distance between the rings in nautical miles. Activating the toggle field displays the rings on the Radar video. |

### 2.3.3.3      Center

| | |
|---|---|
| **i** | The switching over between Center and Off Center is only possible in Relative Motion mode (RM (R) and RM (T)). In True Motion mode the Radar video is to be shown automatically in Off Center presentation. A center presentation is not possible. In small ranges and with an antenna offset the "at least 50% rule" is violated. |

| Operator controls | Task |
|---|---|
|  | Switch to Relative Motion (RM (R) and RM (T)). |
|  | At the Operator Panel<br><br>Press the Center button to place the own ship in the center of the PPI (Figure 2-29). Pressing the Center button again the button lights and the cursor symbol changes. Place the cursor at a position within the permitted range and press the **left** trackball button. |
|  | At the Radar Display<br><br>Selecting this toggle field changes the name to OFF CENTer, the cursor jumps into the upper part of the Radar video area and the cursor symbol changes. Or place the cursor at a position within the permitted range and press the **left** trackball button.<br><br>Press the OFF CENTer toggle field if the Radar video is to be shown centered (Figure 2-29) or shall be moved again.<br><br>Pressing CENter key is convenient to activate the OFF CENter cursor and track ball to confirm the intended position. |

CENTer position
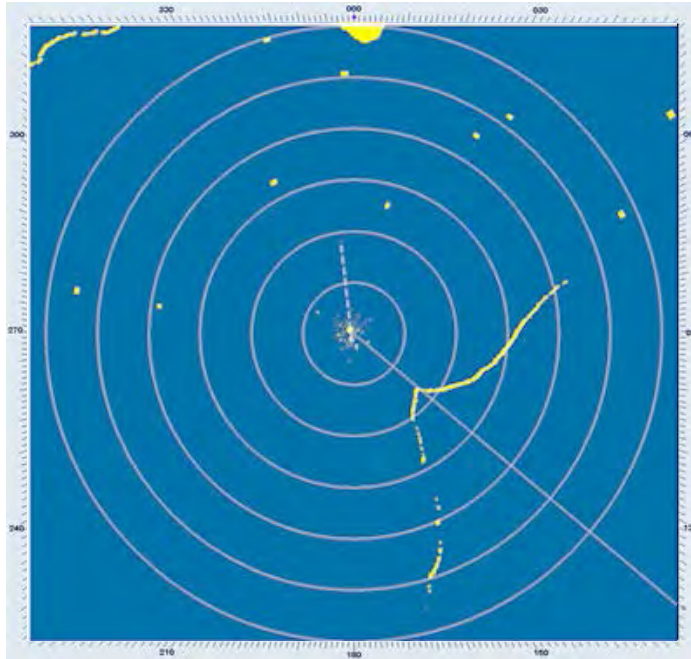


OFF CENTer position
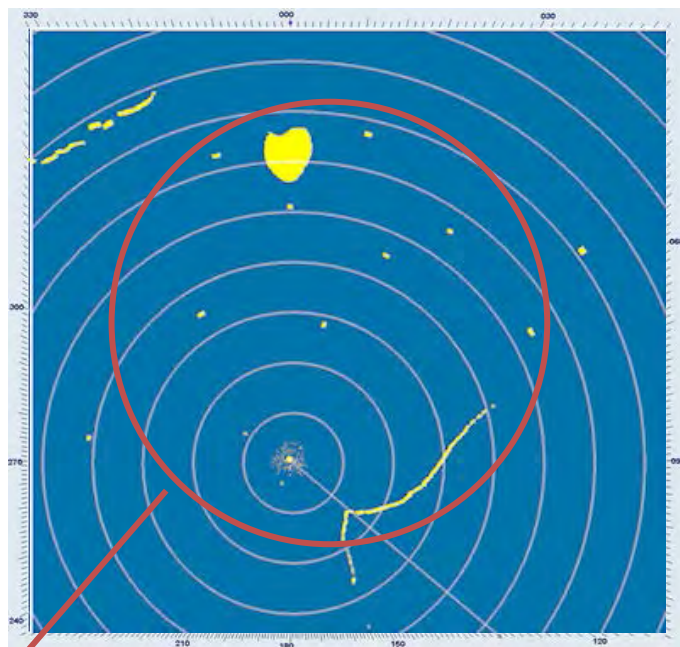


Approx. 50% of PPI radius (circle shown for explanation only will not be visible).

Figure 2-29    Video in CENter and in OFF CENter position

**2.3.3.4 Reset TM**

**RESET TM** can only be used in combination with the **True Motion TM (..)** preset.

Having selected **TM**, the Radar video is moved in the direction of travel i.e. in course direction (Figure 2-29).
If the center of origin is displayed by a distance of half the PPI diameter, it is reset in opposite course direction by 50% of the PPI diameter.

| Operator controls | Task |
|---|---|
| RM(T)  STAB  N UP <br> +  RANGE 12.0 NM  - <br> RR 2.0 NM <br> OFF CENT | Activating the toggle field resets the Radar video. <br><br> Depending on the situation, this allows a maximum forward view on the Radar video. |

### 2.3.4 Navigational Elements MAP, PIL, EBL and VRM

Electronic bearing lines (EBL) and variable range markers (VRM) are tools used to determine bearings and distances.

The readouts and navigational settings come up with default factory settings. The default factory settings for the readouts are TRUE and for navigation (ALIGNMENT) NORTH STABILIZED.

These factory default settings can be adapted to customer settings per service tool.

Parallel index lines PIL are used to mark the limits of areas or channels. These lines can be used to observe the advancing along an intended a course.

The following description subdivided this tools into three groups (Figure 2-30 and Figure 2-31).

Group 1

This soft button opens further Nav Element applications in the Function Display;

**MAP** MENU

The MAPS function allows the operator to create and permanently store maps.

**PIL** MENU

This menu is used to create and edit Parallel Index Lines (PIL 1/1).

**EBL/VRM** MENU

This menu is used to select the BASE POINT fixed position and the ALIGNMENT stabilization mode from EBL/VRM1 and EBL/VRM2. Furthermore this menu is used to create further EBL/VRM tools (3 and 4).

Group 2

**EBL/VRM** 1 for **E**lectronic **b**earing **l**ine/ **V**ariable **r**ange **m**arker with **CENTER** or **FLOATING** function. The **EBL 1** numerical bearing value can be switched to relative or true.

Group 3

**EBL/VRM 2** for **E**lectronic **b**earing **l**ine/ **V**ariable **r**ange **m**arker with **CENTER** or **FLOATING** function. The **EBL 2** numerical bearing value can be switched over to relative or true situation.
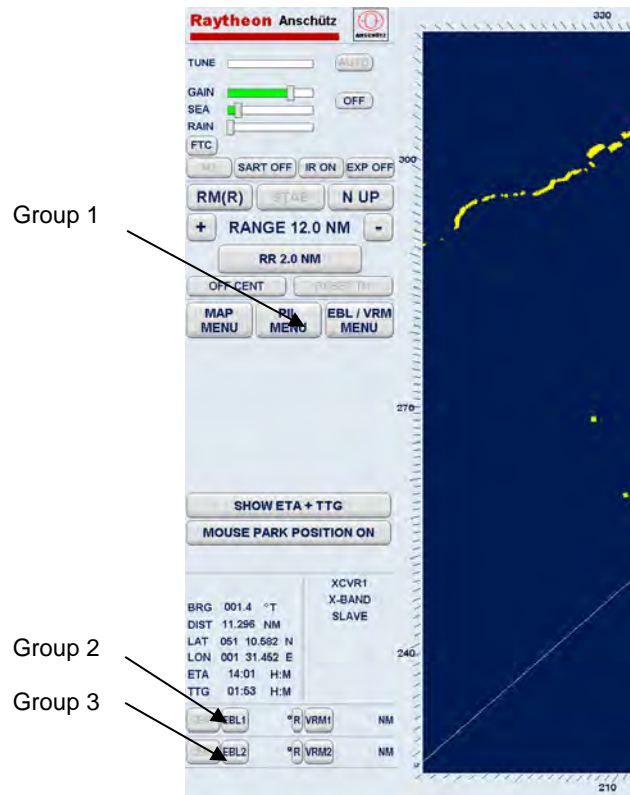
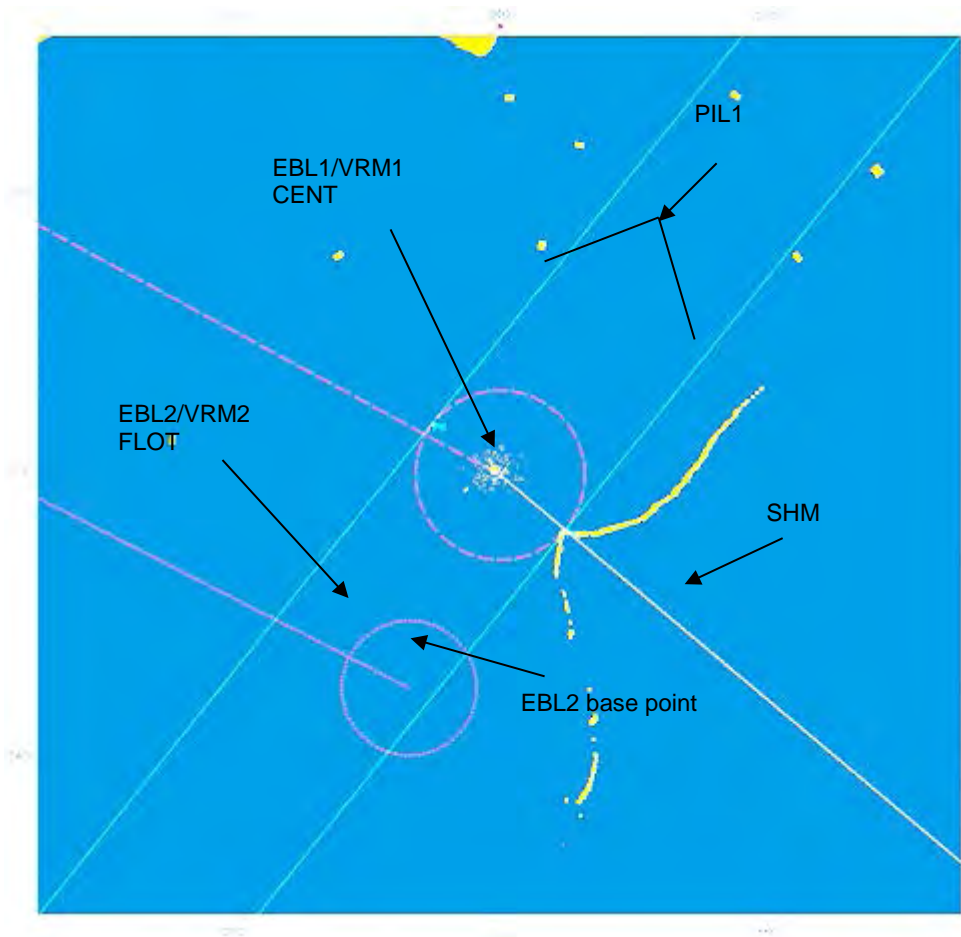Figure 2-30    Navigational Elements EBL, VRM and PIL

Figure 2-31    Radar video 2 EBL, 2 VRM and PIL navigational elements

### 2.3.4.1 Select Map Menu

The MAPS function allows the operator to create and store maps.

MAPS are normally produced for the Radar video in use. For example, they can be saved under the name of a sea area which corresponds to the Radar video in use. If the ship enters this sea area again, the associated map can be loaded.

A map is formed by adding true mark symbols, navigational lines, route lines and index lines to the PPI at points selected by the operator or at areas of interest. The symbols can be used to mark navigation channels, safety zones, buoys or other points of interest.

| | |
|---|---|
| **i** | Valid position information is required to create maps. Position information is transferred from a position receiver (e.g. GPS) to the Radar as of data telegram. The MAP MENU cannot be called up without valid position information. |

A map can be made up of any combination of 100 TRUE MARKS, 250 NAV/ROUTE LINES and 50 INDEX LINES.

When a map is created, it is placed in temporary storage. It can then be saved in permanent storage. Each map can be assigned with a label made up of 8 alpha numeric characters.

| Operator controls | Task |
|---|---|
| MAP MENU / PIL MENU / EBL / VRM MENU | After pressing the soft button the MAIN MAP MENU appears in the functions display. |
| MAP MENU — EDIT, CONTROL, EXCHANGE, SAVE, DELETE, LOAD — MAP DETAILS: MAP:  USED POINTS  TRUE MARKS 0 of 100  NAV/ROUTE LINES 0 of 250  INDEX LINES 0 of 50  EXIT | After pressing the soft button the MAP MENU appears in the functions display. The MAP DETAILS gives an overview about the workload. |

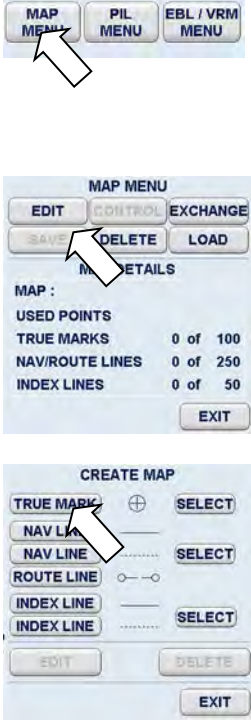**2.3.4.1.(1) Map Menu - EDIT -**

**(1) CREATE MAP, TRUE MARK**

**TRUE MARK**

True marks may be used to identify targets or points of interest. This function is available in the RM (..), TM, N UP or C UP modes.

Once entered into the system, a true mark is treated as stationary object, being true motion stabilized and fixed to the Radar map.

| Operator controls | Task |
|---|---|
|  | Place a TRUE MARK on a desired target. |
|  | *Step 1* Select the MAP MENU soft button the menu appears in the functions display. |
|  | *Step 2* Select the CREATE MAP soft button the menu appears in the functions display. |
|  | *Step 3* Select the TRUE MARK function. |
|  | *Step 4* Position the cursor over the desired target and press the **left** trackball button. |

| Operator controls | Task |
|---|---|
| **CREATE MAP**<br>TRUE MARK ⊕ SELECT<br>NAV LINE ──<br>NAV LINE ⋯⋯ SELECT<br>ROUTE LINE ○──○<br>INDEX LINE ── SELECT<br>INDEX LINE ⋯⋯<br>EDIT    DELETE<br>EXIT<br><br>**EDIT TRUE MARK**<br><br>LAT   N 56° 44.740'<br>LON   E 003° 06.391'<br><br>EXIT | Editing a TRUE MARK<br><br>*Step 1* Select the SELECT soft button for TRUE MARK.<br><br>*Step 2* Select TRUE MARK symbol on the PPI using trackball and   press **right** trackball button. The color of the symbol changes to ORANGE.<br><br>*Step 3* Select the EDIT soft button. The cursor jumpes to the TRUE MARK symbol. The EDIT TRUE MARK dialog window appears in the function display.<br><br>*Step 4* The MARK can now be repositioned using the trackball. Pressing the **left** button drops the MARK. |

| Operator controls | Task |
|---|---|
| **CREATE MAP**<br>TRUE MARK ⊕ SELECT<br>NAV LINE ──<br>NAV LINE ⋯⋯ SELECT<br>ROUTE LINE ○──○<br>INDEX LINE ── SELECT<br>INDEX LINE ⋯⋯<br>EDIT MARK    DELETE<br>EXIT | Deleting a TRUE MARK<br><br>*Step 1* Select the SELECT soft button for TRUE MARK.<br><br>*Step 2* Select TRUE MARK symbol on the PPI using trackball and press **right** trackball button. The color of the symbol changes to ORANGE.<br><br>*Step 3* Select the DELETE soft button. The TRUE MARK is deleted immediately. |

### (2) CREATE MAP, NAV LINE (ROUTE LINE)

**NAV LINE and ROUTE LINE**

Navigation and route lines can be displayed on the PPI.

The navigation lines can be plotted on the PPI as polygons in solid and /or dotted line form.

The route lines can be plotted on the PPI using the polygon in the same way as navigation lines. The route polygon is marked with typical route points between the polygon lines. The polygon lines will be drawn in broken line form.

The coordinates (LAT/LON) of the polygon connecting points can be shown on the display (EDIT NAV LINE) using the cursor.

| | |
|---|---|
| **i** | Navigation lines and route lines are stored as latitude and longitude values of the connecting points. Ensure that correct positioning information is available before creating a new map. |

**Cursor returns to park position.**

If using the cursor is interrupted for a longer period the cursor is returned to park position.
The NAV LINE operation is canceled. The previous NAV LINE remains on the PPI but switches to SET status (connecting points are not displayed). If the NAV LINE is to be extended or changed, this can be done immediately by selecting it again or by using the EDIT function.

| Operator controls | Task |
|---|---|
| CREATE MAP<br>TRUE MARK ⊕ SELECT<br>NAV LINE ——<br>NAV LINE ····· SELECT<br>ROUTE LINE —○<br>INDEX LINE ——<br>INDEX LINE ····· SELECT<br>EDIT MARK DELETE<br>EXIT | Creating a NAV LINE (ROUTE LINE) overlay.<br><br>*Step 1* Select the NAV LINE soft button (e.g. solid lines).<br><br>*Step 2* Position the cursor and press the **left** trackball button for the start drawing of the 1st line. Position the cursor at the next point and press the **left** trackball button again. Repeat this action until the complete NAV LINE is shown on the PPI.<br>Pressing the **right** trackball button completes drawing of the NAV LINE. |

| Operator controls | Task |
|---|---|
| CREATE MAP<br>TRUE MARK ⊕ SELECT<br>NAV LINE ——<br>NAV LINE ····· SELECT<br>ROUTE LINE ○—○<br>INDEX LINE ——<br>INDEX LINE ····· SELECT<br>EDIT MARK DELETE<br>EXIT<br><br>EDIT NAV LINE<br>LAT N 56° 46.485'<br>LON E 003° 10.019'<br>ADD POINT<br>EXIT | Editing a NAV LINE (ROUTE LINE) overlay.<br><br>Editing a NAV LINE allows you to change existing navigation lines. Either individual polygon points or the entire MAP can be repositioned.<br><br>*Step 1* Select the SELECT soft button for NAV LINE.<br><br>*Step 2* Select NAV LINE overlay using trackball and press **right** trackball button. The NAV LINE display changes and all connecting points are shown. The EDIT function is activated.<br><br>*Step 3* Select the EDIT MARKER soft button The EDIT NAV LINE dialog window appears in the function display.<br><br>*Step 4* In this status, there are three editing options possible:<br><br>A　Change the bearing of the NAV LINE by moving one of the points. Select the point of interest using the trackball and press the **right** trackball button. The current cursor position is shown in the EDIT NAV LINE display. Determine marker position and drop by pressing the **left** trackball button.<br><br>B　Move NAV LINE or entire MAP in Radar video. Position the cursor on a line in the MAP and press the |

| Operator controls | Task |
|---|---|
| | **right** trackball button. This position is shown in the EDIT NAV LINE display. The entire MAP can now be moved as required. Pressing the **left** trackball button drops the MAP on the PPI.<br><br>C      ADD POINT<br><br>After pressing the ADD POINT soft button.<br>Position the cursor on a line in the MAP and press the **right** trackball button. This position is shown in the EDIT NAV LINE display. Determine marker position and drop by pressing the **left** trackball button. |

| Operator controls | Task |
|---|---|
| CREATE MAP<br>TRUE MARK   ⊕   SELECT<br>NAV LINE<br>NAV LINE   SELECT<br>ROUTE LINE<br>INDEX LINE<br>INDEX LINE   SELECT<br>EDIT MARK   DELETE<br>EXIT | Deleting a NAV LINE (ROUTE LINE) overlay.<br><br><br>*Step 1* Select the SELECT soft button for NAV LINE.<br><br>*Step 2* Select NAV LINE overlay using trackball and press right trackball button. The NAV LINE display changes and all points are shown. The EDIT function is activated.<br><br>*Step 3* Select the DELETE soft button. The NAV LINE is deleted immediately. |

**(3) CREATE MAP, INDEX LINE**

**INDEX LINE**
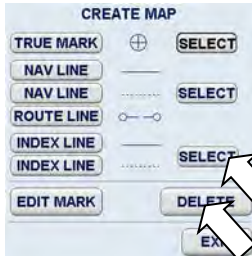
Map index lines are shown as relative lines on the PPI. Using a paper chart they are planned before passing obstacles to maintain stand- off range. They also used to prepare wheel-over points.

The index lines can be plotted on the Radar video using two points. Index lines can either be shown as continuous or dotted.

The coordinates of the index lines are ship- specific (relative) and are shown in (˚ ) for the bearing and in (NM) for the distance in the EDIT INDEX LINE display.

| Operator controls | Task |
|---|---|
|  | **Creating an INDEX LINE overlay.**<br><br>*Step 1* Select the INDEX LINE soft button (e.g. continuous lines).<br><br>*Step 2* Position the cursor and press the **left** trackball button for the 1st point on the index line. Position the 2nd point on the index line. |

| Operator controls | Task |
|---|---|
| CREATE MAP<br><br>TRUE MARK ⊕ SELECT<br>NAV LINE ——<br>NAV LINE ·········· SELECT<br>ROUTE LINE ○——○<br>INDEX LINE ——<br>INDEX LINE ·········· SELECT<br>EDIT MARK DELET<br>EXIT<br><br><br>EDIT INDEX LINE<br><br>BEARING 331.5 °<br><br>DISTANCE 1.5 NM<br><br>EXIT | **Editing an INDEX LINE overlay.**<br><br>The index lines can be edited by shifting their index points.<br><br>*Step 1* Select the SELECT soft button for INDEX LINE.<br><br>*Step 2* Select INDEX LINE overlay using trackball and press **right** trackball button. The INDEX LINE display changes and both points are shown. The EDIT function is activated.<br><br>*Step 3* Select the EDIT MARKER soft button The EDIT INDEX LINE dialog window appears in the function display.<br><br>*Step 4* Select the point of interest using the trackball and press the **right** trackball button. The current position is shown in the EDIT INDEX LINE (bearing and distance) display. Determine the new position and drop by pressing the **left** trackball button. |

| Operator controls | Task |
|---|---|
| CREATE MAP<br><br>TRUE MARK ⊕ SELECT<br>NAV LINE ——<br>NAV LINE ·········· SELECT<br>ROUTE LINE ○——○<br>INDEX LINE ——<br>INDEX LINE ·········· SELECT<br>EDIT MARK DELETE<br>EX | **Deleting an INDEX LINE overlay.**<br><br><br>Step 1 Select the SELECT soft button for INDEX LINE.<br><br>Step 2 Select INDEX LINE overlay using trackball and press **right** trackball button. The INDEX LINE display changes and all points are shown. The EDIT function is activated.<br><br>Step 3 Select the DELETE soft button. The INDEX LINE is deleted immediately. |

**2.3.4.1.(2)    Map Menu – Control –**

**CONTROL**

The control menu allows the operator to correct the placement of a MAP.
This function can be used to realign NAV LINES, TRUE MARKS and INDEX
LINES on the PPI.

| | |
|---|---|
| **i** | A position offset between a MAP and the current Radar video can have various causes (position, gyro, map date). <br><br> The MAP MENU function CONTROL is only activated when a MAP is loaded (chapter 2.3.4.1.(6)). |

| Operator controls | Task |
|---|---|
| MAP MENU / PIL MENU / EBL / VRM MENU <br><br> MAP MENU <br> EDIT  CONTROL  EXCHANGE <br> SAVE  DELETE  LOAD <br> MAP DETAIL <br> MAP : 007  (Mod) <br> USED POINTS <br> TRUE MARKS  3 of 100 <br> NAV/ROUTE LINES  17 of 250 <br> INDEX LINES  2 of 50 <br> EXIT <br><br> CONTROL MAP <br> ADJUST  RADAR FIX <br>  N 00° 00.000' <br> CANCEL  E 000° 00.000' <br> SHOW TRUE MARKS <br> SHOW NAV LINES <br> SHOW ROUTE LINES <br> SHOW INDEX LINES <br> ERASE DISPLAYED MAP  EXIT <br><br> ADJUST MAP <br> RADAR FIX  Δ N 00° 00.000' <br>  Δ E 000° 00.000' <br> MOVE ALL TRUE PTS <br> MOVE ALL INDEX PTS <br> ROTATE INDEX PTS <br> EXIT | *Step 1* Select the MAP MENU soft button. <br><br> *Step 2* Select the CONTROL soft button. <br><br> *Step 3* Select the ADJUST soft button. Depending on the composition of the MAPs (TRUE points or INDEX points or both) the individual operations are activated. <br><br> MOVE ALL TRUE Points <br><br> Allows a new positioning of TRUE MARKERS and TRUE LINES. Pressing the soft button, the Cursor is positioned at the PPI- center. The MAP is displayed at its current geographical position. If the MAP is not visible, the range has to be adjusted accordingly. The MAP can now freely be moved on the Radar Video by means of the cursor and adjusted related to reference points or lines (such as buoys or coastlines). Pressing the **left** trackball button, the MAP is placed on the Radar Video. <br><br> The new position is indicated as RADAR FIX coordinate ΔLATITUDE and ΔLONGITUDE on the CONTROL MAP display. Simultaneously, the alarm message FIX ACTIVE: MAP LAT/LON is displayed at the window for ALARM MESSAGES Pressing the CANCEL FIX soft button shows the original position of the MAP on the Radar video. |

| Operator controls | Task |
|---|---|
| **ADJUST MAP**<br><br>RADAR FIX  △ N 00° 00.000'<br>　　　　　　△ E 000° 00.000'<br><br>MOVE ALL TRUE PTS<br>MOVE ALL INDEX PTS<br>ROTATE INDEX PTS<br><br>EXIT | MOVE ALL INDEX Points (relative)<br><br>Allows realignment of INDEX LINES, if the passage plan has to be changed. On pressing the soft buttons, the cursor is positioned into the PPI- center, the MAP shows up on the PPI. Now the MAP can be freely moved on the Radar Video. The current distance is indicated on the ADJUST MAP display. Pressing the **left** trackball button, the MAP is fixed at the new position on the PPI.<br><br>ROTATE INDEX Points (relative)<br><br>Allows realignment of the INDEX LINES. As Index Lines are stabilized in azimuth but are fixed to own ship in range.<br><br>Pressing the soft buttons, the MAP can be rotated/turned in any direction.<br><br>Pressing the **left** trackball button, the MAP is fixed on the intended position on the PPI. |
| **CONTROL MAP**<br><br>ADJUST　　RADAR FIX<br>CANCEL FIX  △ N 00° 00.000'<br>　　　　　　△ E 000° 00.000'<br><br>SHOW TRUE MARKER<br>SHOW NAV LINES<br>SHOW ROUTE LINES<br>SHOW INDEX LINES<br><br>ERASE DISPLAYED MAP　EXIT | *Step 1* TRUE MARKERS, NAV LINES or INDEX LINES can be shown or hidden as required.<br><br>*Step 2* The current MAP is hidden on the Radar video. |

The RADAR FIX effect:

If a MAP has been created and does not fit the current Radar video a RADAR FIX can be applied.

If a saved MAP does not fit the Radar video one or more of the following causes may apply:

a) The TRUE MAP was created using points or lat/long information from a paper chart not in WGS 84 datum.

b) The TRUE or INDEX MAP was created "live" from a Radar image on a previous voyage while the gyro was faulty.

c) The TRUE or INDEX MAP was created "live" from a Radar image using different gyros (for ships equipped with two gyros).

d) The gyro currently in use is faulty and requires service.

e) The position sensor is faulty.

| | |
|---|---|
| **i** | Before using RADAR FIX, check the position sensor and gyro data. Radar fix can only be of temporary assistance (particularly in case). |

### 2.3.4.1.(3)   Map Menu – EXCHANGE –

**EXCHANGE**

This function allows MAPs created on the Radar to be imported and exported. A USB stick can be used as a portable storage medium.

The USB port is located at the front of the Remote Panel or of the Console.

| Operator controls | Task |
|---|---|
| MAP MENU   PIL MENU   EBL / VRM MENU | *Step 1* Select the MAP MENU soft button the menu appears in the functions display. |
| MAP MENU  EDIT  CONTROL  EXCHANGE  SAVE  DELETE  L...  MAP DETAILS  MAP : 007  (Mod)  USED POINTS  TRUE MARKS  3 of  100  NAV/ROUTE LINES  17 of  250  INDEX LINES  2 of  50  EXIT | *Step 2* Select the EXCHANGE MAPS soft button the menu appears in the functions display.  *Step 3* Insert the USB stick into USB port. |
| EXCHANGE MAPS  DEVICE:F: (Removable Media)  MAPS ON SYSTEM  0  MAPS ON DEVICE  0  REFRESH  EJECT DEVICE  EXPORT  ...PORT  EXIT | *Step 4* Press the REFRESH soft button; the processor automatically  detects the USB stick.  *Step 5* Select the intended operation.  EXPORT – All MAPs retained in the Radar MAP memory are transferred onto the USB stick.  IMPORT – All MAPs stored on the USB stick are transferred to the Radar memory.  *Step 6* Press the EJECT DEVICE soft button; the processor automatically completes the operation. |

| | |
|---|---|
| **i** | To prevent possible data loss, ensure that the EJECT DEVICE soft button is pressed before removing the USB stick! |

## 2.3.4.1.(4)    Map Menu – SAVE -

**SAVE**

MAPS are created in the current PPI and can then be saved, for example under the name of the sea area.

MAPS are saved based on the fixed LATITUDE and LONGITUDE coordinates.

| Operator controls | Task |
|---|---|
| | *Step 1* Select the MAP MENU soft button the menu appears in the functions display. |
| | *Step 2* Select the SAVE MAP soft button the menu appears in the functions display. |
| | *Step 3* Enter a MAP name using the cursor and the soft button keyboard (maximal 8 characters).<br><br>Pressing the SAVE soft button completes the operation.<br><br>To check if the procedure has been carried out correctly, call up the MAP MENU - LOAD - (chapter 2.3.4.1.(6)). The name of the saved MAP appears when you press button LOCAL MAP in the MAP MENU – LOAD – or – DELETE – . |

**2.3.4.1.(5)    Map Menu – DELETE –**

**DELETE**
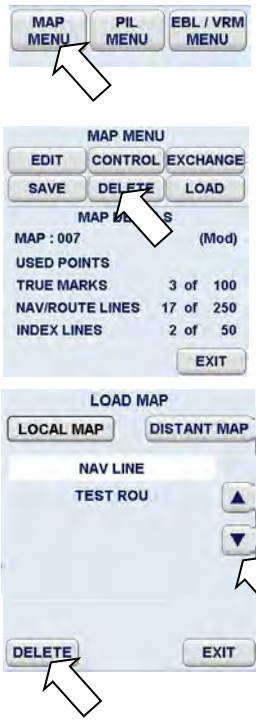
Delete allows the operator to delete MAPS, which can be LOCAL or DISTANT MAPS see also chapter 2.3.4.1.(6).

LOCAL MAP

Local MAPS are MAPS whose saved coordinates match the current sea area.

DISTANT MAP

Distant MAPS are MAPS created for a different sea area.

| Operator controls | Task |
|---|---|
|  | *Step 1* Select the MAP MENU soft button the main appears in the functions display. |
| | *Step 2* Select the soft button DELETE MAP the menu appears in the functions display. |
| | *Step 3* Select the MAP of interest. A toggle field allows the operator to scroll through the list. |
| | The first name in the list reflects the desired MAP name. |
| | This MAP will be deleted after the operator acknowledged the last system question with YES. |

### 2.3.4.1.(6)   Map Menu – LOAD –

**LOAD**

LOAD allows the operator to load a saved MAP. The Radar system uses the saved LATITUDE / LONGITUDE coordinates to identify the correlation between the MAP and the sea area currently displayed on the PPI.
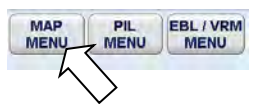
This function supports two MAP categories.

LOCAL MAP

Local MAPS are MAPS whose saved coordinates match the current sea area.

DISTANT MAP

Distant MAPS are MAPS created for a different sea area.
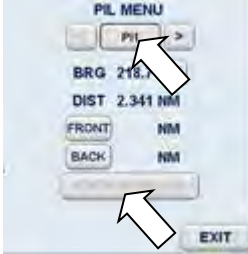
| Operator controls | Task |
|---|---|
| MAP MENU / PIL MENU / EBL / VRM MENU | *Step 1* Select the MAP MENU soft button the menu appears in the functions display. |
| MAP MENU — EDIT CONTROL EXCHANGE SAVE DELETE LOAD — MAP DETAILS — MAP : 007 (Mod) — USED POINTS — TRUE MARKS 3 of 100 — NAV/ROUTE LINES 17 of 250 — INDEX LINES 2 of 50 — EXIT | *Step 2* Select the LOAD MAP soft button the menu appears in the functions display.

*Step 3* Select LOCAL MAP or DISTANT MAP. |
| LOAD MAP — LOCAL MAP DISTANT MAP — NAME — TEST ROU ▲ ▼ — LOAD EXIT | *Step 4* Select the MAP of interest. A toggle field allows the operator to scroll through the list. The first name in the list reflects the desired MAP name.

