LOWRANCE

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# Radar Operation

## Instruction Manual

Lowrance Electronics may find it necessary to change or end our policies, regulations and special offers at any time. We reserve the right to do so without notice. All features and specifications subject to change without notice. This manual covers all display units compatible with Lowrance Radar at press time. On the cover: LCX-111c HD sonar/GPS unit.

**For free owner's manuals and the most current information on this product, its operation and accessories, visit our web site:**

**www.lowrance.com**

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## Table of Contents

# Warnings and Cautions

***Caution:***

*Use this radar at your own risk. This radar was designed for use as a navigation aid. It should* not *be used for purposes that require precise measurements of direction, distance, topography or location. Always compare the navigation information received from your radar with data from other navigation aids and sources. When a conflict arises between the navigation data from your radar and data from other navigation aids, make sure you resolve the conflict before proceeding with navigation.* ***A CAREFUL NAVIGATOR NEVER RELIES ON ONLY ONE METHOD TO OBTAIN NAVIGATION INFORMATION.***

***Caution:***

*International Regulations for Preventing Collisions at Sea mandate that when radar is on a vessel, the radar must be used at all times, regardless of weather conditions or visibility. Numerous court decisions have not only ruled the radar must be used, but that the radar operator must be knowledgeable in all operational aspects of radar performance or otherwise face a greater risk of liability if an accident occurs.*

***Caution:***

*If you purchased an open array radar antenna, make sure it is installed in an area free of hardware obstructions and free of potential obstructions like sails, lines or other vessel components that could intermittently intrude or be caught up in the array antenna's rotation path.*

**WARNING:** ***High Voltage Hazard***

**Dangerously high voltages are present within the radar scanner unit. The unit contains no user-serviceable parts. The cover should be removed only by a qualified radar service technician. Technicians must exercise extreme care when working inside the unit. ALWAYS remove power before removing the cover. Some capacitors may take several minutes to discharge, even after switching off the radar. Before touching the magnetron or any high voltage components, ground them with a clip lead. There are no internal connections or adjustments necessary for installation or operation.**

**WARNING: *Microwave Radiation Hazard***

**The microwave energy radiated by a radar antenna is harmful to humans, especially to the eyes. NEVER look directly into an open waveguide or into the path of radiation from an enclosed antenna. Radar and other radio frequency radiation can upset cardiac pacemakers. If someone with a cardiac pacemaker suspects abnormal operation, immediately turn off the radar equipment and move the person away from the antenna. Turn off the radar whenever it is necessary to work on the antenna unit or other equipment in the beam of the radar.**

**WARNING: *Turn Off Radar When Docked***

**The radar beam can be harmful to humans in close proximity (within 20 yards, or 18.3 meters). When docked, be considerate of other boats and pedestrians nearby and remember to turn off your radar. If your boat is in a covered marina and the radar is on, a metal roof can act as a reflector, bouncing microwave energy back at your boat and passengers.**

# Section 1: Introduction

Thank you for buying a Lowrance Radar with the RIM 100 radar interface module. Your radar consists of three main components: the radar scanner unit (antenna), your display unit (sold separately) and the RIM 100 radar interface module which connects the scanner and display units.

**WARNING:**

**Radar radiation can be harmful to you and bystanders. Radar misuse or misunderstanding radar operation could lead to a collision, which could result in property damage, personal injury or death.**

***You must be familiar with the procedures and all warnings and cautions described in the installation and operation manuals in order to operate your radar safely and effectively.***

We know you're eager to begin using your radar, but first, we want you to take note of the three instruction manuals you need to read to get started.

First is the *Read Me! Insert for Radar Display Unit Software Update* (part number 988-0161-022). It tells you how use the memory card in your package to update your display unit software to make it radar-ready. (For your convenience, this information is also repeated below.)

Second is the *Radar and RIM 100 Installation Manual* (part number 988-0161-001). It tells you how to install your radar's hardware.

Third is this *Radar Operation Manual* (part number 988-0161-011). After installing the radar scanner unit, the RIM 100 and the new display software, you need to read this manual to learn how your display unit and radar antenna work together.

To get the highest level of performance from your radar, it is a good idea to keep this manual and your display unit's sonar or GPS instruction manual handy for reference.

## Models Covered

This manual covers the following radar-compatible display units: LCX-25c, LCX-26c HD, LCX-110c, LCX-111c HD sonar/GPS combos; and GlobalMap® 6500c, GlobalMap® 6600c HD, GlobalMap® 7500c, GlobalMap® 7600c HD GPS units.

**Note for GlobalMap users:** Menus and function commands in your units are identical to those shown in this manual, except your display will not have sonar page options, sonar alarm options or sonar simulator options.

This manual covers the following radar units: LRA-1000, LRA-1500, LRA-2000 radomes; and LRA-4000, LRA-5000 open array radars.

## Update Display Unit Software

Your display unit must have software version 1.3.0 or later to work with radar. Depending on when you bought your display, it may require a software update. To avoid delays in setting up your radar system, your radar package includes an MMC or SD memory card with a basic software upgrade.

