INSTALLATION MANUAL

SIMRAD DX45/60

Marine Radar Scanner

183-xxxx-102 English Preliminary

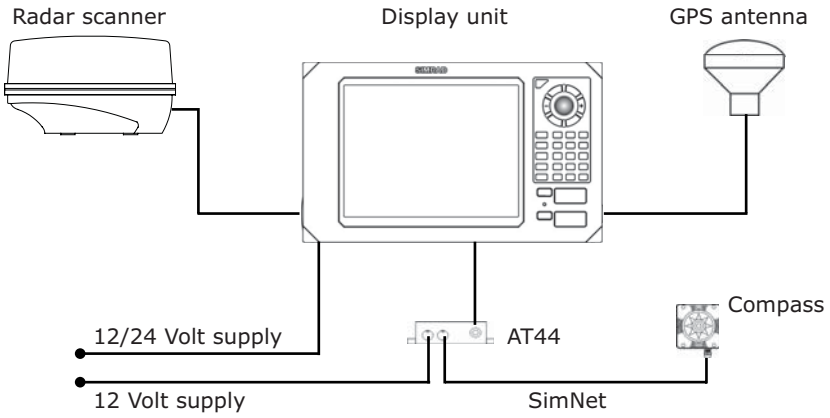
Important information and warnings!

The active radar scanner radiates powerful RF energy. Continuous exposure to RF energy may cause harmful effects to the human body. It also causes Cardiac Pacemaker to malfunction. A person who uses a Cardiac Pacemaker should under no circumstances be exposed to RF radiation. Most countries accept that RF power density levels below 100 W/m^2 cause no significant RF hazard. Please read the Safety Notices on the next page.

About this manual

The technical data, information and illustrations contained in this publication were to the best of our knowledge correct at the time of going to print.
We reserve the right to change specifications, equipment, installation and maintenance instructions without notice as part of our policy of continuous development and improvement. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form, electronic or otherwise without prior permission from Simrad AS. No liability can be accepted for any inaccuracies or omissions in the publication, although every care has been taken to make it as complete and accurate as possible.

This manual provides information for installation, safety notices and maintenance safety of the radar scanner DX45/60. The installation will require connection to a compatible display unit: CX34/44/54. A typical radar system is illustrated below:



Safety notices

Beware of RF radiation hazard
The active radar scanner radiates powerful RF energy. Continuous exposure to RF energy may cause harmful effects to the human body. It also causes Cardiac Pacemaker to malfunction. A person who uses a Cardiac Pacemaker should under no circumstances be exposed to RF radiation.

Most countries accept that RF power density levels below 100 W/m^2 cause no significant RF hazard.

Distance vs. specified RF power density level:

Power / scanner size	100 W/m^2	10 W/m^2
4 kW / 1.5 ft. / 465 mm	x.x m	x.x m
4 kW / 2.0 ft. / 615 mm	x.x m	x.x m

Precaution
Do not open the equipment, only authorized Simrad technicians are qualified to do so. There is high voltage present inside the scanner which may also be present even after the power switch has been turned off.

Power source, fuse and power cable
The radar scanner will get its power from the display unit. Ensure that the power cable is firmly attached to the appropriate port on the display unit. Note: the appropriate fuse(s) must be employed, see fuse rating in the specifications.

Maintenance safety

Beware of residual high voltages
High voltages may remain in the capacitors several minutes after you have turned the power switch off and disconnected the cable between the radar scanner and display unit. Wait for at least five minutes or discharge them to ground before starting your inspection.

Main power supply must be disconnected
To prevent electrical injury due to erroneous power switching, make sure that the main power supply and the system power switch are both OFF. Also attach a safety label showing that service is in progress.

Avoid inhaling dust
When cleaning inside of the equipment, avoid inhaling the dust, as it could be a temporary health hazard.

Avoid static electricity
Take care not to damage the ESDs (Electrostatic Sensitive Devices) due to static electricity from carpeting and clothing.

Routine check
Periodically check that the scanner's mounting bolts are tight and not cor-

roded. Every 6-12 months an even coating of grease should be applied to the entire surface of the scanner drive gear with a spatula or brush. Most of the maintenance of the radar scanner should be left to qualified personnel. If there are problems with the performance, please contact your authorized dealer.

Surface cleaning
Wipe the scanner surfaces with a clean damp cloth. For heavier cleaning, use a clean, damp cloth which has been dipped in a solution of mild dish detergent and water. Wring out firmly before wiping the scanner.
☞ Never use cleaning solutions containing spirit, alcohol, gasoline or oils.

Repair and service
There are no user serviceable parts in the radar scanners. Unauthorized handling of the scanner will void its warranty. If your radar scanner requires servicing or repair, call your authorized SIMRAD dealer, but first check Troubleshooting on next page.

Troubleshooting

Symptom	Possible cause	Suggested solution
Scanner is not responding.	Cable is damaged or not firmly attached to display unit.	Check that the cable connecting the scanner to the display unit is firmly attached: turn the plug as far as it will go into the receptacle marked 'RADAR' on the rear of the cabinet and turn the plug's coupling ring clockwise until it's tight.
Echo image on radar display differs from actual image.	Ship's heading is incorrect.	Adjust ship's heading*
Echo images on radar display are blurred.	Gain, Sea or Rain settings may be incorrect.	Adjust Gain, Sea or Rain*
Too much noise in radar display.	Tuning setting may be incorrect.	Adjust tuning*
Alarm/warning appears on radar display.	See below list of alarms/ warnings.	

*) refer to procedure described in display unit's Operator manual, section 9.1.

List of alarms/warnings

- Bearing pulse alarm (check if scanner is rotating)
- Bearing zero alarm (check if scanner is rotating)
- Changing to Head-Up alarm (indicates the orientation mode has changed - see section 3.2.5 and 3.2.7*)
- Communication failure alarm (check connection to scanner)
- Communication time-out failure alarm (no communication between display and scanner)
- Guard Zone alarm (see GZ under section 3.2.5*)
- Heading missing alarm (check connection to compass)
- Position missing alarm (see Position update under section 6.3*)
- Rotation lock alarm (check if scanner is rotating)
- Trigger fail alarm (check connection to scanner)

*) refer to display unit's Operator manual.

Description: Page no.:

1. Installation of scanner

1.1 Standard equipment list

When unpacking the received equipment, please check that the following items are present and have not been damaged during shipment:

Scanner	Cable	Manual	Miscellaneous
DX45	153-3002-0xx length:10-60m	183-xxxx-102 English*	Plastic bag containing: Drilling template, 4 washers, 4 spring washers, 4 M10 Hexagonal bolts.
DX60	153-3002-0xx length:10-60m	183-xxxx-102 English*	Plastic bag containing: Drilling template, 4 washers, 4 spring washers, 4 M10 Hexagonal bolts, 4 pads for support.

*) Depending on language variant.

1.2 How to determine the site of installation

A radar's target detection capacity varies greatly depending on the fitted position of the scanner. An ideal fitting position is a location high above the ship's keel line where there is no obstacle all around the scanner. In an actual ship, such an ideal location is limited by various factors. Therefore, consider the following suggestions when you determine the place to install the scanner:

A. Install scanner away from smoke-stack and mast

If the scanner is installed at the same height as the smoke-stack or mast, radar waves may be blocked, crating shadow zones or generating false echoes. Therefore, do not install the scanner at such a position.

B. Install scanner forward away from obstacle

To avoid creating shadow zones or generating false echoes, install the scanner at a position nearer to the ship's bow away from obstacles. When installing the scanner on a mast, position it in front of the mast. If obstacles cannot be avoided for the ship's structural reasons, refer to "Shifting away from obstacles" described in section 1.2.1.

C. Do not install the scanner near hot or heat-generating items

Do not install the scanner at a position where it may be subjected to smoke or hot air from smoke-stacks or heat from lamps.

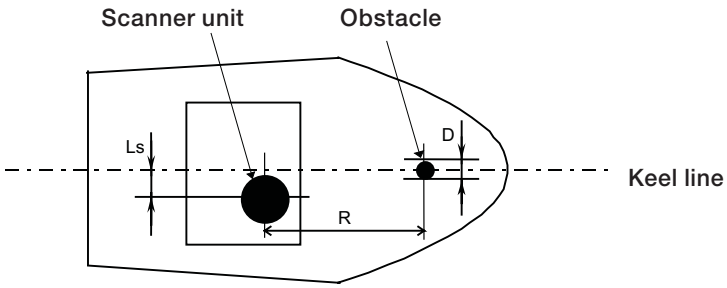
D. Install the scanner away from antennas or other equipment

Install the scanner as far away as possible from the antennas of a direction finder, radio transceiver, etc..

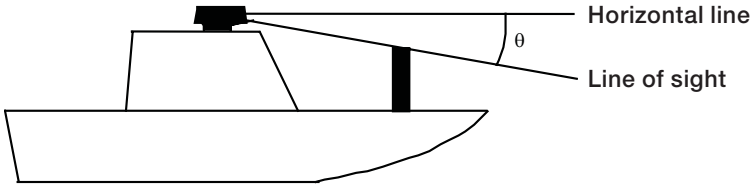
1.2.1 Shifting away from obstacles

Shifting from keel line: By shifting the scanner position from the keel line to the starboard side of the ship, it is possible to move shadow zones to the port side which makes it possible to keep a clear vision in the bow direction. The distance to be shifted can be obtained by calculation depending on the distance from the scanner to obstacles using the following equation:

Ls=0.4R+D/2 [m] (when R<15 m)
Ls=0.025R+D/2 [m] (when R>15 m)
where Ls= distance to be shifted from keel line
D= diameter of obstacle on keel line
R= distance from scanner to obstacle



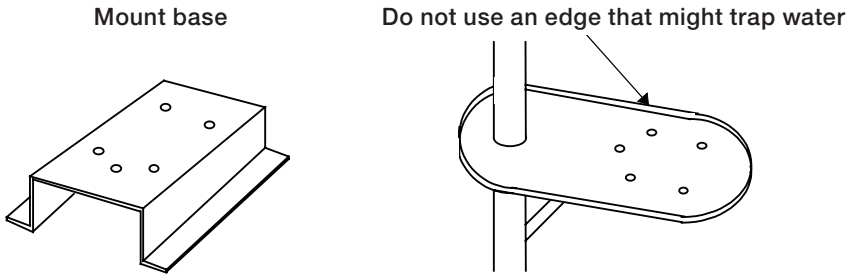
Obtaining sufficient dip angle: Raise the scanner position so that there is a sufficient dip angle available between the line of sight from the scanner to the obstacle and the horizontal line. By raising the dip angle above 5° it is possible to prevent mid and long distance shadow zones. The radar cannot detect objects below the line of sight.



1.2.2 Mounting of scanner

Deciding the place of installation, a minimum distance must be considered to the master compass (2 meters) and steering compass (1.4 meters). If a mount base like the one shown below is available, it may be easier to install the scanner. If not available, you may install the scanner directly to the roof, etc. In this case, pay attention to the water drain tube located at the bottom of the scanner unit during installation.

☞ When the radar mast or mounting bracket has a curvature of more than 2 mm, repair it or use spacers.



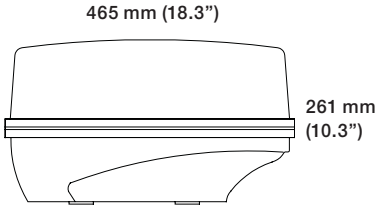
Which size bolts to use for mounting of scanner unit:

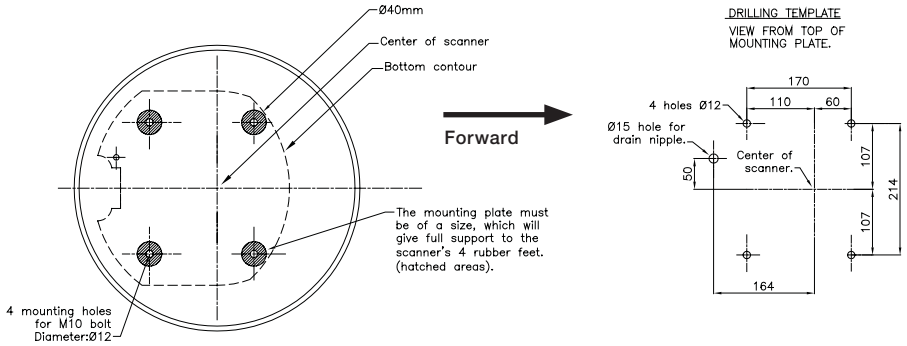
Thickness of mount base	*Bolt requirement*	*Material*	*Remarks*
1-4 mm (0.04-0.16 in.)	M10 × 15 (1.5 mm pitch)	Steel	
4-9 mm (0.16-0.35 in.)	M10 × 20 (1.5 mm pitch)	Steel	
9-14 mm (0.35-0.55 in.)	M10 × 25 (1.5 mm pitch)	Steel	Incl. with radar
14-19 mm (0.55-0.75 in.)	M10 × 30 (1.5 mm pitch)	Steel	

Converting mm to inches:
Divide 25.4 into the number of mm e.g. 1 mm divided by 25.4 = 0.03937

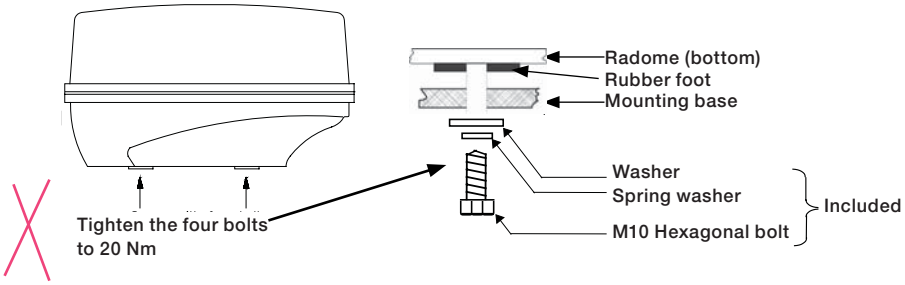
DX45 Radome scanner

- 46.5 cm radome
- 4 kW
- Range up to 28 nm
- Rotation speed 20-50 rpm
- Beamwidth: Horizontal 5.6°
  Vertical 30°



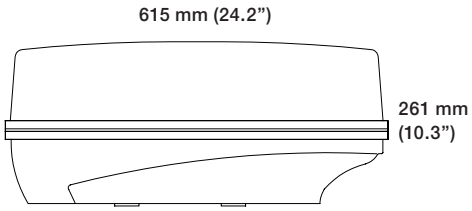


The four bolts included will suffice for mount base thickness of 9 to 14 mm (0.35 to 0.55 in.). If the mount base is thicker or thinner than this, prepare bolts as listed on page 1-3. Use silicone to secure the bolts.

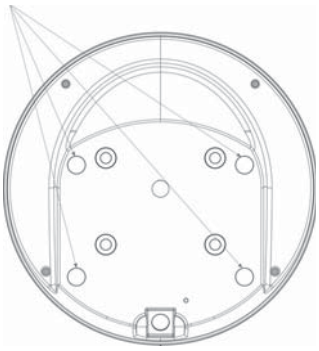


DX60 Radome scanner

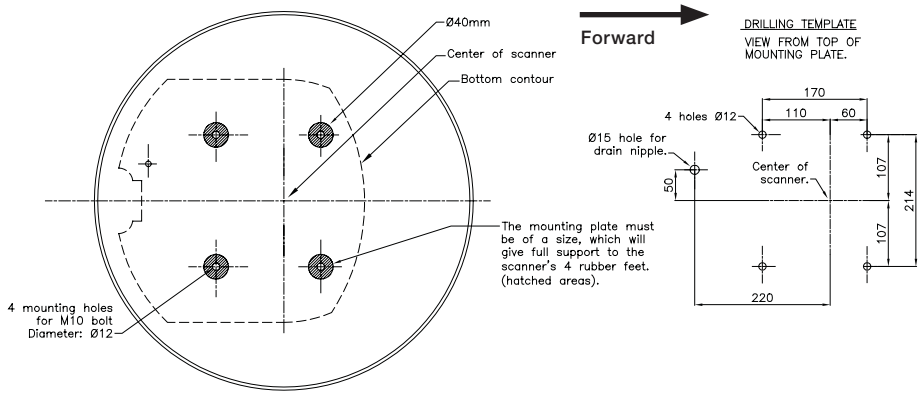
- 61.5 cm radome
- 4 kW
- Range up to 36 nm
- Rotation speed 20-50 rpm
- Beamwidth: Horizontal 5.6°
  Vertical 30°



Pads for support of radome scanner DX60:



If the DX60 is to be mounted on a flat surface, the four pads (included) for support have to be placed according to this illustration. To fit the pads, peel off the paper and place it with the adhesive part on to the radome bottom.