*Step 5* Pressing the LOAD soft button the MAP shows up on the PPI. If necessary, select another range scale to find the LOCAL MAP on the PPI. Possible corrections can be made using the MAP MENU function CONTROL (chapter 2.3.4.1.(2)). |

### 2.3.4.2    Parallel Index Line PIL

| | |
|---|---|
| **i** | The PIL function depends on the heading signal. No heading signal means no results in PIL function. |

Parallel index lines PIL are used to mark the limits of areas or channels. These lines can be used to observe the advancing along an intended course.

| Operator controls | Task |
|---|---|
| MAP MENU   PIL MENU   EBL / VRM MENU | *Step 1* Select the PIL MENU soft button the menu appears in the functions display.<br><br>*Step 2* Select the SWITCH PIL soft button the menu appears in the functions display.<br><br>Within the PIL selection it is possible to create up to 10 parallel index lines on the PPI. The PILs are labeled with the corresponding number. Before creating a parallel index line the operator can determine the stabilization type via soft button (NORTH STABILIZED or OWNSHIP STABILIZED). |
| **MAIN PIL MENU**<br>SWITCH PIL<br>SHOW ALL PIL<br>RESET ALL PIL<br>DELETE ALL PIL<br>EXIT | |
| **PIL MENU**<br>PIL<br>BRG 218.?<br>DIST 2.341 NM<br>FRONT   NM<br>BACK   NM<br>EXIT | *Step 3* Select the stabilization type.<br><br>*Step 4* Create a parallel index line by pressing PI1 soft button (see Figure 2-32).<br><br>The PIL bearing can be switched to relative bearing value or true bearing. |
| BRG 305.0 ° R<br>DIST 0.981 NM | The current distance (DST) and bearing (BRG) are adjustable by the slider function. |

| Operator controls | Task |
|---|---|
| FRONT 1.232 NM<br>BACK NM | Parallel index lines can be clipped individually at their front and back ends. After pressing the soft key (e.g. FRONT) the index line is automatically reduced to 1.000NM (default).<br>This value is adjustable by the slider function. |
| MAIN PIL MENU<br><br>SWITCH PIL<br>SHOW ALL PIL<br>RESET ALL PIL<br>DELETE ALL PIL<br><br>EXIT | SHOW ALL PIL<br>  Displays all PILs on the PPI.<br><br>RESET ALL PIL<br>  All PILs aligned to the ships heading marker (SHM) direction.<br><br>DELETE ALL PIL<br>  Deletes all PILs. |
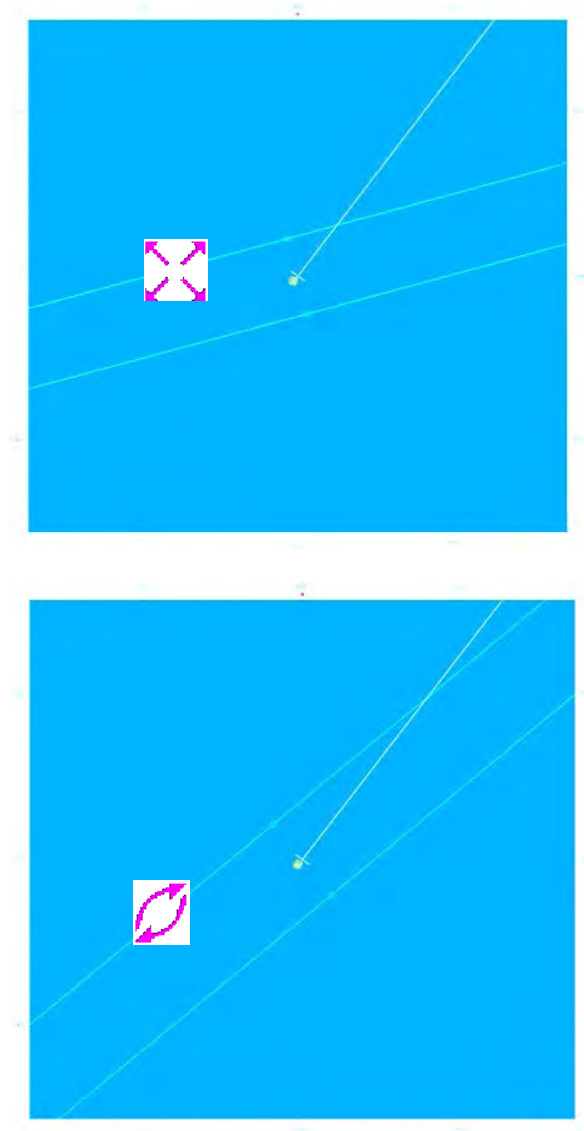
After pressing the PI1 button a parallel index line (1) appears.

Using the trackball the individual distance to your own ship can be assigned.

Press the **left** trackball button.



Using the trackball the individual bearing to your own ship can be assigned.

Press the **left** trackball button.
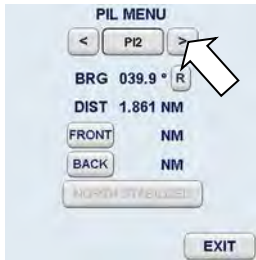
The parallel index line is finished.

Figure 2-32    Creating a parallel index line

**2.3.4.3      Deactivating the Parallel Index Line (PIL)**
The parallel index lines can be deactivated via the PIL MENU or via the
FUNCTION button SYSTEM CLEAR (chapter 2.7.6).

Via the PIL MENU.

| Operator controls | Task |
|---|---|
|  | *Step 1* Select the PIL of interest by pressing the left or right arrow button (e.g. PI2).<br><br>*Step 2* Pressing the PI2 button the parallel index line labeled with no. 2 will be deleted. In this case it is possible to create a new parallel index line labeled with no. 2. |

**2.3.4.4** **EBL/VRM Menu**

In the EBL/VRM menu the navigator has the possibility to create up to four EBL/VRM graphics on the PPI. Before using the EBL/VRM the base point and the alignment can be switched to POSITION FIXED, OWNSHIP FIXED or NORTH STABILIZED.

In this case the EBL/VRM menu displays more nautical information in between the EBL/VRM graphics.

| Operator controls | Task |
|---|---|
| MAP MENU   PIL MENU   EBL / VRM MENU<br><br>EBL /VRM MENU<br>EBL1/VRM1   EBL2/VRM2<br>BASE POINT<br>POSITION FIXED   POSITION FIXED<br>ALIGNMENT<br>OWNSHIP ST   OWNSHIP STAB<br>BRG: ===.=  °   BRG: ===.=  °<br>DIST: ===.= NM   DIST: ===.= NM<br>LAT:  == ==.===   LAT:  == ==.===<br>LON:  === ==.===   LON:  === ==.===<br>MORE  /VRM   EXIT | *Step 1* Select the EBL/VRM MENU soft button the menu appears in the functions display.<br><br>*Step 2* Select the Base Point fixed position fixed for EBL1/VRM1 and EBL2/VRM2.<br><br>*Step 3* Select the stabilization mode for EBL1/VRM1 and EBL2/VRM2.<br><br>Displays the nautical information about the EBL1/VRM1 and EBL2/VRM2 situation.<br><br>*Step 4* More EBL/VRM allows to create more bearing lines and range markers EBL3/VRM3 and EBL4/VRM4 (chapter 2.3.4.5). |

### 2.3.4.5    Enabling EBL/VRM FLOAT Using Cursor

Starting from your own position, the EBL is placed on a desired target, using the cursor. The current coordinates can be displayed numerically to the right of the toggle **field (˚)**.

In this case the EBL/VRM 1 and 2 comes up with the default navigators settings (factory settings for ALIGNMENT are NORTH STABILIZED and for BASE POINT POSITION FIXED). It is possible to change these factory settings via service tool for ALIGNMENT to OWNSHIP STABILIZED and for BASE POINT to OWNSHIP FIXED.

In the EBL/VRM menu the navigator opportunities for EBL/VRM 3 and 4 can be switched over between POSITION FIXED and OWNSHIP FIXED (BASE POINT), OWNSHIP STABILIZED and NORTH STABILIZED (ALIGNMENT). These settings have to be done before editing EBL/VRM 3 and 4.

The numerical display is normally displaying as true information when the GYRO sensor is available. If the GYRO sensor is not available the numerical display changes automatically to relative information.
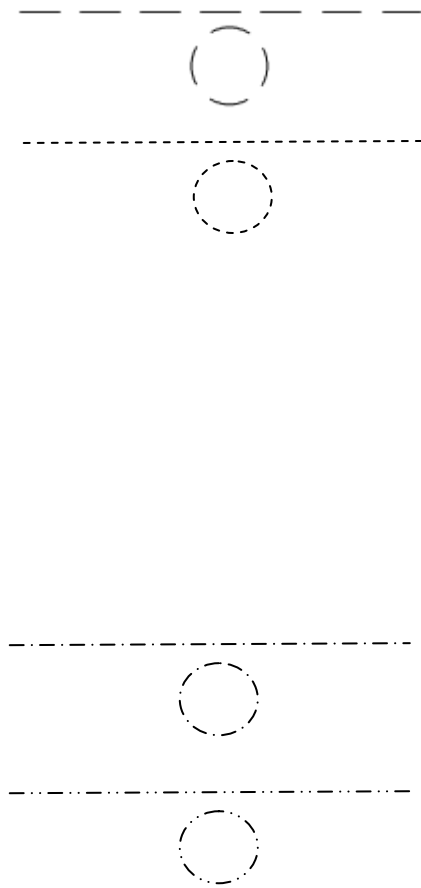
T(rue)          shows the numerical bearing value to the target as a true value(in relation to geographic north).

R(elative)      shows the numerical bearing to the target as a relative value (relative to ship heading).

The variable range marker VRM is used to mark a particular range circle. The center can be your own position or the EBL1 root point, for example. The current radius is displayed to the right of the toggle field (NM).

Electronic bearing lines EBL and variable range markers VRM can be used jointly as a group.

Identification of the EBL and VRM representation.

| Operator controls | Task |
|---|---|
| CENT EBL1 °R VRM1 NM<br>CENT EBL2 °R VRM2 NM<br><br>MAP MENU · PIL MENU · EBL / VRM MENU<br><br>**EBL /VRM MENU**<br>EBL1/VRM1 · EBL2/VRM2<br>BASE POINT<br>POSITION FIXED · POSITION FIXED<br>ALIGNMENT<br>OWNSHIP STAB · OWNSHIP STAB<br>BRG: ===.= ° · BRG: ===.= °<br>DIST: ===.= NM · DIST: ===.= NM<br>LAT: == ==.=== · LAT: == ==.===<br>LON: === ==.=== · LON: === ==.===<br>MORE EBL/VRM · EXIT<br><br>**EBL / VRM MENU**<br>POSITION FIXED · POSITION FIXED<br>OWNSHIP STAB · OWNSHIP STAB<br>FLOAT R · FLOAT R<br>EBL3 328.0 ° · EBL4 271.9 °<br>VRM3 NM · VRM4 NM<br>BRG: 205.0 ° · BRG: 203.0 °<br>DIST: 000.4 NM · DIST: 000.2 NM<br>LAT: N 75° 49.089' · LAT: N 75° 49.265'<br>LON: E 080° 47.822' · LON: E 080° 48.158'<br>EXIT | EBL1<br><br>VRM1<br><br>EBL2<br><br>VRM2<br><br><br><br><br><br>EBL3<br><br>VRM3<br><br><br>EBL4<br><br>VRM4 |

The dotted EBL is drawn from your own ship through the cursor symbol. Place the cursor on a selected target and press the **left** trackball button. The dotted VRM is extended from your own ship by moving the cursor symbol.

Use the cursor to move the bearing line and the range marker. Place the cursor on the EBL and VRM. Press the **right** trackball button to pick up and drag the EBL and VRM. Press the **left** trackball button to drop the EBL and VRM at the desired position. FLOAT allows the EBL1 base point and the VRM1 origin to be moved anywhere within the PPI as an EBL/VRM combination.

| ℹ | If the floating function is canceled, the point of origin of the EBL/VRM is reset to the image center! |
|---|---|

**2.3.4.6** **Editing EBL and VRM**

The EBL and/or VRM can be placed and changed using the cursor or the Operator Panel.

When using the Operator Panel, you are restricted to the EBL1 and VRM1 group. The Radar provides 3 options for editing the EBL/VRM.

In the EBL/VRM menu the navigator options for EBL/VRM can be switched over for the BASE POINT between POSITION FIXED and OWNSHIP FIXED, for the ALIGNMENT between OWNSHIP STABILIZED and NORTH STABILIZED.

These settings have to be done before editing EBL/VRM.

| Operator controls | Task |
|---|---|
| FLOAT EBL1 293.6 °R VRM1 0.926 NM<br>FLOAT 290.6 °R VRM2 2.561 NM | **Cursor**<br><br>In this example, the EBL1 is shown, starting from the current position of the ship. Position the cursor on the desired target and press the right trackball button. This places EBL1.<br><br>Select the Offset toggle field (CENT/FLOAT) if EBL1 is to be moved parallel. Pressing the left trackball button moves EBL1 to the new position.<br><br>**Bearing with Cursor**<br><br>Place the cursor on EBL 1, press the right trackball button. Find the desired target and press the left trackball button (Figure 2-33). |

| Operator controls | Task |
|---|---|
| | **Bearing / distance and toggle field with slider**<br><br>Depending on the toggle field, the bearing (EBL) or the distance (VRM) can be edited by moving the slider (Figure 2-34).<br><br>**Bearing / distance with Operator Panel**<br><br>This alternative method of operation allows the EBL1/VRM1 function to be displayed or adjusted quickly. Pressing the toggle switch releases the rotary knobs for the operation.<br><br>Turn the knob slowly, the VRM/EBL changes/turns in 1° steps.<br>Turn the knob quickly, the VRM/EBL changes/turns in 10° steps.<br><br>The EBL and VRM status LEDs light up.<br><br>The EBL/VRM is always placed at your own position.<br><br>Parallel movement is not possible when using the Operator Panel. Adjust the EBL/VRM rotary knobs to change the bearing (EBL) or the variable range marker (VRM).<br><br>The variable range marker is directly linked to the range rings (RNG) and adapted accordingly on the display. |

**2.3.4.7    Deactivating EBL and VRM**

The EBL/VRM displays can be hidden by selecting the toggle field again.
Position the cursor on the desired toggle field.

Press the **left** trackball button.

**Rotating EBL**



**Editing EBL and VRM**

**FLOAT group moving**



Figure 2-33     Navigating with bearing lines and variable range markers
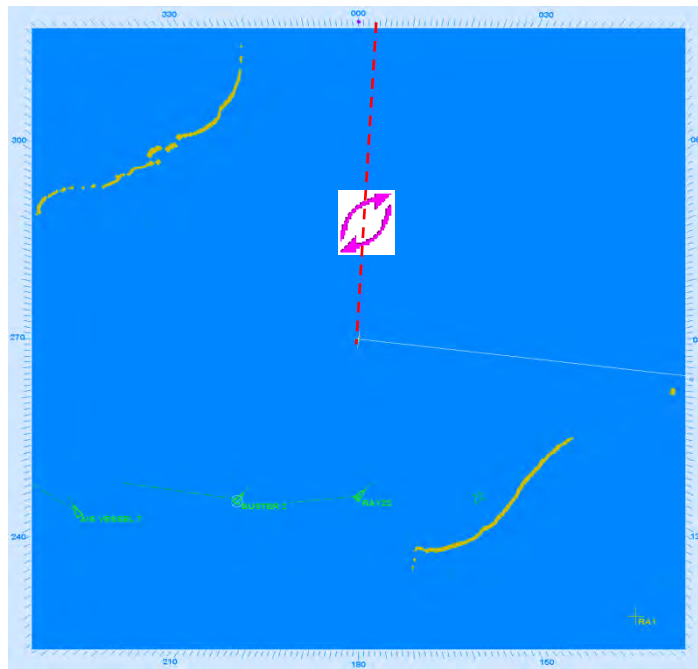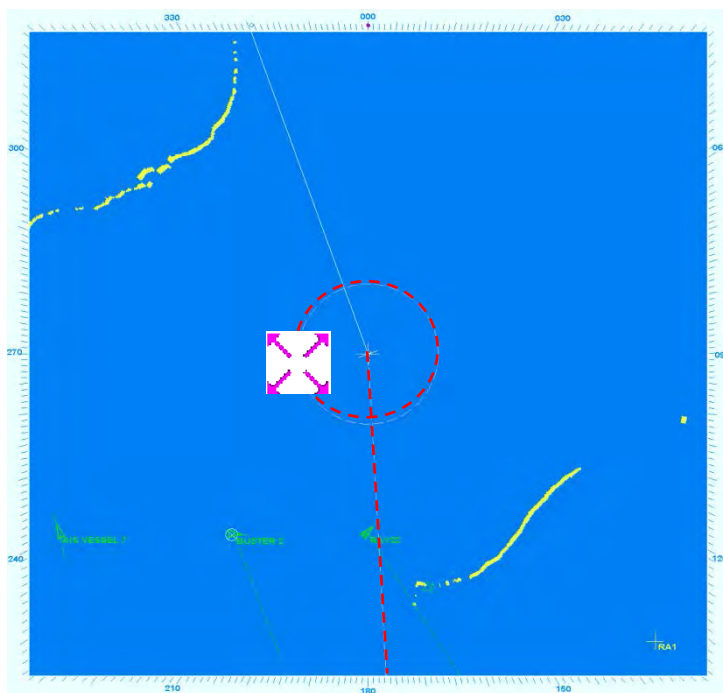
Example:
EBL/VRM 3 displayed OWNSHIP FIXED and NORTH STABILIZED FLOAT and **R** mode used.
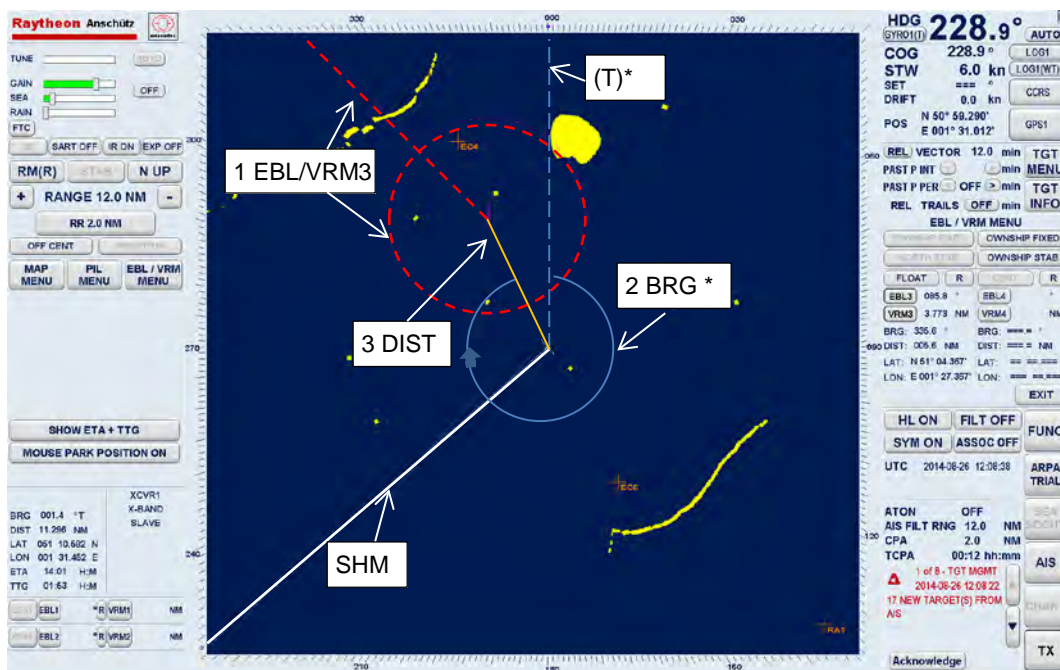


- Help Lines, only used for this example.



\*)
In normal situation the system is stabilized (with Heading) in this case the readout status for BRG is always **T**rue.
In disturbed situation the system is unstabilized (without Heading) in this case readout status for BRG is always **R**elative.
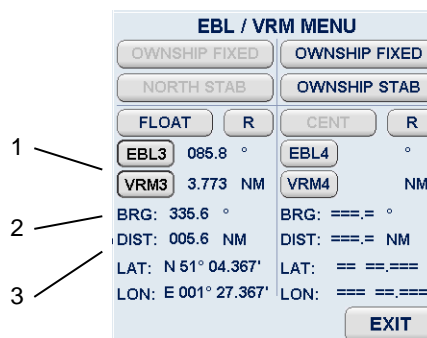
Figure 2-34    EBL3 / VRM3 Example with Information

### 2.3.5 Cursor Information

If the cursor is positioned within the PPI, the position data will be displayed in the cursor information area. This data contains the cursor position (CURS POS), bearing (BRG), distance (DST), estimated time of arrival (ETA) and time to go (TTG) measured relative to your own ship.

| Operator controls | Task |
|---|---|
| SHOW ETA + TTG<br><br>MOUSE PARK POSITION ON<br><br>XCVR2<br>X-BAND<br>MASTER<br><br>BRG 135.2 °T<br>DIST 3.545 NM<br>LAT 055 10.485 N<br>LON 011 54.631 E<br>ETA 00:36 H:M<br>TTG 00:35 H:M | **BRG ...**<br><br>Bearing from own ship to the cursor. The numerical display is normally displaying as true information when the GYRO sensor is available. If the GYRO sensor is not available the numerical display changes automatically to relative information.<br><br>**DST…**<br><br>Distance information from own position to the cursor position.<br><br>**LAT…**<br><br>Latitude cursor position.<br><br>**LON…**<br><br>Longitude cursor position.<br><br>If SHOW ETA + TTG is selected.<br><br>**ETA…**<br><br>Estimated time of arrival at cursor position if present speed is maintained.<br><br>**TTG…**<br><br>Time to go from your own ship's position to cursor position. |

### 2.3.6 Cursor in Park Position

In this case the operator has the option to fade out the cursor symbol after some time automatically or not.

| Operator controls | Task |
|---|---|
| SHOW ETA + TTG<br>MOUSE PARK POSITION ON<br><br>XCVR2<br>X-BAND<br>MASTER<br>BRG   135.2   °T<br>DIST   3.545   NM<br>LAT   055  10.485  N<br>LON   011  54.631  E<br>ETA   00:36   H:M<br>TTG   00:35   H:M | If the **MOUSE PARK POSITION ON** is selected the cursor will automatically move outside PPI when the cursor is idle for some time.<br><br>If the **MOUSE PARK POSITION OFF** is selected, the cursor doesn't move out the PPI. |

**Raytheon Anschütz**

### 2.3.7    Information Panel

The Info Panel is structured as follows.

Display of own ships data (chapter 2.3.7.1).

Sensor selection controlled by CCRS (chapter 2.3.7.1).

Display and selection of VECTOR data and HISTORY TRACK information (chapter 2.3.7.2).

Display submenus when using a SOFTBUTTON or a TOGGLE FIELD (chapter 2.3.7.4

Menu with soft button (chapter 0).

Radar Operator Panel (chapter 2.1.3).

FUNCTION / SERV MENU

UTC (chapter 2.3.7.3)

AIS options (chapter 2.5.4.1).

USER MENU

CPA TCPA (chapter 2.5.2.1).

EXIT RADAR

Display for ALARM MESSAGES (chapter 2.3.7.5).

TRANSCEIVER TX / STANDBY

Figure 2-35    Radar Information Panel

**2.3.7.1**     **Display of Own Ships Data**

The sensor characteristics will be checked and monitored by the Consistent Common Reference System CCRS.

**Consistent Common Reference System CCRS**

The CCRS is an instance running in the background and constantly determining the sensor quality and the sensor accuracy of the sensors (GYRO, GPS, LOG). In this case the Radar system gets the best sensor information to perform a safe target observation.

**CCRS uses reaction and a sensor problem**

If the sensor quality becomes reduced the CCRS switches over automatically to the available sensor with better quality.

**CCRS indications**

The soft button color (GYRO, GPS, LOG and CCRS) is an indication for the sensor performance. In this case the IEC 62288 distinguished into Version 1 or Version 2.

If the Radar Software is used for IEC 62288 Version 1 following soft button color displays the sensor performance:

> **BLACK** indicates the best sensor quality (depending on the selected color palette BLACK will be replaced by a better suited color).

> **ORANGE** indicates a moderate sensor quality.
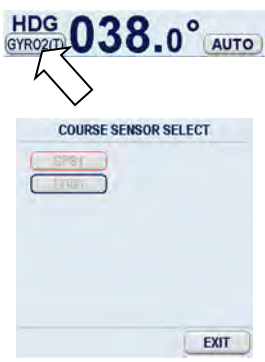
> **RED** indicates an invalid sensor.

If the Radar Software is used for IEC 62288 Version 2 following soft button color displays the sensor performance:

> **BLACK** indicates the best sensor quality (depending on the selected color palette BLACK will be replaced by a better suited color).

> **YELLOW** indicates a moderate sensor quality.

> **ORANGE** indicates an invalid sensor.

| Operator controls | Task |
|---|---|
| **HDG** GYRO2(T) **038.0°** AUTO | In AUTO mode the own ships data will be monitored by the Consistent Common Reference System (CCRS). The CCRS determines sensor quality and accuracy (GYRO, GPS, LOG and CCRS). The soft button color is a measure for sensor performance.<br><br>RED for invalid, ORANGE for doubtful, BLACK for good (corresponding to IEC 62288 edition 1) or ORANGE for invalid, YELLOW for doubtful, BLACK for good (corresponding to IEC 62288 edition 2).<br><br>Depending on the selected color palette BLACK will be replaced by a better suited color. |
| **HDG** GYRO2(T) **038.0°** MAN | In MANUAL mode the own ships sensors will be selected by the user not by the CCRS. |
| **HDG** GYRO2(T) **038.0°** AUTO<br><br>**COURSE SENSOR SELECT**<br>GPS1<br>GYRO2<br><br>EXIT | HEADING (HDG). The type of sensor in use is indicated on the selection button (e.g. GYRO2).<br><br>Select the GYRO2 soft button.<br><br>The Heading Sensor Select menu appears in the function display, showing the available heading sensors.<br><br>In MAN mode the sensor can be selected by the user. If no sensor is available a manual heading value can be used. |

| Operator controls | Task |
|---|---|
| <br>LOG1<br>LOG1(WT)<br>CCRS<br>GPS1 D<br><br>**COURSE SENSOR SELECT**<br>GPS1<br>LOG1<br><br><br><br>EXIT | Course (COG). The type of sensor being in use indicated on the button (e.g. LOG1).<br><br>Select the LOG1 soft button.<br><br>The Course Sensor Select menu appears in the function display, showing the available course sensors in this system. |

| Operator controls | Task |
|---|---|
| LOG1<br>LOG1(WT)<br>CCRS<br>GPS1 D | Speed (SPD). The type of sensor in use is indicated on the button (e.g. LOG1(WT)). (WT for Water Track, BT for Bottom Track).<br><br>*Step 1* Select the LOG1(WT) soft button.<br>The Speed Selection Menu appears in the function display. |
| SPEED SELECTION MENU<br><br>SOG    STW<br><br>SHOW HEAD BT    SHOW HEAD WT<br><br>EXIT | *Step 2* Press the SOG soft button.<br>The SOG Sensor Select menu appears in the function display, showing the available speed sensors in this system. Pressing the DISABLED soft button the stabilization mode changes to LOG1(WT) the indication changes to CTW and STW for sea stabilization.<br>In MAN mode the sensor can be selected by the user. If no sensor is available a manual SOG value can be entered.<br>To set MANUAL input, use the slider function inside the numerical field. |
| SOG SENSOR SELECT<br><br>GPS1    DISABLED<br>LOG1<br><br>6.0 kn<br>MANUAL<br><br>EXIT<br><br>CTW    271.0 °    LOG1(WT)<br>STW    10.0 kn | |
| STW SENSOR SELECT<br><br>LOG1    DISABLED<br>LOG<br><br>EXIT<br><br>COG    271.1 °    LOG1(BT)<br>SOG    10.0 kn | *Step 3* Select the STW soft button.<br>The STW Sensor Select window appears in the function display, showing the available speed sensors in this system. (The interfaced LOG sensor must be a DUAL AXIS LOG sensor, a single axis log cannot detected the effect leeway). Pressing the DISABLED soft button the stabilization mode changed to LOG1(BT) the indication changed to COG and SOG for ground stabilization.<br>In MAN mode the sensor can be selected by the user. If no sensor is available a manual STW value can be used.<br>To set MANUAL input, use the slider function inside the numeric indicator. |

| Operator controls | Task |
|---|---|
| | *Step 4* Select the SHOW HEAD WT or SHOW HEAD BT. The VELOCITY VECTOR and stabilization indicator can be used.<br><br>To SHOW or HIDE the own ship stabilization indicator select a soft button. The Water Track (WT) indicator is presented as a single arrowhead. The Bottom Track (BT) indicator is presented as a double arrowhead. |
| | CCRS (SET and DRIFT). These values are calculated by CCRS.<br><br>Press the CCRS soft button.<br>The Set/Drift Sensor Select window appears in the function display area. In MAN mode the values can be set by the user.<br>To set MANUAL input, use the slider function inside the numerical field.<br><br>SET indicates the drift angle in ˚.<br><br>DRIFT indicates the drift speed in kn. |
| | Position (POS). The type of sensor being used is indicated on the button (e.g. GPS1 D).<br><br>Press the GPS1 soft button.<br>The Position Sensor Select window appears in the function display area, showing the available position sensors in this system.<br><br>In MAN mode the sensor can be selected by the user. If no sensor is available a manual position value can be entered.<br><br>To set MANUAL input, use the slider function inside the numerical values and confirm with the SET button. |
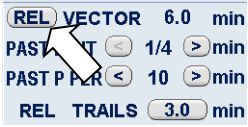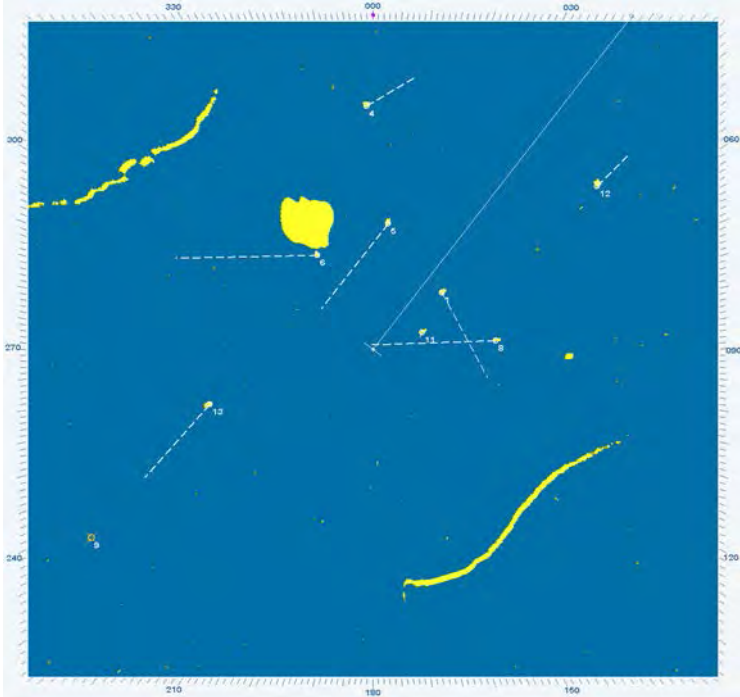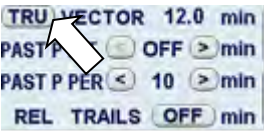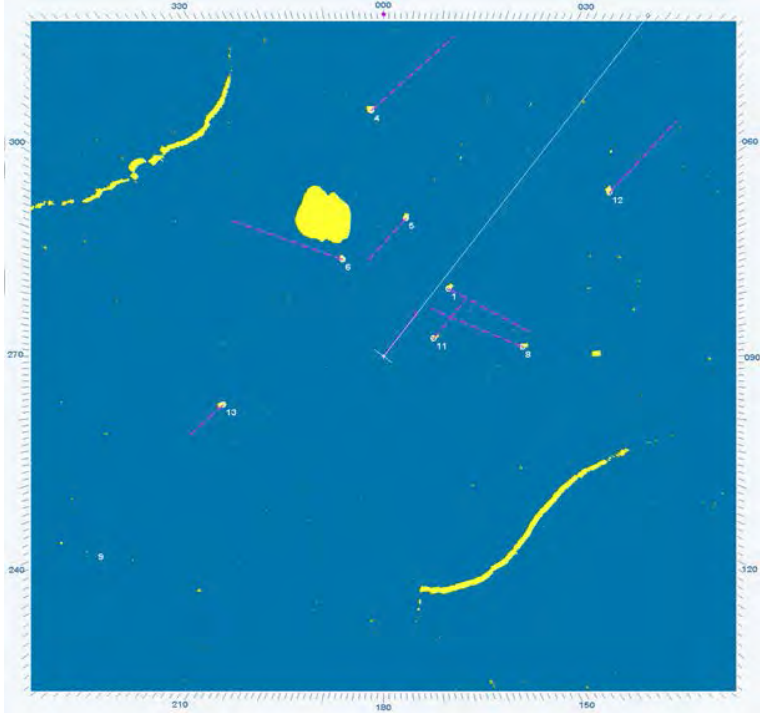
**2.3.7.2**     **Display and Selection of VECTOR and PAST POSITION Information**

This information area allows the operator to select TRUE or RELATIVE VECTORS. True vectors show true course and speed of the target and your own ship. Relative vectors show the target's relative motion compared to your own ship. Your own ship does not have a relative vector. The vector length displayed is determined by the selected time and indicates the distance to be travelled at a given speed.

First of all, the desired targets need to be acquired on the Radar video (chapter 2.5.3.1).

| Operator controls | Task |
|---|---|
| REL  VECTOR   6.0   min<br>PAST P INT  <  1/4  >  min<br>PAST P PER  <  10   min<br>REL   TRAILS   3.0   min | **VECTOR (REL or TRU)**<br><br>By selecting this function, you can define the vector time of the acquired targets, defined by indicating the target vector length derived from the target speed; this can be continuously adjusted between 0.0 and 30.0 min. |

| Operator controls | Task |
|---|---|
| REL VECTOR 6.0 min<br>PAST ... T ◁ 1/4 ▷ min<br>PAST P ... R ◁ 10 ▷ min<br>REL TRAILS 3.0 min  | Relative (REL) vectors show the motion of targets relative to your own ship. Extending the vectors allows you to clarify any anticipated risk of collision. Any stationary tracked target displays a vector opposite to your own ship's heading with a length equal to your own ship's speed.<br><br> |

| Operator controls | Task |
|---|---|
| TRU VECTOR 12.0 min<br>PAST P INT OFF min<br>PAST P PER 10 min<br>REL TRAILS OFF min | Absolute (TRU) vectors allow an overview of the overall traffic situation (ships and navigation marks). Extending the vectors allows you to clarify any anticipated risk of collision. Tracked targets which are not moving do not display a vector.<br><br> |
| REL VECTOR 6.0 min<br>PAST P INT OFF min<br>PAST P PER 10 min<br>TRUE TRAILS OFF min | **PAST POSITION**<br><br>In addition to their symbol, all acquired targets can be given a history track. With the PAST Position INTerval function switched ON, a past position point is set at the target symbol's position (Figure 2-36). The time interval between two past positions can be adjusted. |
| REL VECTOR 6.0 min<br>PAST P INT OFF min<br>PAST P PER 10 min<br>TRUE TRAILS OFF min | Possible PAST Position INTervals;<br><br>1/4min, 1/2min, 1min, 2min, 3min, 6min, 12min, 30min, 60min |

| Operator controls | Task |
|---|---|
| REL VECTOR 6.0 min<br>PAST P INT ◁ OFF ▷ min<br>PAST P PER ◁ 10 ▷ min<br>TRUE TRAILS OFF | The PAST Position PERiod time selection permits the observation time of the history track (length of the trail).<br><br>Possible PAST Position PERiods;<br><br>1/2min, 1min, 2min, 5min, 10min, 15min, 30min, 1hour, 2hours |

Past positions indicate the last completed manoeuvre of the acquired targets. It is possible to recognize between changes of course and changes of speed.
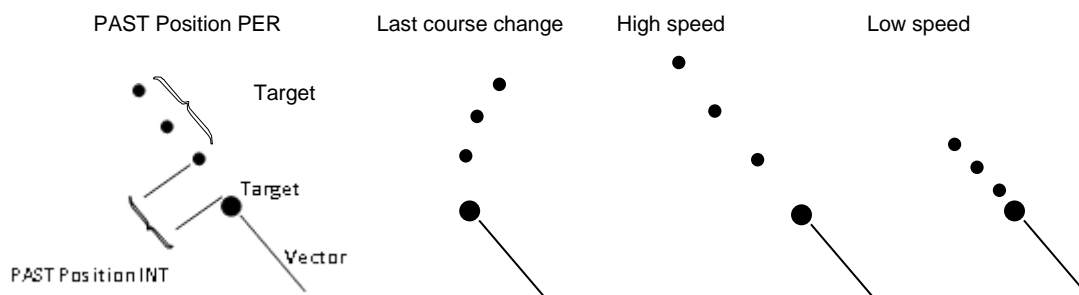


Figure 2-36    Past position information

| Operator controls | Task |
|---|---|
| REL VECTOR 6.0 min <br> PAST P INT < OFF > min <br> PAST P PER < 10 > min <br> TRUE TRAILS OFF min | **TRAILS** <br><br> With this function, all strong targets located in the acquisition range are given an artificial afterglow. These afterglows indicate the route traveled (length of artificial afterglow) in a set time. <br><br> The Radar software distinguishes between strong target echoes (bright green color) and weak target echoes (dark green target color). Targets with a very weak echo do not paint trails. <br><br> Trails are an ARPA independent function that permits an assessment of the current situation in the display acquisition range. <br><br> Trails can be displayed as RELATIVE or TRUE. <br><br>  |

### 2.3.7.3 UTC

The current UTC (Coordinated Universal Time) is the general time format used for the Raytheon Anschütz INS system.