Lowrance continues to regularly develop display enhancements and new radar features. ***We strongly recommend that you periodically check our web site for the latest free radar software updates.***

If you or a friend has Internet access, log-on to www.lowrance.com, browse to our Software page and look for the Product Updates link. If you lack Internet access, call your dealer or Lowrance Customer Service. Complete contact information is on the last page of this manual.

We've made it easy for you to keep up with our latest updates — just subscribe to our free e-mail software release notices. Look for the link at the bottom of our Product Software Upgrades web page.

### Installing Software Update

1. With the display unit turned off, install the MMC card that contains the radar software update.

2. Turn on the unit and the update will install automatically.

3. When the update is finished, the unit will power up normally. After the updated is complete, remove the update MMC from card slot.

**NOTE:**

This manual assumes you have a basic understanding of your display and its sonar and/or GPS operations. For complete instructions on the keyboard, pages and menu structure, refer to the manual packed with your display. That manual also explains the typographical conventions and symbols we use to describe unit operations.

## What is radar?

The word "radar" is an acronym for "RAdio Detecting And Ranging." In simple terms, this is how it works:

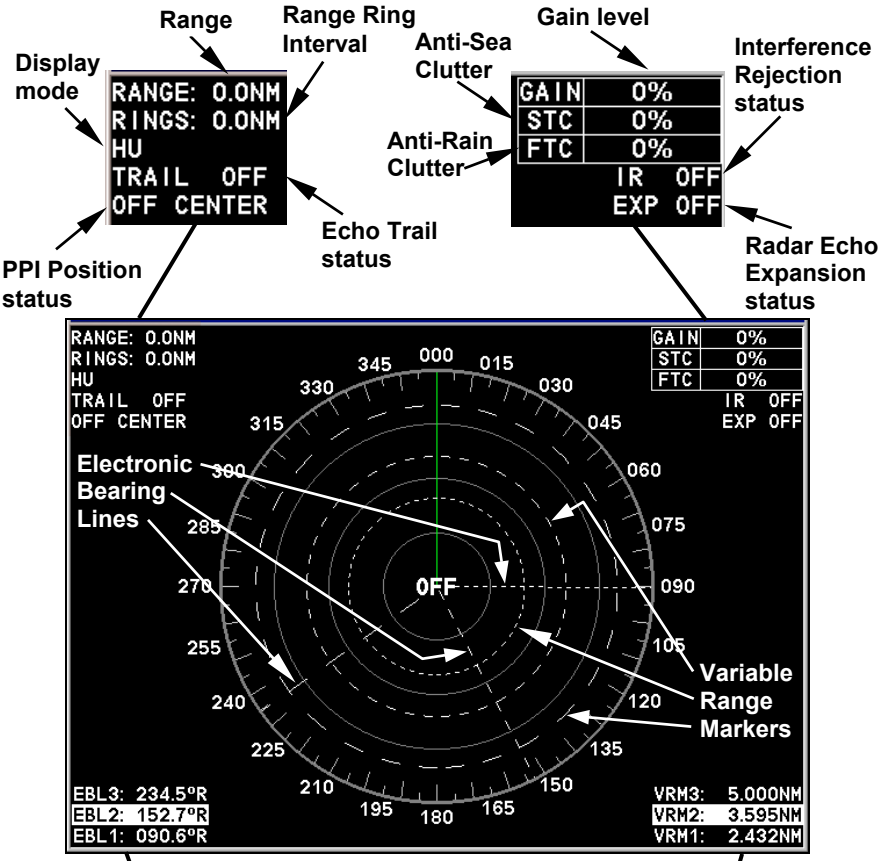
A radio transmitter sends out a quick microwave pulse. A receiver listens for that signal's echo when it bounces back from something in its path.

When the echo returns, it is processed by a computer to determine relative distance, position and bearing of the object that reflected the signal. This information is displayed on the display unit's screen. Other boats or ships, navigational markers, landmasses and the like are referred to as targets.

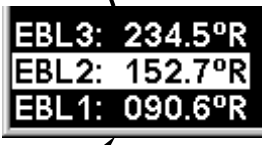
By knowing how long it takes for a signal to return, the distance to a target can be determined. As the radar antenna scans through a 360 degree rotation, it can show where the target is relative to your position. By repeated scans, you can see which direction another vessel is moving.

The following two pages show the basic components of your radar display screen, which is commonly referred to as the PPI, an old term from the early days of radar.

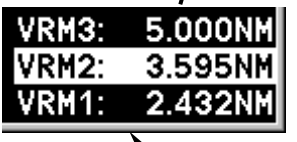
# Basic Radar Display Components




**Your unit has three electronic bearing lines and three variable range markers. An enlarged example of EBLs and VRMs is on the next page.**