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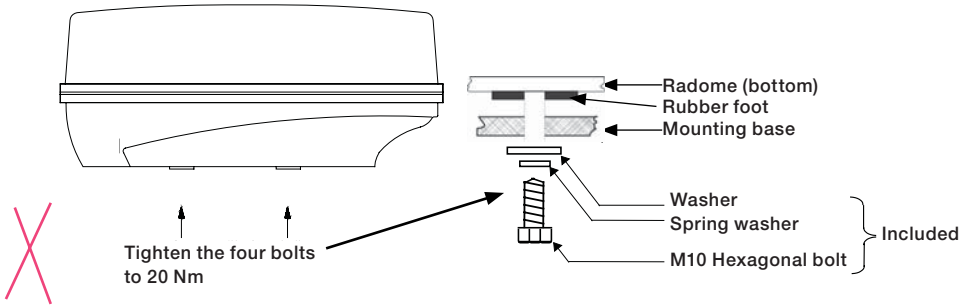


1.2.3 Connecting cables

(length of cables – see chapter 4. Specifications)

Run the cables by following the instructions below:

- Do not bind the cable for the radar collectively with cables of other equipment (especially the power supply cable).
- Run the radar cable along the ship's hull or wall surface, and fasten it at intervals of about 40 cm.
- The scanner side of the radar cable has to be fitted inside the radome scanner, see Interconnecting cable next page.
- The power cable delivered with the display unit must be fitted with two fuses before connecting the radar scanner (see fuse types in specifications).
- After fitting the Interconnecting cable:
  The radar cable has a connector fitted on the display side. Push the connector as far as it will go into the receptacle marked 'RADAR' on the rear of the display cabinet and turn the connector's coupling ring clockwise until it is tight.

Interconnecting cable (DX45 + DX60)

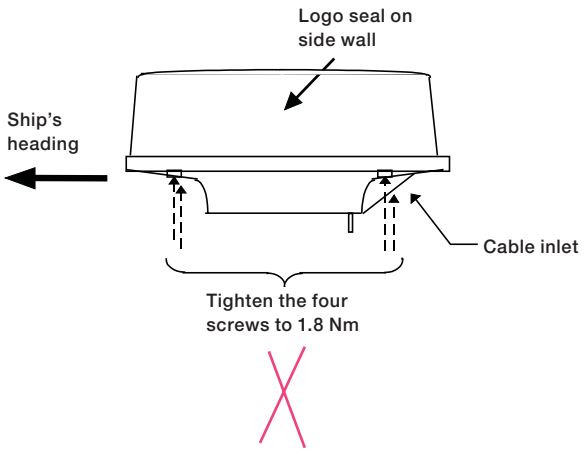
Remove the upper part of the radome from the scanner unit. Avoid bumping it against the antenna by lifting vertically (there are four fixing screws). Remove the tape securing the antenna. Remove the shield cover located on the astern side (four fixing screws). Remove the cable clamping plate and rubber ring, pass the cable through the cable inlet, place the rubber ring around the cable, and clamp the cable to the scanner unit with screws via the fixing plate.

See 'Fitting interconnecting cable' for DX45 and DX60 further on in this section.

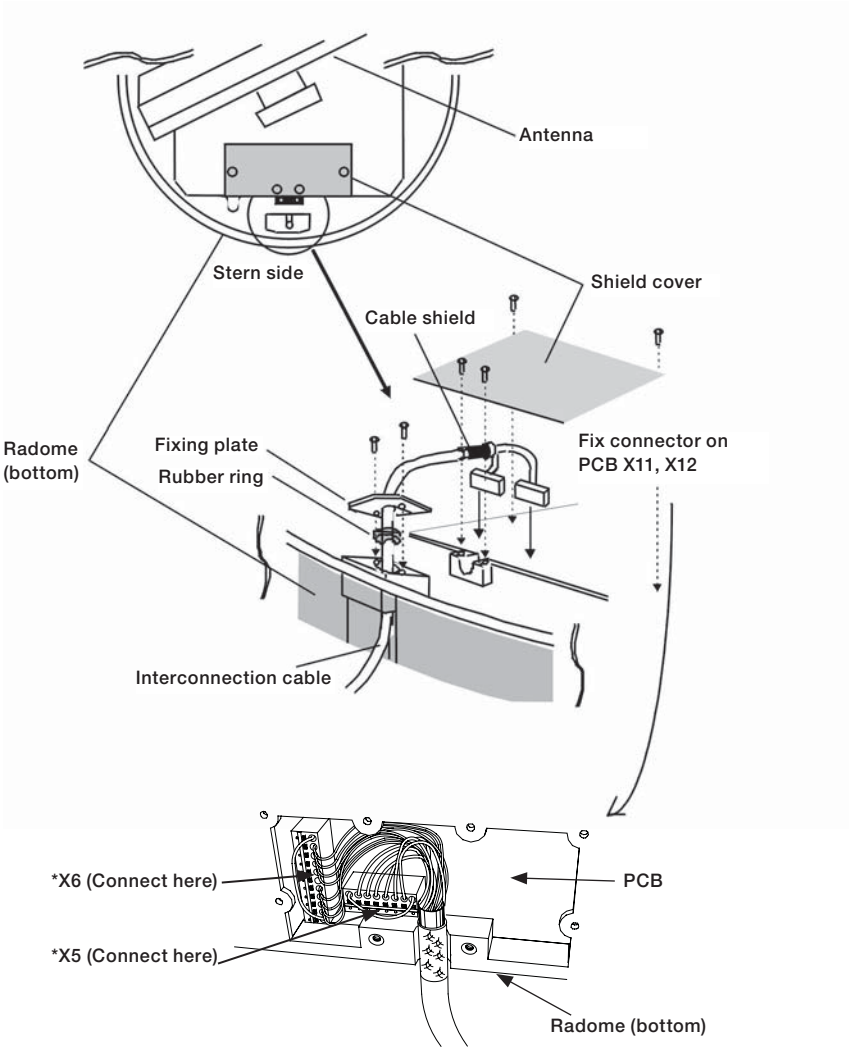
Connect 8-pin connector to X5 and 11-pin connector to X6 of PCB.

Replace the aluminum cover: Attach a cable shield onto a ditch with the aluminum cover. Be careful that the cable does not get caught between main unit and cover, and that the antenna is free to rotate.

Replace the upper part of the radome: Be careful not to bump it against the antenna. Be sure that the cover is fitted in the correct direction (refer to below illustration). Align the upper and lower parts with the holes for the screws.

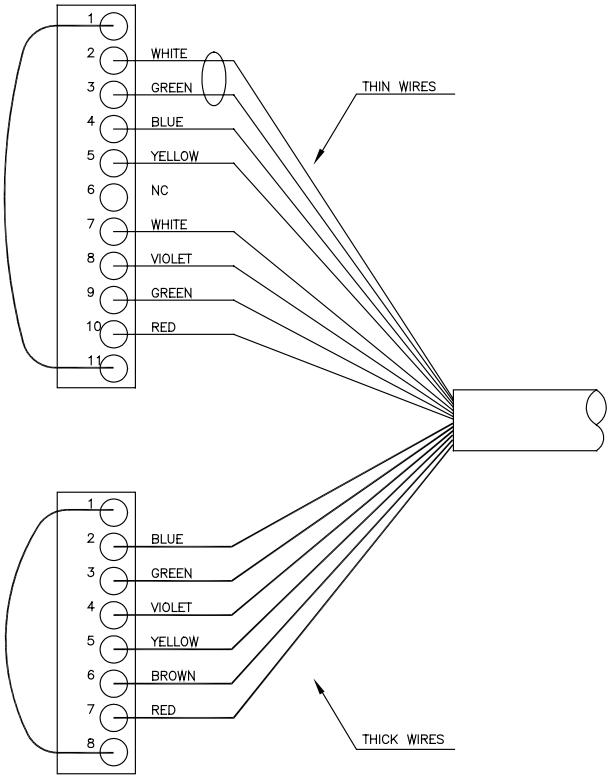


Fitting interconnection cable DX45 and DX60:



*) See wire colors and pin numbers on next page.

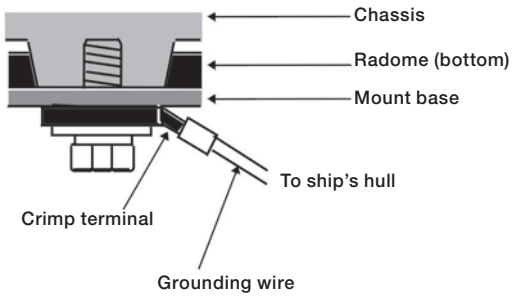
Wire colors and pin numbers for the DX45 and DX60 Radar scanner



1.2.4 Grounding wire

Connect grounding wire from one of the bolts used for mounting the scanner unit to ship's hull. The crimp terminal and grounding wire are not included with the radar equipment.

Radome



2. Initial start-up of radar function

Having completed the installation of the scanner and display units and connecting cables, refer to the operator manual for the display unit for initial start-up of radar function and operation in general.

2.1 The scanner needs to warm up

Starting up for the first time after installation or after long storage (6 months), the scanner will need an extra 20 minutes to warm up, so after Power on and going into Standby, the radar function must be left in Standby mode for the extra 20 minutes it will take to properly warm up the scanner. This way you will contribute to the lifetime of the magnetron in the radar scanner.

Note: Normal start-up at regular usage will take approx. two minutes for the scanner to warm up and be ready for transmission.

2.2 Radar operation from display unit

To activate the radar transmission:

RADAR *Shortcut to radar display*

ENT *Call up the Radar quick menu*

RADAR *Turn 'Power on'*

The legend 'Detecting' will appear on the screen while the system is checking which scanner is connected. When the scanner is detected, a countdown to zero will appear on the screen which will allow two minutes for the scanner to warm up before it enters Standby mode and is ready for use.

When ready to start transmission:

ENT *Call up the Radar quick menu*

GOTO *Start transmission*

2.2.1 Go to Standby

To disengage the radar transmission temporarily, you can return the radar function to Standby mode:

ENT *Call up the Radar quick menu*

GOTO *Enter Standby mode*

2.2.2 Resume radar transmission from Standby

To resume the radar transmission:

ENT *Call up the Radar quick menu*

GOTO *Start transmission*

2.2.3 Resume radar transmission from Standby

To shut down the radar function

ENT *Call up the Radar quick menu*

RADAR *Turn 'Power off'*

3. Radar operation

The CX34/44/54 combines chart plotting with radar navigation. For first time users of Radar, we have included a basic description of the radar presentation with a basic understanding of how the controls affect the radar's operation and display.

The following paragraphs describe the control settings used for initial display setup, turn-on procedure, inclement weather operation and finally the turn off procedure. Radar controls are described in chapter 3.2.

3.1 Radar picture

The radar picture appearing on the display is a map-like representation of the area in which the radar is operating. Typically, the ship's position is at the center of the display. The operator may reposition or offset the ship's position up to 66% of the radius anywhere on the screen. The ship's dead ahead bearing is indicated by the heading line at the 0° relative bearing.

Coastline contours and landmass are generally depicted in solid filled yellow, purple, multi-colored (DAY settings) or green (NIGHT settings) echo areas - choose colors in Pallette setup, section 9.7. Other surface vessels, and channel buoys, are displayed as smaller single "blips" or echoes. The radar picture or map can be viewed in many different ranges from own ship. These sizes are selected by the range controls. Greater detail of radar echoes nearby own ship is shown when the short or nearby range scales are selected. The best technique for assessing the radar presentation characteristics is to start with using a longer range scale and then switching to shorter ranges when nearby targets appear, or as the ship approaches the coastline, harbor, or other vessels in the area.

The long range scales (i.e. 3, 6, 12, 24nm) best show the overview of the ship's relationship to landmasses, weather fronts, and large ship targets at or beyond view.

3.1.1 Orientation

In the Head Up mode, the heading line always appears on the screen at 0° relative according to the on-screen bearing scale, and is coincident with the antenna beam passing the ship's bow. Thus the top of the displayed picture represents the direction in which the ship is heading.

All targets appearing on the display are "Relative" to own ship's position and heading. As you look outside at targets around you, you will see that the targets are appearing on the Radar display at the same relative bearing.

If the vessel alters course to the right, the displayed echoes will be displaced by an equal amount in bearing in a counterclockwise direction, and vice versa. These changes in the display pattern with ship movement is an extremely important characteristic to remember when maneuvering around nearby vessels, or buoys.

In North Up mode, the heading line will indicate the ship's heading in relation to the radar picture, which is presented in north up like a chart.

The Electronic Bearing Lines (EBL) are available radar tools used to measure bearings to radar targets from own ship. The bearing readouts may be in relative or true modes.

3.1.2 Effects of ship's movement

Radar images can be drawn in two ways on the radar display to show the ship's motion. The type of display modes are called "Relative motion" and "True motion". In Relative motion own ship is permanently fixed at the center of the display and radar echoes (targets) move in relation to your vessel. With no movement of the ship, a steady display of fixed radar echoes is shown. If the ship is moving ahead on a constant course, echoes appearing at the top of the display will move downward across the display. Your own ship's position will always remain at the center of the display.

The True motion display mode can be compared to your vessel moving on a map or chart. In True motion mode, the surrounding landmass echoes remain stationary on the screen and if your ship is moving at a constant course and speed, you will see your posi-

tion move across the screen towards the edge of the display. Any other targets which are underway will also be moving on the display screen at their True course and True speed. All motion seen on the True motion display is “TRUE” (meaning motion over the ground).

3.1.3 Environmental effects

The effects of weather and water surface conditions generally act to reduce the ability of radar to detect targets. Weather effects reduce the long range at which targets can be detected. Water surface clutter (waves) reduces the ability to detect targets close by. Either can obscure the echoes from targets that may prove dangerous to your vessel.

You can’t see wind on your radar screen, however you can see its effects when it produces waves and spray on the water surface. “Sea Return” is most pronounced in the direction from which the wind is blowing. Proper use of your Sea clutter control can reduce the effect of wind and waves, but care must be taken not to increase the control to the point where weak targets will be overlooked.

Rain, hail and snow can return echoes that appear on your radar screen as a blurred or cluttered area. Targets within the area of precipitation can be masked by the clutter. The maximum range of the radar pulse is greatly reduced as the energy of the radar beam is scattered and absorbed by the water droplets. Proper use of your Rain clutter control helps you to look into areas of precipitation to detect targets.

Buoys are moored to the bottom with concrete via chain. The chain is longer than the depth of the water to allow the buoys to ride in the current and go up and down with the tide. Unfortunately this allows the buoys to lean in the direction of the current. Radar reflectors built into the buoy do not work well when the side of the buoy is pointed to the sky. Therefore, the images of the channel markers may appear faint.

The iron mass and angles of the metal in the structure of a bridge can cause unpredictable interference patterns on your radar. It is not unusual for a reflected image to appear on the radar screen in front of you just as you pass under the bridge. A similar effect is also common on sailboats where the radar antenna is mounted close to an aluminum mast.

Overhead cable crossings can mimic a moving target on your radar screen. The cable target can appear to be on a collision course. The entire length of cable does not appear on the screen, only a point on the cable, and that point keeps changing giving the illusion of a moving target.

3.1.4 Navigational echoes

Echoes displayed on the radar screen may be large or small, bright or faint, depending on the size and shape of the object and its angle relative to your radar antenna. The radar indication is not always the same as an observer's visual indication; a nearby small object may appear to be the same size as a distant large object on the radar. With experience, however, different targets can be identified by the relative size, brightness, and position of their radar echo returns.

Buoys and small boats are one example of targets that are sometimes difficult to distinguish from each other. Their movement in the waves do not present a consistent reflecting surface. Consequently, their echoes have a tendency to fade and brighten or sometimes to disappear momentarily. Although buoys and small boats often resemble each other, usually the motion of one target identifies the boat from the buoy.

High coastlines and mountainous coastal regions are often observed at the longest ranges of the radar. However, the first sight of landfill on the radar's longest ranges may be a mountain several miles inland from the coastline and not the actual coastline. The coastline may not appear on the radar until the vessel has approached land nearer the line of sight distance.