### 2.3.7.4 Display of Submenus

This display shows a range of submenus.

The different menus are called up using the soft buttons in the menu bar and the toggle fields.

Some submenus are equipped with soft buttons or toggle fields that can be used to select further menus.

### 2.3.7.5 Display for Alarm

- When the Radar is part of in an Integrated Navigation System (INS).

The Alert Management System receives all Alarm, Warning and Caution Messages from the connected equipment and distributes them to the alarm displays of the different INS tasks.

The messages from the Alert Management System are displayed in different colors according to Alert type;

       Alarm messages in RED

       Warning messages in ORANGE

       Cautions in GRAY

The SYNAPSIS Conning application displays all alerts on the information pages CAM (Central Alert Management) and ALERT HISTRORY.

- General Information

This chapter describes only Radar specific Alarm Messages which can be acknowledged at the Radar application only.

Alarms are presented at an alarm message display until their reason no longer exists and the operator has acknowledged them.

Alerts provide the operator with an indication of dangerous situations or sensor failure.
Alerts are released when there is a situation that is critical to safety.
Alerts must be acknowledged, and will only be removed from the alert list when the reason no longer exists.
LOST ARPA TARGET alarms cannot be deactivated.

Alert messages are displayed in the alarm readout displays of individual applications.

Alert messages are numbered according to their occurrence.
Alert messages are provided with the date and time of their occurrence.
The alert readout display can be browsed with scroll buttons.
You can move up and down the alarm message list by pressing the up and down buttons next to the alarm readout display.

In RED color.
Indicates number with alarm message, date and time.

The possible cause readout displays in black color.

Scroll soft button for scrolling up and down the Alarm Messages.



1 of 7 - TGT MGMT
2014-08-08 08:26:42
3 NEW TARGET(S) FROM AIS

Acknowledge

Soft button for acknowledging the Alarm Messages
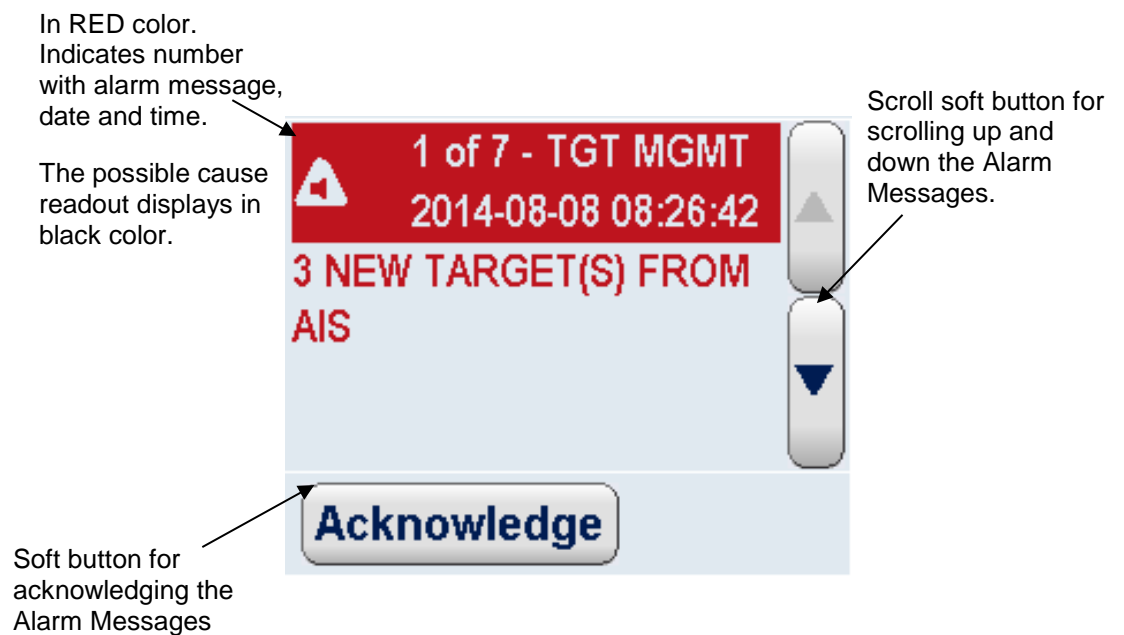
Figure 2-37    Display for alarm messages

As Alarms are received, they are displayed in the chronological order in which they occurred.

When an alarm is received it will be placed at the top of the list. A new alarm will be shown as RED text on a WHITE flashing background.

Alarms that have been acknowledged will be shown as RED text preceded by a number, as well as date and time.

**Sum-Alarm and Sum-Warning Message**

In contrast to the common alarms the ARPA- and the AIS Alarm or Warning massages are combined in six groups:

-- Lost Target Warning AIS

-- Lost Target Warning ARPA

-- TCPA/CPA Alarm AIS

-- TCPA/CPA Alarm ARPA

-- Guard Zone Alarm AIS

-- Guard Zone Alarm ARPA

The purpose of the sum-alarms or warnings is to minimize the number of alarm messages in the alarm readout display and to minimize the acknowledgement effort for the operator.

In case several alarms of one type occur (see groups above), they are displayed as **one** single alarm message in the alarm readout display. Number, date and time stamp of the last received alarm is displayed. The message text is the same for each alarm message of the group.

Situation: e.g. TCPA/CPA ARPA (message text)

first alarm          [ 1 ] RADAR ALARM
                     2013--12--03 13:36:16
                     ARPA TCPA/CPA BY 1
                     TARGET (S)

second alarm     [ 1 ] RADAR ALARM
                     2013--12--03 13:56:13
                     ARPA TCPA/CPA BY 2
                     TARGET (S)

| Operator controls | Task |
|---|---|
|  | **CONTROL PANEL**<br><br>The Alarm Acknowledge button on the control panel is used to acknowledge the actual alarm shown in the alarm display. Once the alarm is acknowledged, the text string will become RED, a number will appear at the beginning of the alarm text string, and the list can be scrolled down in order to see any other Alerts in the list that are not currently displayed. |

Possible Alarm and Warning Messages see chapter 2.11.

### 2.3.7.6 User Settings

The User Settings allow the operator to load Radar pre-adjustments. The pre-adjustments are classified into three groups with special profiles. These profiles contain Radar settings. The Radar settings become active when the Radar is switched to TX mode.

**Pre-Defined** profiles provide display settings for navigation under special conditions.

**User Defined** profiles are profiles containing the display setting used on each workstation when Radar was switched to Standby the last time.

**Workstation** profiles are profiles containing console defined setting witch can be transferred to another MFC console.
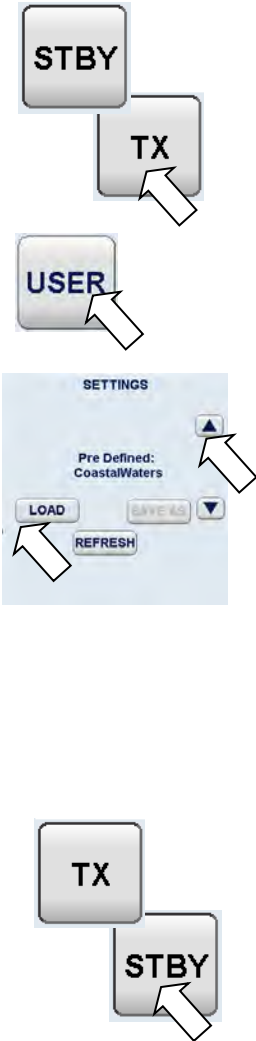
| Group Pre-Defined | Group User Defined | Group Workstation |
|---|---|---|
| Default (see Table 2-10) | User_1 | MFC1 |
| Anchorage | User_2 | MFC2 |
| Harbor Berthing | User_3 | ……. |
| Pilotage | User_4 | ……. |
| Coastal Water | User_5 | ……. |
| Open Sea | | |

In the Pre-Defined group the Default pre-adjustment contains following settings:

Table 2-10        Control settings in response to Default selection.

| Parameter | Default collision avoidance |
|---|---|
| GAIN | As it is |
| Tuning | As it is |
| Range | 6NM |
| Range rings | off |

| Parameter | Default collision avoidance |
|---|---|
| VRM | One VRM on 0,25NM |
| EBL | One EBL on |
| PIL | As it is |
| Display mode | True motion north-up |
| Off-centering | on |
| Stabilization | Ground stab |
| Trails | On (6min) |
| Past positions | off |
| Vectors | Relative (6min) |
| AIS display | on |
| AIS new/lost target alerts | off |
| AIS activation on CPA/TCPA | on |
| Chart | off |
| AIS AtoNs, base station | off |
| AIS outline | on |
| AIS filter range | 12NM |
| PCP/CPA symbols | off |
| CPA warning | off |
| Target label | on |

| Operator controls | Task |
|---|---|
|  | *Step 1* Switch the Radar into STBY mode. |
|  | *Step 2* Select the USER soft button. |
|  | *Step 3* Select your favorite Pre-Defined profile.<br><br>*Step 4* LOAD this profile. |
|  | *Step 5* **User Defined**<br>SAVE AS has to be used if the operator wants to save his own modified pre-adjustments profile.<br>In this case the user profile was saved under the name User_1 in the user defined group.<br><br>*Step 6* **Console Defined**<br>REFRESH has to be used if the operator selects a workstation defined profile and the INS system advanced with a further MFC console. With pressing the REFRESH soft button the further MFC console will be integrated in the workstation defined group.<br><br>Switch back to the Radar TX mode, using a selected profile. |

**2.4**    **Select Target Information TGT INFO**

The TGT INFO display can simultaneously show information on 3 tracked targets. These can be ARPA, AIS or associated targets.
Manual selection is shown in the following procedure.
Automatic selection initiated by acquisition zones (chapter 2.5.1 ARPA targets, chapter 2.5.4 AIS targets).
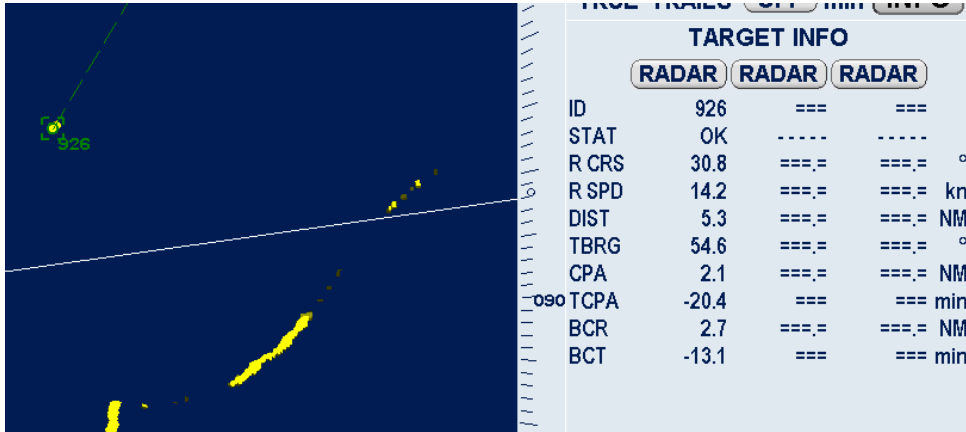
| Operator controls | Task |
|---|---|
| **TARGET INFO**<br>AIS    AIS    AIS<br>ID    232517609 235061723 232051323<br>STAT    OK    OK    OK<br>T CRS    20.5    41.5    40.1    °<br>T SPD    11.5    9.1    18.0    kn<br>DIST    11.3    2.5    4.6    NM<br>TBRG    52.9    59.1    67.2    °<br>CPA    11.3    2.0    1.9    NM<br>TCPA    -3    87    -31    min<br>BCR    11.5    3.7    -23.5    NM<br>BCT    50    -98    -205    min<br>INFO    INFO    INFO<br><br>REL VECTOR 6.0 min<br>PAST INT ◁ OFF ▷ min<br>PAST PER ◁ 10 ▷ min<br>TRUE TRAILS OFF min<br><br>changed to RCSE and RSPD | AIS / ARPA Target association chapter 2.5.5.<br><br><br>ID    Identifier no. ARPA (1..70), AIS ships identifier no.<br>STAT    Status (TCPA, TI, TN, GUARD, REF) )*<br>TCSE    True course can be changed to relative course<br>RCSE<br>TSPD    True speed can be changed to relative speed<br>RSPD<br>DIST    Distance<br>TBRG    True bearing<br>CPA    Closest point of approach<br>TCPA    Time of closest point of approach<br>BCR    Bow crossing range<br>BCT    Bow crossing time<br><br><br>)*    TCPA    collision situation<br>    TI    Target initial, after approx. 10 scans<br>    TN    Target normal<br>    GUARD    Target acquired using an acquisition zone<br>    REF    Info about a reference target |

**Procedure for manual target selection (Prüfen)**

Initial target selection is carried out using the cursor. The target information is shown in the TGT INFO display.

| Operator controls | Task |
|---|---|
| TGT INFO | *Step 1* Open the TGT INFO display.<br><br>*Step 2* Select the targets of interest ((ARPA, AIS) chapter 2.1.5).<br><br>*Step 3* Select INFO for Additional AIS information. |



| TARGET INFO | | | | |
|---|---|---|---|---|
| | RADAR | RADAR | RADAR | |
| ID | 926 | === | === | |
| STAT | OK | - - - - - | - - - - - | |
| R CRS | 30.8 | ===.= | ===.= | ° |
| R SPD | 14.2 | ===.= | ===.= | kn |
| DIST | 5.3 | ===.= | ===.= | NM |
| TBRG | 54.6 | ===.= | ===.= | ° |
| CPA | 2.1 | ===.= | ===.= | NM |
| TCPA | -20.4 | === | === | min |
| BCR | 2.7 | ===.= | ===.= | NM |
| BCT | -13.1 | === | === | min |

**INFO**

Targets classified as dangerous trigger an alarm (visual and acoustic).

### 2.4.1 AIS Symbols on the Radar Video

**Procedure:**

After pressing the AIS soft button AIS targets (sleeping/activated) appear on the PPI if there are AIS targets in the area.

The area in which the AIS information is displayed depends on the used AIS FILTer RNG.

Sleeping targets are displayed smaller than the activated targets. Sleeping targets can be switched over to activate targets per cursor function or per ACTIVATION RANGE.

| Operator controls | Task |
|---|---|
| AIS | *Step 1* Select the AIS soft button. AIS targets appear on the PPI. |
| TGT MENU | *Step 2* Open the TGT menu. |
| TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPTIONS<br>SET AIS OPTIONS<br>ASSOC SETTINGS | *Step 3* Open the SET AIS OPTIONS.<br><br>*Step 4* Select your individual AIS OPTIONS if necessary. |
| AIS OPTIONS<br>LOST TARGET ALARM ON<br>OUTLINE SYMBOLS ON<br>HIDE ATON & BASE STATIONS<br>DEFAULT LABEL SHIP NAME<br>AIS SLEEPING TARGETS<br>ACTIVATE AT CPA/TCPA ON<br>ACTIVATION RANGE 14.5 NM<br>AIS OWN SHIP DATA  BACK | *Step 5* Select the AIS target of interest. Press the **right** trackball button, a pop- up window appears for a short time (10s).<br>Show the AIS target information by selecting **Set AIS ...........**<br>The **Activation Range** can be edited via slider function. |

| Operator controls | Task |
|---|---|
|  | |
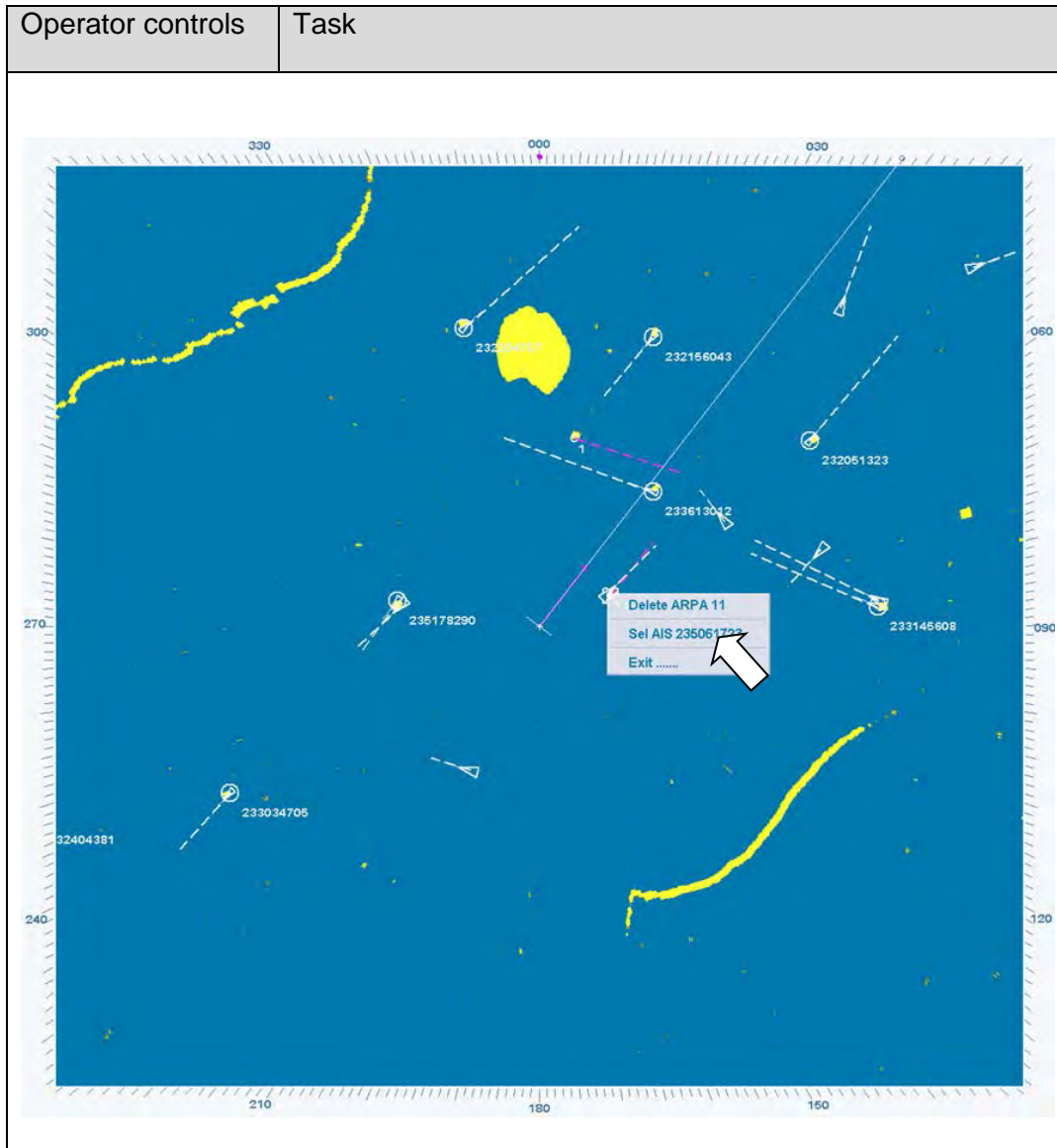
## 2.5 Target Menu

This chapter describes the operation of the target management.
The target management handles ARPA and AIS targets.

| | |
|---|---|
| (!) | The Radar ARPA information is considered to assist decision making in a present current situation.<br><br>The resulting assessment with regard to avoiding collisions must be made independently in accordance with the valid regulations! |

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

### 2.5.1        General Information

- **Requirements for optimum ARPA support**

The following requirements must be met on the Radar to achieve optimum ARPA functionality.

| Operator controls | Task |
|---|---|
|  | The sensitivity controls are optimally adjusted to the current weather conditions. |
|  | *Before using this function select a RANGE higher than 6 NM. The automatic target acquisition zone might not be visible at lower ranges.* |
|  | **Heading** e.g. gyro and **Speed** (log, course thru water (W) or course over ground (B)). |

- **Target acquisition**

It is possible to acquire up to 40 targets manually and up to 40 targets automatically. The tracking data for the selected targets is displayed in the ARPA information window.

- **Target alarms**

Targets generate an alarm message (chapter 2.11.2) and artificial symbols (see ARPA SYMBOLS) accompanied by an acoustical signal.

"CPA TCPA BY xx TARGET(S)"

This alarm is triggered as soon as a tracked target exceeds the set limits for CPA or TCPA.

"GUARD ZONE INSTRUCTIONS BY xx TARGET(S)"

This alarm is triggered as soon as a tracked target enters an guard zone.

"LOST xx TARGET(S)"

This alarm indicates that the tracked target has been lost.

- **Target symbols**

When using the ARPA function, the PPI displays various artificial symbols that describe the following situations.

| Operator controls | Task |
|---|---|
| ⬜ | Indicates that target data is displayed in the TARGET INFO window. |
| | Potential collision point. |
| ⊖ PCP | |
| ◯ CPA | Closest point of approach. |
| **T** TRAIL | This state is indicated if the trial manoeuvre is activated. The symbol flashes. |
| **X** TEST | This state is indicated if the test function has been called up. The symbol flashes. |
| ◯ R | Reference target |

- Used symbol colors

The Radar ARPA function includes the following color assignments.
Ship heading marker, SHM     - WHITE –

- Ship heading marker, SHM    - WHITE
  Vector (TRUE)               - PURPLE –

- Tracked target              - GREEN -
  Vector                      - GREEN -
  Past Pos                    - GREEN -
  Trails                      - GREEN / GRAY -

- CPA/TCPA zone               - ORANGE -
- Acquisition zone            - YELLOW -
- Guard zone                  - ORANGE -
- Exclusion zone              - BLUE -

- Artificial ARPA symbols
  PCP                         - PURPLE
  CPA                         - GREEN

### 2.5.2 Set Target Options

#### 2.5.2.1 PCP/CPA Symbols ON/OFF

PCP and CPA symbols are a useful tool that assists the user in identifying possible collision situations.

This function allows the potential collision point (PCP) or the closest point of approach (CPA) for acquired targets to be indicated by a circular symbol at the PPI.

Acquired targets can be displayed with relative or true vectors.

**TRUE** allows the PCPs for all acquired targets to be displayed at the PPI.
**RELATIVE** allows the CPAs for all acquired targets to be displayed on the PPI.
Both types of display support prompt assessment of close range situations.

**Vector mode TRUE - Potential Collision Points (PCP) -**
Potential collision points (PCP) provide a rapid overview of current and potential collision danger.

Assessment:

- There is a current collision danger if a PCP lies on your own ship's head up line.

- There is a potential collision danger if your own ship changes its current course such that a PCP that did not previously lie on the ship's head up line will now lie on that line.

Potential collision points are calculated after target acquisition.
Every target is normally marked with one PCP, which appears as a small circle.
Under certain circumstances, it is possible that a target is marked by 2 PCPs.
In such a situation, both PCPs are applicable and must be taken into account when viewing the Radar image.

| | |
|---|---|
| **i** | PCPs do not take into account the dimensions of the own ship or the target. |

Target acquisition must first be carried out.

| Operator controls | Task |
|---|---|
| | *Step 1* Switch over to TM(T) (recommended). |
| | *Step 2* Switch over to TRU |
| | *Step 3* Open the TGT menu. |
| | *Step 4* Select the SET TARGET OPTIONS. |
| | *Step 5* Select PCP/CPA SYMBOLS ON. |
| | *Step 6* The LOST ALARM RANGE can be changed via the text slider function (chapter 2.1.4.1). |

| Operator controls | Task |
|---|---|
|  Potential Collision Points – VECTOR mode TRUE - | |
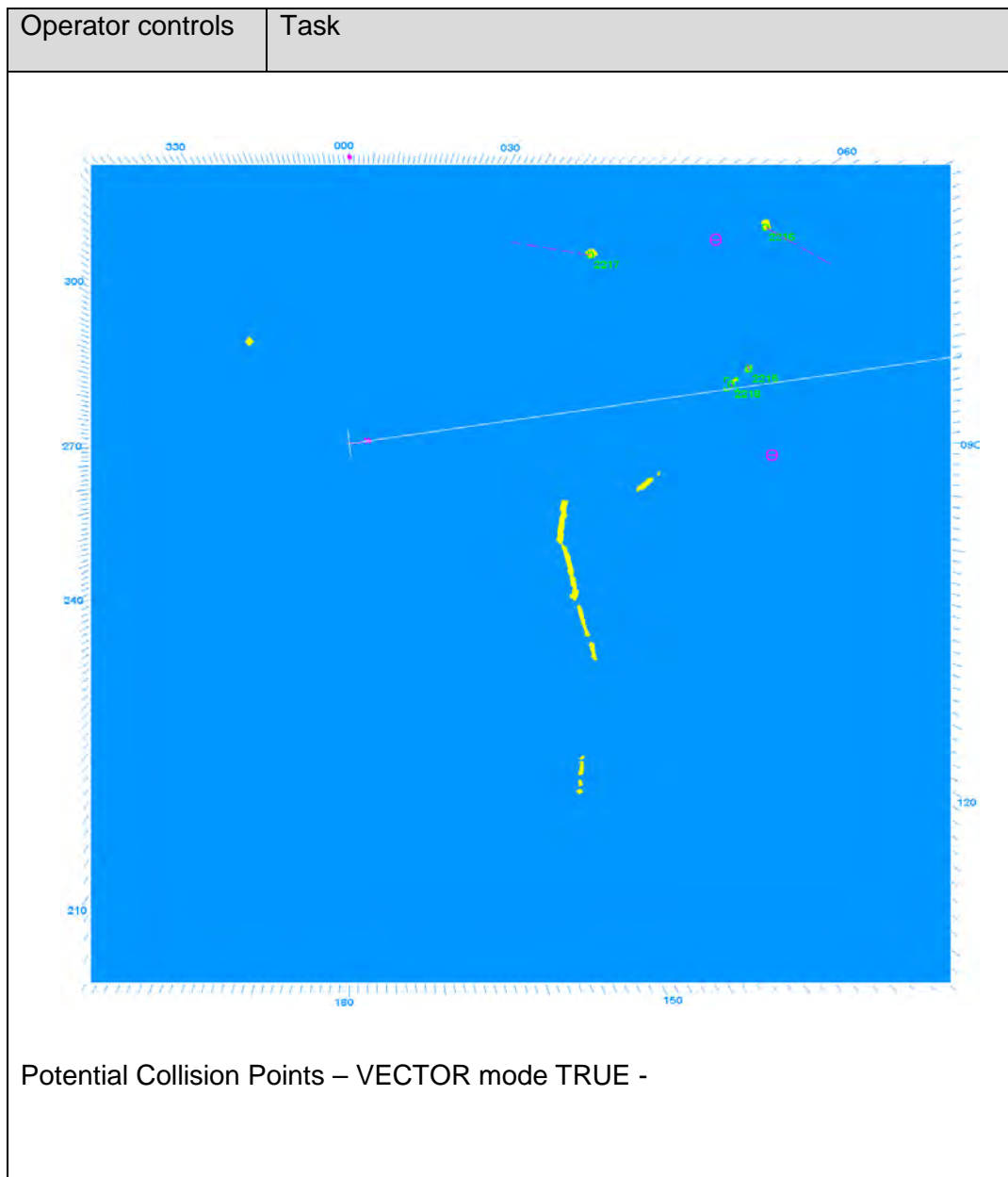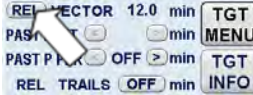
**Result:**

Switching to TRUE VECTORS shows potential collision points (PCP). These are positions on the chart where your own vessel could collide with other targets.

**VECTOR mode REL -- Closest Point of Approach (CPA)**

Using this function, the closest point of approach (CPA) for acquired targets with relative vectors is indicated by a small circle.

| Operator controls | Task |
|---|---|
| | *Step 1* Switch over to TM(T) (recommended). |
| | *Step 2* Switch over to REL (recommended). |
| | *Step 3* Open the TGT menu. |
| | *Step 4* Select the SET TARGET OPTIONS. |
| | Step 5 Select PCP/CPA SYMBOLS ON. |

| Operator controls | Task |
|---|---|



Potential Collision Points – VECTOR mode REL -
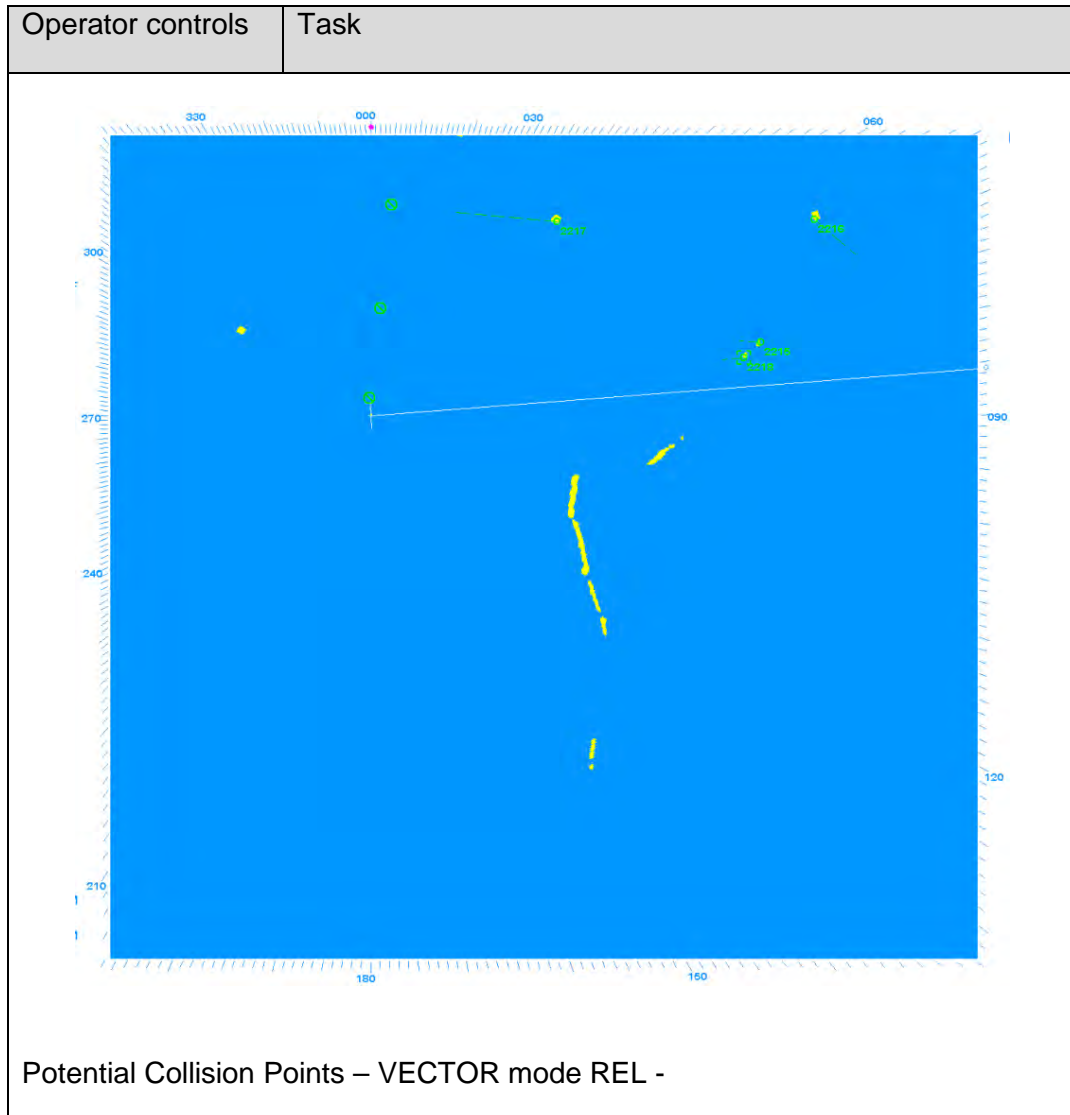
**Result**

A CPA symbol will indicate where the approach will be closest. The CPA/TCPA readout displays when this will happen.

CPA warning circles highlight the condition for dangerous target alarms.

#### 2.5.2.2　CPA Warning Circle ON/OFF (CPA/TCPA)

The target management evaluates the closest point of approach (CPA) and the time to closest point of approach (TCPA) status of each tracked target.

This CPA/TCPA zone is available with predefined values.

The CPA/TCPA values are generally ship-specific and must be adapted to the profile of the ship.
The ship's profile includes features such as stopping distance, sea area and visibility.
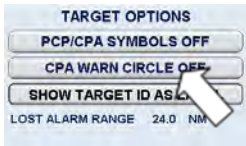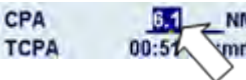
Acquired targets that move inside the radius (CPA) and undercut time threshold (TCPA) generate a "CPA/TCPA BY xx TATGET(S)" in the message display and the relevant target is simultaneously marked by a flashing symbol.