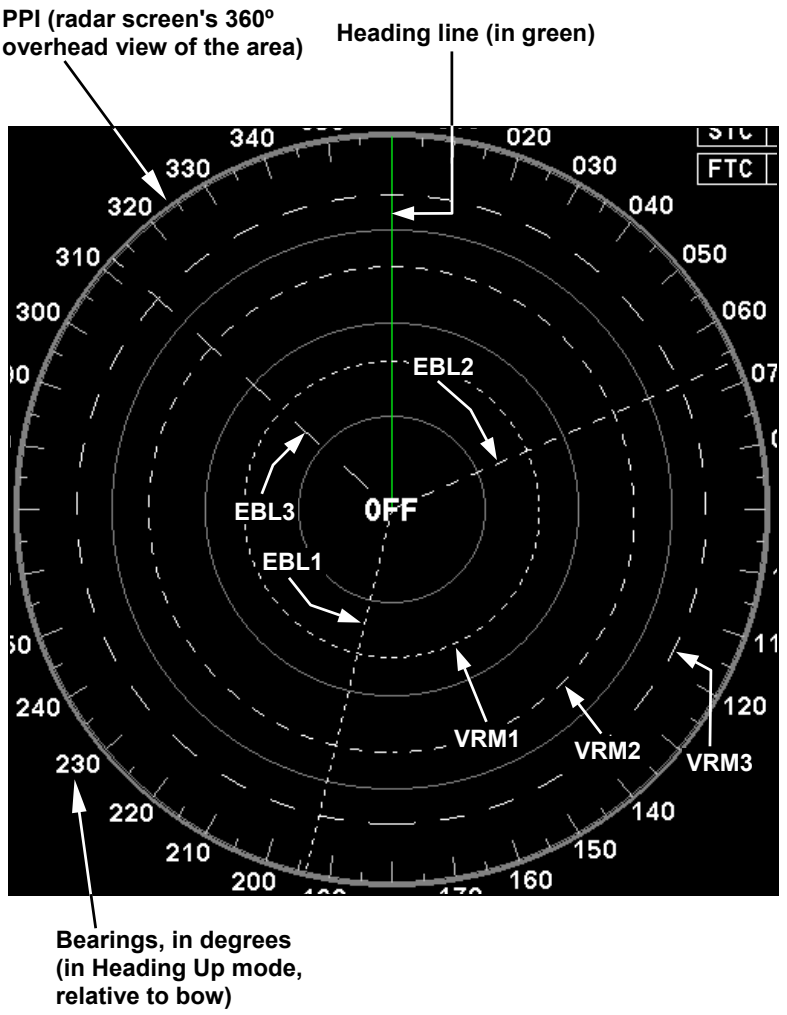



**Electronic Bearing Line position for EBLs 1, 2 and 3. Highlighted in white, EBL 2 is the active bearing line.**




**Variable Range Marker position for VRMs 1, 2 and 3. Highlighted in white, VRM 2 is the active range marker.**

## Basic Radar Display Components




**VRMs and EBLs allow you to track the distance and bearing of multiple radar targets.**

**NOTE:**

This manual is printed in black and white, but a free color version (in Acrobat® PDF format) is available for display or download from the Lowrance web site. The color manual is particularly useful for understanding Sec. 5, Radar Interpretation.

# Notes

# Section 2: Radar Setup

This section will teach you how to prepare your radar for operation. Before you begin radar setup, the radar scanning unit, RIM 100 module and display unit must all be installed and their cables connected. The display unit must be running software version 1.3.0 or later.

**WARNING:**

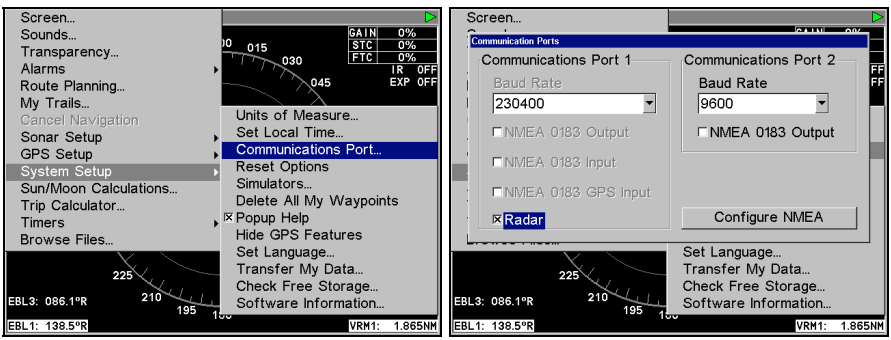
**Do NOT attempt to execute Radar Setup, while the vessel is moving. Some motion from wind and wave action is acceptable, but these setup instructions are NOT intended for vessels moving across the water.**

***Caution***:

*If you are unsure or do not understand the following instructions, it is strongly recommended that an experienced radar technician handles radar setup and the installation of radar hardware.*