3.1.5 Racon (Radar Beacon)

A racon is a radar transponder which emits a characteristic signal when triggered by a ship's radar. The signal may be emitted on the same frequency as that of the triggering radar, in which case it is superimposed on the ship's radar screen automatically.
The racon signal appears on the screen as a radial line originating at a point just beyond the position of the radar beacon or as a Morse code signal displayed radially from just beyond the beacon.

3.1.6 Sea return

Not all radar echoes are produced by hard navigation items such as boats, buoys and land. Some radar echoes may be received from irregularities on the surface of the water, particularly at close range by breaking wavecrests, particularly in windy weather and in heavy seas. These echoes appear on the radar screen on the short range scales as multiple small echoes next to own ship. Under high winds and extreme conditions the echoes from sea clutter may appear as dense background of clutter forming the shape of an almost solid disc, as far as one to three miles in all directions from own ship, but the worst direction is where the wind is blowing towards the ship. The radar has a sea clutter control, which can be used to minimize the effects of sea clutter pickup on the screen.

3.1.7 Storm and rain squall returns

The radar can also see echoes from rain or snow. Echoes from rain squalls consist of countless small echoes, continuously changing in size, intensity, and position. These returns sometimes appear as large hazy areas on the display depending on the intensity of the rainfall or snow in the storm cell. The cells usually may be visible at long distances due to their high altitude above the radar horizon and are very helpful for observing potential bad weather conditions. If the returns from rain squalls are not desired, the Rain clutter control can be adjusted to minimize the effect on the radar screen.

3.1.8 Blind sectors or shadow effect

Funnels, masts or derricks, (when located near the antenna array) may cause shadows. Shadow areas can be recognized since beyond the obstruction there will be a reduction of targets and noise intensity, although not necessarily a complete cutoff seen on the screen. However, if the shadow angle is more than a few degrees, there will be a blind sector.

In some shadow sectors the beam intensity may not be sufficient to obtain an echo from a very small object even at close range, despite the fact that a large vessel can be detected at a much greater range. For this reason, the angular width and relative bearing of any shadow sector should be determined at installation. Sometimes shadowing can be seen on the screen by increasing the radar gain until noise is

present. Darker sectors indicate possible shadowed areas. This information should be posted near the display unit, and operators must be alert for objects in these blind sectors.

3.1.9 Side lobes

Echoes on the radar screen are not always the direct returns to the radar antenna. There are many types of false echoes that can appear on the display if certain conditions occur. The sections that follow, briefly describe the echo patterns that may be produced by these false echoes and their likely cause. It should be noted that the radar operator, through observation, practice, and experience usually can detect these conditions very quickly.

A very small part of the RF (Radio Frequency) energy from each transmitted pulse is radiated outside the radar's narrow beam, producing side lobe patterns. Side lobes normally have no effect from distant or small surface objects, but the echo from a large object at short range may produce an arc pattern on the radar screen similar to a range ring, or appear as a series of echoes forming a broken arc. Side lobe echoes normally occur at a range below 3 miles and usually can be reduced through careful reduction of the Gain or proper adjustment of the Sea clutter control.

3.1.10 Radar interference

Whenever two or more radar equipped vessels are operating within reception range of each other, mutual interference is likely when the radars are operating near the same frequencies. This interference usually appears on the screen as a series of small dots. The interference seems to move from the PPI center (center of radar screen), sometimes in a straight line, but more often in a long, sweeping curve. This type of interference is more noticeable on longer range scales. This does not, as a rule, impair the effectiveness of the radar as a navigational aid. Since the interference can be completely eliminated by turning IR "ON" in the function menu. The IR feature is normally left "on".

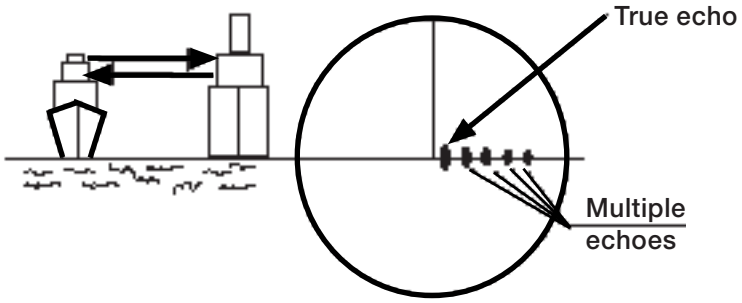
3.1.11 False echoes

Occasionally, echoes may appear on the screen at positions where there is no actual target. This type of target is called a False Echo. Sometimes they are known as Ghost Images, Indirect Echoes or Multiple Echoes depending on how they are generated.

Ghost images usually have the appearance of true echoes, but, in general, they are intermittent and poorly defined. A true ghost image retains a fixed relationship with respect to the true image and characteristically produces a more arc-like appearance with a tendency to smear on the screen. Ghost images are sometimes caused by large targets which have a wide, smooth surface as they pass by near your own ship.
Ghost images sometimes are referred to as indirect echoes. Indirect echoes may appear when there is a large target, such as a passing ship at a short range, or a reflecting surface, such as a funnel or spotlight on your own ship in line with the antenna. The signal, on first striking the smooth side of the large target, will be reflected, and these subsequent echo returns to the antenna are shown on the display. However, the same reflection may also hit other masts or obstacles and then be picked up by the radar antenna with enough strength to appear as a target on the radar screen at various locations.

Multiple echoes could appear if there is a large target having a wide vertical surface to your own ship at a comparatively short range. The transmitted signal will be reflected back and forth between the wide vertical surface of the target and your own ship.

Thus, multiple echoes will appear beyond the true target's echo on the same bearing as shown below.



3.2 Radar menu

The Golden Rule! Today's radars are packed full of neat features designed to make your cruising more enjoyable and safer. Use these features when you can, but remember the old axiom KISS (keep it simple sailor). If a target shows on the display, there most likely is something there. If there are no targets shown on your display, it doesn't guarantee there are no other objects around. *Maintain a good visual watch, proceed at a safe speed and enjoy your boating.*

1 RADAR
1 Radar
2 Dual Radar
3 Radar & Chart
4 Custom screen

The displays obtained from this menu can easily be accessed from the main function key [RADAR] - see section 3.2.1.

To access RadarChart overlay - see section 3.2.6.

The **Radar** display will be presented in full screen with the radar control menu placed in the right side of the display. Press [ADJ] to access the control menu, where the most common adjustments are made - see section 3.2.5.

The **Dual Radar** display requires a full-screen presentation, with the standard display in the left half of the screen and the secondary radar display in the right half of the screen. The two half-screen radar displays can be set up and operated independently - see section 3.2.8.

The **Radar & Chart** display requires a full screen presentation, with the radar display in the left half of the screen and the chart display in the right half of the screen - see section 3.2.9.

The **Custom screen** will present multiple window combinations (section 3.2.1), where the radar display will be fixed in the left half window and the two quarter windows i.e. (default) a chart display and an echo display can be exchanged with different displays.

To access one of the displays via the menu e.g.:

MENU
1,1

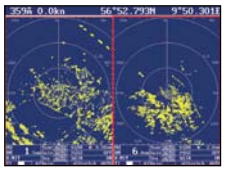
Call up the menu bar, and...
press [1] *and* [1] *to call up the Radar display in full screen*

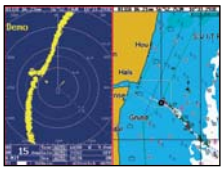
3.2.1 Shortcut to the pages in the radar-series

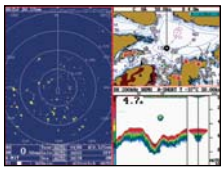
The RADAR function is one of the main functions in the CX34/ 44/54. Each page under the [RADAR] key will include a window representing the radar function. It is not possible to exchange main function displays with a new display. Refer to section 2.1, 2.1.1 and 2.1.2 for further information on the display and page system.

From any display:
RADAR Long press on the [RADAR] key will toggle between:

Radar full screen

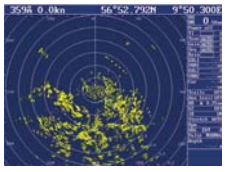

Dual Radar

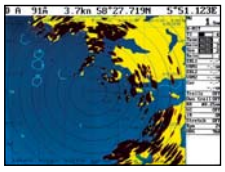

Radar & Chart


Custom screen

All the displays are fixed, except for the two quarter windows in the custom screen, which can be exchanged with a different display selected via the menu.

From radar display:
RADAR Short press on the [RADAR] key will toggle overlay on/off - see section 3.2.6.


Radar display


RadarChart overlay

3.2.2 Initial radar display setup

After the installation is completed, check the Radar setup (section 9.1) if the **Scanner height** is correct and the **Heading adjust** is zero degrees to ship's center line. If not, carry out adjustments as described in the Radar setup. The Scanner type is preset to Auto detect and as such, the system will automatically initiate the correct parameters for the connected scanner.

3.2.3 Start transmission

Normally, when starting the transmission, it will take approx. two minutes for the antenna to warm up and be ready for transmission. For initial start-up and after long storage, see below.

Make sure nobody is standing close to the radar scanner when it starts to rotate after the transmission is activated!

RADAR *Shortcut to radar display*

ENT *Call up the Radar quick menu*

RADAR *Turn 'Power on'*

The legend 'Detecting' will appear on the screen while the system is checking which scanner is connected. When the scanner is detected, a countdown to zero will appear on the screen which will allow two minutes for the scanner to warm up before it enters Standby mode and is ready for use.

When ready to start transmission:

ENT *Call up the Radar quick menu*

GOTO *Start transmission*

☞ Starting up the first time after installation or after long storage (6 months), the antenna will need an extra 20 minutes to warm up, so after Power on and going into Standby, the radar must be left in Standby mode for the extra 20 minutes it will take to warm up the antenna properly. This way you will contribute to the lifetime of the magnetron in the radar antenna.

3.2.4 Shut down procedure for the radar function, or back to 'Standby'

To disengage the radar transmission temporarily, you can return the radar function to Standby mode:

ENT *Call up the Radar quick menu*

GOTO *Enter Standby mode*

To resume the radar transmission:

ENT *Call up the Radar quick menu*

GOTO *Start transmission*

To shut down the radar function:

ENT *Call up the Radar quick menu*

RADAR *Turn 'Power off'*

3.2.5 Standard radar display

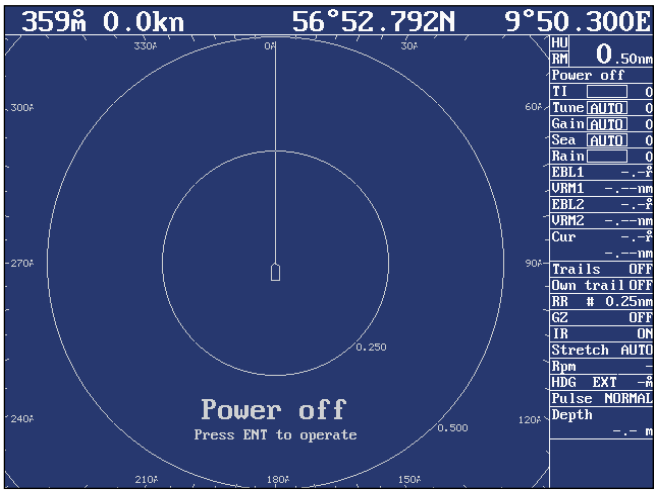
The standard radar display will require full screen presentation.

RADAR *Shortcut to radar display*

Or load the radar display via the menu:

MENU *Call up the menu bar, and...*

1,1 *load the Radar display*



The top line in the radar display indicates the course and speed of the ship together with the position of the ship, which will be exchanged with the position of the cursor when activated on the radar display (heading input is required). The control menu will appear in the right side of the radar display in full screen.

‚Press ENT to operate' - refer to section 3.2.6 Radar quick menu.

Use cursor to activate and move the cross cursor on the radar background - press [CLR] to remove cursor.

EBL

Activate EBL-VRM1, and use cursor to move EBL-VRM1 around in the radar background - more details further ahead in this section - press [EBL] again, or [CLR] to remove EBL-VRM1.

ADJ

Open for adjustment

Use cursor to move around in the control panel

+/-

Toggle between available values

0-9

Key in new values

ENT

Confirm changes by pressing [ENT] *(or* [MENU]*)*

There is no regret or “exit without making any change”-key from the control panel. As soon as the keys are pressed to change a function, the actual change is immediately carried out.

Orientation can be set to:

HU RM (Head-Up in Relative Motion): The heading line always appears on the display at 0 degrees as the antenna beam passes the bow of the vessel. Targets appearing on the display are relative to your own ship. Head-up mode gives an easy interpretation of the situation around your boat.

NU (North-Up): In this mode, targets are displayed at their measured distances and direction relative to north. North being at the top of the display. To operate in NU mode will require valid heading from connected compass.

CU (Course Up): The heading line appears to point upwards within the range of the rotation resolution (default is 15°). If the vessel turns more than e.g. 15°, the radar picture will also turn to make the heading line continue pointing upwards.

TM (True Motion): Own ship moves past land, buoys and fixed objects. To operate in TM mode will require valid GPS position and compass heading.

RM (Relative Motion): The ship will stay in the center of the screen or at an offset position and targets will appear relative to own ship's position.

☞ If receiving the alarm: "Heading missing" or "Position mising" the system will change to Head-Up in Relative Motion after 60 seconds and at the same time inform of "Changing to HeadUp" in a pop-up window.

0.50nm indicates the displayed range in the radar picture.

Power off indicates that the radar function is not active.

TI is the Tuning Indicator, which provides an indication of the receiver tuning.

Tune – make manual adjustments to Tune by means of the +/- keys, and return to AUTO mode by pressing [CLR].

Tune control – is a variable control used to tune the receiver in the radar antenna for maximum target returns on the display. If no land or ship targets are available, the operator may tune for maximum sea clutter. The tuning indicator will show the strength of tuning peak conditions and is tuned for maximum deflection. Tuning of the radar should be performed on a 3nm range scale or higher.

Gain – Auto mode can be used in most situations, but in some situations manual adjustment leads to better performance of the system. Make manual adjustments to Gain by means of the +/- keys, and return to AUTO mode by pressing [CLR].

Gain control adjusts the gain level of the radar's receiver. The Gain control level is usually set for the best target presentation with a slight noise speckle in the background on the 12 or 24nm range. A semi-automatic Gain reduction is used on shorter ranges to improve target definition. Use some caution when adjusting the Gain control. If gain is set too low, small or weak targets may be missed. If the gain is set too high on short ranges, the display may become excessively covered with noise speckle making target observation difficult.

Sea – Auto mode is optimized for open sea and is recommended when the distance to shore is over 300 meters. Closer to shore and when approaching a harbor, choose Harbor mode.
Make manual adjustments to Sea by means of the +/- keys, and

return to AUTO mode by pressing [CLR].
Press [CLR] to toggle between HBR (Harbor) and AUTO mode.

Sea control – is used on the shorter ranges to suppress the effects of sea clutter close to own ship by reducing the nearby gain level. It can effectively reduce the strength of the mass of random echoes received from nearby sea clutter for up to approx. 1 to 2 nm depending on wave and sea conditions. Sea control is set to reduce the strength of these echoes such that the clutter appears only as intermittent small dots, yet stable targets can still be distinguished.

☞ If manual adjustments are made, the setting will affect the system's ability to detect targets and remove sea clutter in heavy sea situations.

Rain – the rain clutter filter enhances the leading edge of a target whereas the signal behind the leading edge area of rain will be depressed. This can also be of great advantage on shorter ranges to distinguish between two very close echoes on the same bearing which may otherwise merge and appear as one echo.

☞ To properly adjust for rain clutter:
1. Set rain clutter to zero.
2. Slowly increase rain clutter until the hazy area caused by the rain or snow become less dense. Increasing it too much will not only remove the rain clutter, but also other weak targets.
   Note! Since Rain and Snow are continually changing in size and density, tweaking of the rain clutter adjustment is necessary to maintain the best results. Manual fine tuning of Gain and Sea may improve the performance.

EBL (Electronic Bearing Line) - bearing and distance (read-only) from ship's position to cursor. Two independent EBLs are available - see section 3.2.6.

VRM (Variable Range Marker) - bearing and distance (read-only) from ship's position to VRM cursor. Two independent VRMs are available - see section 3.2.6.

Cursor - bearing and distance (read-only) from ship's position to cursor.

Trails after targets – toggle between OFF, 30sec, 1min, 2min, 5min, 10min, 15min, 30min, PERM (permanent).
Using the Trails feature will show the trails of target movement as an

after-glow or wake behind the moving targets or own ship.
If the range scale is changed, the trails are cleared and new trails will be drawn on the screen. The trails are drawn for anything that moves on the screen, including sea gulls, sea clutter, buoys, and shoreline.