The CPA/TCPA zone can be shown or hidden on the Radar video as desired.


**Determining the CPA/TCPA radius**
The CPA/TCPA radius can quickly be adjusted to the desired situation as shown.

| Operator controls | Task |
|---|---|
| **TGT MENU** | *Step 1* Open the TGT menu. |
| TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPT<br>SET AIS OPTIONS<br>ASSOC SETTINGS | *Step 2* Open the SET TARGET OPTIONS. |
| TARGET OPTIONS<br>PCP/CPA SYMBOLS OFF<br>CPA WARN CIRCLE OFF<br>SHOW TARGET ID AS<br>LOST ALARM RANGE  24.0  NM | *Step 3* Show or hide the radius on the PPI (CPA WRN). |
| CPA        6.1      NM<br>TCPA     00:51  mm | *Step 4* Edit and apply individual values for CPA and TCPA. |
|  | *Step 5* Complete the input by pressing the **left** trackball button. |
|  | **Result:**<br><br>If a tracked target moves inside the set limits, a "Dangerous Target Alarm" is triggered. |

| Operator controls | Task |
|---|---|
|  | ARPA symbol<br><br>Collision condition |

### 2.5.2.3 Show Target ID as Label

This soft key function allows the Target label to be shown or hidden on the PPI.

| Operator controls | Task |
|---|---|
| TGT MENU | *Step 1* Open the TGT menu. |
| TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPT<br>SET AIS OPTIONS<br>ASSOC SETTINGS | *Step 2* Open the SET TARGET OPTIONS. |
| TARGET OPTIONS<br>PCP/CPA SYMBOLS OFF<br>CPA WARN CIRCLE OFF<br>SHOW TARGET ID AS LABEL<br>LOST ALARM RANGE 24.0 | *Step 3* Show or hide TARGET ID AS LABEL. |

### 2.5.2.4    Lost Alarm Range …NM

In this case the operator has the possibility to adjust the Lost Alarm Range per slider function.

When a target is lost outside this range, no lost target alert is raised.

| Operator controls | Task |
|---|---|
| **TGT MENU**<br><br>**TARGET MENU**<br>SET TARGET OPTIONS<br>SET TRACKER OPT<br>SET AIS OPTIONS<br>ASSOC SETTINGS<br><br>**TARGET OPTIONS**<br>PCP/CPA SYMBOLS OFF<br>CPA WARN CIRCLE OFF<br>SHOW TARGET ID AS LABEL<br>LOST ALARM RANGE   24.0   NM | *Step 1* Open the TGT menu.<br><br>*Step 2* Open the SET TARGET OPTIONS.<br><br>*Step 3* Place the cursor on the value and press the **left** trackball button and adjust your favored value. Press the **left** trackball button again to set the value. |

**2.5.2.5    Delete All Targets**

Pressing this soft key deletes all acquired targets in the system. Please note that this is a global function which affects all workstations.

| Operator controls | Task |
|---|---|
|  | *Step 1* Open the TGT menu.<br><br>*Step 2* Select the SET TARGET OPTIONS button.<br><br><br>*Step 3* Select the DELETE ALL TGT button.<br><br><br>Result:<br><br>All acquired targets lost their selected status on the PPI. |

**Delete a target**

| Operator controls | Task |
|---|---|
|  | *Step 1* Place the cursor over an ARPA target and press the **right** trackball button, a pop- up window appears for a short time (10s). Delete the ARPA target by selecting **Delete ARPA.** |

### 2.5.2.6    Reference Target ON/OFF

The reference target feature tracks a fixed target (zero speed) and calculates own ship's if no other speed sensor is available.
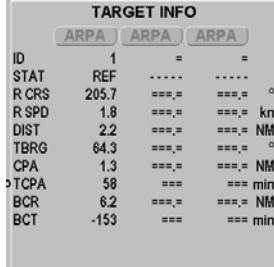
|  | If the fixed target is lost the Radar generates a LOST REFERENCE TARGET alarm. Own ship's speed values cannot be evaluated. |
|---|---|

The Radar can support this by accepting one echo that the user knows is geostationary. After 2 minutes, the Radar accuracy calculates the ship's ground velocity until the track is lost or new echoes chosen.

|  | Accuracy of the calculated ground speed depends on the selected target and the environmental conditions and may deviate from the real speed of the target. Please monitor the value carefully. Collision avoidance data (relative speed, CPA/TCPA, BCR/BCT) of AIS targets cannot be calculated with a reference target speed. |
|---|---|

| Operator controls | Task |
|---|---|
| | First, the desired target must be acquired. |
| AIS | *Step 1* Switch AIS to OFF. |
| TGT MENU | *Step 2* Open the TGT menu |
| **TARGET MENU** SET TARGET OPTIONS SET TRACKER OPTIONS SET AIS OPTIONS ASSOC SETTINGS | |
| Select Target (ID 1174) Set Target Label (ID 117 Delete Target (ID 1174) Exit | Step 3 Acquire a target of interest via the **left** Trackball button, then press the **right** Trackball button (must be a fixed target). The context Menu appears. Select "Select Target (ID..)" and press the **right** Trackball button. |
| **TARGET OPTIONS** PCP/CPA SYMBOLS OFF CPA WARN CIRCLE OFF SHOW TARGET ID AS LABEL LOST ALARM RANGE 24.0 NM DELETE ALL TGT REF TGT OF TARGET CAPACITY ALL: 1 of 7000 BACK | *Step 4* Open the TARGET OPTIONS menu. *Step 5* Select REF TGT OFF/ON the SHOW symbol changes to REFERENCE TARGET symbol. The target info appears in TARGET INFO window. |
| REF TGT 1175 | The target no. (example) displays in the REF TGT button. |
| | **TARGET INFO** ARPA ARPA ARPA ID 1 = = STAT REF ..... ..... R CRS 205.7 ===.= ===.= ° R SPD 1.8 ===.= ===.= kn DIST 2.2 ===.= ===.= NM TBRG 64.3 ===.= ===.= ° CPA 1.3 ===.= ===.= NM TCPA 58 === === min BCR 6.2 ===.= ===.= NM BCT -153 === === min |
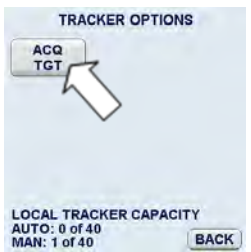
### 2.5.3        Set Tracker Options

#### 2.5.3.1       Manual Plotting - ACQ TGT -
This target acquiring method is helpful if the desired target is hidden with e.g. a bearing line.

With this function maximum 40 Targets can be manually acquired by pressing the **left** trackball button.
The manually tracking is possible up to 24 NM.

| Operator controls | Task |
|---|---|
| **TGT MENU** | *Step 1* Open the TGT menu. |
| **TARGET MENU** SET TARGET OPTIONS / SET TRACKER OPTIONS / SET AIS OPTIONS / ASSOC SETTINGS | *Step 2* Select the SET TRACKER OPTIONS button. |
| **TRACKER OPTIONS** ACQ TGT  LOCAL TRACKER CAPACITY AUTO: 0 of 40 MAN: 1 of 40 BACK | *Step 3* Select the ACQ TGT soft button. |
| (Cursor symbol) | Step 4 Select the desired target per cursor and press the **left** trackball button (chapter 2.5.4.2). |

### 2.5.4 Set AIS Options

#### 2.5.4.1 AIS Options

The Automatic Identification System (AIS) is designed for automatic and autonomous data communication between ships. Transferred data include (among others) information such as identification, status, position, speed, course over ground (detailed information see AIS Manual).

All AIS targets can be displayed on the PPI, detailed information can be shown on request at the target info display and alarms for LOST and DANGEROUS AIS Targets will be generated automatically.

AIS targets can be filtered, ranges for display of AIS targets are selected between 3 and 96 NM.

The AIS OPTIONS allows following AIS FILTER settings.

  LOST TARGET ALARM ON (switchable ON/OFF)

  OUTLINE SYMBOLS ON/OFF (switchable ON/OFF)

  HIDE ATON & BASE STATIONS (switchable SHOW/HIDE)
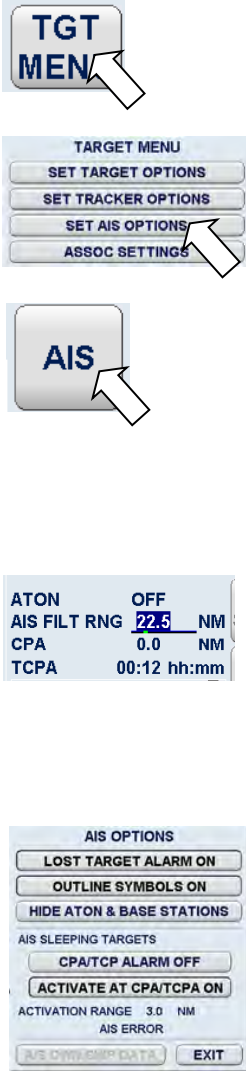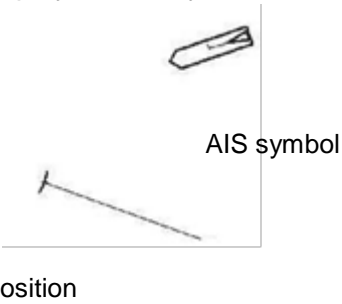
Automatically acquisition (Automatic Activation) of dangerous, sleeping AIS targets via CPA/TCPA zones

  CPA/TCPA ALARM ON (switchable ON/OFF)

  ACTIVATE AT CPA/TCPA OFF (switchable ON/OFF)

Manually acquisition of sleeping AIS targets

  ACTIVATION RANGE (default 3NM)
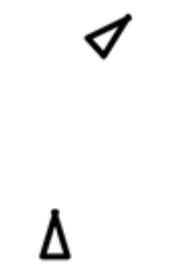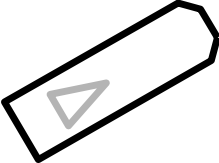
| Operator controls | Task |
|---|---|
| **TGT MEN** | The Radar AIS OPTIONS allows the following settings.<br><br>*Step 1* Select the SET AIS OPTIONS button. |
| TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPTIONS<br>SET AIS OPTIONS<br>ASSOC SETTINGS | *Step 2* Select the AIS soft button. AIS targets appear on the PPI. |
| **AIS** | **LOST TARGET ALARM ON** (switchable ON/OFF).<br>In this case the target symbol will be marked by crossed lines centered on the target symbol. The symbol is flashing. An alarm message is generated (chapter 2.11.2). |
| ATON         OFF<br>AIS FILT RNG  22.5    NM<br>CPA           0.0     NM<br>TCPA       00:12 hh:mm | **AIS FILT RNG** (adjustable within 3-96NM)<br>Only new AIS targets are visible on the display. Contrary to the activation range this setting is separate for each display. |
| AIS OPTIONS<br>LOST TARGET ALARM ON<br>OUTLINE SYMBOLS ON<br>HIDE ATON & BASE STATIONS<br>AIS SLEEPING TARGETS<br>CPA/TCP ALARM OFF<br>ACTIVATE AT CPA/TCPA ON<br>ACTIVATION RANGE  3.0  NM<br>AIS ERROR<br>AIS OWN SHP DATA    EXIT | **OUTLINE SYMBOLS ON** (switchable ON/OFF).<br>If a target symbol is drawn at a low range the target symbol is automatically presented on scale showing the outline of the targets.<br>If the Outline Symbol is displayed depends on ship's length and width and on the range scale selected.<br><br>The next figure displays a AIS symbol in close up situation.<br><br>AIS symbol<br><br>Own position |

| Operator controls | Task |
|---|---|
| | **HIDE ATON & BASE STATIONS** (switchable SHOW/HIDE).<br>Aids to Navigation (ATON) (special buoys equipped with an AIS unit) or Base Stations appear with following symbols.<br><br>(physical)          (virtuell) |
| HL ON  FILT OFF  FUNC<br>SYM ON  ASSOC OFF<br>UTC  2014-08-26 11:40:09  ARPA TRIAL<br>ATON      OFF  SEA<br>AIS F   NG  12.0  NM  SCOUT<br>CPA      2.0  NM | The selected mode displays as ATON **ON** or **OFF** message on the display.<br><br>**CPA/TCPA ALARM ON** (switchable ON/OFF).<br>In this case the **ACTIVATE AT CPA/TCPA** changes to OFF. Dangerous, sleeping AIS targets passing the CPA/TCPA range generate automatically an Alarm Message.<br>The AIS targets maintain the sleeping status.<br><br>**ACTIVATE AT CPA/TCPA ON** (ON/OFF).<br>In this case the **CPA/TCPA ALARM** changes to **OFF**.<br>Dangerous, sleeping AIS targets passing the CPA/TCPA range will be activated and generate automatically an Alarm Message.<br>The target symbol color changes to orange.<br>The target symbol flashes.<br>The target symbol becomes bigger.<br>The TARGET INFO displays the AIS information. |
| ACTIVATE AT CPA/TCPA ON<br>ACTIVATION RANGE  3.2  NM | **ACTIVATION RANGE** (default 3NM).<br>Sleeping Targets passing this range change to active status. The range scale can be adapted by the slider function.<br><br>**AIS OWN SHIP DATA.**<br>Displays the own AIS SHIP DATA. |
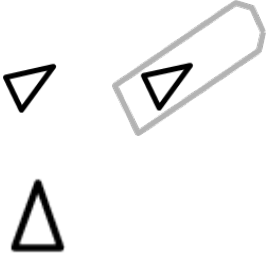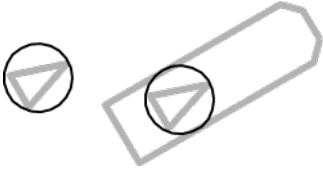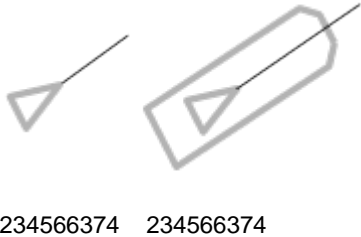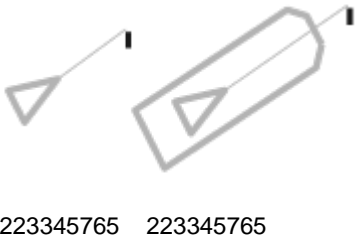
**2.5.4.2      Target Symbols (ARPA / AIS)**
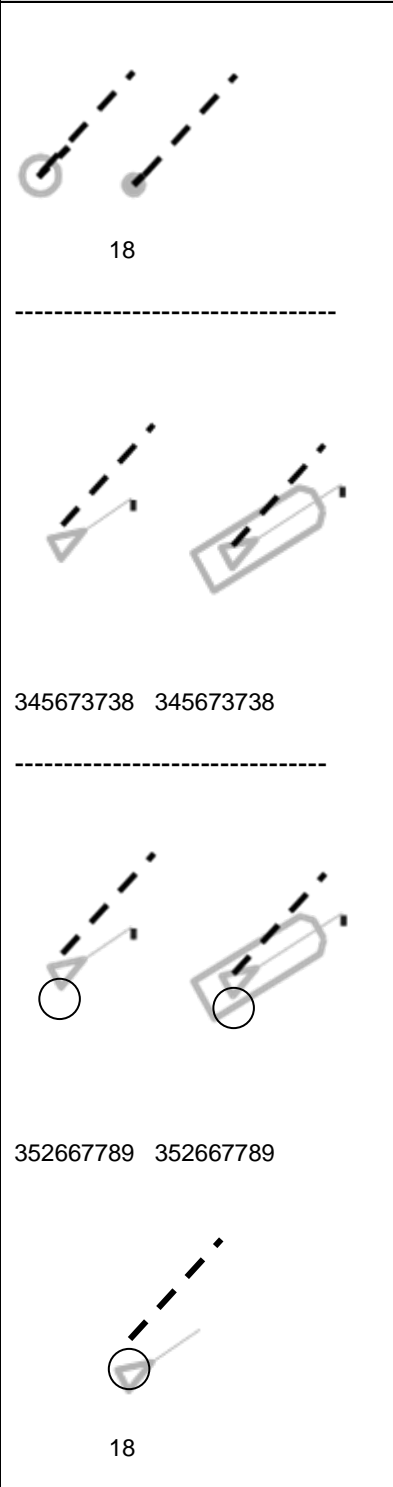
The AIS symbols are assigned different pieces of target information. Depending on the situation, each symbol has a different meaning (see following table).
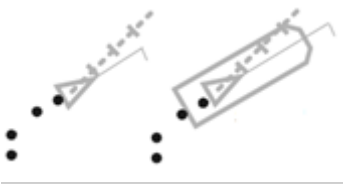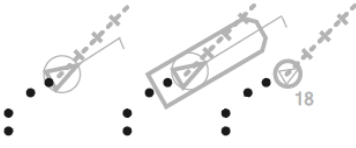
| AIS Target | Symbol | Description of symbols |
|---|---|---|
| Sleeping AIS targets | <br><br><br><br><br><br><br>◁<br><br><br><br><br><br>Δ<br><br>Sleeping AIS target with neither reported heading nor COG | Sleeping AIS targets shall be presented as acute isosceles triangles oriented to the targets' reported heading (or COG if heading is not reported) and centered at the targets' reported position. The base of the triangles shall be 3 mm and the height shall be 4,5 mm. The triangles shall be drawn using a thick solid line style (or a broken line if a collision avoidance computation cannot be done) with the same basic color used for target symbols.<br><br><br>A sleeping AIS target with neither a reported heading nor COG shall be oriented toward the top of the operational display area. |

| AIS Target | Symbol | Description of symbols |
|---|---|---|
| Activated AIS targets | Activated AIS target with neither reported heading nor COG. | Activated AIS targets shall be presented as acute isosceles triangles oriented to the targets' reported heading (or COG if heading is not reported) and centered at the targets' reported position. The base of the triangles shall be 4 mm and the height shall be 6 mm. The triangles shall be drawn using a thick solid line style (or a broken line if a collision avoidance computation cannot be done) with the basic color used for target symbols.<br><br>An activated AIS target with neither a reported heading nor COG shall be oriented toward the top of the operational display area.<br><br>Activated AIS targets may be labeled. Alphanumeric text used to label AIS targets shall be drawn with the same basic color as used for target symbols. |
| Activated AIS targets – true scaled outlines | 254485373 | Alternatively, when own ship is presented as a true scaled outline, the user may select to add true scaled outlines to activated AIS target symbols.<br><br>True scaled outlines for activated AIS targets shall be drawn around the AIS target symbol triangles relative to the targets' reported position according to the offsets, beam and length. The outline shall be drawn using a thick solid line style.<br><br>True scaled outlines for activated AIS targets shall be drawn with the same basic color used for target symbols. |

| AIS Target | Symbol | Description of symbols |
|---|---|---|
| | Activated AIS target with neither a reported heading not COG | Activated AIS targets designated as dangerous targets may be presented with larger triangles, with a base of 5 mm and a height of 7,5 mm, shall be the required basic color red, drawn with a thick solid line and shall flash until acknowledged by the user.<br><br>Once acknowledged, the symbols shall cease flashing but shall still be presented using the required basic color red until no longer considered to be a dangerous target. |
| Associated targets – alternative | 234566374    234566374<br><br>Associated targets represented by Radar target symbols<br><br>18 | The user may select to present associated targets (i.e. activated AIS targets associated with tracked Radar targets) as either activated AIS target symbols or tracked Radar target symbols.<br><br>Alternatively, activated AIS target symbols representing associated targets may be modified by circumscribing a circle around the symbols' isosceles triangle. Tracked Radar target symbols representing associated targets may be presented with larger diameter circles (up to 5 mm), modified by inscribing an isosceles triangle inside the symbols' circle.<br><br>The circumscribed circle and inscribed triangle shall be drawn using a thin solid line style with the same basic color used for target symbols.<br><br>Associated targets may be labeled or numbered, as appropriate. Alphanumeric text used to label/number associated targets shall be drawn with the same basic color as used for target symbols. |

| AIS Target | Symbol | Description of symbols |
|---|---|---|
| Heading lines | 234566374    234566374 | Heading lines shall be selected for display for activated AIS targets and associated targets, represented by AIS target symbols.<br><br>Heading lines shall originate at the apex of the AIS triangle and shall extend not less than 4 mm and at least 4 mm beyond the bow of the true scaled outline when it is used. They shall be drawn using a solid line style with the same basic color as used for target symbols.<br><br>Heading lines for dangerous AIS target shall flash with their base symbol until acknowledged by the user.<br><br>An activated target without a reported heading shall be orientated to the top of the operational display area and when AIS heading is enabled shall not include a heading line. |
| Heading lines – turn indicators | 223345765    223345765 | The user shall select to display turn indicators for activated AIS targets and associated targets represented by AIS target symbols.<br><br>Turn indicators shall be presented as a single line extending at least 1 mm but not more than 2 mm perpendicular to the heading line in the direction of turn. The indicator shall be drawn using a thin solid line style with the same basic color as used for their target symbols.<br><br>Turn indicators for dangerous targets shall be the required color red (until no longer dangerous) and shall flash with their symbol until acknowledged by the user. |

| AIS Target | Symbol | Description of symbols |
|---|---|---|
| Velocity vectors | 18<br><br>-------------------------------<br><br>345673738   345673738<br><br>-------------------------------<br><br>352667789   352667789<br><br>18 | Velocity vectors for targets shall be selected for display.<br><br>Velocity vectors shall be presented as single lines originating at the targets' tracked/reported position and extending in the direction of course CTW or COG, as appropriate, for a length representing the distance the target will travel in the time interval used for own ship's velocity vector. Vectors shall be drawn using a thick short dashed line style with the same basic color used for target symbols.<br><br>Velocity vectors for dangerous targets shall be the required red basic color and shall flash with their base target symbols until acknowledged by the user.<br><br>Once acknowledged, the symbols shall cease flashing and unless considered as dangerous, shall assume the basic color of other non-dangerous target symbols. |

| AIS Target | Symbol | Description of symbols |
|---|---|---|
| Target past positions | Radar target past position:<br><br>18        18<br><br>----------------------------------<br><br>AIS target past position:<br><br><br><br>234264658   234264658<br><br>----------------------------------<br><br>Associated target past positions:<br><br>18<br><br><br>234264658   234264658 | Optionally, target past positions may be shown.<br><br>Past positions shall be presented as a series of small circular symbols of 1 mm diameter. They may be connected by a line drawn from the current tracked or reported position of the target.<br><br>The line shall be drawn using a thin short dashed line style with the same basic color as their target symbols. |

| AIS Target | Symbol | Description of symbols |
|---|---|---|
| AIS aids to navigation – Physical |  | Physical AIS aids to navigation (ATON) shall be presented as an open diamond. The sides of the diamond shall be not more than 6 mm in length.<br><br>The diamond shall be drawn using a thin solid line style.<br><br>The basic color for an "on position" AIS ATON is defined as the normal color for AIS ATON symbols.<br><br>The basic color for the diamond of an "off position" AIS ATONN is yellow, it shall be drawn using thick solid line style and when used against light background it shall include a black one pixel outline to improve readability.<br><br>If available, on Radar display AIS AtoN shall be drawn indicating the purpose of the AIS AtoN.<br><br>On display containing an underlying chart AIS AtoN shall be drawn without indication of purpose unless the object is selected in which case, if available, the symbol is drawn indicating the purpose of the AIS AtoN. Purpose symbol shall be drawn using a thin solid line style and shall be the same basic colour as the AIS AtoN symbol. The height of the purpose symbol shall be not more than 5 mm in length.<br><br>AIS AtoN shall indicate off position of floating aid with yellow text "Off Posn". AIS AtoN shall indicate failure of light with yellow text "Unlit".<br><br>AIS AtoN shall indicate failure of Racon with yellow text "Racon err". When used against light background the yellow text may include a black one pixel outline to improve readability. |

| AIS Target | Symbol | Description of symbols |
| --- | --- | --- |
|  |  | AIS AtoN may be labeled. Alphanumeric text used to label an AIS AtoN shall be the same basic colour as the AIS AtoN symbol. <br><br> Other information from AIS AtoN, if available (for example from Message 14 for the same MMSI), shall be available on demand. <br><br> All physical AtoNs shall be in their own layer which shall have own display on/off selection. |

| AIS Target | Symbol | Description of symbols |
|---|---|---|
| AIS aids to navigation – Virtual | Basic shape<br><br>Emergency wreck mark / North cardinal mark<br><br>East cardinal mark / South cardinal mark / West cardinal mark<br><br>Port hand mark / Starboard mark / Isolated danger<br><br>Safe water / Special mark<br><br>(ILAI dictionary, topmarks)<br><br>Missing<br><br>Intended location of missing AtoN | Virtual AIS aids to navigation (AtoN) shall be presented as an open diamond with crosshair centred at reported position.<br><br>The sides of the diamond shall be not more than 6 mm in length.<br><br>The diamond shall be drawn using a thin dashed line style.<br><br>The basic colour for a Virtual AIS AtoN is as used for the physical AIS AtoN symbols.<br><br>If available, AIS AtoN shall be drawn indicating the purpose of the AtoN. Purpose symbol shall be drawn using a thin solid line style and shall be the same basic colour as the AIS AtoN symbol. The height of the purpose symbol shall be not more than 5 mm in length.<br><br>The absence of a charted physical AtoN is communicated as a combined state of 'virtual' and 'off position'. This shall be indicated with yellow text "Missing" above the dotted outline diamond using colour yellow. This symbol shall have no crosshair at the position centre. When used against light background the yellow text may include a black one pixel outline to improve readability.<br><br>AIS AtoN may be labelled. Alphanumeric text used to label an AIS ATON shall be the same basic colour as the AIS AtoN symbol.<br><br>Other information from AIS AtoN, if available (for example from Message 14 for the same MMSI), shall be available on demand.<br><br>All virtual AtoNs shall be in their own layer which shall have own display on/off selection.<br><br>When selected off a permanent indication shall be provided. |

| AIS Target | Symbol | Description of symbols |
|---|---|---|
| AIS search and rescue transmitter and other devices using AIS burst transmission technology | ⊗ | An AIS search and rescue transmitter (AIS- SART) shall be drawn as a 6mm diameter circle with a cross inside drawn with a solid line. A test version of the AIS-SART shall use the same basic color as the AIS ATON symbols. An active version of the AIS-SART shall use the required red basic color. If the equipment includes alert functionality based on active AIS-SART, then symbol shall flash until acknowledged by the user.<br><br>AIS-SART symbol has no associated speed or course vector.<br><br>If selected the operational mode is indicated as received from AIS Message 14 (e.g. SART ACTIVE, SART TEST, MOB ACTIVE, MOB TEST, EPIRB ACTIVE, EPIRB TEST) in the associated AIS object dialog.<br><br>NOTE: AIS-SART use MMSI range 97000000 - 97099999.<br><br>NOTE: AIS-MOB use MMSI range 97200000 -97299999<br><br>NOTE: EPIRB AIS use MMSI range 97400000 – 97499999 |

| AIS Target | Symbol | Description of symbols |
|---|---|---|
| Selected targets | Selected Radar targets:<br><br><br><br>----------------------------------<br><br>Selected AIS targets:<br><br><br><br>245667891  245667891<br><br>----------------------------------<br><br>Selected associated targets:<br><br><br><br>----------------------------------<br><br>Selected AIS ATON:<br><br><br><br>----------------------------------<br><br>Selected AIS SART:<br><br> | Selected target symbols shall be presented as broken squares indicated by their corners, centered on the selected target symbol by the user and clearly extending beyond it. The square shall be drawn using a dashed line.<br><br>Alphanumeric text used to label a selected target shall be the same basic color as the selected target symbol. |

| AIS Target | Symbol | Description of symbols |
|---|---|---|
| Lost targets | Lost Radar targets:<br><br>18    18<br><br>----------------------------------<br><br>Lost AIS targets:<br><br>2436463763  2436463763<br><br>----------------------------------<br><br>Lost associated targets:<br><br>354678453 354678453  18<br><br>----------------------------------<br><br>Lost AIS ATON:<br><br>----------------------------------<br><br>Lost AIS SART: | Lost target symbols shall be presented as crossed lines centered on the target symbol and extending at least 2 mm but not more than 3 mm beyond the symbol. The lines shall be drawn using a solid line style and shall flash with the required color red until acknowledged by the user.<br><br>Once acknowledged, the lost target symbol and its target symbol. |
| AIS SAR aircraft | | An AIS SAR aircraft shall be drawn with a thin solid outline with the same basic color as used for target symbols. The symbol shall be oriented in the direction of the COG. The length of the symbol shall be 6 mm. |

| AIS Target | Symbol | Description of symbols |
|---|---|---|
| AIS SAR vessel |  | If provided, a vessel performing SAR operations shall be presented by having a circle with cross drawn with a solid line inside the standard activated AIS vessel symbol. |

### 2.5.5 Association Settings

The target association combines the information of targets which are close together to one single target. Target association is performed between ARPA and AIS targets as well as ARPA targets tracked at different workstations. Targets are associated, if the position, speed, and course of the targets are within the pre-defined association limits.
The Radar supports several association profiles for navigation under different conditions (see SYNAPSIS SYSTEM MANUAL (Document No. 4279 chapter 4.1)).

By switching on the Radar function TGT ASSOC ON, both AIS and Target information of acquired targets are associated if the association criteria are fulfilled.
The ASSOCIATION SETTINGS menu is organized by factory predefined profiles.

### 2.5.5.1 Target Type Hierarchy
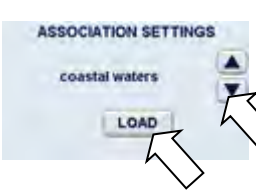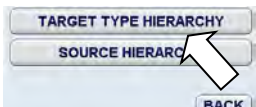
The priority selection TARGET TYPE HIERARCHY allows the operator to decide which source is used to calculate collision avoidance data. If AIS is selected and a combined target contains AIS data, the combined target is displayed with position, speed, and course from AIS. If Radar X Band is selected and the combined target contains data from an X-Band ARPA tracker, position, speed, and course from this ARPA tracker is used.
Depending on the priority (MODIFY button) selected, the target info display switches over accordingly; AIS or Target.
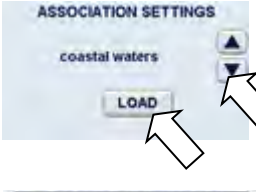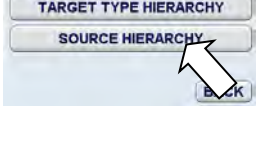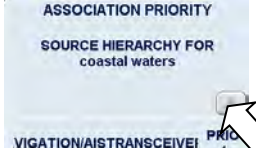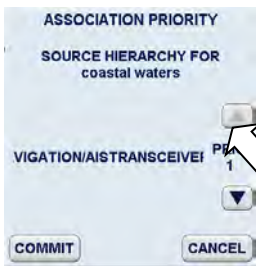
After pressing the AIS soft button AIS targets (sleeping/activated) appear on the PPI if there are AIS targets in the area.
The area in which the AIS information is displayed depends on the used AIS FILTer RNG.
Sleeping targets are displayed smaller than the activated targets. Sleeping targets can be switched over to activated targets per cursor function or per ACTIVATION RANGE.

| Operator controls | Task |
|---|---|
| **AIS** | *Step 1* Select the AIS soft button. |
| FOR LOCAL TRACKER  ZONE USAGE<br>HL ON  FILT ON  FUNC<br>SYM ON  ASSOC OFF<br>UTC  2014-08-26  08:1  ARPA TRIAL | *Step 2* Switch-over to ASSOC ON. |
| **TGT MENU** | *Step 3* Select the TGT MENU. |
| TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPTIONS<br>SET AIS OPTIONS<br>ASSOC SETTINGS | *Step 4* Select the ASSOC SETTINGS button. |
| ASSOCIATION SETTINGS<br>coastal waters ▲ ▼<br>LOAD | *Step 5* Select a Profile and LOAD the desired group (e.g. coastal waters). The LOAD button changes into the passive status to display the selected group. |
| TARGET TYPE HIERARCHY<br>SOURCE HIERARC<br>BACK | *Step 6* Select TARGET TYPE HIERARCHY. |
| ASSOCIATION PRIORITY<br>TARGET TYPE HIERARCHY FOR coastal waters<br>▲<br>AIS  PK 1<br>MODIFY  ▼<br>BACK | *Step 7* For showing the last Target Type Hierarchy press the arrow.<br><br>*Step 8* For modifying the Target Type Hierarchy press the MODIFY button. |
| ASSOCIATION PRIORITY<br>TARGET TYPE HIERARCHY FOR coastal waters<br>▲<br>AIS  PK 1<br>▼<br>COMMIT  CANCEL | *Step 9* Modify the Target Type Hierarchy and COMMIT the entry. |

**2.5.5.2     Source Hierarchy**

The SOURCE HIERACHY allows the operator to decide from which Radar (combined in an Integrated Navigational System (INS)) the associated targets will be used for the TARGET TYPE HIERARCHY selection if a target is tracked by more than 1 ARPA tracker.

| Operator controls | Task |
|---|---|
| AIS | *Step 1* Select the AIS soft button. |
| FOR LOCAL TRACKER  ZONE USAGE<br>HL ON  FILT ON  FUNC<br>SYM ON  ASSOC OFF<br>UTC  2014-08-26  08:1  ARPA TRIAL | *Step 2* Switch-over to ASSOC ON. |
| TGT MENU | *Step 3* Select the TGT MENU. |
| TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPTIONS<br>SET AIS OPTIONS<br>ASSOC SETTINGS | *Step 4* Select the ASSOC SETTINGS button. |
| ASSOCIATION SETTINGS<br>coastal waters<br>LOAD | *Step 5* Select a Profile and LOAD the desired group (e.g. coastal waters). The LOAD button changes into the passive status to display the selected group. |
| TARGET TYPE HIERARCHY<br>SOURCE HIERARCHY<br>BACK | *Step 6* Select SOURCE HIERARCHY. |
| ASSOCIATION PRIORITY<br>SOURCE HIERARCHY FOR coastal waters<br>VIGATION/AISTRANSCEIVEI PRIO 1<br>MODIFY<br>BACK | *Step 7* For showing last Source Hierarchy press the arrow.<br><br>*Step 8* For modifying the Source Hierarchy press the MODIFY button. |

| Operator controls | Task |
|---|---|
| **ASSOCIATION PRIORITY**<br><br>**SOURCE HIERARCHY FOR**<br>coastal waters<br><br>VIGATION/AISTRANSCEIVE<br><br>COMMIT    CANCEL | *Step 9* Modify the Source Hierarchy and COMMIT the entry. |

### 2.6 Zone Management

Automatic plotting means that the Radar can acquire and track maximal 40 targets automatically.
The possible tracking zone of all acquired targets can be 0,25 to 20 NM.