## Getting Started

1. After turning on the unit, press **MENU** | **MENU**, then use ↑ ↓ to **SYSTEM SETUP** and press **ENT**.



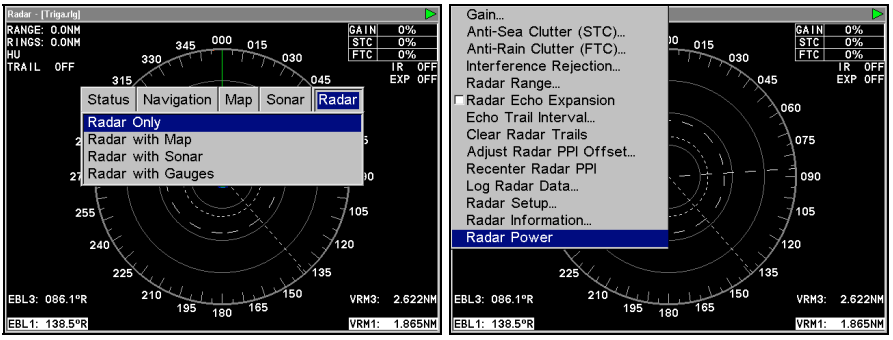

**Communications Port selected from System Setup menu (left). Communications Port menu (right).**

2. From the System Setup menu, highlight **COMMUNICATIONS PORT** and press **ENT**.

3. Press ↓ to **RADAR** and press **ENT**, which will place an X in the radar checkbox. The Baud Rate automatically will switch to 230400. Press **EXIT** repeatedly to return to the main page display.

4. Press **PAGES**, then use ← → to select the radar tab.

5. Press ↓ to select **RADAR ONLY**, then press **EXIT**.

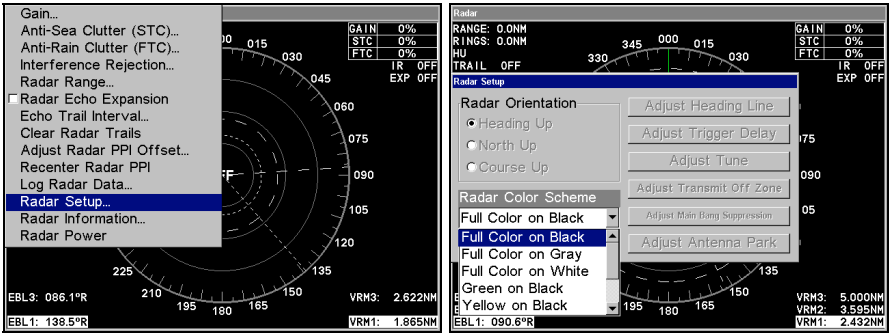



**Radar only highlighted on Radar Pages menu (left). Radar menu with Radar Power selected (right).**

6. Press **MENU**, then use ↑ ↓ to select **RADAR POWER** from the radar menu and press **ENT**. A confirmation message will appear. Press ← to select **YES** and press **ENT**. A warm-up countdown will commence that will vary depending on the model of radar you have.

7. After the countdown is finished, the unit will enter STANDBY mode.

8. Access the Radar Setup menu to make sure your radar display is set to Heading Up and is set to a Full Color scheme. Press **MENU**, select **RADAR SETUP** and press **ENT**.




**Radar Setup selected from Radar menu (left). Radar Setup menu with Full Color on Black highlighted (right).**

9. Highlight **HEADING UP** and press **ENT**, which will set the radar to Heading Up.

10. To display the radar images in full color, press ↓ to select **RADAR COLOR SCHEME** and press **ENT**.

11. Use ↑ ↓ to highlight one of the three full color options and press **ENT**. Press **EXIT** to return to the main page display.

## Radar Setup

The Radar Setup menu allows you to setup and adjust radar settings, like Transmit Off Zone and Antenna Park. Most of the settings in the Radar Setup menu will only have to be set once, but we recommend you check the settings periodically for general maintenance.

**NOTE:**

Before starting radar setup, take your vessel out on open water with fairly calm seas, like an open bay.

The three setup features we want to modify are Adjust Trigger Delay, Adjust Main Bang Suppression and Adjust Heading Line.

We will set them up in that order, but before making any adjustments, make sure the display is set to a range of 1/8 nautical miles and that Gain, Anti-Sea Clutter (STC), Anti-Rain Clutter (FTC), Main Bang Suppression and Trigger Delay all have been set to zero percent.

### Trigger Delay Preparation

#### Range

1. To reset range to 1/8 nm, make sure you are on the Radar Only page and press **MENU**.

2. Use ↑ ↓ to select **RADAR RANGE** and press **ENT**, which will call up the Radar Range list. Press ↑ to select 1/8 nm and press **ENT**. You also can set the range to 1/8 nm from the radar screen by using the **ZIN** and **ZOUT** keys.

#### Gain

1. To set Gain to zero, press **MENU**, select **GAIN** and press **ENT**.

2. That will launch the Gain vertical scrollbar. Press ↓ until the Gain is set to zero percent. Press **EXIT**. (Notice the corresponding value in the upper right-hand corner of the screen.)

**NOTE**:

When adjusting Gain back to a useable level, increase the level until you see a light peppering on the display. Also remember, you will have to adjust gain every time you change ranges.

#### Anti-Sea Clutter

1. To set Anti-Sea Clutter to zero, press **MENU**, select **ANTI-SEA CLUTTER (STC)** and press **ENT**.

2. That will launch the Anti-Sea Clutter vertical scrollbar. Press ↓ until the Anti-Sea Clutter is set to zero percent. Press **EXIT**. (Notice the corresponding value in the upper right-hand corner of the screen.)