Own trail – toggle between OFF and ON. This function will require that 'Trails' (above) is activated and mode of orientation is TM.

RR = RangeRings – toggle between # *.** (as display example), *.** (no RR figures), OFF (no RR)

GZ (Guard Zone alarm) – The use of the Guard zone feature built into the radar can detect approaching vessels entering your guard zone. You can use the guard zone while you are moving or when anchored to protect you in a full 360 degrees. The audio alarm can be sounded from the unit or through an external speaker/buzzer wired into the system – see Electrical connections in Installation manual.

☞ In Head Up mode the GZ relates to the vessel and in North Up or Course Up it relates to geographic north.

Define the guard zone by means of the EBL and VRM markers:

1. Press the [EBL] key and move cursor (EBL-VRM1) to make the left side and top of the guard zone.

2. Press [ENT], [2] and move cursor (EBL-VRM2) to make the right side and bottom of the guard zone. The guard zone will be generated clockwise from EBL1 to EBL2.

3. Press [ADJ] and move cursor to the GZ line. Use the [+] key to toggle between: IN / OUT / OFF.

   IN = the alarm will be activated if any target enters the defined guard zone.
   OUT = the alarm will be activated when all targets have left the defined guard zone i.e. at least one target must be present inside the GZ when the function is activated.

4. Press [ENT] to exit the control panel.

5. Press and hold [CLR] to clear the EBL-VRMs. This will give a better view of the defined guard zone.

☞ The guard zone is not available in the secondary radar display in Dual Radar mode.

IR (Interference Rejection) – will reduce false echoes from other radars nearby, see section 3.1.10.

Stretch – toggle between AUTO, ON, OFF.
AUTO (default) - small targets are enhanced at ranges above 12 nm.
ON - all targets will be enhanced.
OFF - all targets will remain unchanged.

Rpm – will determine the scanner rotation (full screen presentation). Manually, the rotation speed can be set to either 24 or *48 rpm, depending on the scanner type (use +/- keys).
*Running 48 rpm (double update rate) is liable to reduce the lifetime of the mechanical parts.

HDG – your heading will be shown (full screen presentation) in degrees from connected compass. If no compass is connected, you can use the course (COG) from the built-in GPS module by changing "Use COG as internal heading" from NO to YES in the interface setup. Press [MENU], [7], [2], and then press [PLOT] repeatedly until the tab reads Compass.

☞ When using the GPS course as replacement for heading input, the accuracy will be reduced in relation to speed, wind and current.

Pulse - can be set to SHORT, NORMAL or LONG.
NORMAL (default) will not change the presentation of targets.
SHORT - (press the [-] key to access) will enhance target resolution at range 0.5-6.0 nm. However, this setting may result in making some smaller targets disappear.
LONG - (press the [+] key to access) will enlarge targets on screen and improve target detection. However, this setting will also enlarge any noise picked up.

Depth - readout in meters, feet or fathoms from built-in echosounder function or external depth source.

3.2.6 Radar quick menu

From active radar display:
ENT *Call up the Radar quick menu*

Radar quick menu
RADAR Power On
GOTO Transmit
1 Activate EBL-VRM1
2 Activate EBL-VRM2
3 Activate Cursor
4 Show Navigation Point
5 Heading line
6 Clear trails
CHART Show Overlay Chart
PLOT Show Overlay User Data
ADJ Overlay Chart Setup
MENU Exit

If working with both EBL-VRM cursors, you can toggle between which one should be active via the quick menu.

RADAR **Power On/Off** - Turning power on will activate scanner warm up and enter standby mode, see section 3.2.3.

GOTO **Transmit/Standby** - Transmit will start transmission and antenna rotation, see section 3.2.3.

1 **Activate EBL-VRM1**
A dotted line + circle will be drawn on the screen. Use the cursor key to move the EBL-VRM1 cursor. By placing the square cursor point over a target or over an object, it will indicate the distance to same.
To turn off: Press [ENT], [1] again to hide EBL-VRM1.
Long press on [CLR] will turn off all active cursors.
Toggle on/off directly from the [EBL] key.

2 **Activate EBL-VRM2**
A dotted line + circle will be drawn on the screen. Use the cursor key to move the EBL-VRM2 cursor. By placing the square cursor point over a target or over an object, it will indicate the distance to same.
To turn off: Press [ENT], [2] again to hide EBL-VRM2.
Long press on [CLR] will turn off all active cursors.

3 **Activate Cursor** - will activate cursor on radar display. Press again to turn off cursor, or press [CLR]. Long press on [CLR] will turn off all active cursors on the radar display.

4 **Show/Hide Navigation Point** - this function will require a valid position, and heading input from connected sensor. When a navigation mode is active, the approaching waypoint can be shown on the radar display. Turning the navigation mode off will temporarily disable the function, because there is nothing to show - but when navigation is started up again, the function will also become active again. You will not have to turn it on and off all the time. Press [ENT], [4] Hide Navigation Point if you no longer want the waypoint to be shown on the radar display.

5 **Heading Line** - by pressing the [5] key the heading line will disappear for approx. 5 seconds.

6 **Clear Trails** - will clear all trails, both from targets and own boat.

CHART **Show/Hide Overlay Chart** - dedicated chart overlay on the radar display. This function will require a valid position, and heading input from connected sensor. The type of chart data/objects shown on the screen can be adjusted in the 'Overlay chart setup', see section 3.2.7.

PLOT **Show/Hide Overlay User Data** - plotted user data overlay on the radar display. This function will require a valid position, and heading input from connected sensor. The type of user data shown on the screen can be adjusted in the 'User data' group in the 'Overlay chart setup', see section 3.2.7.

ADJ **Overlay Chart Setup** - will open for change to the current setup. The changes will only affect the chart used with the overlay - see section 3.2.7, and section 4.5.2 Description of chart features.

MENU **Exit** Radar quick menu

3.2.7 RadarChart overlay

Radar and chart images merged into one presentation takes away the guesswork of interpreting radar information by providing the full picture. The overlay is a feature under the radar function, which consists of three layers of information. The first layer is the chart with the ship's symbol indicating precisely where you are at all times. The second layer is the radar image with targets. And finally the third layer adds the coast lines, buoys, lights, user data and other vital navigational data which always will be shown on top of the radar targets. Radar operation will be as usual with full access to the radar control menu. The dedicated chart used with the overlay is adjustable via the Radar quick menu.

The overlay function will require the following conditions: Valid position, valid heading information, and Radar orientation mode must be in NU (North Up) or CU (Course Up). The overlay is disabled in HU (Head Up).

The overlay function can not be activated in the 'Radar & Chart' display.

From active radar display:

RADAR *Short press will toggle the overlay on/off*

Calling up the overlay function via the [RADAR] key will automatically show the dedicated chart together with any user data plottet in the area presented on the screen.

The amount of information in the overlay is controlled via the Radar quick menu where you can Hide/Show Overlay Chart or Hide/Show Overlay User Data, or enter Overlay Chart Setup to turn off some of the objects if the screen is too cluttered with information.

ENT *Call up the Radar quick menu*

CHART *Hide/Show Overlay Chart*
- special chart dedicated to the overlay.

PLOT *Hide/Show Overlay User Data*
- plottet waypoints, routes, etc. stored in the memory.

If you choose to e.g. Hide Overlay User Data, then the Overlay Chart will be shown on the radar display and a short press on the

[RADAR] key will toggle the overlay on/off, but now only with the Chart data, as the User Data is currently 'hidden'.

Color presets for the overlay display
Different color combinations of radar targets and chart or radar background color are available:

PWR *Call up the Light and power pop-up window*

1 - 9 *Select a different number in the color Palette*

ENT *Confirm the change*

The color palettes from 1 to 4 are fixed, palette 9 is preset with multi color radar targets, the rest (5-8) can be customized to suit individual needs. See how in section 9.7.

Adjustment of overlay settings
The special chart used with the overlay is not used anywhere else in the system and therefore has its own individual setup. A description of the chart features can be found in section 4.5.2. To access the overlay chart setup, the active window must contain a radar display, and then:

ENT *Call the Radar quick menu*

ADJ *Open for change in the overlay chart setup*
- see display example next page.

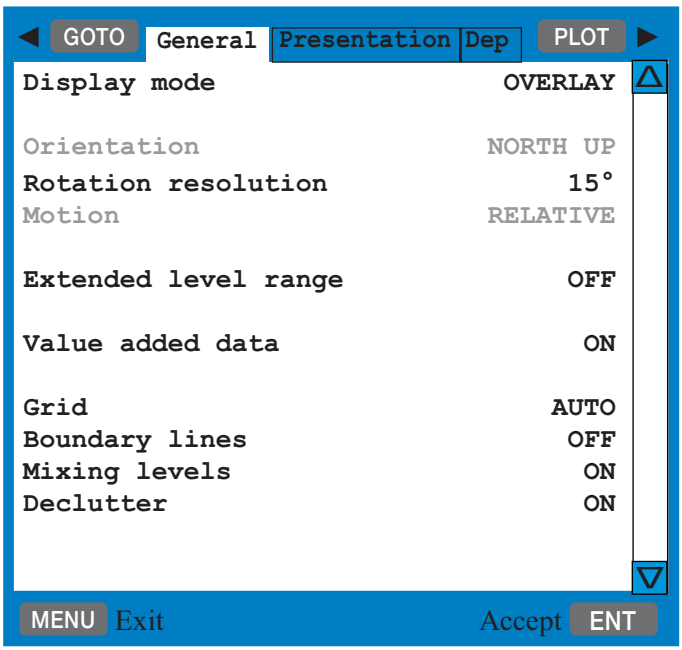
The tabs indicate which groups are available in each display mode e.g. in the above example, OVERLAY display mode, you have access to the groups in black: General, Areas and User data. The two groups in red i.e. Presentation and Depth are only adjustable in CUSTOM display mode. See further on in this chapter for more details.

+/- *Select display mode:* OVERLAY, FULL, CUSTOM, SIMPLE, FISHING, LOW

PLOT *Go to the next group*

GOTO *Step back to the previous group*

Scroll up/down in the chart settings
- functions in light grey are not accessible in selected display mode.



+/- *Toggle between available settings*

ENT *Confirm changes, or...*

MENU *Abandon Chart setup without making any changes*

Display modes in the overlay chart setup
There are 6 different display modes to choose from: OVERLAY (default), FULL, CUSTOM, SIMPLE, FISHING and LOW. When a group is shown in red or a function is shown in light grey it is not available in the selected display mode. The default settings in the various display modes are:

Group: General - specification of chart display in general.
The available functions are according to display example on previous page for all display modes and any change of the default settings will be applied in all display modes.

Group: Presentation - specifies presentation of marine, land and chart topics
The default settings in this group are fixed in all display modes, except for *Custom where it is possible by the user to turn a feature ON (shown on the chart) or OFF (not shown on the chart), etc. - see next page.

C-MAP features	Overlay	Full	*Custom	Simple	Fishing	Low
Marine:						
Names	OFF	ON	OFF	ON	ON	OFF
Nav-Aids	INT	INT	INT	INT	INT	INT
Lights	OFF	ON	ON	OFF	OFF	OFF
Light Sectors	OFF	ON	OFF	OFF	OFF	OFF
Signals	ON	ON	ON	ON	ON	OFF
Buoys	ON	ON	ON	ON	ON	OFF
Attention Areas	ON	ON	ON	ON	ON	OFF
Tides, currents	ON	ON	ON	ON	OFF	OFF
Nature of seabed	ON	ON	ON	OFF	ON	OFF
Ports	OFF	ON	OFF	ON	OFF	OFF
Tracks, routes	ON	ON	ON	OFF	OFF	OFF
Land:						
Natural features rivers	OFF	ON	OFF	ON	OFF	OFF
Natural features	OFF	ON	OFF	OFF	OFF	OFF
Cultural features	OFF	ON	OFF	OFF	OFF	OFF
Landmarks	OFF	ON	OFF	ON	OFF	OFF
Traffic	OFF	OFF	OFF	OFF	OFF	OFF
Points of interest	ON	ON	ON	OFF	OFF	OFF

Group: Depth - specifies the presentation of depth lines, levels, etc. on chart The default settings in this group are fixed in all display modes, except for *Custom where it is possible by the user to alter the features. The color indication for depth levels 1, 2 and 3 is determined by the color palette in the SETUP menu.

C-MAP features	Overlay	Full	*Custom	Simple	Fishing	Low
Soundings	OFF	ON	OFF	ON	ON	OFF
Underwater objects	OFF	ON	OFF	ON	ON	ON
Depth Lines	ON	ON	ON	ON	ON	OFF
Depth Lines>	0000m	0000m	0000m	0000m	0000m	0000m
Depth Lines<	9999m	9999m	9999m	5m	9999m	5m
Depth Areas	ON	ON	ON	ON	ON	OFF
Depth						
Level 1	0-002m	0-002m	0-002m	0-002m	0-002m	0-002m
Level 2	2-009m	2-009m	2-009m	2-009m	2-009m	2-009m
Level 3	9-MAX	9-MAX	9-MAX	9-MAX	9-MAX	9-MAX

Group: Areas - specifies the presentation of different areas on chart
The default settings in this group are the same for all display modes and any change of the default settings will be applied in all display modes.
The features can be changed from FILLED to CONTOUR:

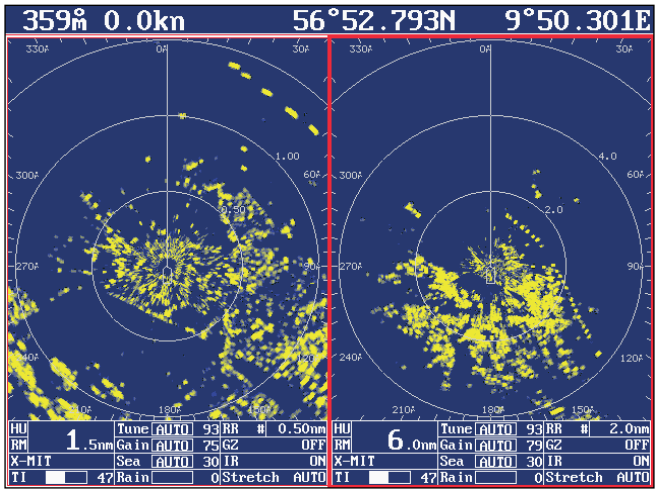
C-MAP features	All display modes
Land areas	FILLED
Depth areas	FILLED
Caution areas	FILLED
Dredged areas	FILLED

Group: User data - user defined objects can be visible or invisible on chart.
The default settings in this group are the same for all display modes and any change of the default settings will be applied in all display modes.

Chart features		Defaults and choice of settings
Waypoints		All the features in the user data level that are set as default to ON= shown on chart, can be changed to OFF= not shown on chart. Non active routes and tracks, all lines and all targets are default to: AS SELECTED= the choices made for a particular route etc via the menu e.g. MENU, 6, 2, ENT, ENT - Edit route, where 'Course line' can be set ON or OFF. 'AS SELECTED' can also be changed to 'ALL ON'= shown on the chart, or 'ALL OFF'= not shown on the chart.
Non active waypoints	ON	
Waypoint names	ON	
Waypoint depths	ON	
Routes		
Non active routes	AS SELECTED	
Route names	ON	
Tracks		
Non active tracks	AS SELECTED	
Track names	ON	
Lines		
Lines	AS SELECTED	
Line names	ON	
Targets		
Targets	AS SELECTED	
Target names	ON	

3.2.8 Dual radar display

MENU *Call up the menu bar, and...*
1,2 *load the Dual Radar display*



Standard radar display Secondary radar display

This feature requires a full-screen presentation, with the standard display in the left half of the screen and the secondary radar display in the right half of the screen. The two half-screen radar displays can be set up and operated independently.

To make adjustments in the standard radar display (left half screen), the window must be active:

WIN *Toggle between active windows on screen*

ADJ *Open for adjustment*
- by pressing [ADJ] again will toggle between 1st and 2nd half of control menu.

Use the cursor to move around in the control menu
- and toggle between available values with the +/- keys, and insert data by the numeric keys.