The operator can define acquisition zones.
As soon as a target enters such a zone, it is plotted and tracked by the Radar.
If a sleeping AIS target enters an acquisition zone, the target is activated.

| | |
|---|---|
| ⊙ | Despite all the advantages of automatic target acquisition, it may be found: |
| | Certain targets cannot be acquired due to the current weather conditions. |
| | Targets cannot be acquired due to the set acquisition zone. |
| | Targets cannot be acquired due to their size and material. |

The target information is displayed when striking the TGT INFO soft key.

ARPA ZONES in a INS System.

An ARPA ZONE created on a MFC console displays in continuous line and yellow color (active ARPA ZONE). Targets arriving this ARPA ZONE will be acquired on this MFC console.
The same ARPA ZONE displays on the other MFC in yellow color and dashed lines (passive ARPA ZONE). Targets arriving this ARPA ZONE will **not** be acquired (chapter 2.6.4).

### 2.6.1 Create Zone Form

Three different zones are available using the Create Zone menu.
Within these zones, various zone forms are available (sector, polygon or circle).
You can choose to edit each of these zone forms using the **cursor** (drag and drop) or a **text slider**.

The desired zone form is initially shown on the Radar video with preset values.
The zone form can be modified in editing mode.
Editing mode can be identified by the editing marks.

Once acknowledged, the zone becomes effective, the editing marks are hidden and the lines are continuous.

| Operator controls | Task |
|---|---|
| | *Step 1* Open the TGT menu. |
| | *Step 2* Open the CREATE ZONE menu |
| | *Step 3* Select the zone form. |

| Operator controls | Task |
|---|---|
| ACQUISITION ZONE ▲ ▼ | The ACQUISITION ZONE is used for automatic target acquisition and subsequent target tracking.<br><br>The target is automatically acquired and tracked.<br><br>**!** The ACQUISITION ZONE is considered to be an essential aid and information source for assessing the situation. The decision as to whether a short-range situation will develop from this information must be made by the navigator himself! |
| GUARD ZONE ▲ ▼ | If an acquired target enters this GUARD ZONE, the Radar outputs a "Guard Zone Alarm".<br><br>**!** The GUARD ZONE and related target acquisition are only intended to draw the Radar user attention to a target. The decision as to whether a short- range situation will develop from this information must be made by the navigator himself! |
| EXCLUSION ZONE ▲ ▼ | If the user wants to exclude certain areas from automatic acquisition, he can create an EXCLUSION ZONE. In this zone, all Radar returns (video) will be ignored.<br><br>**!** Within the exclusion zone, no targets are acquired and displayed on the Radar video.<br><br>The master and navigator are responsible for assessing and considering any possible collision situations that could result from this. |

### 2.6.1.1    Select ACQUISITION Zone Shape

The sequence of operations below can be used to select the acquisition zone form SECTOR.

The Radar menu provides 3 types of acquisition zones;

- **ACQUISITION ZONE SECTOR**

| Operator controls | Task |
|---|---|
|  | *Step 1* Open the TGT menu.<br><br>*Step 2* Open the CREATE ZONE menu.<br><br>*Step 3* Open the ACQUISITION ZONE menu with the options SECTOR, POLYGON, RING.<br><br>*Step 4* Open the ACQUISITION ZONE SECTOR menu.<br><br>*Step 5* Apply the values. Pressing the COMMIT button activates the ACQUISITON ZONE SECTOR in continuous line.<br><br><br>The BEARING values are relative to own ship.<br><br>**Result:**<br><br>A sector (displayed as a dashed outline) with preset values appears in the direction of travel on the PPI.<br><br>The sector can be changed immediately using the sector editing marks (1...4). These changes can be made directly using the cursor (drag and drop (chapter 2.1.4.1)) or using the text lines with slider functions for BEARING and RANGE located in the ACQUISITION ZONE SECTOR display field.<br><br>Subsequent changes can be introduced at any time. Several SECTORS can be displayed on the PPI. |

| Operator controls | Task |
|---|---|
|  | |
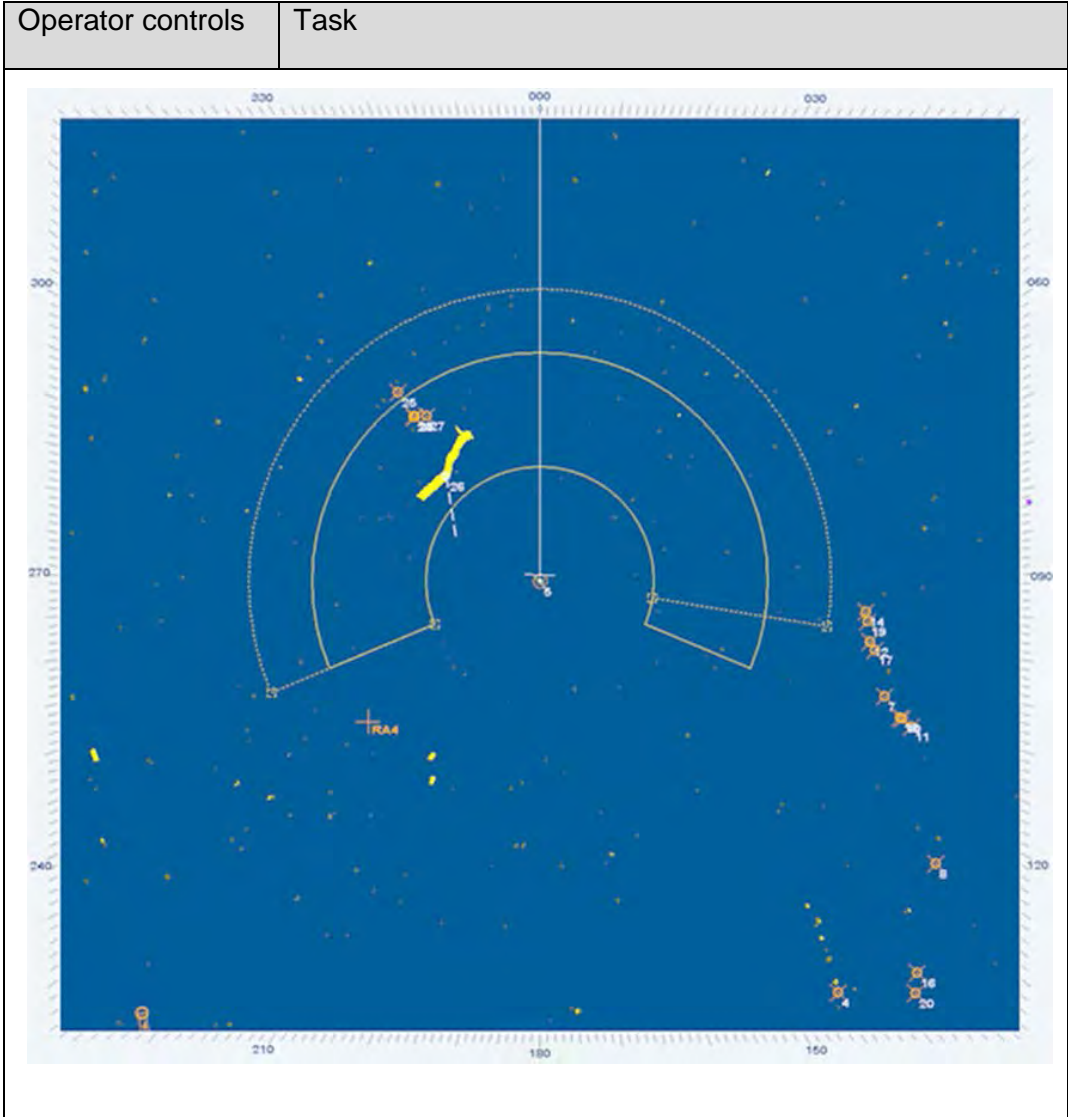
- **ACQUISITION ZONE POLYGON**

This function allows the user to create a zone with an arbitrary shape.

| Operator controls | Task |
|---|---|
| | *Step 1* Open the TGT menu. |
| | *Step 2* Open the CREATE ZONE menu. |
| | *Step 3* Open the ACQUISITION ZONE menu with the options SECTOR, POLYGON, RING. |
| | *Step 4* Open the ACQUISITION ZONE POLYGON menu. |
| | *Step 5* Apply the values. Pressing the COMMIT button activates the ACQUISITON ZONE POLYGON in continuous line. |
| | The BEARING values are relative to own ship. |
| | **Result:** |
| | A polygon with preset BEARING and RANGE values appears on the Radar video. |
| | The polygon can be individually adapted using the editing marks (1....8). |
| | The polygon method can be edited to any shape. The default shape is shown in the PPI. |
| | **It must be ensured that the ACQUISITION ZONE AREA includes the ship for the special polygon shape ACQUISITION ZONE.** |
| | These changes can be made directly using the cursor (drag and drop (chapter 2.1.4.1)) or using the text lines with slider functions for BEARING and RANGE located in the ACQUISITION ZONE POLYGON display field. |

| Operator controls | Task |
|---|---|
| | |
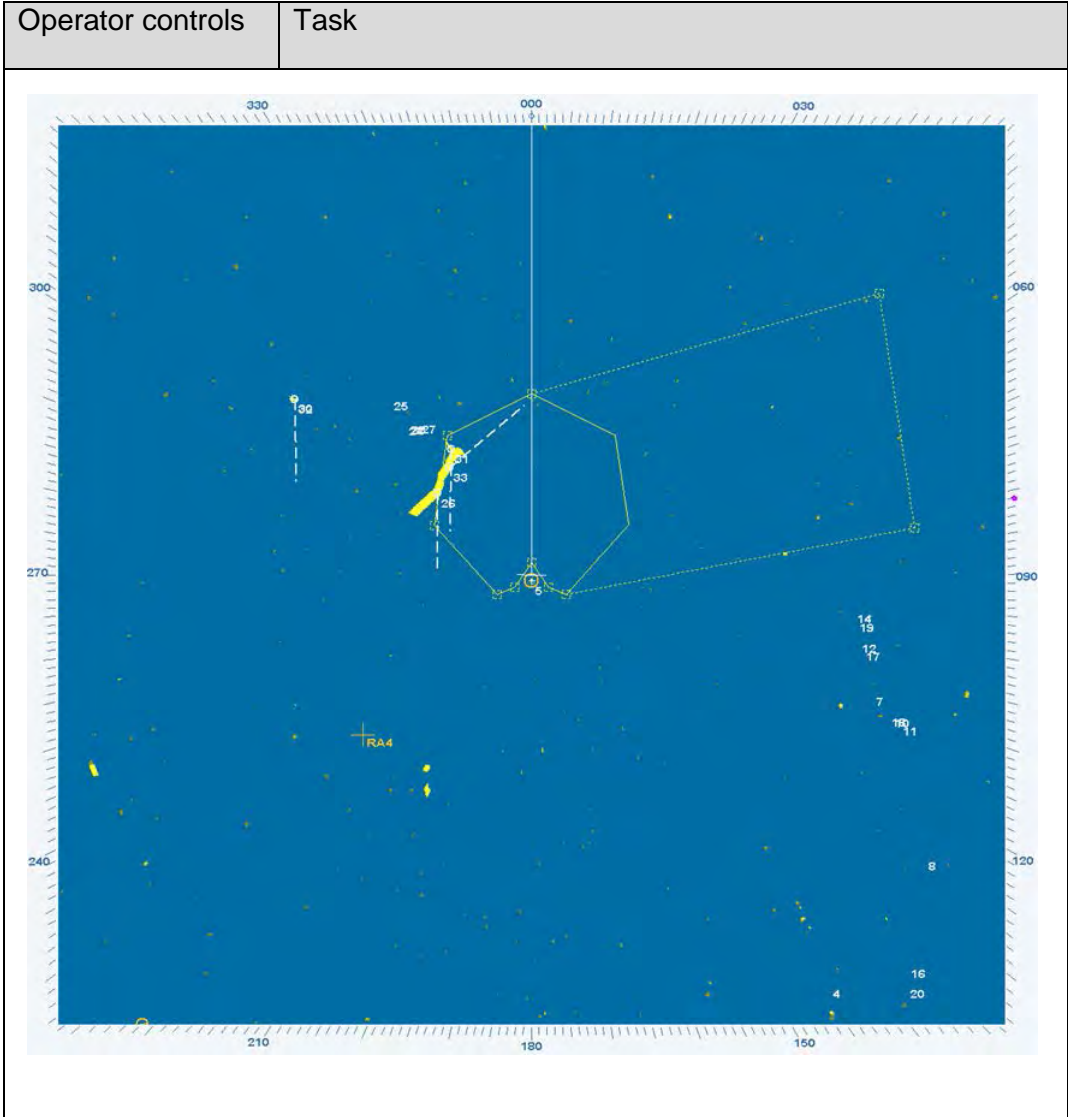
- **ACQUISITION ZONE RING**

| Operator controls | Task |
|---|---|
| **TGT MENU**<br><br>**TARGET MENU**<br>SET TARGET OPTIONS<br>SET TRACKER OPTIONS<br>SET AIS OPTIONS<br>ASSOC SETTINGS<br>**ZONE MANAGEMENT**<br>CREATE ZONE — EDIT ZONE — DELETE ZONE<br>FOR LO... TRACKER — ZONE USAGE<br><br>**CREATE ARPA ZONE**<br>**ACQUISITION ZONE**<br>SECTOR POLYGON RING<br><br>**ACQUISITION ZONE RING**<br>RANGE<br>START 1.93 NM<br>END 3.26 ...<br><br>COMMIT CANCEL | *Step 1* Open the TGT menu.<br><br>*Step 2* Open the CREATE ZONE menu.<br><br>*Step 3* Open the ACQUISITION ZONE menu with the options SECTOR, POLYGON, RING.<br><br>*Step 4* Open the ACQUISITION ZONE RING menu.<br><br>*Step 5* Apply the values. Pressing the COMMIT button activates the ACQUISITON ZONE RING in continuous line.<br><br>**Result:**<br><br>A range area with preset values for range START, range END centered around own ship appears on PPI.<br>The range area is made up of two rings that can be individually adjusted using editing marks.<br>There is an inner ring, which can be edited using drag and drop or the text line (*START*) and an outer ring, which can likewise be edited using drag and drop or the text line (*END*).<br><br>The default ring is small, as a suggestion for monitoring the area around the anchor place.<br><br>When opening the RING menu the circles are displayed with a dashed outline. |

| Operator controls | Task |
|---|---|
|  | |
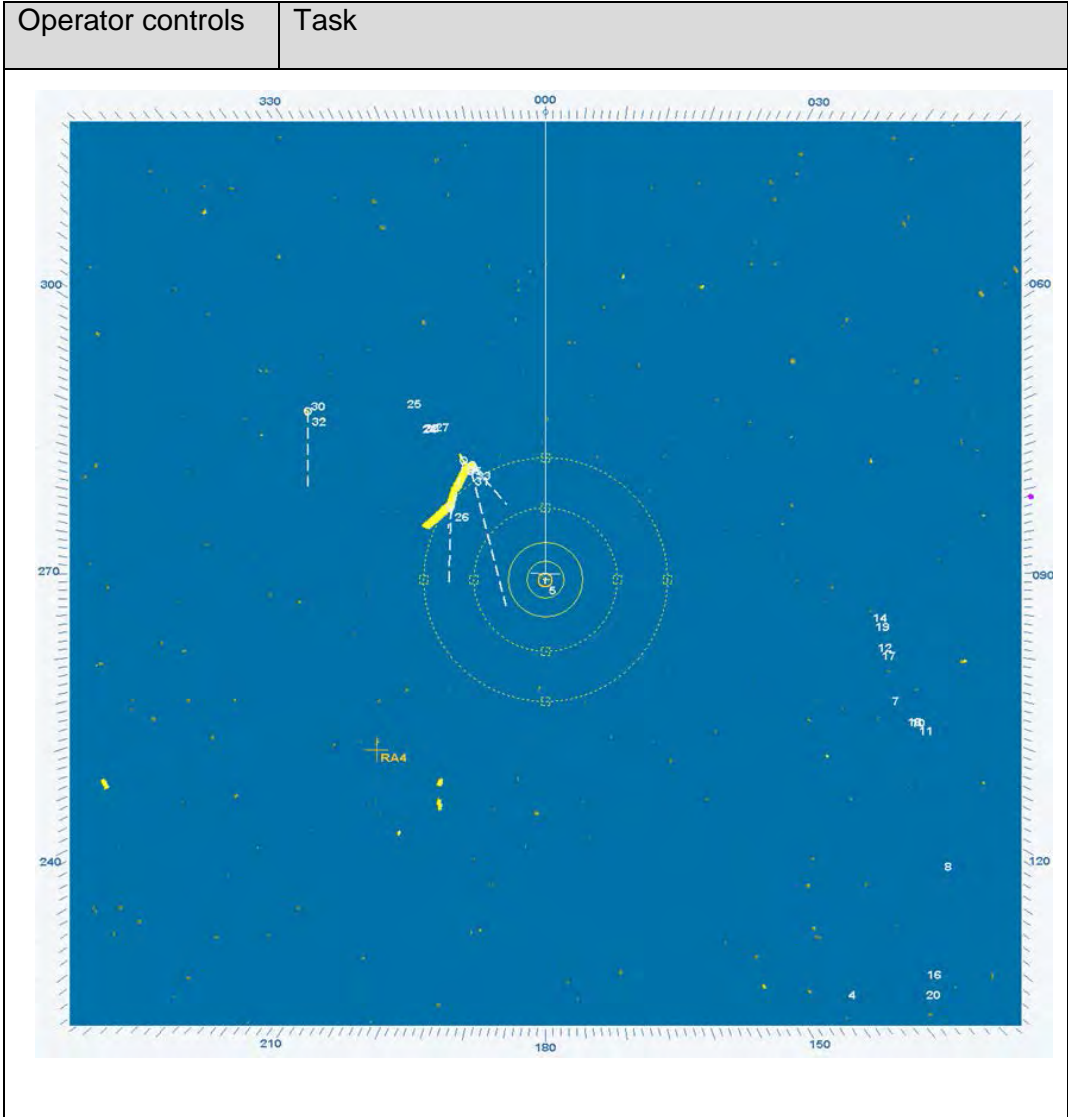
### 2.6.1.2 Select GUARD Zone Shape

The sequence of operations below can be used to select the GUARD ZONE shapes. The Radar menu provides 2 possible GUARD zone types, sector and ring.

The GUARD zone detects tracked ARPA targets that enter the preselected area. This situation is indicated by an alarm (visual and acoustic).

- **GUARD ZONE SECTOR**

| Operator controls | Task |
|---|---|
| **TGT MENU**<br><br>TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPTIONS<br>SET AIS OPTIONS<br>ASSOC SETTINGS<br>ZONE MANAGEMENT<br>CREATE ZONE   EDIT ZONE   DELETE ZONE<br>FOR LO... TRACKER   ZONE USAGE | *Step 1* Open the TGT menu.<br><br>*Step 2* Open the CREATE ZONE menu.<br><br>*Step 3* Open GUARD ZONE menu containing the options SECTOR and RING.<br><br>*Step 4* Open the GUARD ZONE SECTOR menu.<br><br>*Step 5* Apply the values. Pressing the COMMIT button activates the GUARD ZONE SECTOR in continuous line. |
| **CREATE ARPA ZONE**<br><br>GUARD ZONE<br>SECTOR   RING<br><br><br>**GUARD ZONE SECTOR**<br>BEARING<br>START   247.50 °<br>END   77.<br>RANGE<br>START   1.00 NM<br>END   6.20 NM<br><br>COMMIT   CANCEL | **Result:**<br><br><br>A sector with preset values appears in the direction of travel on the PPI.<br>The sector can be changed using the sector editing marks (1...4).<br>These changes can be made directly using the cursor (drag and drop (chapter 2.1.4.1)) or using the text lines with slider functions for BEARING and RANGE located in the GUARD ZONE SECTOR display field.<br>Subsequent changes can be introduced at any time.<br>Several SECTORS can be displayed on the PPI. |

| Operator controls | Task |
| --- | --- |
|  | |

- **GUARD ZONE RING**

| Operator controls | Task |
|---|---|
| TGT MENU<br><br>TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPTIONS<br>SET AIS OPTIONS<br>ASSOC SETTINGS<br>ZONE MANAGEMENT<br>CREATE ZONE · EDIT ZONE · DELETE ZONE<br>FOR LC TRACKER · ZONE USAGE<br><br>CREATE ARPA ZONE<br>GUARD ZONE<br>SECTOR · RING<br><br>ACQUISITION ZONE RING<br>RANGE<br>START 1.93 NM<br>END 3.26 M<br><br>COMMIT · CANCEL | *Step 1* Open the TGT menu.<br><br>*Step 2* Open the CREATE ZONE menu.<br><br>*Step 3* Open GUARD ZONE menu containing the options SECTOR and RING.<br><br>*Step 4* Open the GUARD ZONE RING menu.<br><br>*Step 5* Apply the values. Pressing the COMMIT button activates the GUARD ZONE RING in continuous line.<br><br>**Result:**<br><br>A range area with preset values for range START, range END and own position appears on the PPI.<br>The range area is made up of two rings that can be individually adjusted using editing marks.<br>There is an inner ring and an outer ring. When opening the menu the circles are displayed with a dashed outline. The rings can be changed by using the cursor and drag and drop or by using the text line sliders. |

| Operator controls | Task |
|---|---|
|  | |
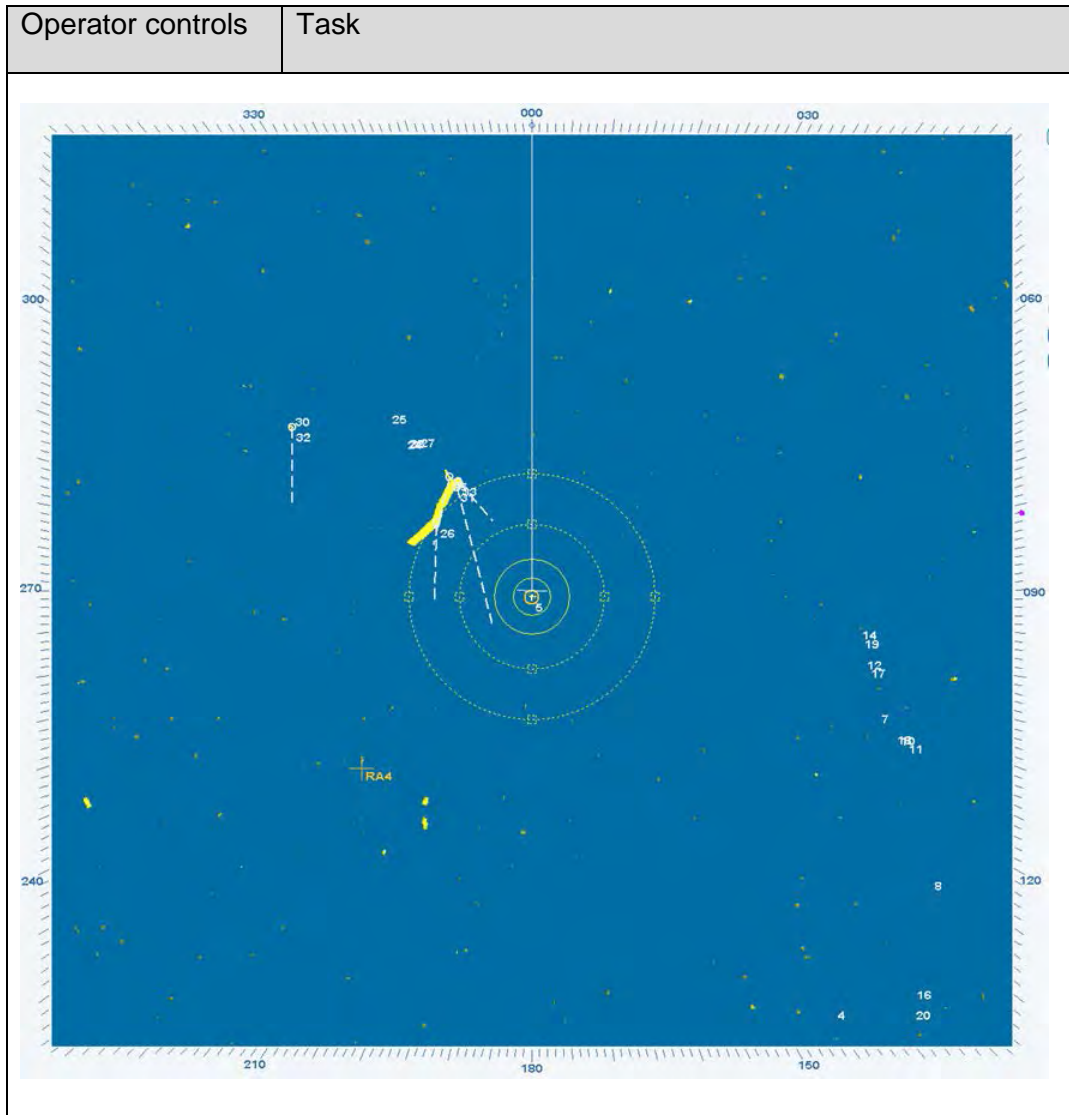
**2.6.1.3** **Select Exclusion Zone Shape**

The sequence of operations below can be used to select the EXCLUSION ZONE. Exclusion zones move.

- **EXCLUSION ZONE RELATIVE**

| Operator controls | Task |
|---|---|
| TGT MENU<br><br>TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPTIONS<br>SET AIS OPTIONS<br>ASSOC SETTINGS<br>ZONE MANAGEMENT<br>CREATE ZONE   EDIT ZONE   DELETE ZONE<br>FOR LO   TRACKER   ZONE USAGE<br><br>CREATE ARPA ZONE<br>EXCLUSION ZONE<br>RELATIVE<br><br>RELATIVE EXCLUSION ZONE<br>RANGE<br>END   5.18 NM<br><br>COMMIT   CANCEL | *Step 1* Open the TGT menu.<br><br>*Step 2* Open the CREATE ZONE menu.<br><br>*Step 3* Open EXCLUSION ZONE menu containing the options RELATIVE.<br><br>*Step 4* Open the Open the GUARD ZONE RING menu.<br><br>*Step 5* Apply the values. Pressing the COMMIT button activates the RELATIVE EXCLUSION ZONE in continuous line.<br><br>**Result:**<br><br>| ! | The relative exclusion zone is predominantly used to avoid sea clutter at close range (smaller 3 NM). However, not only sea clutter but also small targets can be suppressed. The Radar user must be aware of this situation. |<br>|---|---|<br><br>This example shows a ring centered at own ship, which is useful when the sea conditions produce numerous false alarm echoes from waves. The exclusion zone will inhibit the auto acquisition function. This function can be used to eliminate the acquisition of false echo effects.<br>The range area can be individually adjusted using the editing marks or the text slider. |

| Operator controls | Task |
|---|---|
| | |
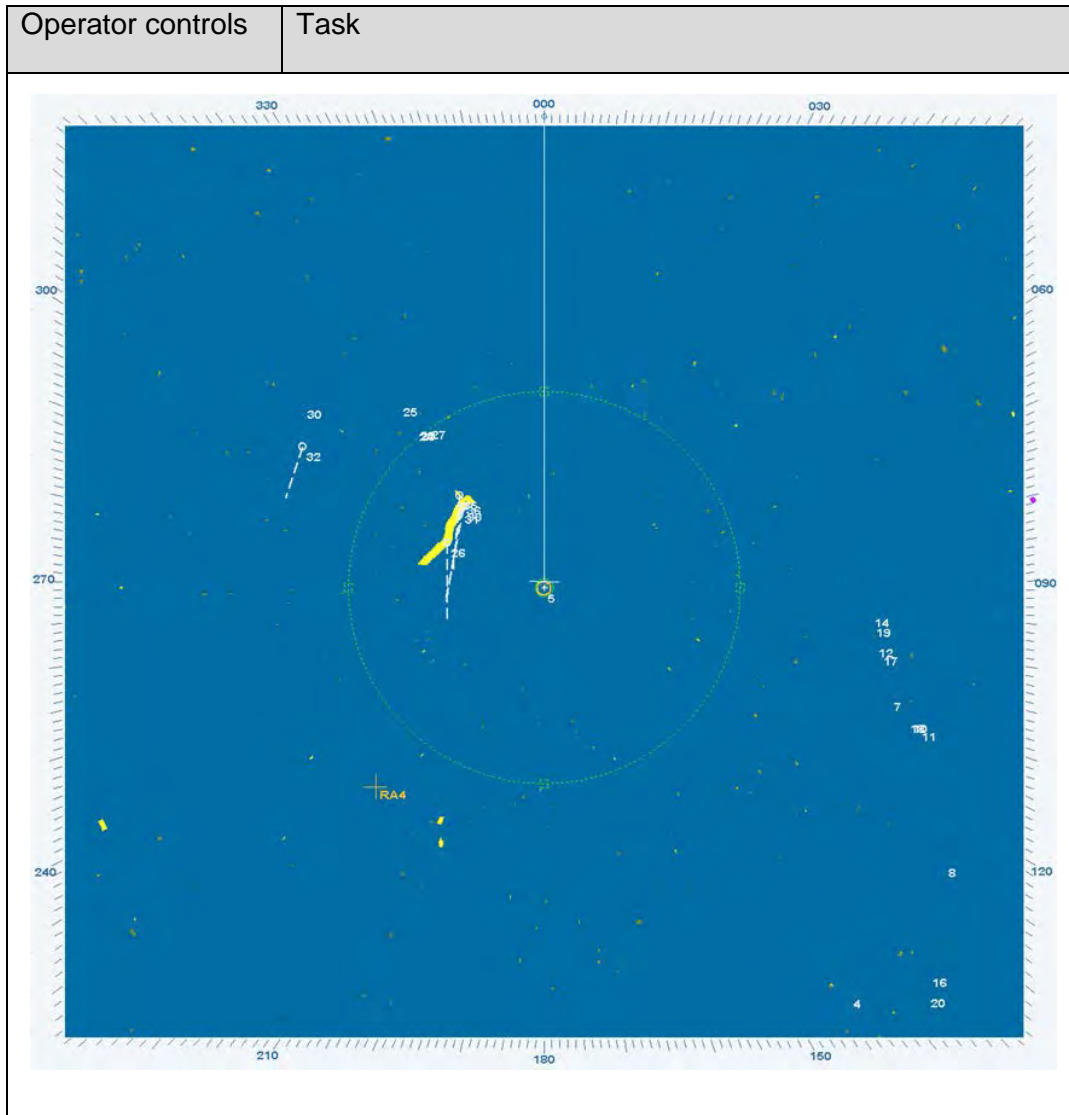
**2.6.2**     **Edit Zone**

EDIT ZONE allows later editing of an active zone.

In the example below, the ACQUISITION ZONE POLYGON is to be changed.
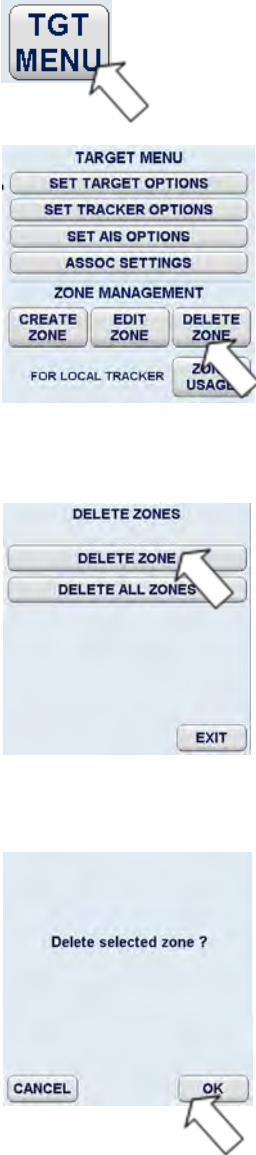
| Operator controls | Task |
|---|---|
| TGT MENU | *Step 1* Open the TGT menu.<br><br>*Step 2* Open the EDIT ZONE menu.<br><br>TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPTIONS<br>SET AIS OPTIONS<br>ASSOC SETTINGS<br>ZONE MANAGEMENT<br>CREATE ZONE / EDIT ZONE / DELETE ZONE<br>FOR LOCAL TRAC — ZONE USAGE<br><br>*Step 3* Select polygon using the **right** trackball button (the polygon points are visible).<br><br>*Step 4* Pick up editing mark point using the **right** trackball button, change the point position (dotted line).<br><br>*Step 5* Drop down the point position using the **left** trackball button, pick up next point or complete the editing procedure with pressing the COMMIT soft button in the ACQUISITION ZONE POLYGON window.<br><br>EDIT ZONES<br>Please select a zone for editing.<br>EXIT<br><br>ACQUISITION ZONE POLYGON<br>POINT<br>ID 4<br>BEARING 82.10 °<br>RANGE 10.34 NM<br>COMMIT CANCEL |

| Operator controls | Task |
|---|---|
|  | |

**2.6.3**     **Delete Zone**

DELETE ZONE allows you to delete a selected zone or all zones located at the PPI.