#### Anti-Rain Clutter

1. To set Anti-Rain Clutter to zero, press **MENU**, select **ANTI-RAIN CLUTTER (FTC)** and press **ENT**.

2. That will launch the Anti-Rain Clutter vertical scrollbar. Press ↓ until the Anti-Rain Clutter is set to zero percent. Press **EXIT**. (Notice the corresponding value in the upper right-hand corner of the screen.)

#### Main Bang Suppression

1. To set Main Bang Suppression to zero, press **MENU**, select **RADAR SETUP** and press **ENT**.

2. Press →|↓ to **ADJUST MAIN BANG SUPPRESSION** and press **ENT**. That will call up the Main Bang Suppression vertical scrollbar.

3. Press ↓ until Main Bang Suppression is set to zero percent. Press **EXIT**.

#### Trigger Delay

1. To set Trigger Delay to zero, press **MENU**, select **RADAR SETUP** and press **ENT**.

2. Press →|↓ to **ADJUST TRIGGER DELAY** and press **ENT**. That will call up the Adjust Trigger Delay vertical scrollbar.

3. Press ↓ until Trigger Delay is set to zero percent. Press **EXIT**.

### Adjust Trigger Delay

This feature eliminates the time lag between real radar returns and the time it takes data to be processed by the radar software, a common issue with all radars.

***Caution:***

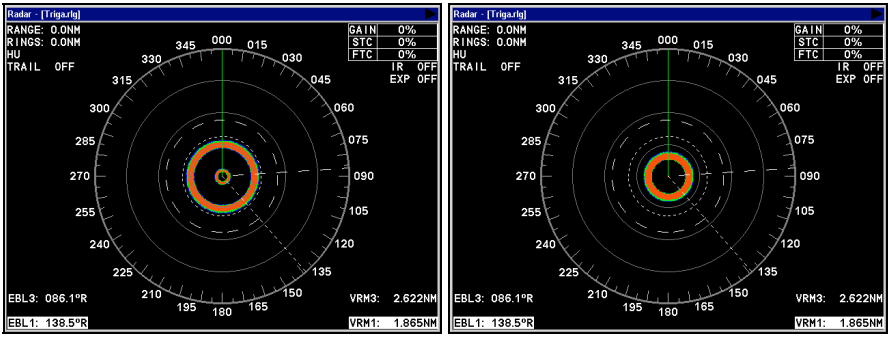
*If you have any doubt about your understanding of the Trigger Delay feature, you should have it set up by a qualified radar technician.*

1. The radar should already be in STANDBY mode, so press **PWR** for 2 seconds to switch the radar into transmission mode. A confirmation message will appear, press ← to select **YES**.

2. Press **MENU**, then select **GAIN** and press **ENT**, which will call up the Gain vertical control bar. Press ↑ to increase the Gain level to around 15%. One or two red rings with blue borders should be visible on the screen, depending on the wattage of your radar antenna.

3. Now from the Radar Setup menu, press →|↓ to **ADJUST TRIGGER DELAY**, then press **ENT**. The Adjust Trigger Delay vertical scrollbar will appear.

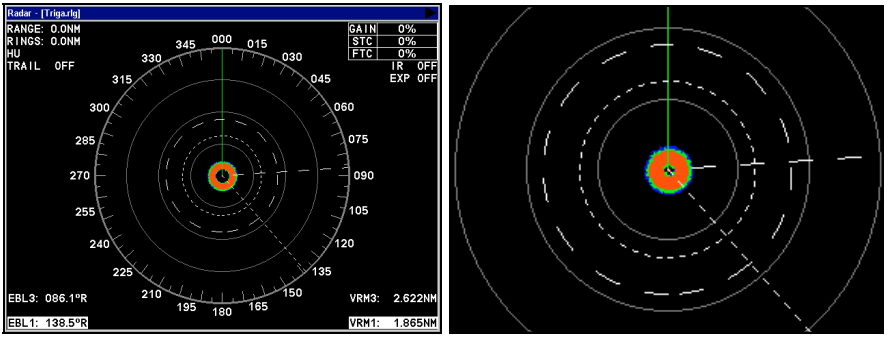
The 2 kW models, the LRA-1000 and LRA-1500, will have only one ring on the display. The 4 kW radars — LRA-2000, LRA-4000 and LRA-5000 — will have two rings on the display. See the following figures.




**Before adjusting the Trigger Delay for 4 kW radars, two rings will be shown on the screen (left). As Trigger Delay is increased, the larger ring will start to get smaller. The small ring will disappear (right).**

You may have to increase gain in the previous step if the rings are not visible. Increase gain until you have solid red rings shown on the screen, like in the preceding example. Increasing Gain too much can cause distortion of the rings.

4. Press ↑ to increase the level of Trigger Delay, which will decrease the size of the ring. If you have a 4 kW radar, as the large ring decreases in size, the smaller ring in the center of the screen will disappear, leaving only one ring.




**Increase Trigger Delay to diminish the size of the red ring (left). To set Trigger Delay correctly, reduce the ring to as small a size as possible, while keeping a black circle in the middle (enlarged view, right).**

In either case, continue to increase the Trigger Delay level until the ring is as small as possible, while keeping a black circle in the middle. Every radar is different, but typically, a setting between 35 and 42 percent will get the job done.