ENT *Confirm changes by pressing* [ENT] *or* [MENU]

To make adjustments in the secondary radar display:

WIN *Make the secondary radar display active*

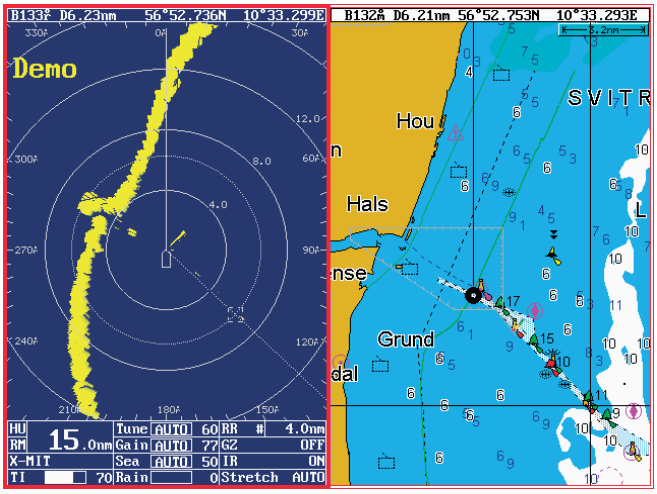
Carry out adjustments by using the same procedures as described in section 3.2.5 for the standard radar display, except for the guard zone which is not available in the secondary radar display.

☞ Indication of HDG (heading), Rpm (scanner rotation speed) and Pulse is only available in full screen presentation.

3.2.9 Radar & Chart display

MENU
1,3

Call up the menu bar, and...
load the Radar & Chart display



The RadarChart overlay is not available in this display!

WIN *Toggle between active windows on screen*

• **Synchronize cursors or scale and range** (will require a valid position, and heading input from connected sensor)
In synchronized mode the orientation mode of the chart is set to the same as the radar orientation. When position data is available the chart scale is adjusted to approximately the same range as the radar. When heading data is available and a cursor is active, the chart cursor will be set to the radar cursor position.

The lock function is controlled by the radar display, which means that e.g. moving the cursor in the radar display will move the cursor in the chart display as well. However, when moving the cursor in the

chart display, nothing will happen in the radar display, because the synchronization is 'one way only'.

☞ The lock function is automatically activated when the required data is available. When the data is not available, the radar display and the chart display will both function as individual standard displays. This synchronized feature is only available in the Radar & Chart display.

3.2.10 General features for the radar operation

• **Alarms:**
The alarms that can appear in connection with the radar operation, are:

- Bearing pulse alarm (check if scanner is rotating)
- Bearing zero alarm (check if scanner is rotating)
- Changing to Head-Up alarm (indicates the orientation mode has changed - see section 3.2.5 and 3.2.7)
- Communication failure alarm (check connection to scanner)
- Communication time-out failure alarm (no communication between display and scanner)
- Guard Zone alarm (see GZ under section 3.2.5)
- Heading missing alarm (check connection to compass)
- Position missing alarm (see Position update under section 6.3)
- Rotation lock alarm (check if scanner is rotating)
- Trigger fail alarm (check connection to scanner)

• **Off-center mode** (only when operating in RM - Relative Motion) – permits the operator to obtain a greater view in the direction of interest. Place the cursor within 2/3 of the display and press the [0] key. The ship's position will now be moved to the cursor position and thereby increasing the desired area of view. To deactivate the Off-center mode, press [CLR] and [0]. This will replace the ship's position back at the center of the display. If the radar system is turned off while the Off-center mode is on, at next power up the offset mode will still be on.

• **PLOT function** – will require that a heading sensor (Gyro or Compass) is connected to the CX34/44/54. If so, then you can plot the actual cursor position on the radar display by pressing [PLOT], [2] from the radar display, and thereby save the position in the WP-list as a waypoint i.e. you can give the plotted waypoint a new name/ number, symbol, color, etc.

• **Radar colors** - There are several color settings to choose from for the radar display. See Palette setup ([MENU],[7],[3]).

• **Range** - The extension of the range depends on how powerful the connected radar antenna is. There are several ways of adjusting the range on the screen, the quickest way is:

1-9 *Use one of the shortcut keys to quickly go to a different range:*

Press	[1] = 0.125 nm	[2] = 0.25 nm	[3] = 0.50 nm
	[4] = 0.75 nm	[5] = 1.5 nm	[6] = 3 nm
	[7] = 6 nm	[8] = 12 nm	[9] = 24 nm

+/- *Or you may use the +/- zoom keys to go to a different range*

ADJ Or from the active control panel: use the cursor key to highlight the current range scale, then adjust the range scale with approx. 10 percent each time you press the +/- keys.

• **Show navigation waypoint on radar display** - (will require a valid position, and heading input from connected sensor)
When a navigation mode is active, the approaching waypoint can be shown on the radar display:

ENT *Call up Radar quick menu*

4 *Show navigation waypoint*

Turning the navigation mode off will temporarily disable the function, because there is nothing to show - but when navigation is started up again, the function will also become active again. You will not have to turn it on and off all the time. Press [ENT], [4] Hide navigation waypoint if you no longer wish to have it shown on the radar display.

• **Targets** - The **shape** of the target has a direct affect on the image displayed. A flat surface at right angles reflects a good image. Flat surfaces at shallow angles reflect very poor images. A concave surface will concentrate the reflective energy and display an image larger than normal. Convex surfaces will scatter the energy and display week images. A conical surface may not display any image.

The **texture** of the target surface also controls the amount of reflected signal, and therefore the image displayed. A smooth surface is a good reflector, while rough surfaces tend to break up the reflection.

Composition - materials such as metal and water are good reflectors. Others, such as wood and fiberglass are poor reflectors.

3.3 Demo mode

For the purpose of a demonstration, the radar function has a demo mode, which can present a simulated radar picture without having a radar scanner connected.

☞ Warning! Any adjustments/setups already made to the radar function will return to default settings when selecting the Demo mode.

To activate the demo mode:

MENU *Call up the menu bar, and...*

7 *Open the SETUP menu*

RADAR *Load the Radar setup*

- a warning will pop up that you are about to change settings for the radar, press [MENU] to abandon, or [ENT] to continue.

Use the cursor to go to 'Scanner type', and select 'Demo' with the +/- keys

ENT *Accept change & exit Radar setup*

ENT *Call up Radar quick menu*

RADAR *Turn 'Power on'*

- the legend 'Detecting' will appear on the screen for a short while, then a countdown of 20 seconds will start before the system enters Standby mode. It now says 'Standby' on the screen.

ENT *Call up Radar quick menu*

GOTO *Start transmission*

+/- *Use the +/- keys to adjust the range and presentation*

The legend **Demo** will stay in the top left of the screen to indicate the demo mode is active.

Bring the Demo mode in Standby:

ENT *Call up Radar quick menu*

GOTO *Go to Standby mode*
- this way you can easily return to the simulated radar picture by repeating the [ENT] and [GOTO] sequence.

Turn off the Demo mode and return to normal operation:

ENT *Call up Radar quick menu*

RADAR *Turn 'Power off'*

MENU *Call up the menu bar, and...*
7 *Open the SETUP menu*
RADAR *Load the Radar setup*
- a warning will pop up that you are about to change settings for the radar, press [MENU] to abandon, or [ENT] to continue.

Use the cursor to go to 'Scanner type', and select 'Auto detect' with the +/- keys

ENT *Confirm changes & exit Radar setup*

4. Specifications

4.1 DX45 Radome scanner

General data

Approvals:	EU Declaration of Conformity, 1999/5/EC, EN60945
Dimensions:	Ø 465 mm (18.3”), H 261 mm (10.3”)
Weight:	10 kg (22 lbs)
Input voltage:	12-32 V DC (from display unit). Power cable for display unit, part no. 153-5000-007 with two fuses: T6.3A slow (5x20 mm) on red wire, F8.0A Fast (5x20 mm) on white wire.
Power consumption:	70 W or less (incl. display) xx W Standby
Environment:	Waterproof to USC 46 CFR Temperature range: -25° to +70°C Humidity: up to 95% at 35°C Max. wind speed for satisfactory operation: 100 Kts
Housing:	Casted aluminum ?
Max. range scale:	28 nm
Radar cables:	10 m, 153.3003.100 15 m, 153.3003.150 20 m, 153.3003.200 30 m, 153.3003.300 40 m, 153.3003.400 60 m, 153.3003.600
Compatible display unit:	CX34 color 7”, software version 3.06 and up. CX44 color 10”, software version 3.06 and up. CX54 color 15”, software version 3.06 and up.

Transmitter	Solid-state modulator driving magnetron
Frequency:	9410 +/- 30 MHz
Output power:	4 kW
Bearing accuracy:	Within 1°
Pulse length:	0.07-0.7 µs
Antenna	Radome 1.5 ft.
Type:	Slotted array
Beam width:	5.6° horizontal, 30° vertical
Polarization:	Horizontal
Side lobes:	Less than -22 dB
Rotation rate:	20-50 rpm (nominal?)
Receiver	
IF frequency:	60 MHz (nominal)
Characteristics:	Semi-log
Noise figure:	5.5 dB
Bandwidth:	12/3/0.7/0.5 MHz

4.2 DX60 Radome scanner

General data

Approvals:	EU Declaration of Conformity, 1999/5/EC, EN60945
Dimensions:	Ø 615 mm (24.2”), H 261 mm (10.3”)
Weight:	11.5 kg (25.4 lbs)
Input voltage:	12-32 V DC (from display unit). Power cable for display unit, part no. 153-5000-007 with two fuses: T6.3A slow (5x20 mm) on red wire, F8.0A Fast (5x20 mm) on white wire.
Power consumption:	70 W or less (incl. display) xx W Standby
Environment:	Waterproof to USC 46 CFR Temperature range: -25° to +70°C Humidity: up to 95% at 35°C Max. wind speed for satisfactory operation: 100 Kts
Housing:	Casted aluminum ?
Max. range scale:	36 nm
Radar cables:	10 m, 153.3003.100 15 m, 153.3003.150 20 m, 153.3003.200 30 m, 153.3003.300 40 m, 153.3003.400 60 m, 153.3003.600
Compatible display unit:	CX34 color 7”, software version 3.06 and up. CX44 color 10”, software version 3.06 and up. CX54 color 15”, software version 3.06 and up.

Transmitter	Solid-state modulator driving magnetron
Frequency:	9410 +/- 30 MHz
Output power:	4 kW
Bearing accuracy:	Within 1°
Pulse length:	0.07-0.7 µs
Antenna	Radome 2 ft.
Type:	Slotted array
Beam width:	3.8° horizontal, 30° vertical
Polarization:	Horizontal
Side lobes:	Less than -22 dB
Rotation rate:	20-50 rpm (nominal?)
Receiver	
IF frequency:	60 MHz (nominal)
Characteristics:	Semi-log
Noise figure:	5.5 dB
Bandwidth:	12/3/0.7/0.5 MHz

9. Setup menu

7 SETUP	
RADAR Radar setup	- see section 9.1
CHART C-MAP cartridges	- see section 9.2
ECHO Echosounder setup*	- see section 9.3
PILOT Pilot/Position setup	- see section 9.4
1 Speed alarm, units & language	- see section 9.5
2 Interface setup	- see section 9.6
3 Palette setup	- see section 9.7
4 Factory settings	- see section 9.8
5 QuickGuide	- see section 9.9

*) available with built-in Echosounder function.

9.1 Radar setup

After the installation is completed, check the Radar setup to see if the **Scanner height** is correct and the **Heading adjust** is zero degrees to ship's center line. If not, then they need to be corrected - see further ahead in this section. All default settings from the factory are tested for various situations, however, if your situation is such that adjustments are required, please refer to the details described in this section. The Scanner type is preset to Auto detect and as such, the system will automatically initiate the correct parameters for the connected scanner.

MENU *Call up the menu bar, and...*
7 *activate the SETUP menu, and...*
RADAR *load the Radar setup* - see example next page.

You will now receive a warning that you are about to change settings for the radar. Press [ENT] to Continue, or [MENU] to Abandon.

Use the cursor key to move around in the settings. Toggle between available values with the +/- keys, and insert data by the numeric keys.

ENT *Confirm the adjustments by* [ENT] or [MENU]

Example of Radar setup:

HU **RM**			**0**.50nm	Head-Up in Relative Motion Range= 0.50nm
Power off				Power off, X-MIT
TI			**0**	Tuning Indicator
Tune	**AUTO**		**100**	*Tune, Gain, Sea: adjust with +/- keys, and press [CLR] to return to AUTOmatic mode.
Gain	**AUTO**		**44**	
Sea	**AUTO**		**30**	
Rain			**0**	*Rain Clutter / FTC
Scanner type			**Auto**	/Demo
Scanner height			**05m**	5 meters above water
Heading adjust			**000.0°**	*In degrees to ship's center line
Tuning reference			**079**	*Adjust with +/-/numeric keys
Zero range/timing			**0109**	*Adjust with +/-/numeric keys
MBS			**050 050**	Main Bang Suppression, level and length (area)
Sensitivity			**048**	*Adjust with +/-/numeric keys
GZ target threshold			**5**	*Levels of 1 to 7
Power-on time			**000000 h**	Elapsed power-on time
Transmit time			**000000 h**	Elapsed transmission time
Sea Auto	**025**	**050**	**090**	*Sea Auto, Sea Harbor and Gain Auto are preset for best performance under normal conditions.
Sea Harbor	**000**	**025**	**030**	
Gain Auto	**020**	**082**	**040**	
Scanner status			**Activate**	For technicians only.
				*= only adjustable in X-MIT mode. More details on next pages.

Scanner type: is preset to Auto detect. After having installed the scanner (see the Installation manual for selection of scanner), the radar function must stay in **Power off** mode until the scanner type is detected. The system will automatically set up the correct parameters for the connected scanner.

☞ Demo mode – see section 3.3.

Scanner height: enter the actual height above water of the radar antenna/scanner.

Heading adjust: Orientation should be HU (Head-Up). Turn the ship, so a target is just in front and adjust until target is straight ahead on the heading line. Use the +/- keys to position it correctly.

Tuning reference: Normally there should be no need to adjust the Tuning reference. However, if sensitivity is poor or there are any symptoms at all suggesting improper tuning, you may need to make an adjustment: Choose a displayed range of 3nm or higher. Use cursor to go to the Tuning reference value. Use +/- keys to adjust the value in single steps (allowing 3-4 revolutions) until weak echoes in the distance becomes acceptable.

Zero range/timing: Most common settings are between 105 and 115. Default setting depend on which scanner type is connected.
To adjust: Press the [1] key to set the displayed range to 0.125nm. Use cursor to highlight "Sea" and with +/- keys set the sea clutter to zero, then move cursor to MBS level and change all figures to zero, so you can see the transmitting pulse. Now adjust the value for Zero range so the ring around the ship is just closing.
If you have knowledge of the distance to a nearby object, say a mast or a buoy, you can verify if the Zero range is set correctly by measuring the distance. To do so, place the VRM ring on top of the object and check the readout in the control panel (follow procedure in sec. 3.2.5). If the readout is not the same as the known distance, adjust the value in Zero range with 1 figure up/down for every 3 meter adjustment.

MBS - Main Bang Suppression: Each transmitter pulse will result in an immediate strong return signal, which will form a 'sun' (main bang) in the center of the screen. Main bang suppression is a filter, which will eliminate or minimize this effect. The first 3-digit number indicates the level and the last 3-digit number indicates the length (area). Adjustmets can be made for best performance for individual antennas. The first 25 to 30 meters, however, will always be 'blinded' by the transmission pulse. Adjustment of MBS requires STC=0 and reasonable GAIN. If the suppression zone around the center is too large, suppression length can be lowered. If strong targets disappear within the suppression zone, the level of suppression can be lowered.

Sensitivity: is preset to 048. Adjust value if echoes are not reasonable clear i.e. the higher the value, the less detailed presentation of echoes.

GZ target threshold: is preset to 5. Objects are identified according to weak/strong signals. 1= weakest, 7= strongest.

Sea Auto and **Sea Harbor** values for the automatic STC modes i.e. Minimum, Maximum, and Sensitivity. The first two 3-digit numbers define the limits of the automatic functions. These numbers

refer to minimum (first set of numbers) and maximum (second set of numbers) allowed STC value, the automatic function will never use an STC outside this interval. The third set of numbers equals the sensitivity of the function. The higher the number (more sensibility), the more STC filter.
If necessary, the factory presets can be adjusted to expand or limit the effect of the auto function, but first check if Gain Auto needs to be adjusted (see below). After the adjustment, the new values will be the new AUTO settings. If a new scanner type is recognized, these parameters are set to default. During adjustment of minimum and maximum, the display will show the current value. The auto function is active when the sensitivity is adjusted. The auto function parameters will take effect when the auto function is selected.