In the example below, an ACQUISITION ZONE POLYGON is to be deleted.

| Operator controls | Task |
|---|---|
| TGT MENU<br><br>TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPTIONS<br>SET AIS OPTIONS<br>ASSOC SETTINGS<br>ZONE MANAGEMENT<br>CREATE ZONE  EDIT ZONE  DELETE ZONE<br>FOR LOCAL TRACKER  ZONE USAGE<br><br>DELETE ZONES<br>DELETE ZONE<br>DELETE ALL ZONES<br><br>EXIT | *Step 1* Open the TGT menu.<br><br>*Step 2* Open the DELETE ZONE menu.<br><br>*Step 3* Select polygon using the **right** trackball button (the polygon points are visible).<br><br>*Step 4* Select the DELETE ZONE soft button.<br><br>Selecting the DELETE ALL ZONES soft button all zones will be deleted on the Radar video. |
| Delete selected zone ?<br><br>CANCEL       OK | *Step 5* Select the OK soft button. The polygon was deleted. |

| Operator controls | Task |
|---|---|
|  | |
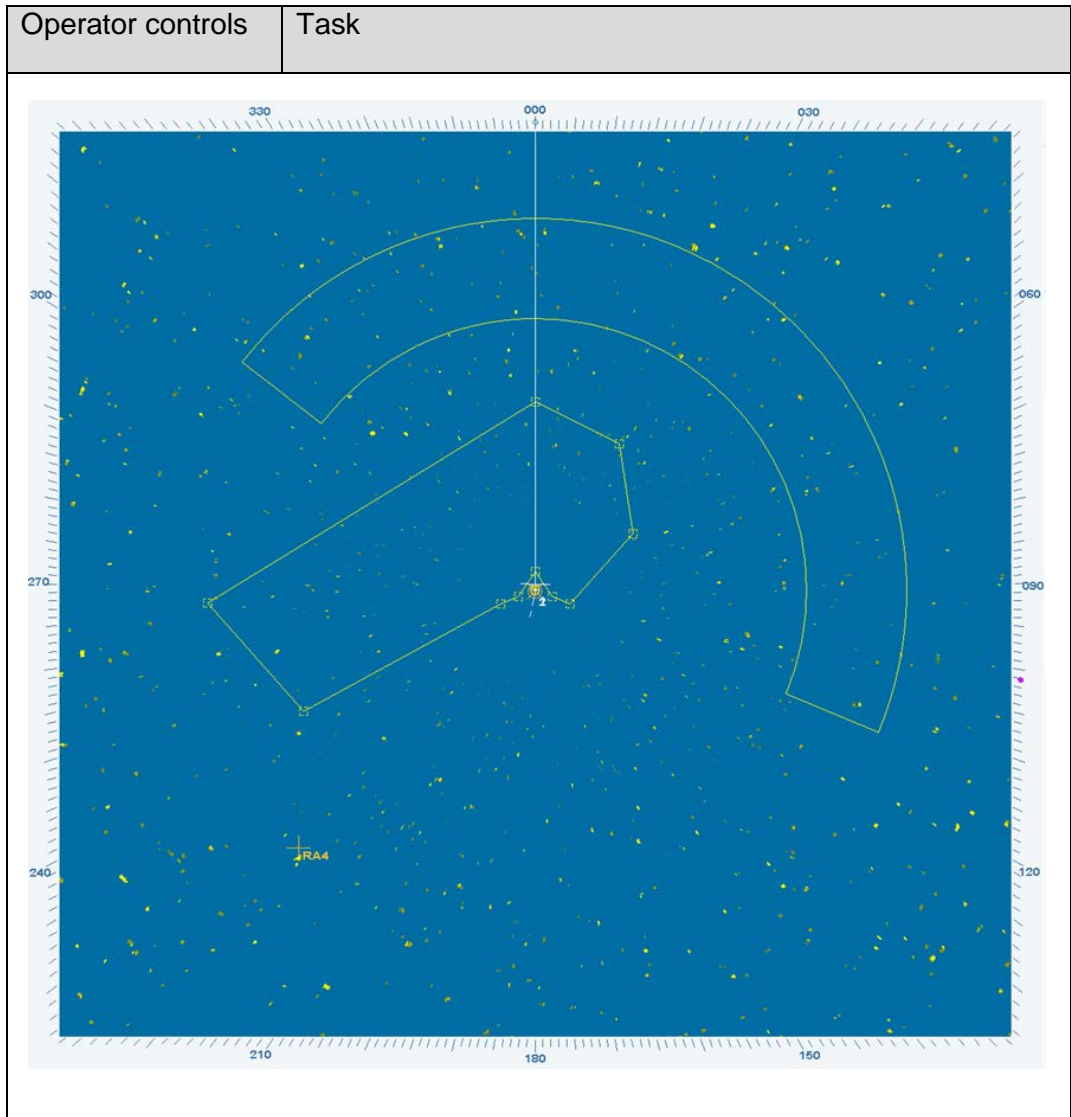
### 2.6.4 Zone Usage

An ARPA ZONE created on selected MFC console displays in continuous line and yellow color (active ARPA ZONE). Targets arriving this ARPA ZONE will be acquired on this MFC console.

The same ARPA ZONE displays on the other MFC in yellow color and dashed lines (passive ARPA ZONE). Targets arriving this ARPA ZONE will **not** be acquired.

ZONE USAGE allows the operator to use this ARPA ZONE on another MFC console.

The operator can activate or edit the ARPA ZONE on the local MFC console.

| Operator controls | Task |
|---|---|
| **TGT MENU**<br><br>TARGET MENU<br>SET TARGET OPTIONS<br>SET TRACKER OPTIONS<br>SET AIS OPTIONS<br>ASSOC SETTINGS<br>ZONE MANAGEMENT<br>CREATE ZONE  EDIT ZONE  DELETE ZONE<br>FOR LOCAL TRACKER  ZONE USAGE<br><br>USE ZONE BY ARPA TRACKER<br><br>Please select an acquisition zone to enable or disable usage by local tracker.<br><br>EXIT | *Step 1* Open the TGT menu.<br><br>*Step 2* Pressing the ZONE USAGE soft button the menu USE ZONE BY ARPA TRACKER appears.<br><br>*Step 3* Select the ARPA ZONE and press the **right** trackball button to enable the ZONE.<br>The menu changes.<br><br>*Step 4* Pressing the OK soft button the ARPA ZONE presentation changes from dashed lines to a continues line. The ARPA ZONE is activated. It is possible to edit this zone (chapter 2.6.2). The new zone form appear on all MFC consoles if selected.<br><br>For deactivating this ARPA ZONE follow *Step 1* to *Step 3* again.<br><br>*Step 5* Pressing the OK soft button APRA ZONE presentation changes from continues line to dashed lines. The ARPA ZONE is deactivated.<br><br>If this ARPA ZONE is not used in the INS system the ZONE will be fade out automatically.<br><br>For activating this ZONE again follow *Step 1* to *Step 4* again. In this case the ARPA ZONE is present on all MFC consoles again. |

**2.7** **Function Menu**

This menu provides additional functions.
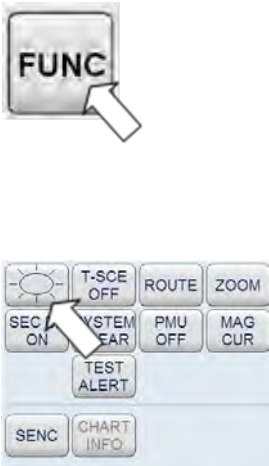
**2.7.1** **Select the Backlight Menu Brightness Control and Color Palette**

This Backlight Menu allows the operator to switch over between the functions CENTRAL and LOCAL backlight dimming. The SYNAPSIS INS generally consists of several MFCs which are combined to groups. In this case the selected CENTRAL function is used for one group.

This function menu allows the operator to find the optimum brightness for graphical presentation located around the PPI.

DIMMER MENUs 1 or 2 provide several sliders which allow individual adjustment of the various parts of the Radar display surface.

On the bottom side of the dimmer menus the operator can select a Color Palette from five options.

| Operator controls | Task |
|---|---|
|  | *Step 1* Open the FUNC menu.<br><br>*Step 2* Select the Sun symbol button.<br><br>*Step 3* Switch over between CENTRAL or LOCAL backlight dimming. The slider symbol follows the changeover.<br><br>*Step 4* Select the BACKLIGHT MENU button. DIMMER MENU 1 fades in.<br><br>*Step 5* Adjust your favoured slider by pressing the **left** trackball button. Deselect the slider adjustment by pressing the **left** trackball button again or wait for the time out (10s), then the slider adjustment will deselect automatically.<br><br>*Step 6* Select the DIMMER MENU 1 button DIMMER MENU 2 fades in.<br><br>*Step 7* Adjust your favoured slider (see step 5).<br><br>*Step 8* Select the DIMMER MENU 2 button the BACKLIGHT MENU fades in again.<br><br>*Step 9* Change COLOR PALETTE by pressing on one of the numbered fields. |

| Operator controls | Task |
|---|---|
| | BACKLIGHT MENU<br><br>CENTRAL selected, adjust the slider to set the requested brightness. This brightness value will be synchronized at all MFC consoles which are configured to one group.<br><br>LOCAL selected, adjust the slider to set the desired brightness for this console.<br><br><br>DIMMER MENU 1<br><br>MENU slider used for dimming the menus.<br><br>R- RINGS slider used for dimming the RANGE RINGS. SHM slider used for dimming the ship heading marker. EBL slider used for dimming the electronic bearing line. VRM slider used for dimming the variable range marker. VIDEO slider used for dimming all video information on the PPI.<br><br><br>DIMMER MENU 2<br><br>SYMBOLS slider used for dimming all synthetic symbols. TEXT slider used for dimming the bearing scale and text. ARPA slider used for dimming the ARPA symbols. CHART slider used for dimming the chart. |

**2.7.2** **Select T-SCE (ON/OFF)**
This function allows you to call up the TEST SCENARIO.
The Test scenario is described by an independent Radar video, in which the test targets are displayed.
If the Test Scenario has been activated, this is indicated by flashing **S** characters shown at the bottom of the PPI.

| Operator controls | Task |
|---|---|
| | *Step 1* Open the FUNC menu. |
| | *Step 2* Select the T-SCE ON/OFF symbol button. After several cycles, the test scenario appears on the PPI. These targets can be acquired manually or using the ARPA zones. The corresponding target information can be read out using the ARPA INFO. |
| | Result: |
| | This test allows the ARPA tracker to be tested. The test is normally carried out in open waters. Activating **T-SCE** displays an artificial Radar video containing several targets. These targets can be acquired manually or using acquisition zones.<br>Each target acquired can be identified by the ARPA INFO.<br>The VECTORS, TRAILS and PAST POSITIONS for the targets can also be shown. |

| Operator controls | Task |
|---|---|
|  | |
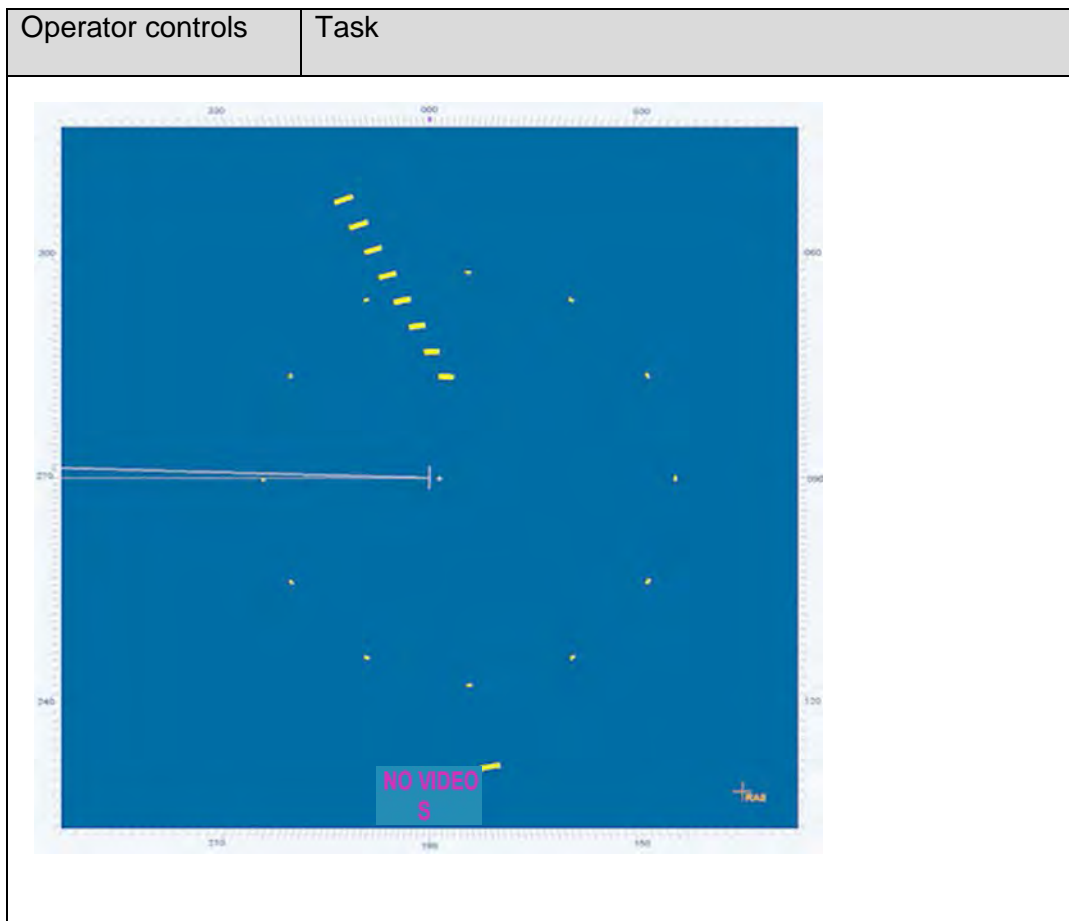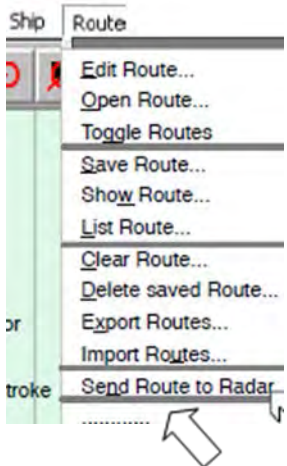
### 2.7.3  Select Route (Option)
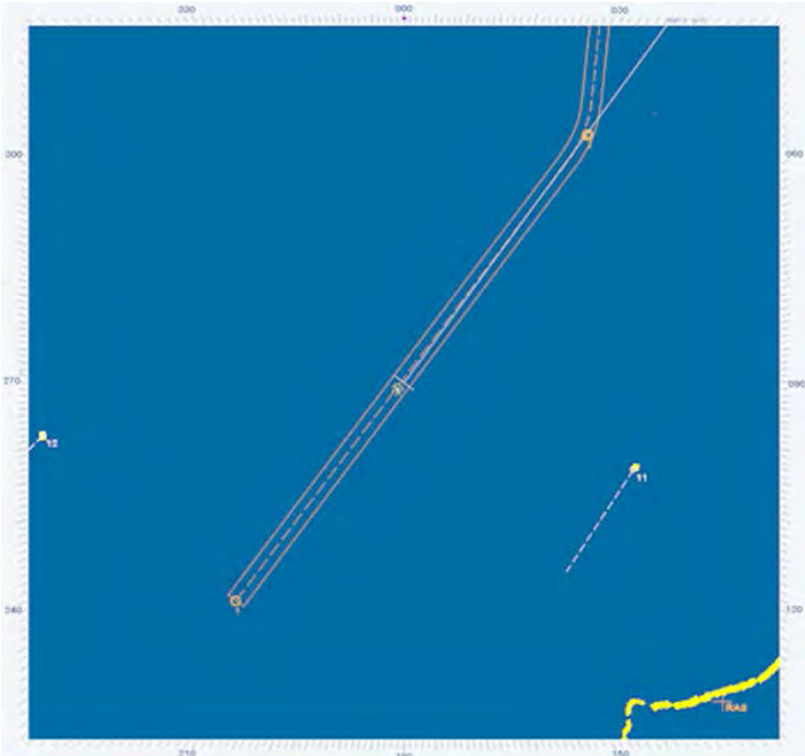
This function allows the transfer of routes, e.g. between an electronic sea chart ECDIS and the Radar.

The route planning is carried out via ECDIS (see ECDIS manual).

**ECDIS Procedure:** for selecting a Route in the ECDIS chart.

| Operator controls | Task |
|---|---|
|  | The "Send Route to Radar" function is only applied to the Primary Route. Select the function "Send Route to Radar" in the "Route Menu". <br><br> After approx. 1min the Primary Route appears on the Radar display. Alternatively use the **right** trackball button and click on any waypoint displayed on ECDIS. A pop up window appears providing the "Send Route to Radar" function. <br><br> If the route position (ECDIS) matches the Radar position, the route is displayed on the PPI. <br><br> In addition to the route display, the active cursor of the ECDIS shows up on the PPI in ORANGE color, and the active cursor from the Radar shows up on the display of the ECDIS in GREEN color. |

**Radar Procedure:**

| Operator controls | Task |
|---|---|
|  | *Step 1* Open the FUNC menu. |
|  | *Step 2* Select the ROUTE button. |
|  | *Step 3* Select the ROUTE view of interest.<br><br>The information field in the lower area displays the route name (e.g. AROUND GB), the route source (from ECDIS Route Server) and the XTD LIMITS (e.g. 300m). |

**2.7.4** **Select Zoom Menu**

The ZOOM menu allows the operator to display a selected PPI area (zoom frame) in a Zoom Window. If the operator selects the ZOOM Menu after switching ON the Radar the zoom frame displays the default setting RELATIVE TO OS (Own Ship). Other settings can be selected as described below.

| Operator controls | Task |
|---|---|
|  | *Step 1* Open the FUNC menu.<br><br>*Step 2* Select the ZOOM button.<br><br>*Step 3* The zoom frame appears on the display (default setting RELATIVE TO OS). Use the trackball to find the area of interest and press the **right** trackball button. The frame color changes from ORANGE to WHITE.<br><br>*Step 4* Using the Zoom In (+) or Zoom Out (-) function.<br><br>The Zoom menu provides following options as reference points:<br><br>a geographical position<br><br>a constant distance and bearing to own ship<br><br>a tracked ARPA target<br>a tracked AIS target<br><br>Zoom Window with crosshair<br><br>press the EXIT soft button, the ZOOM window appears again.<br><br>To leave the ZOOM function, select another soft button e.g. FUNC. |

### 2.7.5 Select Sector Blanking (ON/OFF)

SECTOR BLANKING is one of the ship- specific settings to be made during commissioning.

The setting normally depends on the ship's superstructure (e.g. cranes, chimneys, etc.), from which strong reflection effects can be expected. These effects have a negative impact on the quality of the Radar video.

To counteract this, the relevant sectors can be blanked out on the Radar video.

| Operator controls | Task |
|---|---|
| | *Step 1* Open the FUNC menu. |
| | *Step 2* Select the SEC BL ON button.<br>Pressing the soft button disables the blanked sectors SECTOR BLANKING OFF.<br><br>Pressing the soft key again blanks the sector again, SECTOR BLANKING ON.<br><br>Result:<br>Radar video quality depends on influences of reflections from superstructures.<br>Sectors with strong reflections are blanked. |

| Operator controls | Task |
|---|---|
|  | |
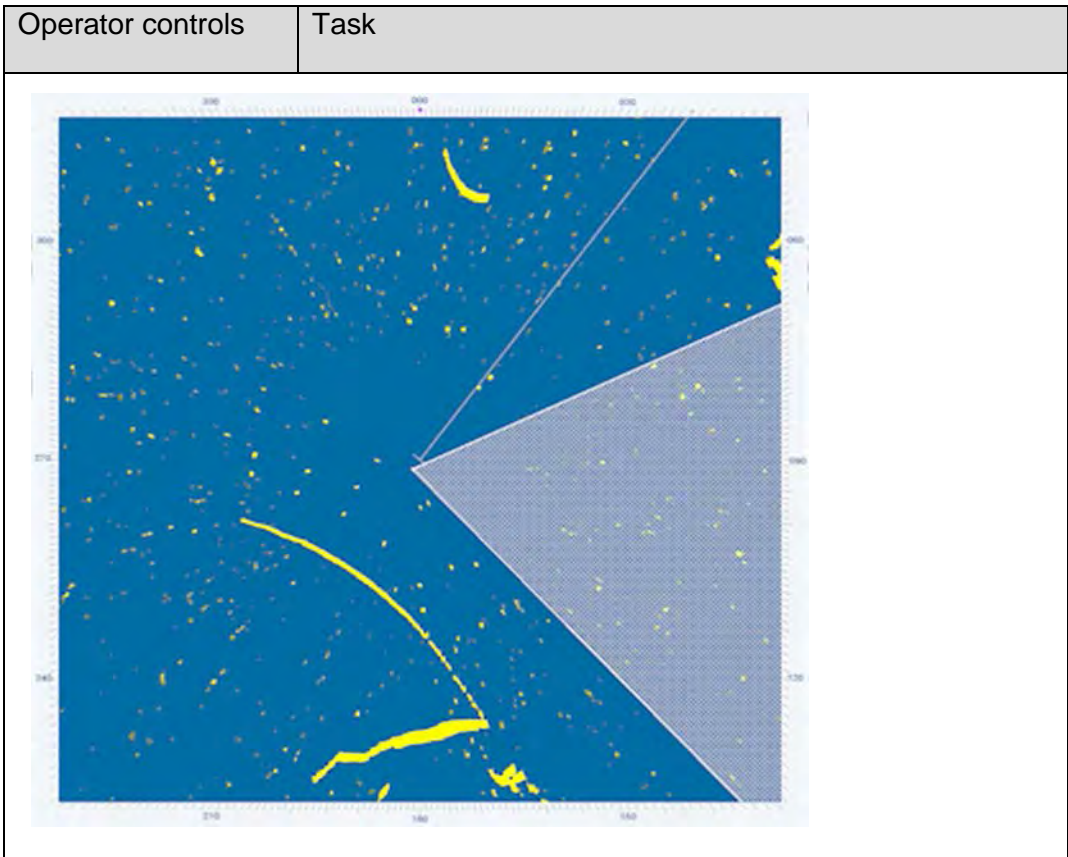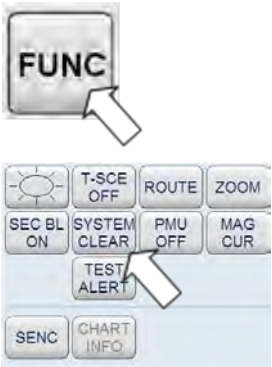
**2.7.6**      **System Clear**

This function allows the user to clear the PPI.

SYSTEM CLEAR removes:

- all plot symbols,
- navigation lines,
- true marks
- EBLs and VRMs
- SENC and ROUTE information from the PPI.

| Operator controls | Task |
|---|---|
|  | *Step 1* Open the FUNC menu.<br><br><br><br>*Step 2* Select the SYSTEM CLEAR button. |

### 2.7.7 Performance Monitor (PMU)
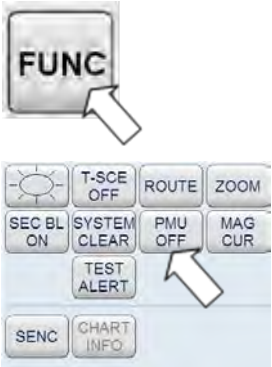
| WARNING | |
|---------|---|
| ⚠️ | No target evaluation possible. <br><br> Please note that the actual target evaluation during the active PMU test (PMU ON) is not possible. |
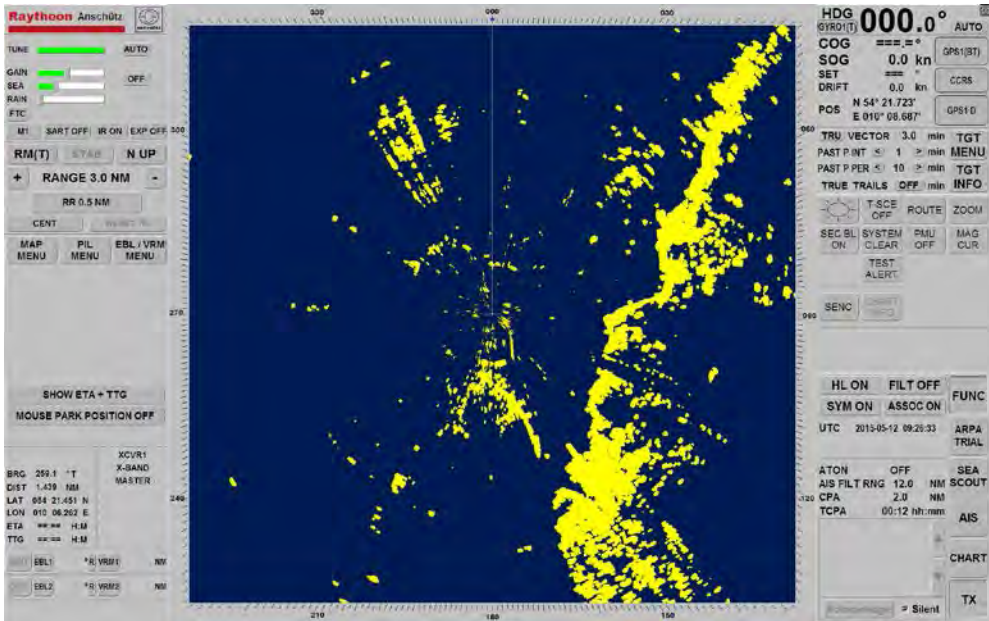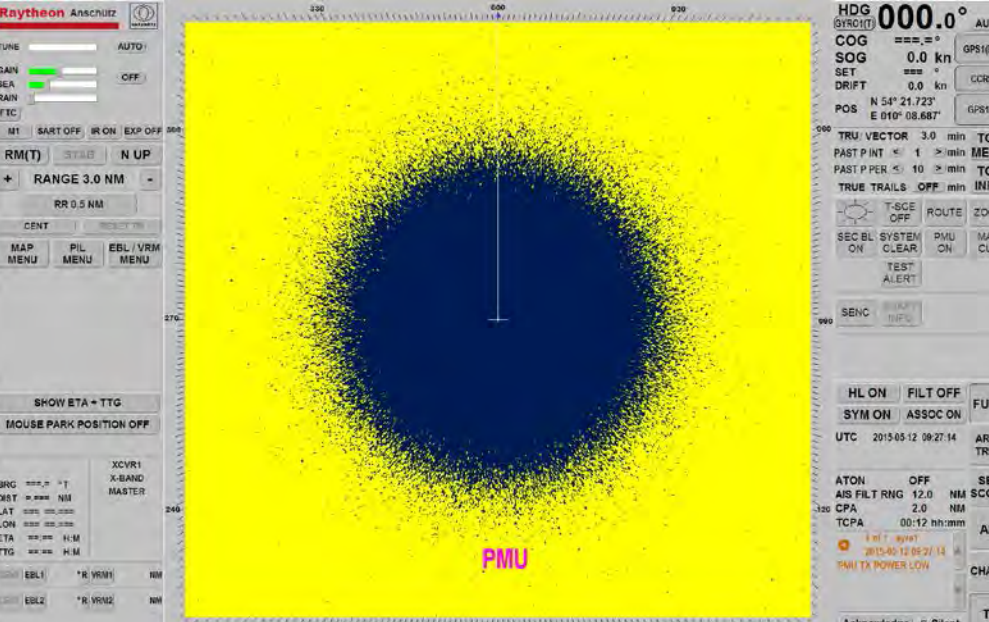
The transmitted power from the magnetron is measured permanently during TX mode.
If the actually measured TX-power is less than half of the power during first installation or prior magnetron exchange a permanent warning message will be generated. After exchanging the magnetron the warning message disappear automatically.

With pressing the PMU soft button the receiver performance will be checked as well.

Pressing this button a noise source injects a broadband microwave signal into the receiver. Hence follows an increase in the radar video level. This level will be compared to the corresponding level stored during first installation. A decrease in sensitivity by more than 7dB will cause an alarm message.

| Operator controls | Task |
|-------------------|------|
|  | *Step 1* Open the FUNC menu. <br><br> *Step 2* Select the PMU OFF button. <br> Pressing the soft button the reference level is compared to the actual level. <br><br> In this case targets and land contour will be fading out. The PMU abbreviation flashes in the lower PPI side. The increased noise level is to been on the PPI. <br><br> *Step 3* Select the PMU ON button. <br> Targets and land contour will be fading in again. |

| Operator controls | Task |
| --- | --- |

**PMU OFF**



**PMU ON**

### 2.7.8    Magnetron Current
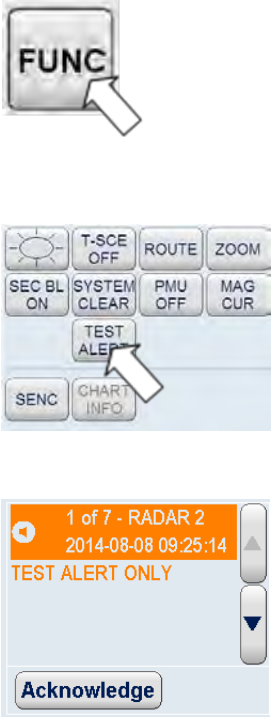
The Magnetron Current feature is a special tool to measure power on the Magnetron. The video quality will degrade as the magnetron ages (over 8000 operating hours).

| Operator controls | Task |
|---|---|
| | *Step 1* Open the FUNC menu. |
| | *Step 2* Select the MAG CUR button.<br><br>. |
| | *Step 3* The actual Magnetron Current displays. |

**2.7.9     Test Alert**

The Test Alert was used to check the alarm management in an INS system.
This Test Alert must be displayed in the Display for Alarms in all MFC consoles.
After acknowledging the Alarm Message the check was finished.

This Test Alert can be set from the Radar and ECDIS application.

| Operator controls | Task |
|---|---|
|  | *Step 1* Open the FUNC menu. |
|  | *Step 2* Select the TEST ALERT soft button. |
|  | *Step 3* A test alarm message appears in the alarm display. The alarm message disappears after 1min. |

### 2.7.10    Senc Menu

SENC stands for System Electronic Navigational Chart.
This function can only be realized via ECDIS in connection with the C—MAP Chart Data (vector charts).

**ECDIS procedure**

ECDIS allows the operator to send objects (e.g. Depth contour or Buoys) to selected Radars and displays them on the PPI. The interface between Radar and ECDIS is serial and designed according to NMEA 0183.

**Radar procedure**

The Radar Function SENC allows the user to adjust (Radar Fix) the object positions of objects transferred between ECDIS and Radar.
Transferred lines and objects can be individually switched on and off by the Radar user.
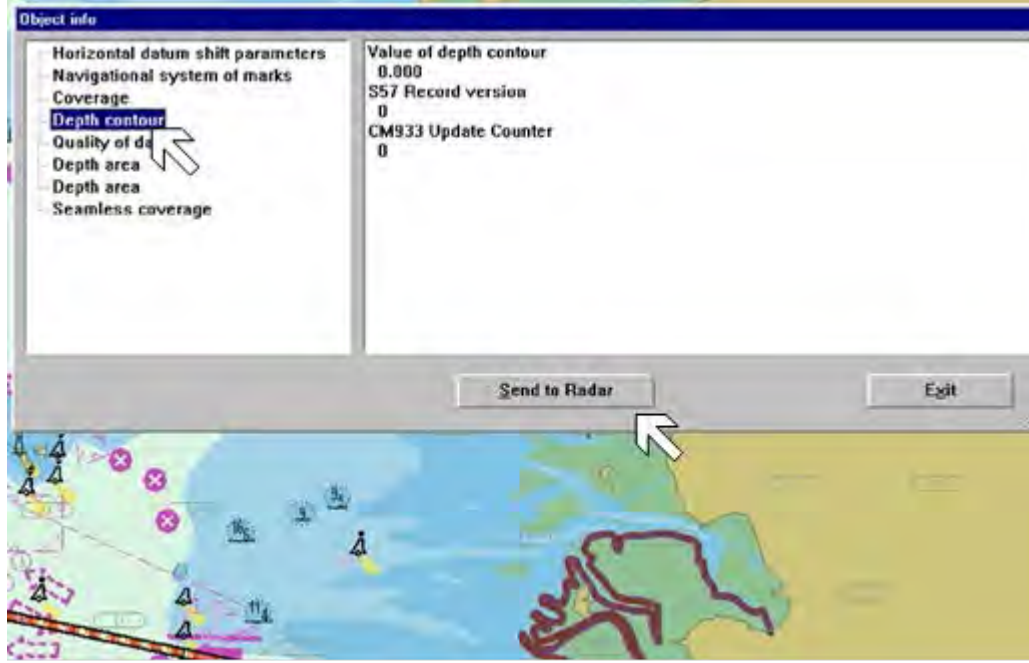
**Cursor**

- The Radar cursor appears in the ECDIS chart as a second cursor in GREEN color.

- The ECDIS cursor appears on the Radar PPI as a second cursor in ORANGE color.

| | |
|---|---|
| **i** | A route planned on an ECDIS is based on the electronic chart vector format being used on the ECDIS PC. This chart presentation is based on a MERCATOR projection. |
| | If a route is created on an ECDIS and send to the Radar, the route will be displayed on the Radar PPI. |
| | If the distance between two waypoints is too long the track leg should be drawn as a Great Circle. As the route on the Radar is displayed as a Rhumb line it deviates from the Great Circle presentation. |
| | To keep the deviation as small as possible the distance between two waypoints should be maximum 40 nautical miles to approximate it to a series of Rhumb Line tracks. |

**ECDIS Procedure:**
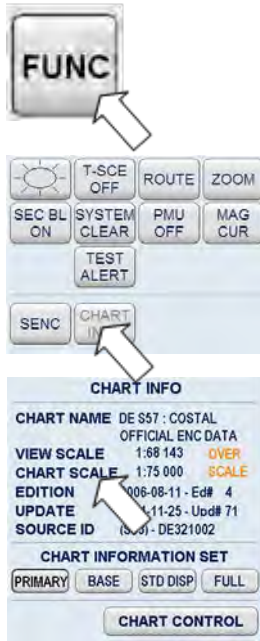
| Operator controls | Task |
|---|---|
| | *Step 1* Place the cursor e.g. on the coast line from the chart and press the **right** trackball button. An Object Info window appears. Objects with special info such as coastlines or depth contour lines activate the Send to Radar button in the Object Info window. To transfer e.g. the depth contour to this Radar the operator has to push the "Send to Radar" button. After approx. 1min the depth contour layer appears on the PPI.<br>You can select another object on the ECDIS chart as described before. |
| |  |

**Radar Procedure:**

| Operator controls | Task |
|---|---|
| FUNC | *Step 1* Open the FUNC menu. |
| | *Step 2* Select the SENC button. |
| | *Step 3* Switching over between SENC ON and OFF function. SENC ON means all objects are presented on the PPI. SENC OFF means no objects are presented on the PPI. |
| | *Step 4* SENC CONFIG provides following functions DELETE ALL. All objects are deleted from the Radar PPI and from the Radar storage. |
| | ADJUST (RADAR FIX) The amount of change is expressed in the change of Latitude and Longitude from the original position. Use this when position is very poor (e.g. Loran C), or when no sensor is available (for example when auto drift is in use to Dead Reckon the ship's progress using Radar). |
| | **Do not use with GPS.** |
| | CANCEL FIX If the Radar Fix is no longer required. |
| | LINE MENU The Line Menu provides a means for the operator to select line styles to be displayed when interfacing the Radar to an ECDIS. |
| | ALL LINES ON/OFF All feature of the LINE MENU are ON (default settings). |
| | MARK MENU The MARK MENU provides a means for operator to select |

| Operator controls | Task |
| --- | --- |
|  | various symbols to be displayed when interfacing the Radar to an ECDIS. |

## 2.7.11        Chart Info

| Operator controls | Task |
|---|---|
|  | *Step 1* Open the FUNC menu.<br><br>*Step 2* Select the CHART INFO button. The chart appears on the PPI, and in the function area the CHART INFO window is displayed.<br><br><br><br>Describes the current chart features.<br><br><br>Special chart functions see chapter 2.8.2. |

## 2.8 Chart Radar Function

This chapter describes the operation of the ChartRadar function. In this case a Chart appears as chart underlay on the PPI.