If you over apply the Trigger Delay, the black circle will disappear. Decrease the Trigger Delay level and it will reappear.

3. Press **EXIT** to return to the main page display.

**Adjust Main Bang Suppression**

Main Bang Suppression is only for 4kW units — LRA 2000, LRA 4000 and LRA 5000. This feature filters out electronic noise close to your vessel. It gives you control of radar sensitivity in the area surrounding your vessel, approximately 180 feet in all directions.

Before making any adjustments to Main Bang Suppression, take your vessel out on open water with fairly calm seas, like an open bay.

***Caution:***

*If you have any doubt about your understanding of the Main Bang Suppression feature, you should have it set up by a qualified radar technician.*

1. From the Radar Setup menu, press →|↓ to **ADJUST MAIN BANG SUPPRESSION** and press **ENT**. That will launch the Main Bang Suppression vertical scrollbar.

2. The small red ring we adjusted during Trigger Delay setup will still be on the display.

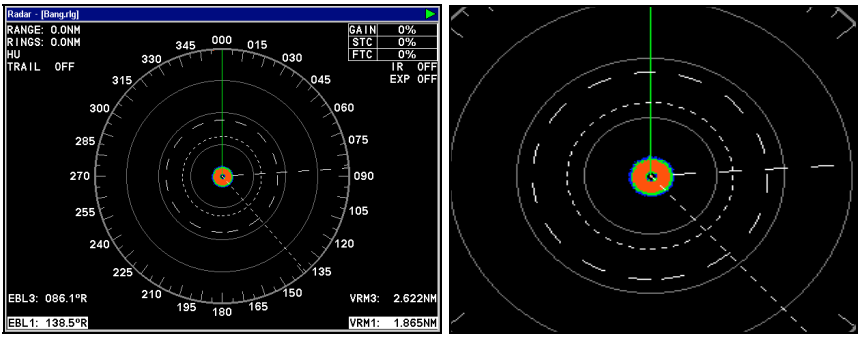
3. Press ↑ slowly — Main Bang Suppression can be sensitive — to increase the Main Bang Suppression level so the red ring becomes as thin as possible.

4. Press ↓ to slowly decrease the level until you have returned the red ring back to its thinnest point. Every radar is different, but typically, a setting between 2 and 8 percent will be satisfactory.

**NOTE:**

In many cases, depending on the radar unit you have, over applying Main Bang Suppression can make the ring disappear, start to make it wider or the ring can get to a point where it is as small as it will get. At this point, increasing the main bang level will not change the red ring.

If the red ring does not does not decrease in size when increasing the suppression level, reduce the level until you see a slight increase in the size of the ring, then leave it at that setting.



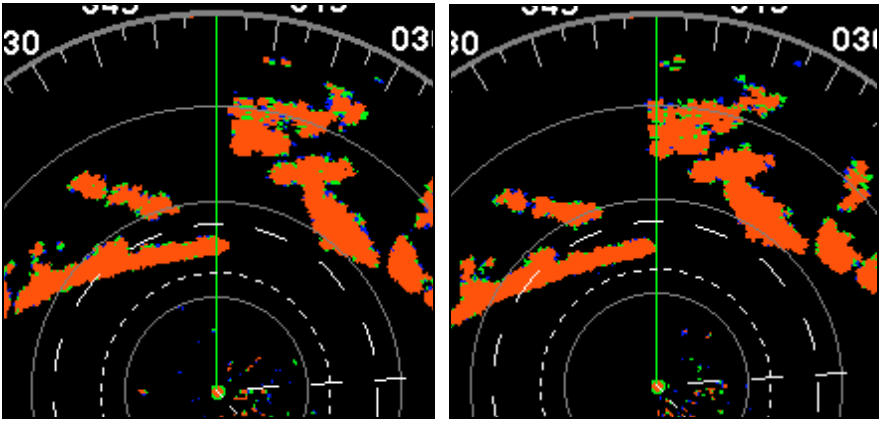

**Main Bang Suppression begins with the same red ring we resized during Trigger Delay setup (left). Slowly increase Main Bang Suppression to make the ring as thin as possible (enlarged view, right).**

5. Press **EXIT** to clear the scrollbar from the screen. Now reset Gain, Anti-Sea Clutter and Anti-Rain Clutter back to a desired level.

### Adjust Heading Line

The Heading Line command is used to make sure the green heading line (zero point) on your display is lined up with the bow of your vessel.

**(Before heading line adjustment)** **(After heading line adjustment)**



**The bow of the ship is lined up with the tip of the peninsula (left), but the green heading line is not. Adjusting the heading line will allow you to align the direction of the heading line with the direction of the bow (right).**

1. Line up the bow of your vessel with a point of reference, like a peninsula, lighthouse or other stationary target.

2. From the Radar Setup menu, press → to select **ADJUST HEADING LINE** and press **ENT**. That will place an arrow on each side of the green Heading Line.

3. Use ← → to adjust the position of the green heading line, so its line to the reference point's radar image matches your bow's actual line to the reference point.