Gain Auto values for the automatic Gain mode. The first two set of numbers will define the limits of the automatic functions.

• Gain Auto settings
To adjust the preset values, you first have to:
1. Adjust Rain to minimum acceptable value: move cursor to the 'Rain' bar, and adjust with +/- keys.
2. Adjust Sea to minimum acceptable value: move cursor to the 'Sea' bar, and adjust with +/- keys.
3. Set 'Tune' bar to 'AUTO' mode: move cursor to the 'Tune' bar and press [CLR].
4. Choose a displayed range of 6nm (press key [7]) or higher.

Now you are ready to adjust the Gain Auto values in the lower part of the Radar setup display:
First 3 digits - minimum: Adjust to a minimum value, which will show an acceptable radar image.*
Last 3 digits - maximum: Adjust to maximum acceptable level of noise.*
*) wait for screen to update to see the result of adjustment.

• Sea Auto and Sea Harbor settings
Sea Auto should be adjusted to an offshore situation, and Sea Harbor to a harbor situation.
To adjust the preset values, you first have to check that Gain Auto is set correctly - see above, and then:
1. Choose a displayed range of 0.5nm (press key [3]).
2. Set 'Tune' bar to 'AUTO' mode: move cursor to the 'Tune' bar and press [CLR].
3. Set 'Gain' bar to 'AUTO' mode: move cursor to the 'Gain' bar and press [CLR].

4. Set ‘Rain’ to minimum: move cursor to the ‘Rain’ bar, and adjust with +/- keys.

Now you are ready to adjust the Sea Auto and Sea Harbor limits in the lower part of the Radar setup display:
First set of 3 digits - minimum: Adjust to lowest figure with acceptable amount of sea clutter on screen.*
Second set of 3 digits - maximum: Adjust to highest figure with acceptable amount of sea clutter on screen.*
Third set of 3 digits - Sensitivity: Adjust to max. acceptable suppression of sea clutter.* 0 = no suppression - Low STC level, and 100 = 100% suppression - High STC level. (If the value is set too high, some targets may be invisible on close range).
*) wait for screen to update to see the result of adjustment.

Note! As the auto mode is always working in the background, any new adjustments may not be immediately visible on the screen. Depending on the weather and personal requirement, these adjustments will need to be aligned more than once.

Scanner status – to activate press one of the +/- keys, which will call up an info window. Press [CLR] to initiate a test of the scanner, which will provide measurement values and other technical details. (For technicians only).

9.2 C-MAP cartridges

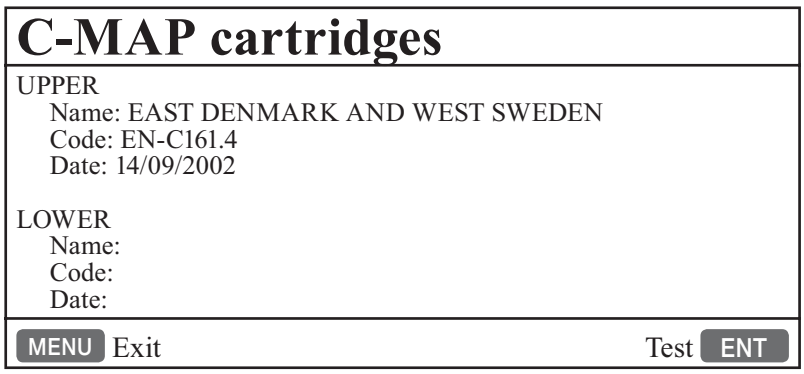
On the unit’s front, below the keypad, are two watertight drawers wherein you place the C-MAP cartridge/C-card you wish to load.

☞ Do not attempt to insert or remove a cartridge unless the unit is turned off, or chart reading is in stand-by - see below.

MENU
7
CHART

Call up the menu bar, and...
open the SETUP menu, and...
load the pop-up window for C-MAP cartridges (which also brings the chart system in stand-by)

To open the drawer below the keypad, press the eject key next to the drawer. Place the cartridge in the tray with the terminals pointing towards the unit, and push the drawer back in place - make sure it is closed tight, so it remains watertight.



ENT *Press* [ENT] *to test the data on the C-MAP C-card*

☞ If a C-card is defect, it must be removed before you can exit the display.

MENU *Exit the window*
In addition to the larger boundaries of the world chart there will be separate boundary lines for the individual charts stored on the same cartridge. However, the boundary lines for the C-MAP chart areas can be turned off, so they will not be visible on the chart - refer to section 4.5 Chart setup.

Other chart areas can quickly be reached by means of the zoom keys:

\+ *Zoom out until desired area becomes visible*

Move cursor to approximate area, and...

\- *Zoom in*

The chart will automatically start to move when cursor reaches the edge of the screen. When cursor is switched off [CLR], the chart will return to ship's position.

9.3 Echosounder setup

With built-in echosounder function: The Echosounder setup display mainly consist of general settings, but also applies to a specific frequency where stated. The CX34/44/54 features single and dual transceiver transmitting at 38 (CX44/54), 50 and 200 kHz.

MENU *Call up the menu bar, and...*

7 *open the SETUP menu, and...*
ECHO *load Echosounder setup display*

CX34 example:

```
Echosounder setup:

Transducer:                    SINGLE 200kHz  00.0 m
Keel depth below surface:                     00.0 m
Display:                          DEPTH BELOW KEEL
Data on NMEA-out from:                          NONE
Alarm for fish:              Strength: 065%      OFF
Depth DS fish:          min: 0005 m   max: 0030 m
Depth DK alarm min.:                  0005.0 m  OFF
Depth DK alarm max.:                  0030.0 m  OFF
Water profile:                                  SALT
Velocity of sound in water:                  1470m/s
Time/distance scale:                            ON
Restart of AUTO pulse/power:                20 sec.
Echo sampling:                               BOTTOM
Demo mode:                                      OFF

MENU Exit                                Accept ENT
```

CX44/54 example:

```
Echosounder setup:

Select transducers:
                              TYPE              PORT
Transducer 1:                          NONE     ECHO1
Transducer 2:                          NONE     ECHO2
                         BEAM ANGLE             DEPTH

Keel depth below surface:                     00.0 m
Display:                          DEPTH BELOW KEEL
Data on NMEA-out from:                          NONE
Alarm for fish:              Strength: 065%      OFF
Depth DS fish:          min: 0005 m   max: 0030 m
Depth DK alarm min.:                  0005.0 m  OFF
Depth DK alarm max.:                  0030.0 m  OFF
Water profile:                                  SALT
Velocity of sound in water:                  1470m/s
Time/distance scale:                            ON
Restart of AUTO pulse/power:                20 sec.
Echo sampling:                               BOTTOM
Demo mode:                                      OFF

MENU Exit                                Accept ENT
```

Use the cursor key to move cursor around in the display

+/- *Select new values by means of the +/- keys*

ENT *Confirm changes, or...*

MENU *Abandon changes and exit display*

Transducer - select transducer type. Insert the depth (position) of the transducer below surface.

Display can show: DEPTH BELOW KEEL / SURFACE / TRANSDUCER

Data on NMEA-out from - select the frequency you wish to use for transfer of data to connected navigator, plotter, etc.

Alarm for fish - set the strength from min. 000 (weak echo) to max. 099% (strong echo), and you can set it ON or OFF.

Depth DS fish - define a specific area below the water surface of minimum and maximum depth for the fish alarm.

Depth DK alarm min. and max. - set up a depth limit alarm for depth below keel.

Water profile - choose between SALT and FRESH water. The setting will reflect on the:

Velocity of sound in water: SALT = 1470 meters per second and FRESH = 1430 meters per second as standard. The standard settings can be even more accurate by slightly increasing the number of meters in warm waters and decreasing in cold waters.

Time/distance scale - will indicate the elapsed time or distance for the echo picture. The readout will appear in the upper part of the echo display. Toggle between time and distance in “Scroll synchronisation”, section 5.7.

Restart of AUTO pulse/power - will automatically restart the echosounder if bottom detection has been lost for the chosen time interval i.e. 10, 20 or 40 seconds. The AUTO pulse and power will restart from 10W and SHORT pulse.

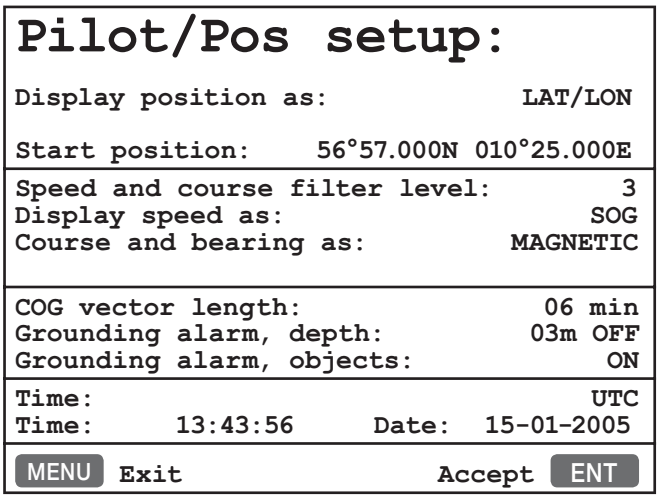
Echo sampling - is preset to BOTTOM, which enables auto range and a view all the way to the bottom. For vessels moving at high

speed with the risc of losing bottom detection, RANGE or a max. depth setting (50 to 2000m) is recommended. The unit will not wait for a bottom echo, but transmit a new pulse as soon as the selected range has been reached. Auto range is automatically switched off. The depth alarm setting will have a higher priority than the selected depth range.

Demo mode - the echosounder will function as though a transducer was connected, but all data presented in the display will be simulated.

9.4 Pilot / Position setup

MENU *Call up the menu bar, and...*
7 *open the SETUP menu, and...*
PILOT *load Pilot/Position setup display*



Go to the function you wish to change

0-9 *Key in new values, or...*
+/- *Toggle between available values*

ENT *Confirm editing*

Display position as - the position can be shown in latitude/ longitude, Loran C or decca coordinates (after selecting chain from

the Miscellaneous menu). Toggle with +/-.

Start position - can be inserted if the exact start position is known.

Speed and course filter level - there is a filter of 10 steps available (0= fast response, 9= stable readout).

Display speed as - SOG Speed Over Ground or STW Speed Through Water. Toggle with +/-.

☞ To receive STW information will require connection of external instrument via the SimNet system or the NMEA port.

Course and bearing as - readings of course and bearing can be made in either MAGNETIC or TRUE. Toggle with +/-.

COG vector length - (default to 6 minutes) - indicates own course and speed. The length of the COG vector reflects a distance run during the specified number of minutes at the immediate speed.

Grounding alarm - the function will require a valid position, COG, SOG and a C-MAP C-card inserted in the drawer below the keypad. When an alarm is activated, an info-window will state the cause of the alarm. Reset with [CLR].
Depth alarm - will be activated if the depth at the COG vector end point is less than the value in the Pilot/Position setup and the alarm is set to ON.
Object alarm - will be activted if set to ON and an object is detected beneath the ship i.e. rocks, wrecks, etc.

Time - can be set to UTC or local. Toggle with +/-
Correct actual time and date by means of the numeric keys.

9.5 Speed alarm, units & language

MENU *Call up the menu bar, and...*
7,1 *load Speed alarm, units & language display*

The display example sections are for:

CX34/44/54

```
Setup for speed:
 Speed alarm maximum (SOG):000.0kn  OFF
 Speed alarm minimum (SOG):000.0kn  OFF
Setup for units:
 Depth/altitude in:                 METERS
 Distance in:               NAUTICAL MILES
 Speed in:                          KNOTS
 Temperature in:          DEGREE CELCIUS
```

CX34

```
Software version:                CX34 3.00
Serial number:                  0x003d69ab
Interface software version:           1.19
GPS receiver type:                 N11999
PAGE rotation interval:           05 sec.
Display text in:                English GB
MENU Exit                      Accept ENT
```

CX44/54

```
Software version:              CX44/54 3.00
TL50 version:                Not connected
AT44 version:       HW rev.: 2, SW: 12.34
GPS receiver type:                 N12000
PAGE rotation interval:           05 sec.
Display text in:                English GB
MENU Exit                      Accept ENT
```

Scroll up/down to go to the function you wish to change

0-9 *Key in new values, or...*

+/- *Toggle between available values*

ENT *Confirm changes, or...*

MENU *exit function without making any changes*

Speed alarm - can be set to maximum and/or minimum cruising speed. This may be handy for trawl fishing, entering harbors with speed limits, etc. Speed stability and time of response can be

adjusted in Pilot/Position setup, press [MENU], [7], [PILOT], and use the cursor key to go to "Speed and course filter level" to adjust the setting, confirm with [ENT].

☞ Press [CLR] to reset an alarm - this applies to all activated alarms in the system.

Depth / altitude in - can be set to meters (m), feet (ft) or fathoms (fm).

Distance in - can be calculated in nautical miles (nm), kilometers (km) or statue miles (mi).

Speed in - can be shown in knots (kn), kilometers/hour (kh) or miles/hour (mh).

Temperature in - can be shown in Celcius or Fahrenheit.

Software version - indicates which software version is installed in the unit.

TL50 version (CX44/54) - indicates if a TL50 Turbo Loader is connected and which software version is implemented.

AT44 version (CX44/54) - indicates if an AT44 SimNet converter is connected and which revision hardware and software is implemented.

Serial number (CX34) - indicates the unit's internal serial number.

Interface software version (CX34) - indicates which version is installed in the CX34 unit (for technicians only).

GPS receiver type - indicates which type is installed in the unit (for technicians only).

PAGE rotation interval - can be set to anywhere between 03 to 99 seconds. Refer to "Fundamentals of the display and page system" in section 2.1 for more details on how the function works.

Display text in - as standard the CX34/44/54 is supplied with the following national display languages: Danish (DK), English (GB) and (US*), French (F), German (D), Italian (I), Dutch(NL), Spanish (E), Swedish (S), and Portuguese (P).
*) The difference from GB English to US English is: Celcius is changed to Fahrenheit, meters is changed to feet, and the date presentation is changed from dd.mm.yy to mm.dd.yy.

9.6 Interface setup

CX34 has a connector for SimNet control or NMEA2000 plus one NMEA in/out port.

CX44/54 has two NMEA in/out ports:
1. NMEA1 contains both an NMEA port and connection for the dual station. The NMEA1 data from the main unit is available from NMEA2 port on the dual station i.e. DS44-CX or DS54-CX.
2. NMEA2 is used for connection to SimNet or NMEA2000 via AT44 Active Tee or for standard NMEA interfacing.

Plug-and-play: SimNet offers easy and uncomplicated interfacing with a unique cable and plug solution and automatic system setup. SimNet is the optimum solution for integrating SimNet products and other products with NMEA 2000.

Group selection or stand-alone: Main products, e.g. NavStation, Chartplotter and Autopilot will automatically select the optimum sources for position, heading, depth, speed etc. for all other SimNet products connected. This means that if two Chartplotters are connected, they will both use position data from the same GPS and heading from the same compass. If you wish to use the built-in GPS, also on the Chartplotter, which automatically was set to operate with an external position, you can change the Group selection from SIMRAD to STAND-ALONE.

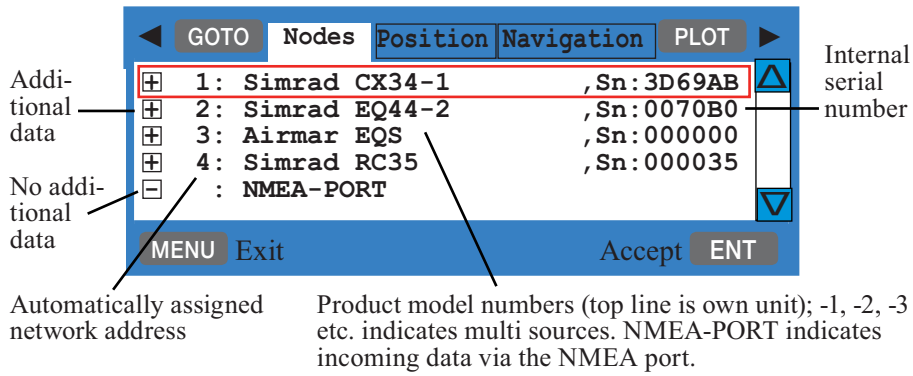
Multi source: If a main product recognizes e.g. two heading devices it will automatically select a gyro compass before a fluxgate compass, and DGPS before GPS.