For this Radar/ECDIS System the complete Chart handling (license, installation and updates) has to be done at the ECDIS.

| | |
|---|---|
| ! | An accurate position sensor is required to make sure that the chart underlay and Radar images agree with each other. Depending on the range of the Radar and the scale of chart underlay being used, GPS is usually suitable for mid- to long- ranges, while DGPS is suitable for close ranges and large- scale display (e.g. > 1:10.000).<br><br>In general, the more accurate and reliable the position fixing system, the more accurate and reliable is the combined Radar and chart underlay. It has to be realized that for the position obtained from the Radar image to be in precise agreement with the GPS, the chart data must be referenced to WGS 84. This is a requirement for ECDIS.<br><br>RNC charts are prohibited to use with Chart Radar. |

### 2.8.1    Chart

After pressing the CHART soft button the chart appears as a chart underlay on the PPI.

In this case the Radar function SENC will be blocked. The chart scaling effect is combined with the range scale effect.

| | |
|---|---|
| **i** | The chart presentation on the PPI is dependent on the heading and position (Gyro/GPS) information. No heading or no position information leads to disabling of the chart presentation. |
| | Radar and chart underlay use the same Common Reference Point CRP. |

| Operator controls | Task |
|---|---|
| HL ON  FILT ON  SYM ON  ASSOC OFF | *Step 1* Switch to SYM ON. All symbols (EBLs, VRMs, PILs, ARPA zones, MAPs) are shown on the PPI. |
| CHART | *Step 2* Select the CHART button. A proper chart appears on the PPI. |
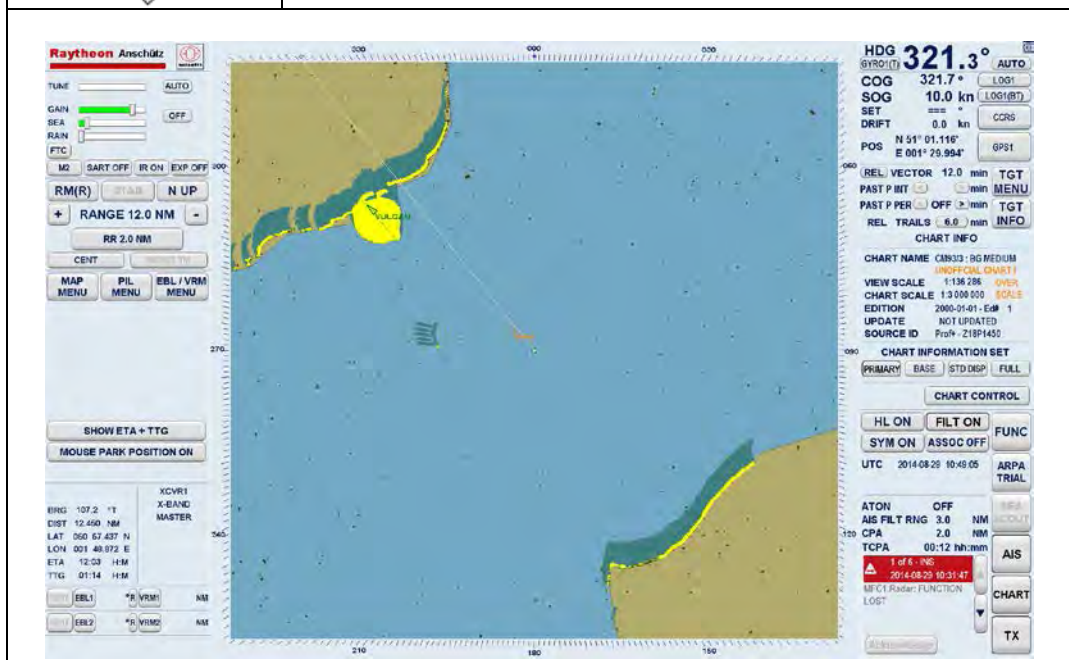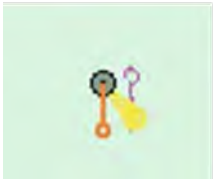
### 2.8.2 Chart Info

This function display appears automatically after selecting the CHART button. The CHART INFO function display provides additional functions and information.

| Operator controls | Task |
|---|---|
|  | *Step 1* Select the CHART button. A proper chart appears on the PPI and the CHART INFO appears in the function display. |
|  | Describes the current chart characteristics. The OVER SCALE note displays if the chart scale is below the view scale. The view scale depends on the range scale. |
| | CHART INFORMATION SET |
| | The special chart functions allow the user to enable or disable additional chart information. |
|  | PRIMARY chart information set |
| | – for coastlines |
| | – own ship's safety contour |
| | – dangers to navigation |
| | – fixed and floating aids to navigation |
|  | BASE chart information set |
| | – Primary chart information set |
| | – traffic routing system |
| | – caution areas |
| | – build up areas |

| Operator controls | Task |
|---|---|
| STD DISP | STD DISP chart information set<br><br>− base chart information set<br>− drying line<br>− boundaries of fairway, channels, etc.<br>− visual and Radar conspicuous features<br>− prohibited and restricted areas<br>− chart scale boundaries<br>− indication of cautionary notes |
| FULL | FULL Display chart information set<br><br>− Standard chart information set<br>− spot soundings<br>− submarine cables and pipelines<br>− ferry routes<br>− graticule<br>− place names<br>− all contour lines<br>− buildings |

| Operator controls | Task |
|---|---|
| CHART CONTROL<br><br>CONTROL CHART<br>ADJUST  RADAR FIX<br>Λ N 00° 00.000'<br>CANCEL FIX  Λ E 000° 00.000'<br>ENC AUTO SCALE<br>NORMAL  MEDIUM  HIGH<br>SYMBOL TYPE<br>TRADITIONAL  SIMPLIFIED<br>SAFETY CONTOUR  886  m<br>EXIT<br><br>ADJUST<br><br>CANCEL FIX | CHART CONTROL<br><br>Chart control allows the user to correct or change following chart features.<br><br>RADAR FIX<br><br>An adjustment is necessary when there is a big difference in position between the contours on the chart layer and on the Radar PPI.<br><br>*Step 1* Select the ADJUST button. The chart layer position can be changed by using the trackball.<br><br>*Step 2* Press the **left** trackball button to fix the chart at the new layer position on the PPI.<br><br>A warning message appears;<br>FIX ACTIVE:<br>CHART<br><br>*Step 3* After selecting the CANCEL FIX button the adjustment returns. The warning message disappears. |

| Operator controls | Task |
|---|---|
| | **ENC AUTO SCALE**<br><br>With this function the system can be forced to use ENC charts, which are not intended to be used at the current scale. |
| **NORMAL** | **NORMAL**<br><br>Use only ENC charts which are intended to be used at the current scale. |
| **MEDIUM** | **MEDIUM**<br><br>If there are no ENC charts at the current scale, the system will use ENC charts, up to factor 4 larger than the view scale, of the display. |
| **HIGH** | **HIGH**<br><br>If there are no ENC charts at the current scale, the system will use ENC charts, up to factor 8 larger than the view scale, of the display. |

| Operator controls | Task |
|---|---|
| TRADITIONAL<br><br>or<br><br>SIMPLIFIED | **SYMBOL TYPE**<br><br>Using this menu function, buoys and beacons can be displayed either as TRADITIONAL symbols as known from paper chart or as SIMPLIFIED symbols acc. to IHO-paper S52.<br><br> <br><br>A beacon as TRADITIONAL symbol      A beacon as SIMPLIFIED symbol |
|  | **SAFTEY CONTOUR**<br><br>Using this menu function, the special safety contour can be selected per numerical input in [m].The default value is 30 m.<br><br>*Step 1* Select the numerical indicator and enter a value. The safety contour displays the new value in the chart area.<br><br> |

## 2.9 Select ARPA Trial Manoeuvre

The trial manoeuvre feature allows the operator to see the results of possible changes in their own speed and/or course, delay and radius, without actually committing their own ship to those changes.

The trial manoeuvre scenario takes place in real time. The trial manoeuvre can be used for all ship categories.

When the trial manoeuvre function is on, a large letter T flashes at the bottom of the PPI. This is to remind the operator that the current Radar video and plotting data is not the true navigational situation. The user can return to normal Radar operation by clicking on TRIAL again.

When changing course or testing a proposed course, the trial heading is indicated in white and by a dashed line originating from own ship. The trial radius is indicated as a thicker white line originating from own ship.

| | |
|---|---|
| ! | Use realistic DELAY and RADIUS values which describe to own ship's dynamic characteristics in the trial functionality in terms of turning performance and rate of change of velocity. |

| | |
|---|---|
| ! | If True vectors are selected, your own ship's vector will reflect any set and drift inputs (course made good). Target data (SPD, CSE, ID, CPA, TCPA) that is being plotted is still shown in the actual TRIAL MANOEUVRE readout. |

| | |
|---|---|
| ! | The best trial manoeuvre information is provided by using relative motion and sea stabilization (water tracking). |

During a trial manoeuvre, there are no restrictions on the operation for the Radar user interface.

**Sea Scout and ARPA Trial Manoeuvre**

Using the Sea Scout (chapter 2.10) function it is possible and helpful to use the ARPA Trial Manoeuvre as a second function. The operator can see the "No- Go Areas" and find the gap between these areas per trial manoeuver.
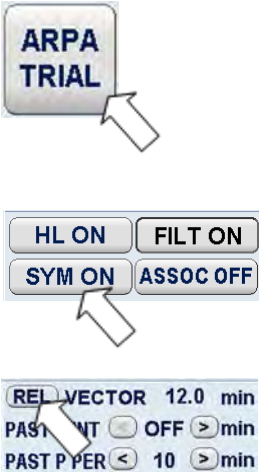
Alarms and warnings during the trial manoeuvre:

Real alarms

The ARPA tracking system continues running in the background. If there is a real close range situation (target enters the CPA/TCPA zone limits), an automatic alarm is generated. The target symbol flashes and a corresponding alert text message appear in the alarm display.

Temporary alarms

If a close range situation occurs during the trial manoeuvre, the target symbols flash.

| Operator controls | Task |
|---|---|
|  | *Step 1* Open the TRIAL function. |
| | *Step 2* Switch the SYM status to ON. All symbols (EBLs, VRMs, PILs, ARPA zones, MAPs) are shown on the PPI. |
| | *Step 3* Switch the vector display into REL mode. |

| Operator controls | Task |
|---|---|
| | *Step 4* Press the INACTIVE button for changing to the ACTIVE situation. The actual SPD, CRS CHG, DELAY and RADIUS values appear. For changing the values, press and hold the **left** trackball button until the text line slider appears. Using the trackball the desired parameter value changes. Follow the display changes.<br>Press the **left** trackball button again, the process stops.<br>The readouts show acquired targets (ID no.) with their CPA/TCPA values. The readouts are classified in TRIAL DATA and ACTUAL DATA.<br>The TRIAL DATA readout displays the possible close range situation during the TRIAL manoeuvre in combination with the acquired targets (ID no.).<br>The ACTUAL DATA readout displays the actual situation in combination with the acquired targets (ID no.).<br><br>*Step 5* Press the CNTDWN button for starting the countdown. The DELAY time counts down in second steps (DELAY time 00.00). The possible close range situation has to be completed by a relevant manoeuvre before the DELAY time is executed. Exit the TRIAL MANOEUVRE by pressing the EXIT button.<br><br><br>Result:<br><br>When a trial manoeuvre is added, the trial course (CSE) identifies the new heading and is able to show potential collision points. Trial speed (SPD) changes the potential collision points and the higher the selected speed the more PCPs will be in the vicinity of the tracked ships. A trial manoeuvre and PCPs are a way to view the advantages of a change in speed. The time changes (DELAY) allow the operator to check the trial course history in the future situation.<br><br>The countdown (CNTDWN) allows the operator to observe the possible close range situation in real time. |

| Operator controls | Task |
|---|---|



CSE 7,4°

RADIUS 5.01 NM

SPD 16.5 kn

DELAY 00:00

Trial manoeuvre symbol

### 2.10 Sea Scout (Option)

The optional Sea Scout function is an aid to the operator for appraising the traffic situation. It can be faded in or out of the current Radar PPI display.

Previous display and PPI- settings will remain preserved.

The Sea Scout function can support the operator in sea areas with heavy traffic. True vector mode has to be selected to enable the Sea Scout button.

Sea Scout will show true zones to the operator, i.e. the Sea Scout position will be true in relation to other true objects on the PPI (i.e. chart underlay, buoys, true markers, traffic separation zones, nav. lines etc.).

Figure 2-38 illustrates a situation with a coastline, a buoy and a moving target. The operator can immediately know from the picture that proceeding on the current course until reaching the buoy and then turning starboard would be safe.

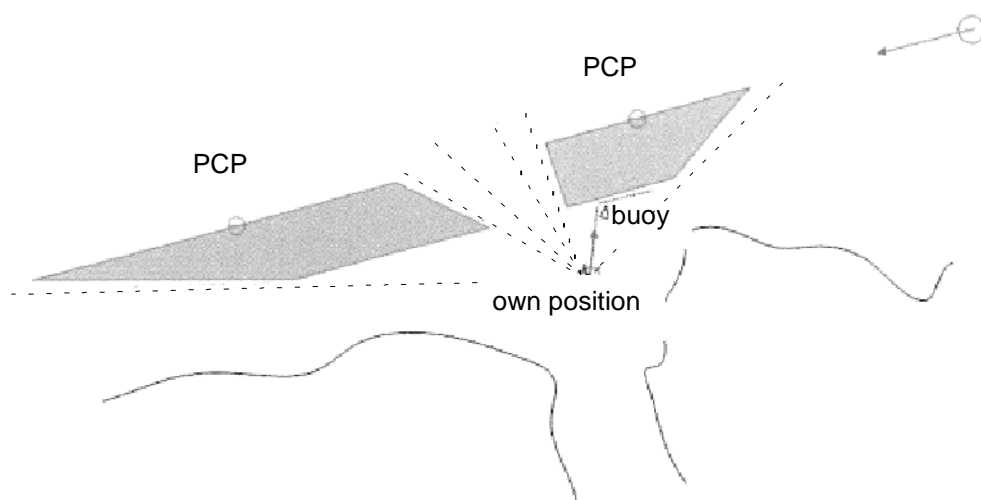So would be any other option shown in the figure as black, dashed lines.



Figure 2-38    Sea Scout situation

The Sea Scout function can be used in combination with the ARPA TRIAL function. The parameter values for SPD, CSE and DELAY can be set in the dedicated ARPA TRIAL MANOEUVRE display. By changing these values a trial manoeuvre can be calculated to avoid a potential close range situation.
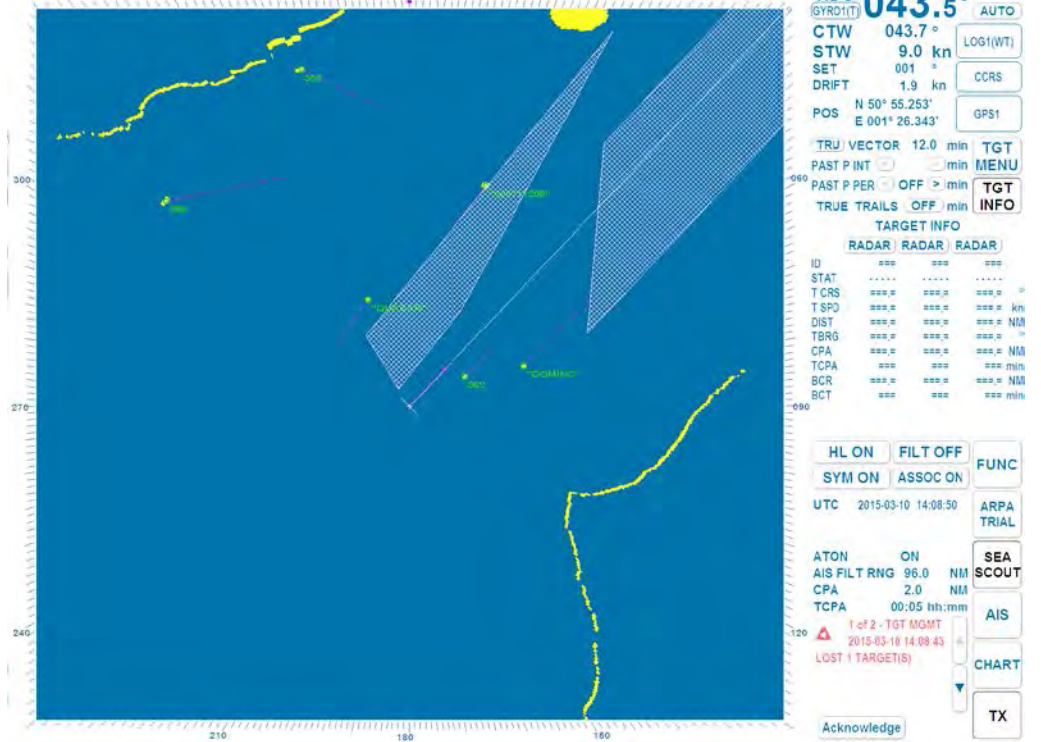
The current TRIAL values for CPA and TCPA are indicated in the ARPA TRIAL MANOEUVRE display.

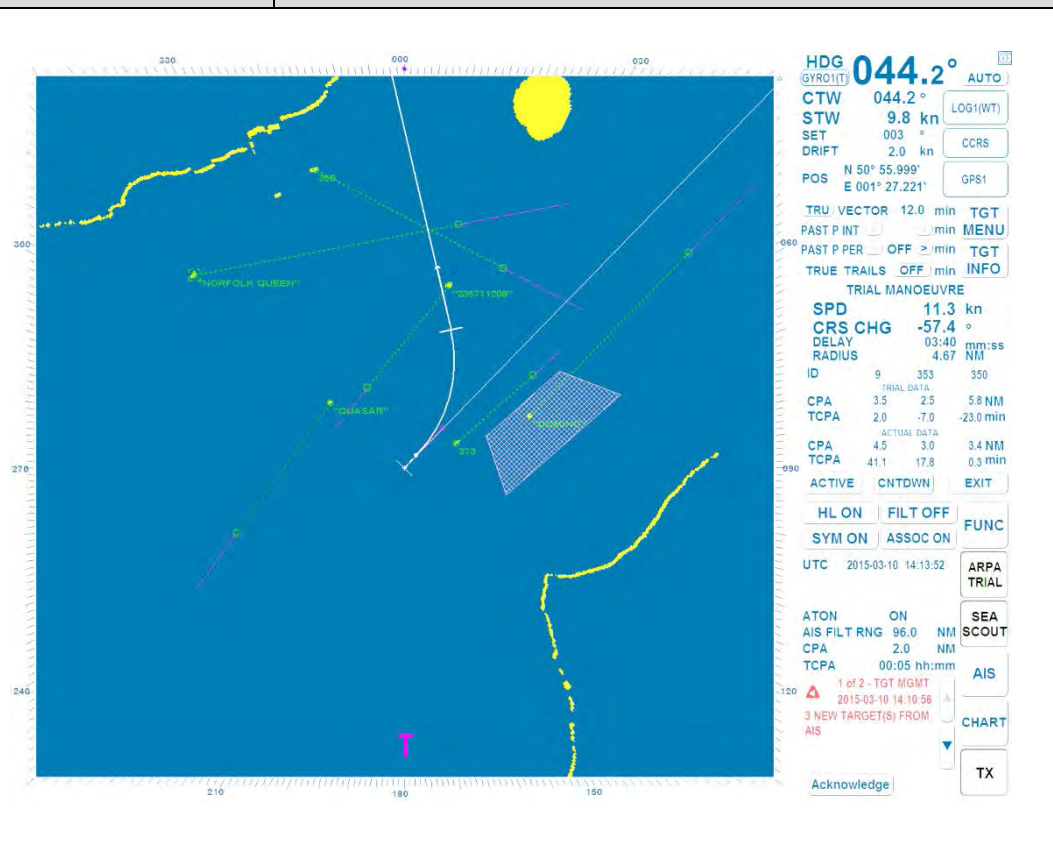|  |  |
|---|---|
| ! | The Sea Scout function supports the operator in analyzing close range situations.<br><br>The navigational decision and appropriate action must be performed by the operator. |

### Procedure without ARPA TRIAL Function

| Operator controls | Task |
|---|---|
| TRU VECTOR 12.0 min<br>PAST P INT OFF min<br>PAST P PER 10 min<br>REL TRAILS OFF min | *Step 1* Acquire targets of interest, wait until the tracking process is stable. |
| RM(R)    N UP<br>+ RANGE 12.0 NM | *Step 2* Switch the vector display into TRUE mode and the Radar video into N UP mode. |
| SEA SCOUT | *Step 3* Select the SEA SCOUT soft button. Calculated "No- Go Areas" will be displayed after a few seconds. |

**Procedure without ARPA TRIAL Function**

| Operator controls | Task |
|---|---|
| ARPA TRIAL / ACTIVE CNTDWN EXIT / TRIAL MANOEUVRE / SPD 11.3 kn / CRS CHG -57.4 ° / DELAY 03/ mm:ss / RADIUS 4.0 M / SEA SCOUT / ACTIVE CNTDWN EXIT | *Step 1* Select the ARPA TRIAL button. The Trial Manoeuvre window will open.<br><br>*Step 2* Select the INACTIVE button for changing to the ACTIVE situation. The actual SPD, CSE, DELAY and RADIUS values appear.<br><br>*Step 3* For changing the values, press and hold the **left** trackball button until the text line with slider appears. Using the trackball the relevant parameter value is changed. Follow the display changes. Press the **left** trackball button again, the process stops.<br><br>*Step 4* Select the SEA SCOUT button to fade- out or fade-in the "No- Go Areas".<br><br>*Step 5* Select CNTDWN soft button for starting the ARPA TRIAL scenario. Exit the TRIAL MANOEUVRE by selecting the EXIT soft button. Exit the SEA SCOUT function by selecting the SEA SCOUT button. |

| Operator controls | Task |
|---|---|

## 2.11 Alarm and Warning messages and handling

### 2.11.1 Program Alarm Pop-Up Window – Picture Freeze Alarm –
In this case the Radar program watchdog routine acknowledged a failure in the current program procedures.

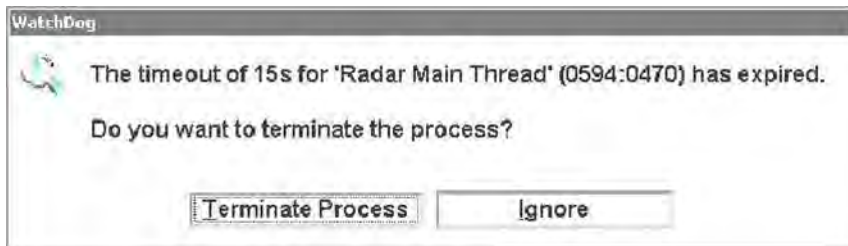The Radar display is frozen. The following Pop- Up window appears.



Figure 2-39    Picture freeze alarm

If this situation recurs please call service.

**2.11.2** **Alarm Messages**

The following ALARM table shows all possible alarm indications and first proposal how to handle an ALARM message.

| ALARM MESSAGE | a) Problem Description<br><br>b) Corrective Action |
|---|---|
| ANTENNA DOWNLINK ERROR<br>(DOWN LINK ERROR ALARM) | a) Antenna System is disturbed. An error has occurred on the transceiver to the display link.<br><br>b) Refer to maintenance section for troubleshooting and repair. |
| ANTENNA SAFETY<br>(ANTENNA SAFETY ALARM) | a) The antenna switch has been switched to OFF.<br><br>b) Check the situation (chapter 2.12). |
| ANTENNA STOPPED | a) Antenna System is disturbed.<br>A signal from the transceiver/adapter interface which indicates that the antenna is not rotating.<br><br>b) Refer to the maintenance section for troubleshooting and repair.<br>Call Service. |
| ANTENNA UPLINK ERROR<br>(UP LINK ERROR) | a) An error has occurred on the display to the transceiver link.<br><br>b) Start the Radar System again.<br>Refer to the maintenance section for troubleshooting and repair.<br>Call Service |
| CAN BUS ERROR<br>(Radar Transceiver CAN BUS ERROR ALARM) | a) External alarm from Radar Transceiver.<br><br>b) Call Service. |

| ALARM MESSAGE | a) Problem Description<br><br>b) Corrective Action |
|---|---|
| CPA TCPA BY xx TARGET (S)<br>(CLOSEST POINT OF APPROACH or TIME TO CLOSEST POINT OF APPROACH) | a) ARPA/AIS Alarm.<br>Track will pass inside CPA limit.<br><br>b) Check the situation. |
| FAST ANTENNA<br>(FAST ANTENNA ALARM) | a) Antenna System is disturbed.<br>The antenna rotation is incorrect.<br><br>b) Start the Radar System again.<br>Refer to the maintenance section for troubleshooting and repair.<br>Call Service. |
| FAILED TO OPEN CAN PORT | a) Internal failure.<br><br>b) Start the Radar System again.<br>Call Service. |
| GUARD ZONE INTRUSION BY xx TARGET (xx) | a) ARPA/AIS Alarm.<br><br>b) Tracks already acquired have moved into an area under watch.<br><br>c) See chapter 2.6.1. |
| NO ACP/APR<br>(ACP Azimuth Commit Point)<br>(APR Azimuth Reset Point) | a) The radar transceiver has detected that azimuth commit point (ACP) or azimuth reset pulses (ARP) are missing. This prevents correct alignment of the antenna.<br><br>b) Refer to the maintenance section for troubleshooting and repair.<br>Call Service |

| ALARM MESSAGE | a) Problem Description<br><br>b) Corrective Action |
|---|---|
| NOT TRANSMITTING | a) The Radar transceiver receives transmit commands but is not transmitting because of an internal error (e.g. electrical failure).<br><br>b) Refer to the maintenance section for troubleshooting and repair.<br>Call Service. |
| NO TRIGGER | a) Radar probably not transmitted.<br><br>b) Start the Radar System again.<br>Refer to the maintenance section for troubleshooting and repair.<br>Call Service. |
| PMU RX ERROR | a) The performance monitor detected reduced sensitivity of the Radar receiver.<br><br>b) Refer to the maintenance section for troubleshooting and repair (Tune the receiver).<br>Call Service. |
| RADAR CONTROL CALLBACK<br>(MK2 Transceiver) | a) External alarm from Transceiver no connection between computer and transceiver.<br><br>b) Call Service. |
| RDP FAILURE<br>(RID FAILURE ALARM) | a) Internal software process is disturbed.<br><br>b) Start the Radar System again.<br>Refer to the maintenance section for troubleshooting and repair.<br>Call Service. |

| ALARM MESSAGE | a) Problem Description<br><br>b) Corrective Action |
|---|---|
| SLOW ANTENNA | a) Antenna System is disturbed.<br>A signal from transceiver/adaptive interface which indicates the antenna is not rotating at the correct RPM.<br><br>b) Start the Radar System again.<br>Refer to the maintenance section for troubleshooting and repair.<br>Call Service |
| SYSTEM UNSTABILIZED (SYSTEM UNSTABILIZED ALARM) | a) Course information has become inoperative. Indicates that an invalid signal has been received.<br><br>b) Check the Gyro Compass information in the Navigational System.<br>Start the Radar System again.<br>Refer to the maintenance section for troubleshooting and repair.<br>Call Service. |
| TRANSCEIVER PROTOCOL VERSION MISMATCH. TRANSCEIVER VERSION: >>VERSION<< | a) The Communication protocol version of the Radar transceiver does not match the protocol version expected by the Synapsis Radar software.<br><br>b) The Synapsis Radar software has to be updated. Call Service. |
| TN INDICATOR ERROR (Radar Transceiver TN INDICATOR ER- ROR ALARM) TN Tune | a) External alarm from Radar Transceiver.<br><br>b) Start the Radar System again.<br>Refer to the maintenance section for troubleshooting and repair.<br>Call Service. |
| VIDEO TRANSFER | a) External alarm from Transceiver no connection between computer and transceiver<br><br>b) Call Service. |

| ALARM MESSAGE | a) Problem Description<br><br>b) Corrective Action |
|---|---|
| XCVR HIGH/LOW TEMP (XCVR HIGH/LOW TEMP ALARM) | a) Antenna System is disturbed. A signal has been received from the transceiver indicating that excessive temperatures are occurring.<br><br>b) Start the Radar System again. Refer to the maintenance section for troubleshooting and repair. Call Service. |

### 2.11.3    Warning Messages

Warnings are not immediately dangerous, but may become so.

As long as there is no active or unacknowledged alarm, a current warning is displayed in the top line of the list in ORANGE.

- The warning text is displayed in ORANGE.
- Unacknowledged warnings are flashing.
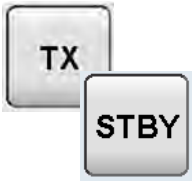- An acoustic signal is released with the warning (two sounds)

The following WARNING table shows all possible warning indications and first proposal how to handle a WARNING message.

| WARING MESSAGE | a) Problem Description<br><br>b) Corrective Action |
|---|---|
| LOST REFERENCE TARGET | a) The Radar System lost the tracked fixed target (Reference Target).<br><br>b) Check the situation and look for a new suitable fixed target (buoy, lighthouse), (chapter 2.5.2.6). |
| LOST ARPA TARGET | a) The Radar System lost the ARPA Target<br><br>b) Check the situation, check the Acquisition zone (chapter 2.6) |
| LOST AIS TARGET | a) The Radar System lost the AIS Target.<br><br>b) Check the situation, the AIS Target is outside the received area. |
| MAX AUTO ARPA TARGETS | a) The Radar automatically acquires more than 40 targets.<br><br>b) Check the situation, check the Acquisition zone (chapter 2.6) |
| MAX MAN ARPA TARGETS | a) The Radar manually acquires more than 40 targets.<br><br>b) Check the situation, delete innocuous targets. |
| Xx NEW ARPA TARGET(S) | a) The Radar automatically acquires a new target.<br><br>b) Check the situation. |
| NEW AIS TARGET | a) The AIS transponder acquires a new AIS target.<br><br>b) Check the situation. |
| FIX ACTIVE: MAP | a) Manual MAP Offset |

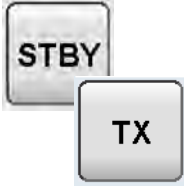| WARING MESSAGE | a) Problem Description<br><br>b) Corrective Action |
|---|---|
| FIX ACTIVE: SENC | a) Manual SENC Offset |
| FIX ACTIVE: CHART | a) Manual CHART Offset |
| PMU TX POWER LOW | a) Transmit power reduced by at least 3dB.<br><br>b) Refer to the maintenance section troubleshooting and repair (change the Magnetron).<br>Call Service. |
| REACHING MAX AUTO ARPA TARGETS | a) The Radar System automatically acquired 38 targets. |
| REACHING MAX MAN ARPA TARGETS | a) The Operator manually acquired 38 targets. |

## 2.12 Working Around the Radar Antenna

**BEFORE STARTING THE WORK**

| Operator controls | Task |
|---|---|
|  | Switching the Radar **OFF.** <br><br> Using the trackball, place the cursor **TX** soft button and press the button. <br><br> The name of the soft button changes to **STBY** and is highlighted. |
|  | Select the EXIT RADAR soft button for opening the Utility Selections. The Utility Selections depend on the Radar application system integration. |
|  | Select System Shutdown in the Utility Selections window. |
|  | On the Radar Pedestal, <br><br> switch the SAFTEY SWITCH to OFF (middle switch setting "0"). |

| Operator controls | Task |
| --- | --- |
|  | Place a note on the Radar Display with the following information.<br><br>⚠<br><br>DON'T START THE RADAR!<br><br>PEOPLE ARE WORKING NEARBY THE RADAR ANTENNA<br><br>    TIME:………………..<br><br>    DATE:…………………. |

**FINISHING THE WORK**

| Operator controls | Task |
|---|---|
|  | On the Radar Pedestal,<br><br>switch the SAFTEY SWITCH to ON (upper switch setting "1"). |
| | Remove the safety note. |
|  | Turn Power ON |
|  | Switching the Radar ON.<br><br>Using the trackball, place the cursor on the **STBY** soft button and press the button.<br><br>The name of the soft button changes to TX and is highlighted. |

**3**      **Theory of Operation**
This chapter gives additional information about Radar operation and functions.

It explains terminology and describes a number of effects which have influence on Radar performance and have to be considered by the operator.

A Radar uses a very high frequency radio wave (microwave) which has similar properties to those of light regarding straightness and uniform velocity. The Radar antenna radiates the fan shape fine microwave (fan beam) to the target just as a search light throws the light beam to the target, and the reflected microwave from the target returns to the antenna.

The Radar does not use an continuous wave but radiates the wave for a very short period (approx. 10-6 to 10-8 second .... called pulse) to measure the time from when the wave is radiated till the reflected wave returns to the antenna. In addition, with rotation of the antenna at a constant speed, the fan shape radio wave radiated from the antenna scans around 360̊ - with the antenna at its center - in order to detect the object.

**3.1**      **Radar Plotting Terminology**

- **Bearing (AZIMUTH)**

    The horizontal direction of one point from another point, expressed as the angle in the horizontal plane between a reference line and the horizontal projection of the line joining the two points.

    – TRUE Bearing > Reference is true north
    – RELATIVE Bearing > Reference is own ship's heading

- **Target Speed**

    – TRUE > Actual speed made good by target.
    – RELATIVE > In relation to own ship's movement

- **Target Course**

    – TRUE > Direction of target movement referenced to true north.
    – RELATIVE > Direction of target movement referenced to own ship bow.

- **Closest Point of Approach (CPA)**

The point at which a target will be closest to own ship

- **Time to Closest Point of Approach (TCPA)**

    The time remaining to CPA, based on current own ship speed.

- **Potential Collision Point (PCP)**

    The point at which a collision would take place if the target vessel maintains present course and speed, and own ship maintains present speed and if own ship were to choose to steer a collision course now.