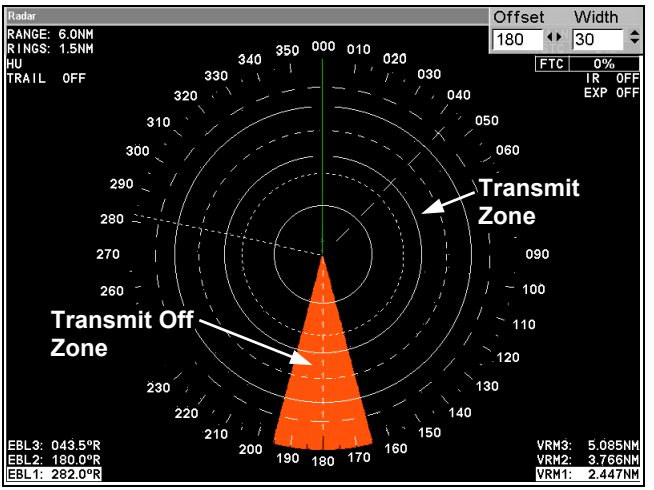
4. Press **EXIT** to remove the heading line arrows from the display.

### Adjust Transmit Off Zone

The Transmit Off Zone is a feature that allows you to select an area in the radar's 360° transmission path where the radar beam will not be transmitted.

**WARNING:**

**ALL targets inside the Transmit Off Zone will NOT be displayed on the screen. This will create a blind spot within the off zone!**




**Transmit Off Zone is shown in bright red; the remaining area of the PPI is considered the Transmit Zone. Color is exaggerated here for clarity; on-screen, the off zone actually appears in a dimmer shade so as not to distract from target images in the transmit zone. Dialog box values at upper right are in degrees, relative to the heading line.**

***Caution:***

*Preventing the main beam or lobe from transmitting through the Transmit Off Zone will diminish the amount of radiation broadcast in that area, but it WILL NOT protect you from radiation transmitted by the side lobes of the radar antenna.*

*To avoid radiation exposure, be sure to follow the installation instructions, which require the radar to be installed at least 1 foot above all persons.*

1. From the Radar Setup menu, press →|↓ to select **ADJUST TRANSMIT OFF ZONE** and press **ENT**. That will launch the Adjust Transmit Off Zone dialogs in the upper right-hand corner of the screen.

2, Use ↑ ↓, ← → to set up the Transmit Off Zone in the desired area. The zone will be colored red on the radar display.

3. Press **EXIT** when the Transmit Off Zone is set. To remove the zone, repeat Step 1, then set both dialog boxes back to zero and press **EXIT**.

**Adjust Tune**

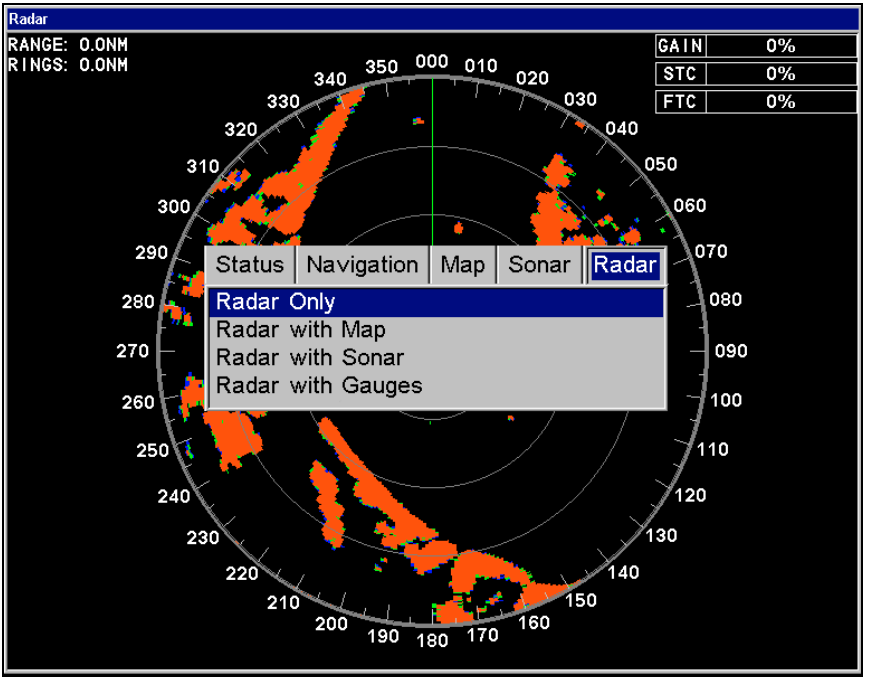
Tuning should require no adjustment during the life of the unit. ***We strongly recommend you do NOT adjust Tune settings yourself.*** This feature is intended for use only by trained technicians. If for some reason you need to use this function, consult your dealer or customer service about the software updates necessary for tuning.

# Notes

# Section 3: Basic Operation

## Pages

The Radar Page has four display options: Radar Only, Radar with Map, Radar with Sonar and Radar with Gauges. GPS only units do not support the Radar with Sonar page, so they have three display options: Radar Only, Radar with Map and Radar with Gauges.