NMEA 0183 input: If there is no data available from the SimNet bus for e.g. heading, position or depth, the system will automatically look for data via the NMEA 0183 port.

The next pages show examples of interface settings, which are divided into the following groups:
Nodes - Position - Navigation - Water - Compass - Wind - Waypoint - Alarm - SimNet diagnostic - SimNet input - SimNet output - NMEA0183 input - NMEA0183 output - Identification.

MENU *Call up the menu bar, and...*
7,2 *load interface setup* - see display example next page.

Searching interface channels for valid sources and data. Please wait till the first page appears on the screen which will show the nodes (products) operating on the SimNet bus. See below example:



Move the cursor up/down to select one of the listed products

+ *Press the* [+] *key to access additional data*

Example:

- **CX34 NAVSTATION**
- **SimNet number=3D69AB, Address: 1**
- **Device: class = 60, function = 170**
- **Instance: system = 0, device = 1**
- **SimNet:Compatible=YES,Ver= 1.000 E**
- **Ver.: NMEA2000 = 1.004, SW = 03.00**
- **Product code=007F,Unique no=138384**

The name **NAVSTATION** can be user defined - see the Identification interface (last tab).

\- *Press the* [-] *key to hide additional data*

General information: Go to the next interface by pressing [PLOT] and step back to the previous interface by pressing [GOTO].
Use the cursor key to move around in the display and toggle between available settings and sentences with the +/- keys.

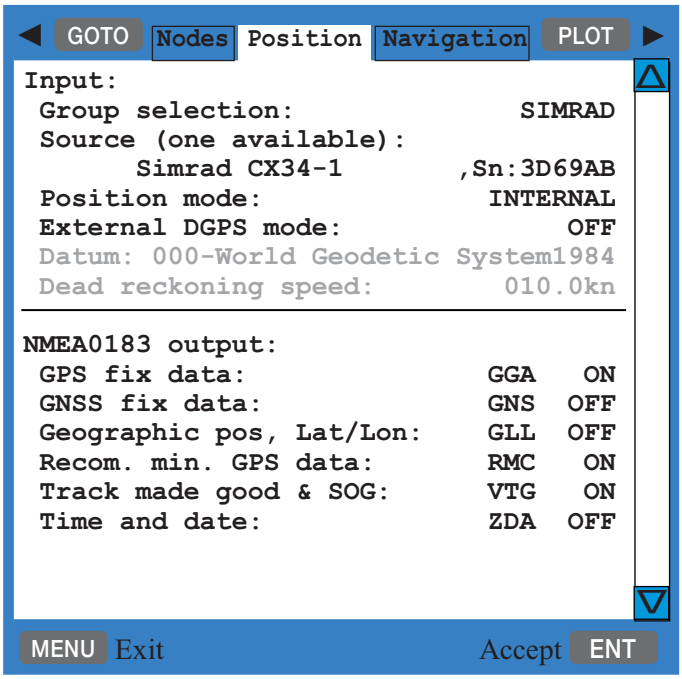
ENT *Confirm editing, or...*

MENU *exit function without making any changes*

Group selection can be set to:
SIMRAD - auto-selected SimNet units from the Simrad group.
STAND-ALONE - manually selected data source and third party units.

Source: - depending on which products (sources) are connected, the legend will indicate: 'none available', 'one available', 'multiple available' or 'owned, data type locked'.

PLOT *Go to Position interface* - step back with [GOTO]



Position mode:

INTERNAL - the applied position is compiled by the in-built GPS receiver.

EXTERNAL - the applied position is compiled by an external unit.

DEAD RECKONING - will allow the system to function as a Navigation simulator, which can be used for demonstration purpose or for practicing 'live' navigation in 'off season'. If you wish to change the preset speed (10 kn), refer to description next page. Navigation to cursor or waypoint, in route or in track is started as described in

chapter 6. The ship symbol will now 'sail' to the point of destination directly or via the route you have selected and you can see how the alarms and automatic waypoint shift all work, as if you were sailing yourself. You can also simulate making a track trailing the ship or plotting eventmarks, etc. as the ship is 'sailing'.

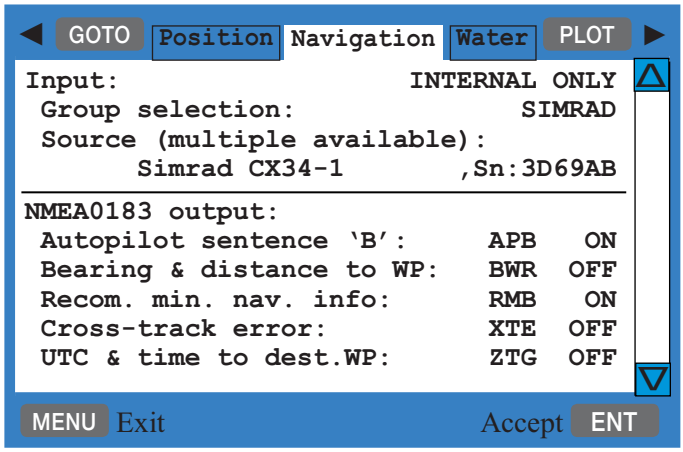
External DGPS mode - set to ON (CX34), NMEA1 or NMEA2 (CX44/54) will enable reception of DGPS data from external receiver. The input port will switch from NMEA0183 to RTCM104 standard, but the output will continue transmitting NMEA0183 data.

Datum:000-World Geodetic System 1984 - the internal datum is applied if the datum line is light grey. If you wish to apply the datum received from external unit and as such need to change the type, the position mode must be EXTERNAL. Enter a new datum by means of the numeric keys or the +/- keys. Refer to list of datums in Appendix B.

Dead reckoning speed - is preset to 010.0 knots, but can be increased or decreased when DEAD RECKONING is selected as position mode. Enter a new speed by means of the numeric keys or the +/- keys.

NMEA0183 output - see also section 9.6.1 Description of sentences.

PLOT *Go to Navigation interface* - step back with [GOTO]

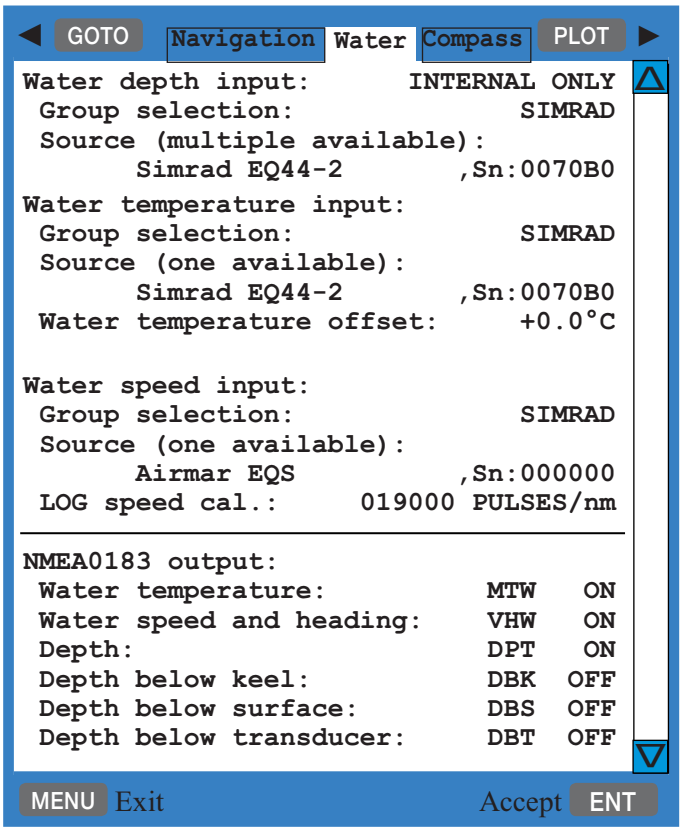


Input: INTERNAL ONLY - indicates that no external source can be selected for navigation.

NMEA0183 output - see also section 9.6.1 Description of sentences.

PLOT *Go to Water interface* - step back with [GOTO]

Example: CX34 with built-in echosounder function:



Example for CX34 without echosounder function, see next page.

Input: INTERNAL ONLY - indicates that no external source can be selected for depth.

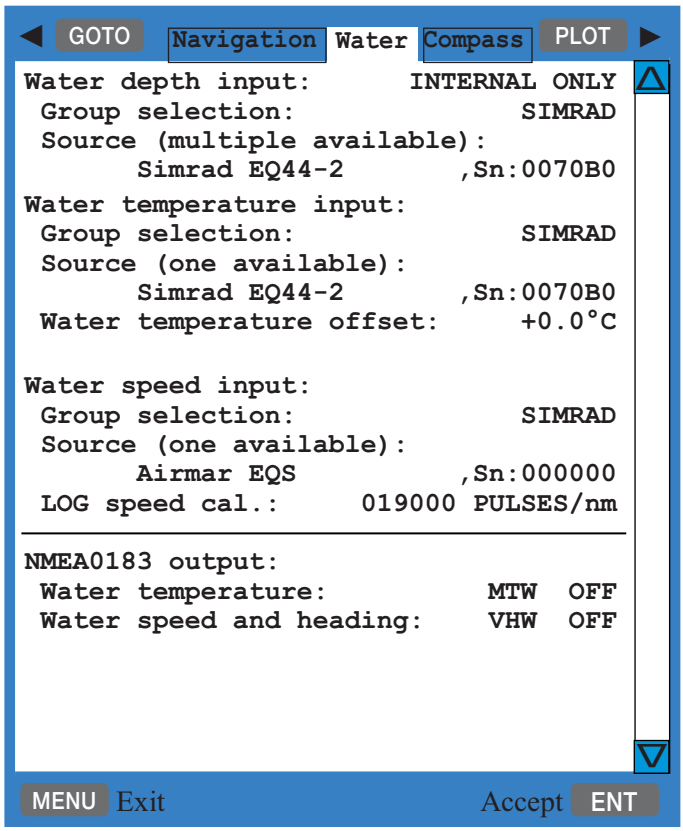
Water temperature offset - a figure can be keyed in to compensate for differencies in temperature sensor.

LOG speed calibration - the unit is preset to receive 19000 pulses per nautical mile from the log transducer (paddle wheel). However the figure might have to be changed to compensate for various transducers and actual water flow passing the transducer. The correct

pulse rate is calculated by:

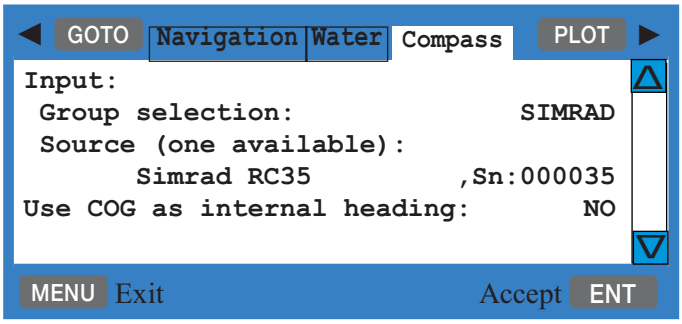
$$\frac{\text{19000 x indicated speed (e.g. 4kn)}}{\text{actual speed (GPS) (e.g. 5kn)}} = 15.200 \text{ pulses/nm}$$

Example: CX34 without echosounder function:



NMEA0183 output - see also section 9.6.1 Description of sentences.

PLOT *Go to Compass interface* - step back with [GOTO]

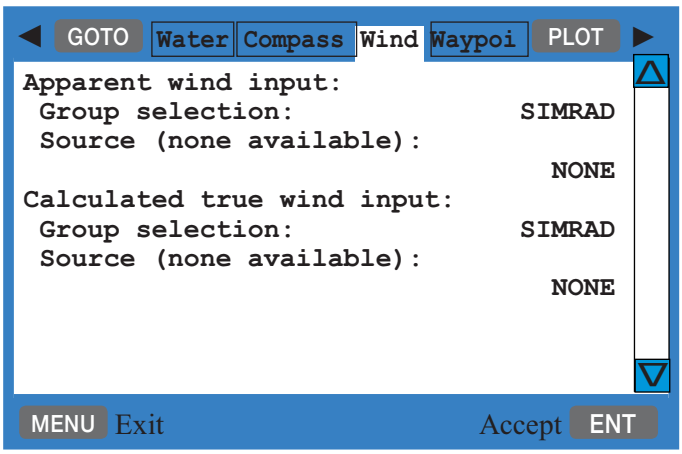


Source - indicates that there is one source available: Simrad RC35.

Use COG as internal heading - if no compass is connected, you can use the course (COG) from the built-in GPS module by changing NO to YES.

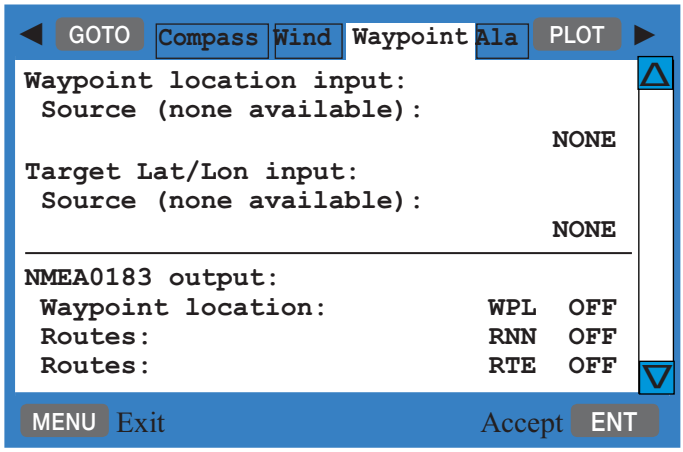
☞ When using the GPS course as replacement for heading input, the accuracy will be reduced in relation to speed, wind and current.

PLOT *Go to Wind interface* - step back with [GOTO]



Source - will indicate how many units are connected and available.

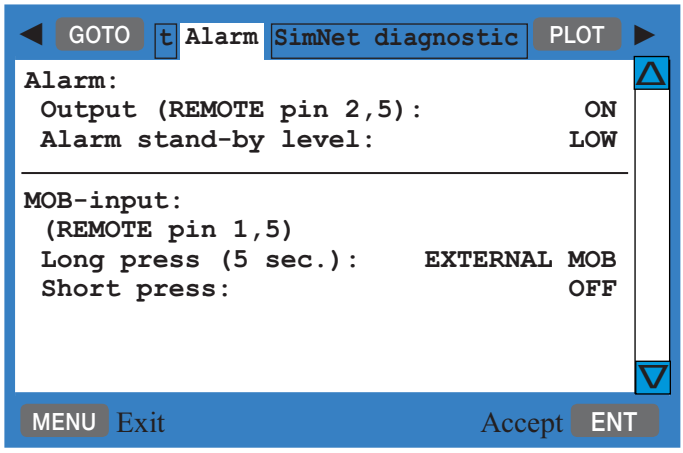
PLOT *Go to Waypoint interface* - step back with [GOTO]



Source - will indicate how many units are connected and available.

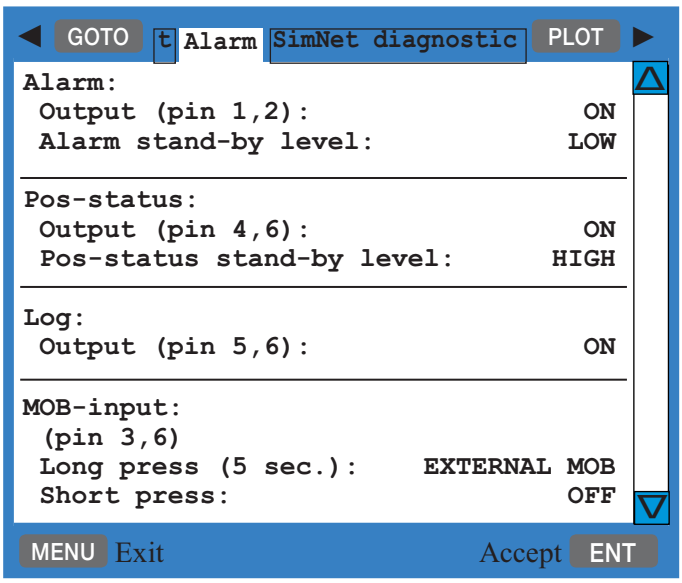
NMEA0183 output - see also section 9.6.1 Description of sentences.

PLOT *Go to Alarm interface* - step back with [GOTO]



Example: CX34

Stand-by level can either be: LOW = 0 volt or HIGH = 5 volt.