- **Radar Video presentation**

    Relative Motion (RM)

    In this mode, the Radar shows the motion of a target relative to the motion of own ship, own ship is fixed on the screen. Targets move on the screen. Relative Motion can be with True Trails RM (T) or Relative Trails RM (R)

    True Motion (TM)

    In this mode, the actual or true motion of a target and own ship, i.e. land masses or non- moving targets are fixed on the screen while targets with actual motion and own ship move on the screen (similar to plotting chart). True Motion can be with True Trails TM (T) or Relative Trails TM (R).
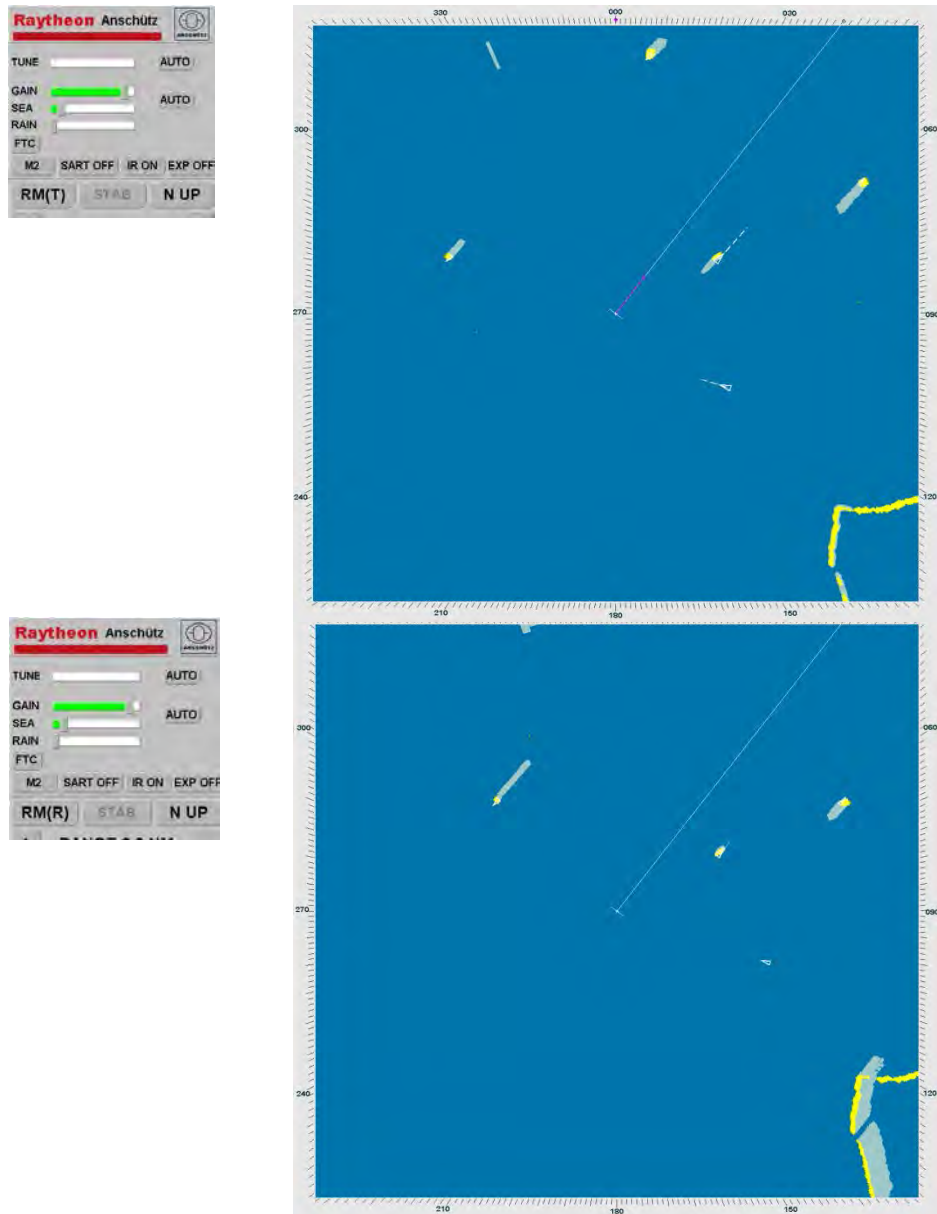
Figure 3-1      Relative Motion (T) / Relative Motion (R)
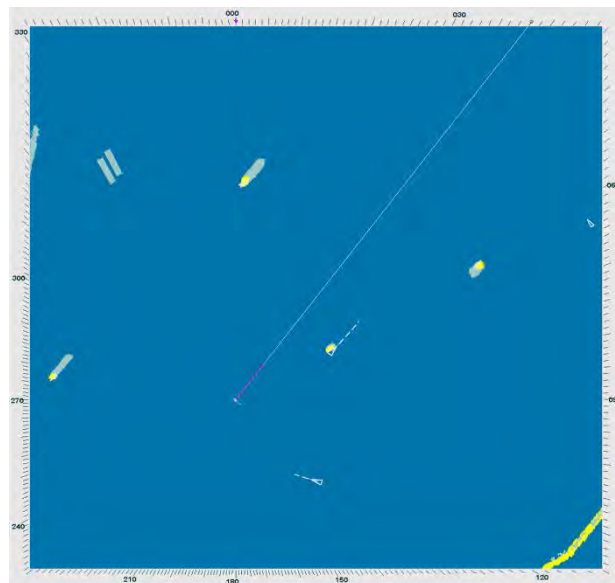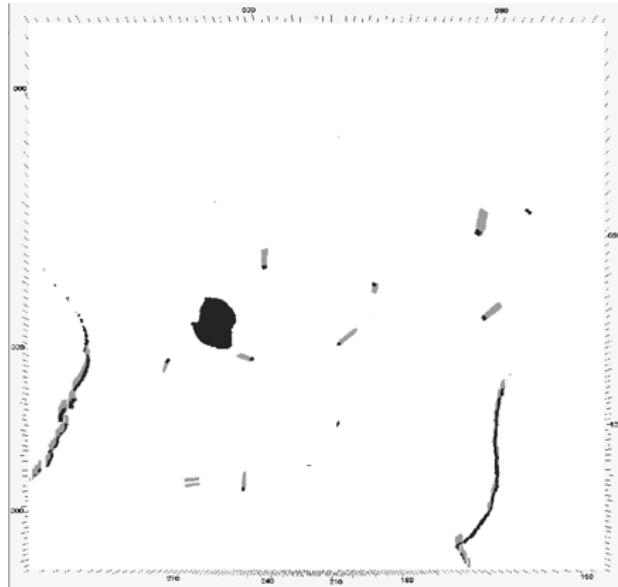
Figure 3-2      True Motion (T) / True Motion (R)

- **Vectors**

    Relative Vector

    Line drawn on screen to indicate calculated relative course and speed of targets.

    True Vector

    Line drawn on screen to indicate calculated true course and speed of targets.

## 3.2 Radar Pattern Interpretation

The Radar displays a chart- like picture (PPI) on TFT under normal conditions. Under certain conditions, however, various false echoes are generated, and small targets are hidden by rain, snow or sea waves. To correctly interpret targets and patterns which appear on the TFT requires considerable experience. Compare patterns that appear on the Radar image to the actual topography to acquire experience as far as possible.

### 3.2.1 Range

The detectable range depends on the antenna height and height of targets. Sometimes, however, the Radar detectable range is longer due to refraction of the wave beam according to weather conditions.

The radio wave is obstructed by mountains and hills, forming a shadow behind these objects.

H1

$$D = 2 (\sqrt{H1} + \sqrt{H2})$$
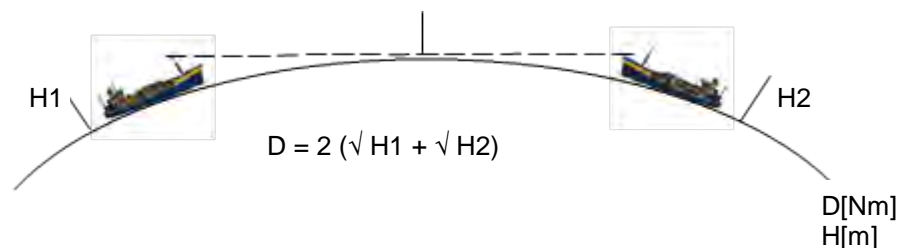
H2

D[Nm]
H[m]

Figure 3-3    Detectable Range

Examples:

A big ship with 25 m antenna high can detect a 4 m high small ship in up to 14 NM distance.

A big ship with 25 m antenna high can detect a 25 m high ship in up to 20 NM. A big ship with 25 m antenna height can detect a 100 m high coast in up to 30 NM.

**3.2.1.1** **Sea Clutter, Rain Clutter**

The Radar wave is reflected by waves, clouds, rain and snow. This is displayed as a bright noise which clutters the Radar Video and may hide targets When this happens, adjust GAIN, SEA (sea clutter), RAIN (rain and snow clutter) controls to assist in the detection of targets.

Then adjust FTC.

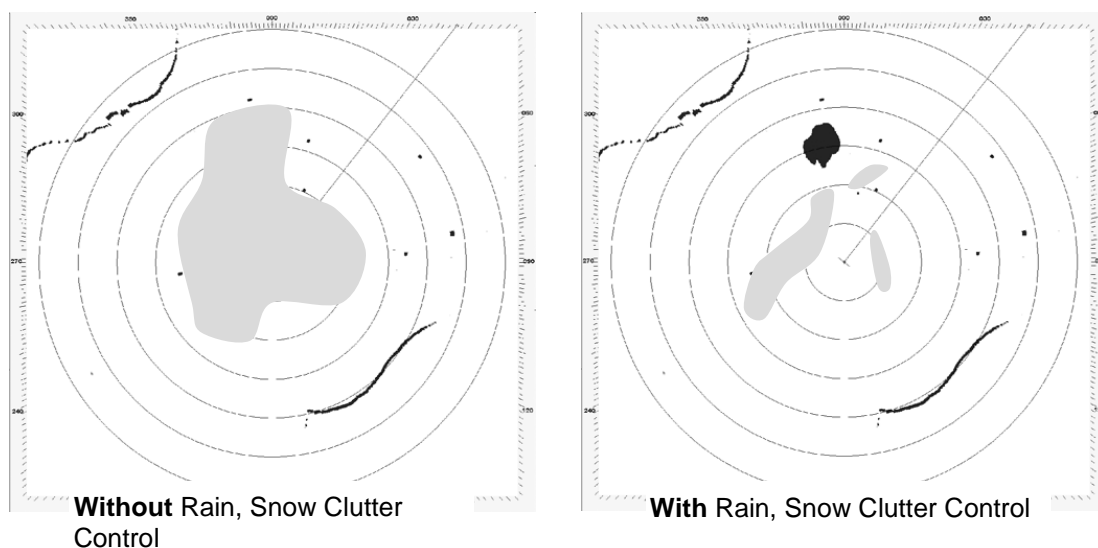Take note that ordinary visible targets cannot be seen in heavy rain and snow (Figure 3-4).



**Without** Rain, Snow Clutter Control        **With** Rain, Snow Clutter Control

Figure 3-4        Pattern interpretation

### 3.2.1.2 Interference Effect

Under certain conditions (e.g. if the interference is nearly synchronous with the own transmit pulse), the transmitted electromagnetic waves of Radar systems from other ships can lead to interferences with own Radar. In that unlikely case slowly moving spotters or spirals can be observed on the PPI.

The Radar processing removes these interferences automatically if IR ON is activated (Figure 3-5). However that filter can have a negative effect when detecting SART's.
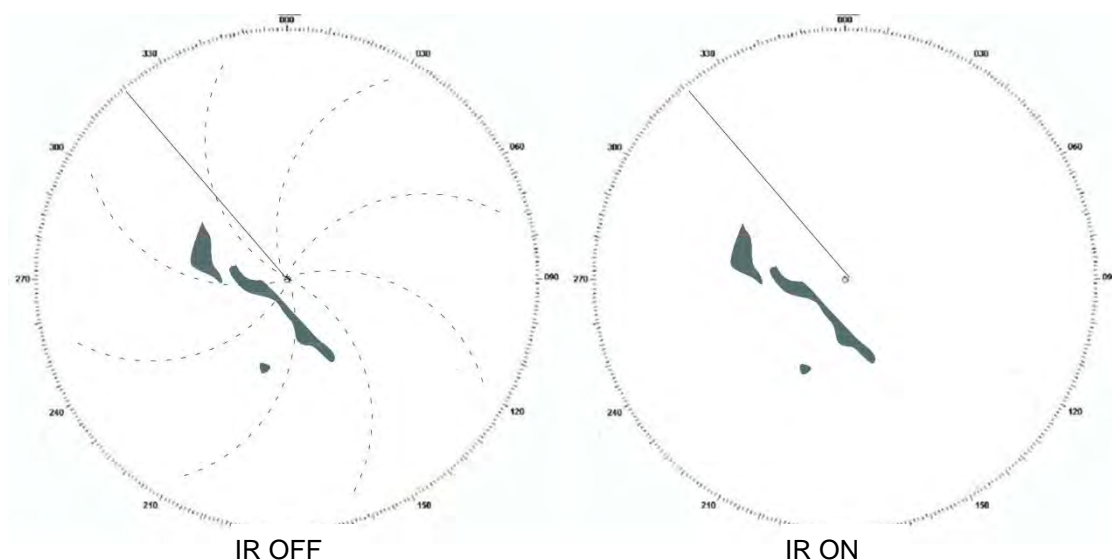
IR OFF                                        IR ON

Figure 3-5        Interference selection IR ON / OFF

### 3.2.1.3 Side Lobe Effect

In short ranges, not only the main lobe of the Radar is reflected by ships nearby but in some cases also the side lobes are reflected.

This leads to false echoes, which are all at same distance, but different bearings.

Multiple reception effect.

If a strong echo reflected from a large object at short range is reflected several times between the object and own ship, false echoes are displayed at positions of 1, 2, 3 or more times the distance of the actual position. A is the actual echo, B and C are false echoes, and D and E are side lobe echoes (Figure 3-6). These echoes can easily be identified because these echoes can be reduced by adjustment of GAIN, SEA controls.
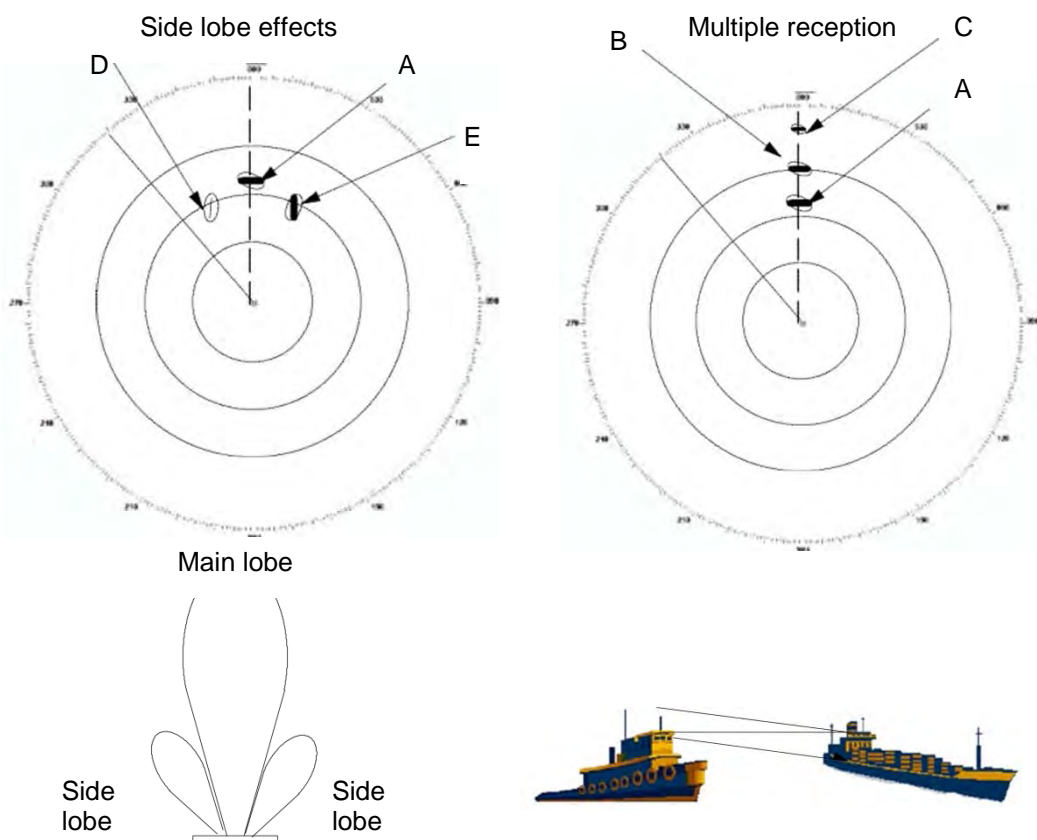


Figure 3-6        Side lobe and multiple reception false echoes

### 3.2.1.4     Second trace false echo

The second trace false echo appears when the signal is received at the next pulse repetition period after it was reflected by a high mountain or similar object in long distance. Therefore, the position in which it appears is identified by subtracting distance corresponding to the pulse repetition interval from the actual distance. Assuming the pulse period is 1000 µs and the range scale is adjusted tor 12 NM, the pulse reflected from a target 80 NM away returns after 1000 µs. Targets lying at a distance of beyond (80 NM + 12 NM=) 92 NM, therefore, can generate second trace false echoes.

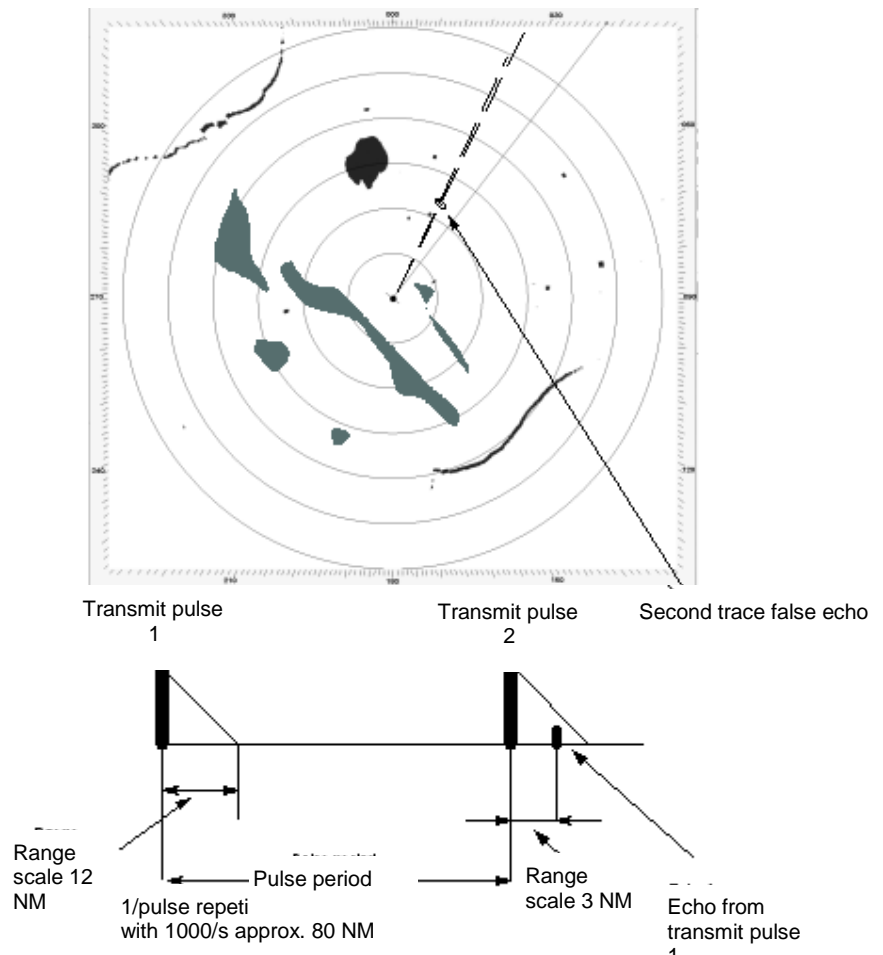A target in 83 NM distance may generate an echo on the Radar display at 3 NM (Figure 3-7).



Figure 3-7      Second Trace False Echo Effect

It often appears that the radio wave propagation is abnormal (duct effect), when the object is a very large mountain. If the signal reception level, however, is small and the transmitted pulse intervals are slightly changed, then a long cloudy form echo appears as shown in the figure, and can easily be identified.

If it is difficult to identify, reduce the receiver gain (GAIN) slightly. In rare cases, the guard ring alarm goes off. In this case, check and observe the video echoes, and reduce the receiver gain, and in case of medium range scale (3, 6, 12 Nm) switch to LONG PULSE or to 24 Nm range scale (Figure 3-9).
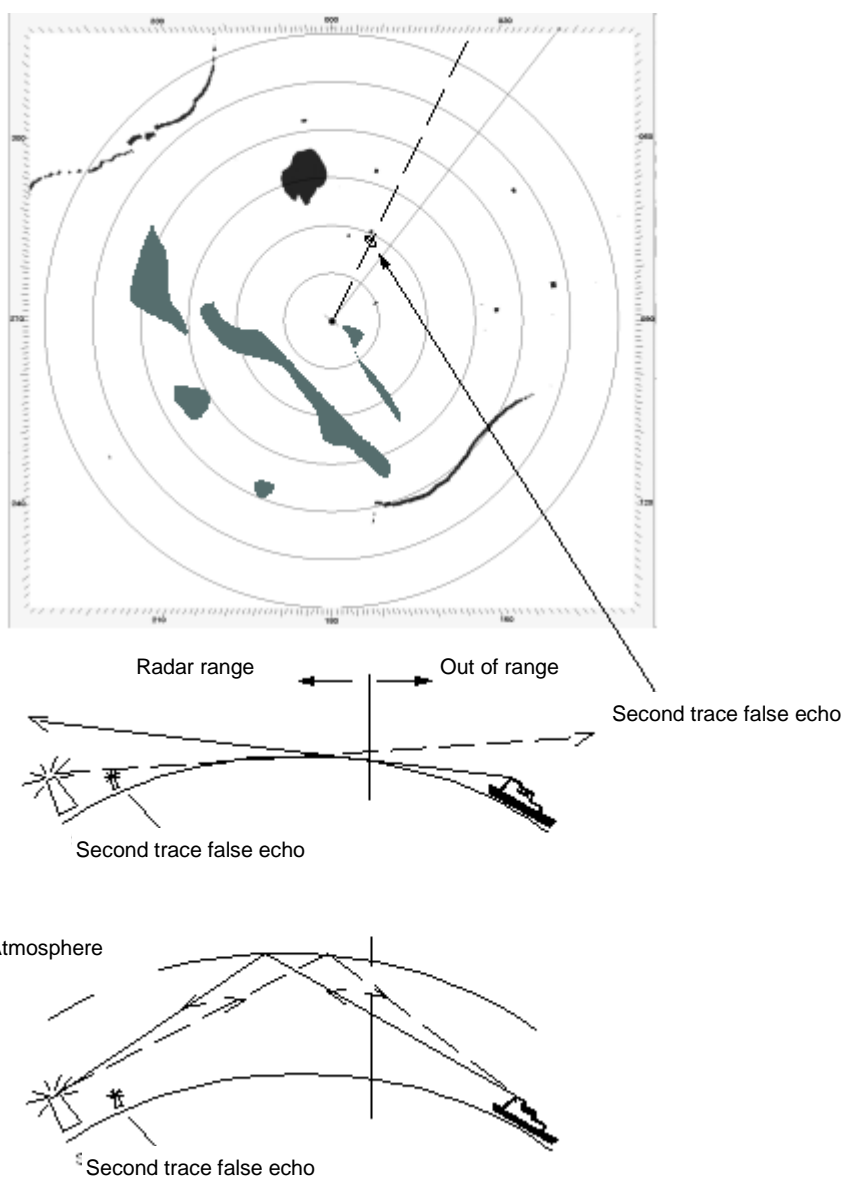


Figure 3-8    Second Trace False Echo, Duct Effect

### 3.2.1.5 Abnormal Atmospheric Conditions

Under certain abnormal atmospheric conditions, the Radar wave can be reflected at higher layers in the atmosphere. This leads to wrong measurements in long distances.
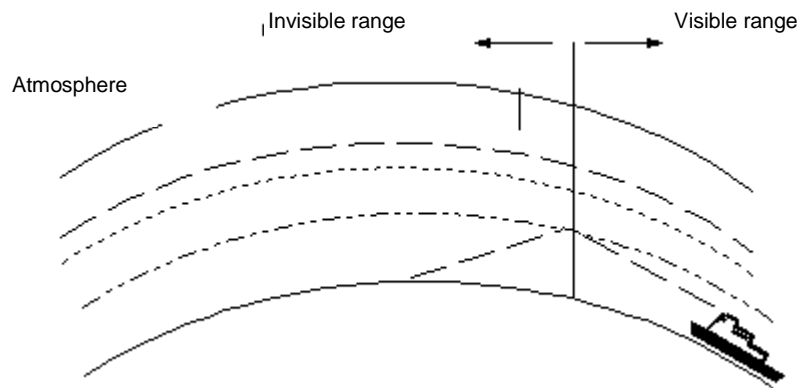


Figure 3-9        Atmospheric Condition

### 3.3 Vector Presentation

### 3.3.1 True Vector Mode

True vector mode displays the true movement of all targets with true course and true speed.

The actual speed and course of own ship and two targets are such that **target 1** will eventually collide with own ship, and the **target 2** will pass well behind own ship. In TRUE vector mode, tracked targets which are standing still (such as **target 3**) do not display a vector.



Figure 3-10    True Vector Mode

### 3.3.2 Relative Vector Mode

Relative vector mode shows how targets move in relation to own ship.

All ships that have relative vectors pointing to my own ship are dangerous targets.
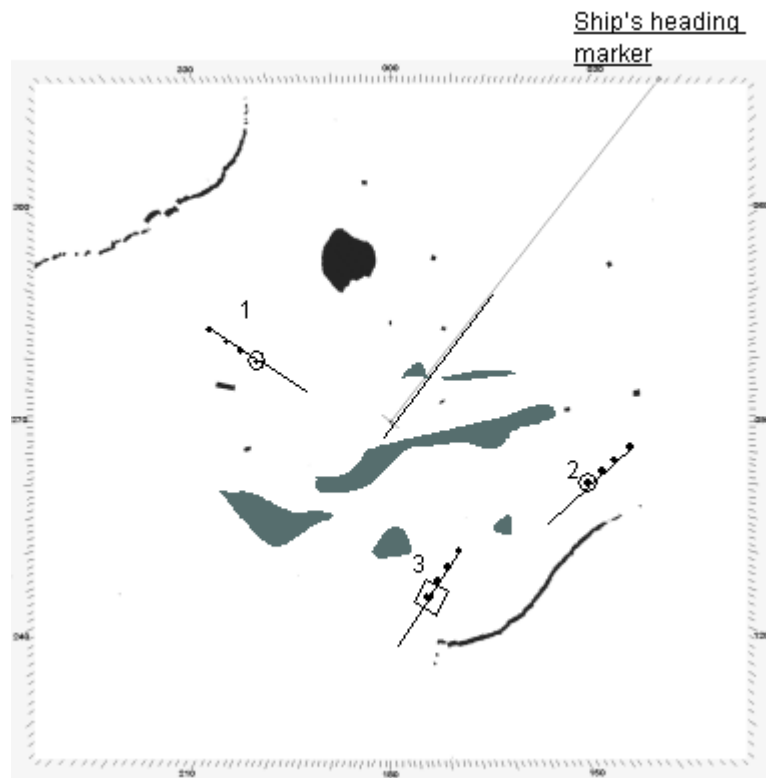


Figure 3-11      Relative Vector Mode

When the same situation is displayed in RELATIVE vector mode, target 1 is gradually closing with own ship and it is apparent that target 2 indicates no threat as long as neither own ship nor target changed their headings.

The stationary target 3 does not move at all. Its relative vector is exactly opposite to own ship's vector.

**3.4** **Automatic Radar Plotting Aid (ARPA)**

The purpose of an Automatic Radar Plotting Aid (ARPA) is to interpret Radar information continuously and to display the results so that watch officers may quickly assess and react to potential danger. The performance specification of the International Maritime Organization (IMO) requires the ARPA plotting reliability to be as good as manual plotting techniques. The NSC meets and exceeds these minimum requirements to provide a greater margin of safety.

The first requirement of safety is to maintain surveillance of traffic and navigation hazards. The ARPA will plot up to 40 automatically and 40 manually acquired (Plot) targets.

For any targets being plotted, the ARPA continuously displays vectors indicating speed and course. Based on preset conditions the ARPA determines if the possibility for collision exists.

When a potentially dangerous target is detected, warnings are given and information detailed on the target is displayed.

If the watch officer determines that an avoidance maneuver is required, the ARPA trial maneuver mode can assist in the planning. When a maneuver is actually made, the ARPA continuously displays the effect on all plotted targets during and after the course change.

### 3.4.1 Sensor Errors

The performance of ARPA depends on the quality of the sensor information which is processed. The Radar is the sensor which measures target range and bearing relative to own ship. The gyro compass measures the heading of the own ship relative to north. The speed log measures the motion of own ship relative to the water or bottom.

### 3.4.1.1 Gyro Compass

A precise Gyro Compass heading is an important condition for accurate target tracking and ARPA information. The Radar user should be aware that Gyro Compasses may have errors (speed error and acceleration error). These errors can degrade the accuracy of target results (ARPA INFO).

Raytheon Gyro Compasses have automatic error correction and supply true heading to Radars.

This may not be the case for other Gyro Compass models.

If Gyro Compass heading input is interrupted, the Radar will give alarm.

### 3.4.1.2 Speed Log

A precise speed input from the log is an important condition for accurate target tracking and ARPA INFO. The Radar user should be aware that speed outputs of logs may be temporarily unstable for various reasons. This may degrade the accuracy tracking results (ARPA INFO).

If speed input is interrupted, the Radar will give alarm.

### 3.4.1.3 Plotting

Plotting is started by positioning the trackball cursor over the desired target echo. When the soft button is pressed the Radar acquires the target.

When a target becomes too weak or too large and is identified by the ARPA as a LOST TARGET, two options are available:

(1) CANCEL Option: As a warning, a flashing symbol marks the last position of the target. The ARPA attempts the target by increasing the window size.

It coasts for five scans (antenna rotations) and if the target is not located in the enlarged window, the plot is cancelled.

(2) COAST Option: The lost target data is not automatically cancelled but rather is "coasted " and the flashing LOST TARGET symbol marks the last position of the target. To delete the LOST TARGET symbol, track, and target data, a manual cancel operation must be done.

| | **CAUTION** |
|---|---|
| | If the target gets close to another target, the two targets cannot be discriminated and tracking may resume on these signals. |
| | The operator should investigate all ARPA Alarms. |

| | |
|---|---|
| | If a plot acquisition is attempted on a target close to another plot, the new plot will be refused. |

To determine accurate ARPA results, a number of past positions have to be recorded. After acquiring a close target, the processor takes about a minute to record enough position data to get a good, accurate speed.
More time could be required for targets more than eight miles away.

| | |
|---|---|
| | For accurate target data, accurate own ships course and speed are required, particularly during course changes. Sensor errors in own ships course and speed will cause equal errors in target data. Manual speed entries can be used, but for best performance an accurate speed log is recommended. |
| | A Ground Reference mode is provided to improve speed measurements. A small, fixed, stable target is plotted to give a zero speed reference. Target positions and own ships position may be referred to the Reference Target. The use of a suitable reference target will improve motion stabilization and target data. |

**3.4.2**      **Collision Assessment (Surveillance)**

Once the true velocities of own ship and targets are established (within one minute of acquisition), it is valid to interpret displayed information for collision assessment. TRUE and RELATIVE VECTORS are available to present target velocities.

The NSC provides two additional surveillance features to aid in rapid assessment of collisions potential in congested situations. When displaying TRUE VECTORS, the operator may choose to display Potential Collision Points (PCPs). The appearance of one or more of these symbols, on or near own ship's heading line, immediately signals collision potential. When displaying RELATIVE VECTORS, the operator may choose to display all CPAs within the set CPA limit, plus one mile of own ship whose TCPA is less than 30 minutes. The appearance of one or more of these symbols near own ship's current position immediately signals collisions potential.

**3.4.2.1**      **Accuracy of Collision Assessment**

The position of PCP and CPA are the key parameter in collision assessment and of vital importance. Both are calculated from knowledge of present position and velocities of targets and own ship.

**3.4.2.2**      **Displaying of CPAs**

CPA is the Closest Point of Approach for any target vessel if both the target vessel and own ship maintain course and speed. The calculated CPA will match the actual CPA only if the present course and speed of the target vessel has been maintained long enough for the target velocity filters to settle. The ARPA specification allows up to three minutes for this purpose. The Radar accomplishes this in one minute.

Furthermore, if own ship's speed-log has no smoothing or delay in its readings, the NSC will produce an accurate CPA even as own ship comes to a new course and/or speed (target not maneuvering). CPA and TCPA are calculated for all targets, once for each revolution of the Radar antenna (approximately two seconds for Raytheon Radars).

CPA symbols will be displayed if:

(1) the operator selects the CPA/PCP display button on the collisions assessment menu page and

(2)  RELATIVE vector mode is selected and

(3)  the CPA symbols are located within the bearing scale and

(4)  display is stabilized and

(5)  symbol display state is ON and

(6)  "ARPA DATA" display state is ON

## 3.5 Keep the Following Points in Mind when Operating the NAUTOSCAN NX

- **Radar Video**

  The Radar video display area is updated from a memory. The memory is updated as the antenna scans. The Radar picture is signal processed from previous scan of the antenna. This process is called scan-to scan correlation. Three scans are required to integrate a target to full brightness. It should be noted that while in head up, the scan integration process is removed and all targets including clutter are displayed at full brightness.

  Anti-clutter filter ON/OFF
  In case of heavy clutter developing on the Radar video, the NSC computer creates a profile of the echo. Within this profile, the received echoes are monitored for a certain period (Scan-to-scan method). Irregular echoes are suppressed on the Radar video. Regular echoes are indicated on the Radar video.
  If Anti-clutter filter is ON, the following effect can happen:
    Fast acquired targets (> 100KN) can be lost.
    Moved acquired targets can be displayed smaller on the PPI.

- **Sensitivity Controls**

  When the sensitivity controls are used, the operator must wait for three scans to see the final result. The Radar picture will "build" until targets are displayed at a bright level. Receiver noise and in most cases, clutter, will not be integrated and will appear dim when the controls are properly set. Adjust the controls in small increments.

- **Radar Detectability**

  The processing of three scans of Radar data results in greater Radar detectability. Targets which otherwise would be in noise now stand out clearly. Greater Radar detectability could occasionally cause reflections and other undesired echoes to appear as strong returns. Use the sensitivity controls to achieve a suitable presentation.

- **Best Clutter/Interface Rejection**

  The best clutter/interference rejection will occur when accurate speed (log) and gyro information is used to stabilize the Radar display. Use the Sea and Rain controls to suppress clutter and leave targets at a bright level.

## 4 Index