Example: CX44/54

MOB-input

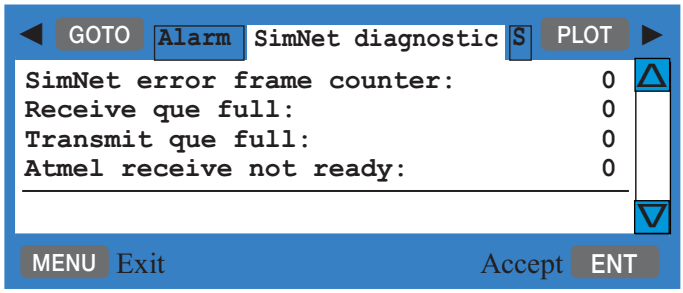
• Press the external switch for more than 5 seconds to activate the MOB function (fixed setting), and press the [ENT] key to start MOB navigation.

• Short press on the external switch (less than 5 seconds) will shift page or plot ship's position. Use the +/- keys to toggle between OFF, SHIFT PAGE and PLOT SHIP's POS:

SHIFT PAGE - short press on the external switch will shift to next page stored under the PAGE key.

PLOT SHIP's POS - short press on the external switch will plot and save the actual position, which will be registered in the WP list.

PLOT *Go to SimNet diagnostic interface* - step back with [GOTO]



SimNet error frame counter - if the figure is not 0 it could be due to a number of things and not necessarily that there is a system error. However, if the counter is active and the number is rapidly increasing, then the system has detected a fault.
For instance, if the SimNet cable is pulled, the counter will be activated and once the cable is back in place, the counter will stop, but will stay at the figure it has reached. So therefore, a figure other than 0 does not necessarily mean that something is wrong, only if the figure continues to increase.

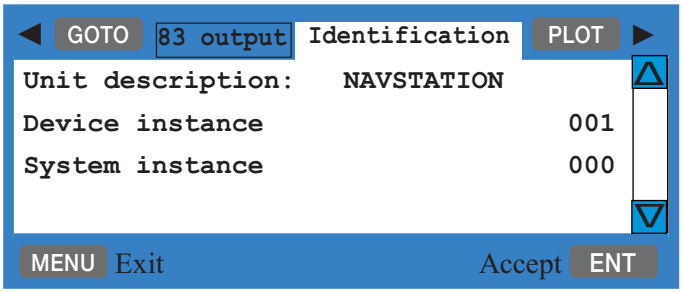
Prior to call for technical assistance:
1. Check connected cabling.
2. Check supply voltage to be between 10.8-15 VDC to the SimNet system.
3. Systematically disconnect one unit at a time to see which one is causing the problem. Start at the opposite end of the 12V power supply.

The three last lines in the SimNet diagnostic interface are for technicians only.

PLOT *Go to the next interface* - step back with [GOTO]

The interfaces: SimNet input, SimNet output, NMEA0183 input and NMEA0183 output are for technicians only.

PLOT *Go to the next and last interface: Identification*
- step back with [GOTO]



Unit description - can be customized to read e.g. MAIN UNIT or BACK-UP UNIT. Maximum number of characters is 16.

The identification name can be seen in the Nodes interface - refer to the beginning of this section.

ENT *Confirm editing, or...*

MENU *exit function without making any changes*

9.6.1 Description of NMEA0183 version 3.0 sentences

Description of output sentences
APB Autopilot sentence 'B'.
BWC Bearing and distance to waypoint (Great circle).
BWR Bearing and distance to waypoint (Rhumbline).
GGA Global Positioning System fix data.
GLL Geographic position, latitude/longitude.
GL2 Geographic position, with 2 decimals.
GNS Satellite Fault Detection
MTW Water temperature
RMB Recommended minimum navigation information.

RMC Recommended minimum specific GPS data.
RNN Routes.
RTE Routes, ONC ON Complete route, or...
ONW ON Working route.
VHW Water speed and heading.
VTG Course over ground and ground speed.
WPL Waypoint location.
XTE Cross-Track-Error, measured.
ZTG UTC & time to destination waypoint.
ZDA Time and date.

Additional sentences for CX34/44/54 with built-in echosounder:
DBK Depth below keel.
DBS Depth below surface.
DBT Depth below transducer.
DPT Depth, including offset.

Description of instrument input
HDG Heading, Deviation and Variation.
HDM Heading, Magnetic.
HDT Heading, True.
MTW Water temperature.
MWV Wind speed and angle.
TLL Target data (will only be updated every 5 seconds).
VHW Water speed and heading.
VWR Relative wind speed and angle.
VWT True wind speed and angle.
WPL Waypoint data (will only be updated every 5 seconds).
RTE Routes

Additional sentences for CX34/44/54 without echosounder:
DBK Depth below keel.
DBS Depth below surface.
DBT Depth below transducer.
DPT Depth, including offset.

Description of external position, heading and speed input
GLL Geographic position, latitude/longitude.
RMA Recommended minimum specific Loran C data.
RMC Recommended minimum specific GPS data.
GGA Global Positioning System fix data.
VTG Track made good (course) and ground speed.

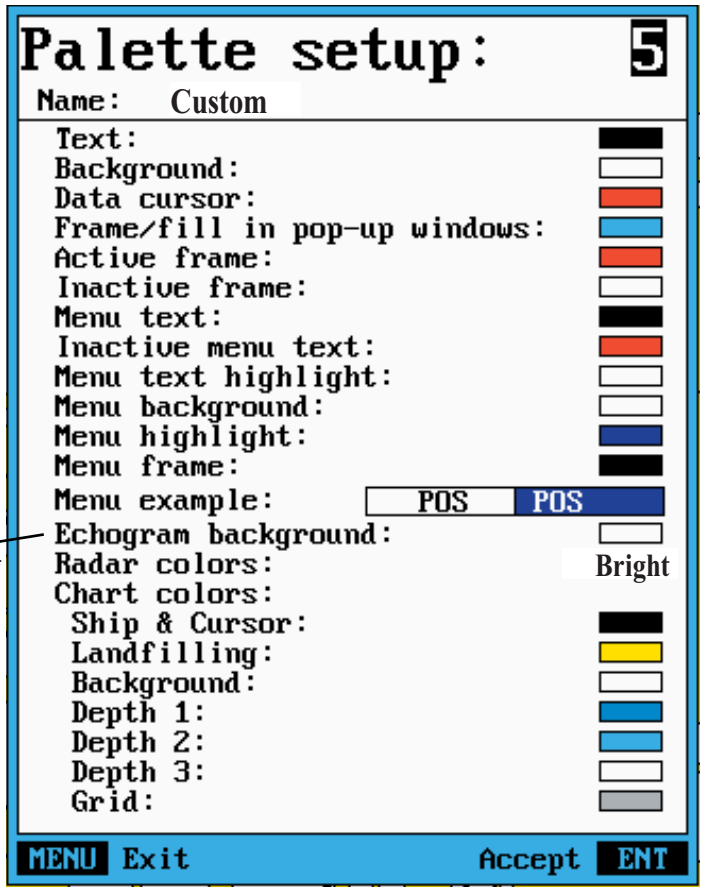
9.7 Palette setup

☞ Quick change of preset color palettes via the [PWR] key.

MENU *Call up the menu bar, and...*
7,3 *load the Palette setup*

Palette 1 to 4 are preset to 1:Bright (sunshine), 2:Day (normal daylight), 3:Dusk and 4:Night settings. These four setups are not adjustable. Palette 9:Multi is preset with multi color radar targets. Palette 5 to 8 can be customized to suit individual needs and wishes. If you wish to make your own special palette setup in e.g. palette 5, then:

5 *Select Palette setup: 5*



only available with built-in echosounder function.

Use cursor to scroll up/down in display

A-Z *Key in a name for the new palette setup* - max. 29 characters, -refer to "Naming of routes, points, etc." in section 2.6.

+/- *Toggle between available color settings*

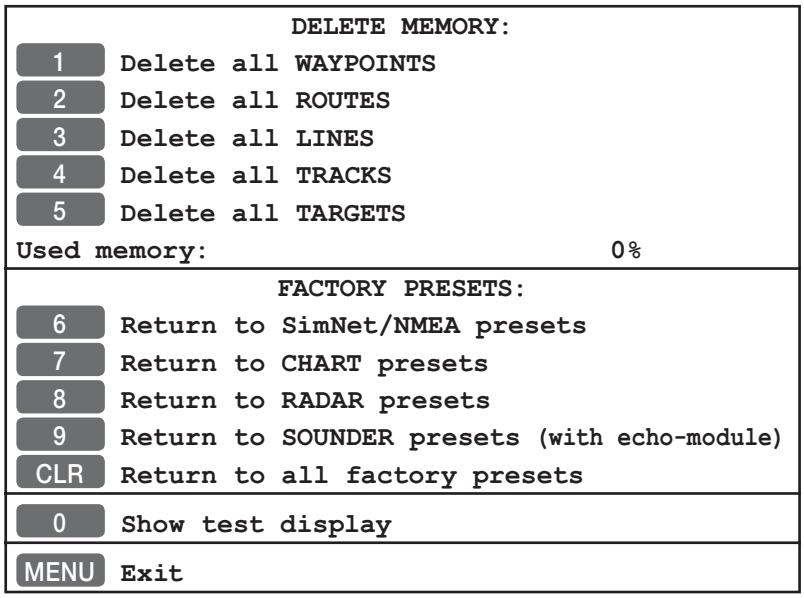
ENT *Confirm new setup*

9.8 Factory settings

DELETE MEMORY: It will be possible to erase a single category of objects entered into the unit by the user - for example, if moving to a different place in the world you may no longer need the routes etc. you have in the memory. However, an alternative is to store the data on a DataCard or disc - refer to section 8.9.

FACTORY PRESETS: If the unit is still 'alive' but has ceased to respond to normal operation, it could become necessary to return to the factory presets - but first check 'Troubleshooting' in section 10.1.

MENU *Call up the menu bar, and...*
7,4 *activate the display for Factory settings*



To activate any of the functions, please follow the instructions in

the display. However, any attempt to make any type of change, will first of all generate a WARNING display to inform you that you are about to erase some or all data/settings.

ENT If you are absolutely sure, *press* [ENT] *to complete the job*

MENU If not absolutely sure, *press* [MENU] *to exit function without having made any changes*

☞ Activating 'Return to all factory presets' will erase all user-made settings including waypoints, routes, tracks etc. and restore the basic settings from the factory. The unit will restart with 'Automatic input source setup' as described in section 2.7 Initial start-up.

☞ Activating 'Return to SimNet/NMEA presets' will give two choices:

Press [1] Product SimNet reset
Reset this unit only

Will bring this unit only back to factory defaults of the Interface setup. The unit will restart with 'Automatic input source setup' as described in section 2.7 Initial start-up.

Press [2] Global SimNet reset
Reset entire Simrad group
on the network

Will bring this unit together with all connected units (which are not turned off at the moment) back to factory defaults of the Interface setup. The units will restart with 'Automatic input source setup' as described in section 2.7 Initial start-up.

Show test display
Information in this display is for technicians only.

POWER OFF - RESET
In case, for some reason, the unit is totally locked i.e. no immediate response from the keypad, then first try to reset the unit by disconnecting the power supply. Reconnect the power cable and then start up the unit again by presssing and holding the [PWR] key until a picture appears on the screen.

MASTER RESET (will return all settings to factory presets)
If the Power off - reset does not solve the problem, you may have to perform a **master reset** by disconnecting the power supply, and then while reconnecting the power cable you will have to press the [PWR] and [CLR] keys at the same time, and hold both keys depressed until a picture appears on the screen. All user-made data will be erased, and all settings are returned to factory presets.

9.9 QuickGuide

A description of the key functions and general guidance* is available in a QuickGuide, which can be accessed either at start-up display - press [PAGE], or via the menu:

MENU *Call up the menu bar, and...*
7,5 *activate the QuickGuide*

PAGE *Leaf through the information/help text in the PAGE system, General, RADAR, CHART, ECHO, PILOT, Owner's setup, and Connectors*

MENU *Exit QuickGuide*

* Some of the information will refer to several models in the CX34/44/54 series.

EU Declaration of Conformity

CE R&TTE

I, the undersigned, hereby declare that the following equipment complies with the relevant essential requirements in the Directive 1999/5/EC of the European Parliament and the Council of 9 March 1999 on radio equipment and telecommunication terminal equipment and the mutual recognition of their conformity.

Conformity assessment	Annex II of 1999/5/EC (internal production control)
Employed standards	Article 3(1)(a) EN60945 Article 3(1)(b) EN60945
Equipment category	Navigational equipment intended for world-wide use aboard non-SOLAS vessels
Model(s)	Simrad DX45 Radar Scanner Simrad DX60 Radar Scanner
Remarks	
Manufacturer	Simrad Støvring AS Østre Allé 6, DK-9530 Støvring Denmark Telephone +45 98373499 Telefax +45 98373807

Signed …….....… Date
John Larsen, Product Manager

EU Declaration of Conformity for DX45/DX60 Radar Scanners

List of Ancillary equipment which is compatible with the DX45/DX60:

Display unit:	Screen:
CX34 NavStation	7” TFT color
CX44 NavStation	10” TFT color
CX54 NavStation	15” TFT color

SIMRAD warrants that every product shall be free of defects in material and workmanship as specified below:

CATEGORY "A":
•Autopilots •Radars •Instruments •Navigators •Radiotelephones •Plotters •Gyro compasses incl. sensitive elements •Sonars •Echosounders •Trawl Instrumentation •SatCom •SatTV.
These products are warranted for a period of 24 months on parts and 12 months on labor from date of purchase, except for category B items. Consumable parts such as lamps, fuses, batteries, bearings, etc. are not covered by this warranty.

CATEGORY "B":
•Antennas •Transducers •Trawl sensors •Monitors (CRT/LCD) •Radar magnetrons •Disk drives.
These items are warranted for a period of 12 months on parts and labor from date of purchase.

WARRANTY SERVICE is available through authorized service dealers or national distributors worldwide. Products returned will, at the sole discretion of Simrad, either be repaired or replaced free of charge within normal working hours. Freight charges, insurance, duties or any other costs are the responsibility of the customer.
Maximum liability shall not, in any case, exceed the contract price of the products claimed to be defective.

ON BOARD SERVICE can be arranged by authorized local service dealers or national distributors upon request. Labor costs for the repair/replacement of the defective modules/parts will be free of charge provided a valid warranty is confirmed. Overtime, travel, lodging, per diem, insurance, duties or any other costs are the responsibility of the customer. Additional expenses connected with replacement of transducers such as dry docking, diving and precautionary measures are not covered by this warranty.

VALIDITY: This warranty is effective only when warranty certificate or proof of purchase and equipment serial number is presented. Furthermore, the installation and operation has to be carried out in accordance with the product manual. Warranty liability does not apply to any equipment which has become inoperative due to misuse, accident, neglect, sea water damage or unauthorized repair. Simrad will not be liable for any loss, incidental or consequential damages whether based upon warranty, contract or negligence, or arising in connection with the sale, installation, use or repair of the product. Consequential damages include, but are not limited to, any loss of profit, property damage or personal injury.

The terms of warranty as described does not affect your statutory rights.

WARRANTY CARD

TO BE RETAINED BY THE OWNER

Simrad Støvring AS
Østre Allé 6
DK-9530 Støvring
Denmark

SIMRAD
A KONGSBERG Company

_____ OWNER

_____ ADDRESS

_____ VESSEL

_____ HOME PORT

_____ TYPE

SERIAL NO.

_____ EQUIPMENT

_____

_____

_____ DATE OF PURCHASE

_____ DATE OF INSTALLATION

YES:_____ NO:_____ INSTRUCTION FOR USE GIVEN

_____ AUTHORIZED INSTALLER/DEALER STAMP

SIMRAD warrants that every product shall be free of defects in material and workmanship as specified overleaf:

tear out

WARRANTY CARD

To be mailed to the NATIONAL DISTRIBUTOR (see overleaf)
together with the installation report *WITHIN 14 DAYS*
from the date of installation.

Simrad Støvring AS
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DK-9530 Støvring
Denmark

SIMRAD
A KONGSBERG Company

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OWNER

_____
ADDRESS

_____

_____
VESSEL

_____
HOME PORT

_____
TYPE

SERIAL NO.

_____
EQUIPMENT

_____

_____

_____

_____
DATE OF PURCHASE

_____
DATE OF INSTALLATION

_____
(CUSTOMER'S SIGNATURE)

_____
(DEALER'S SIGNATURE)

STAMP
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NATIONAL SIMRAD DISTRIBUTOR:

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