**Radar Page Menu with Radar Only selected.**

**To access Radar page display options:**

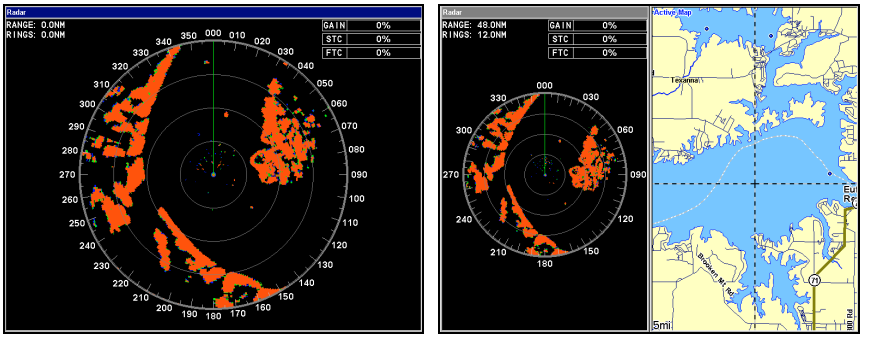
1. Press **PAGES**, then use ← → to highlight the radar tab.
2. Use ↑ ↓ to select the desired radar page configuration.
3. Press **EXIT** when the desired display option is highlighted.

### Radar Only

Choose Radar Only if you want to display the radar full screen.

### Radar with Map

To keep an eye on radar and GPS data at the same time, select Radar with Map.




**Radar Only option (left) with Radar with Map display (right).**

### Radar with Sonar

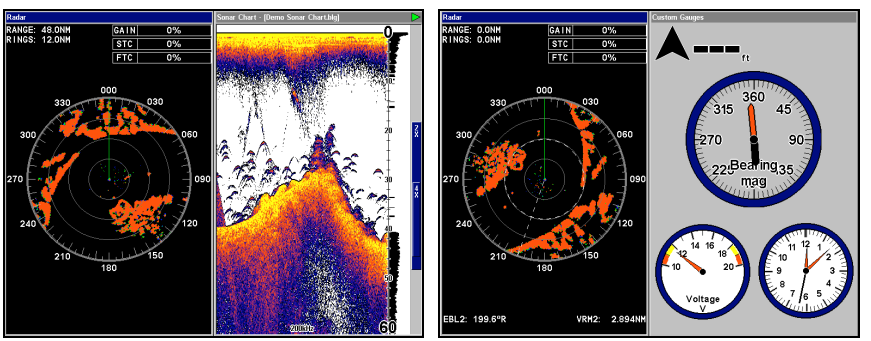
The Radar with Sonar option allows you to monitor radar information, while viewing sonar returns. Not available on GPS only units.

### Radar with Gauges

The Radar with Gauges display will split the screen between the radar page and the gauge page. The gauge page can be customized to display sonar and GPS information in digital and analog gauge formats.

**NOTE:**

For instructions on customizing the gauges window with digital information or analog gauges, refer to the overlay data entry in your unit's instruction manual.



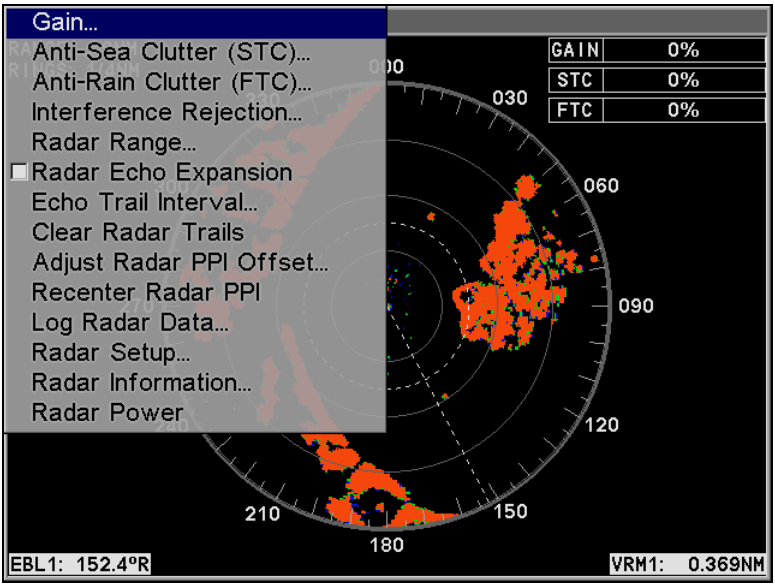

**Radar with Sonar option (left). Radar with Gauges display (right).**

**NOTE:**

When more than one page display is on the screen at the same time, press **PAGES**|**PAGES** to switch the Active status between windows. The title bar at the top of the window will be blue when the window is active. The only exception is the map page, which will display "Active Map" at the top of the map.

## Radar Menu

When a radar page is the active page, you can access the radar menu by pressing **MENU**. To access the main menu, press **MENU** | **MENU**.




**Radar Menu.**

### Gain

This is used to adjust the sensitivity of the receiver. Setting Gain to a low level will clear up some of the clutter on the screen, but also could eliminate some desired echoes. A high level of the Gain, allows you to see greater detail around you, but will clutter the screen.

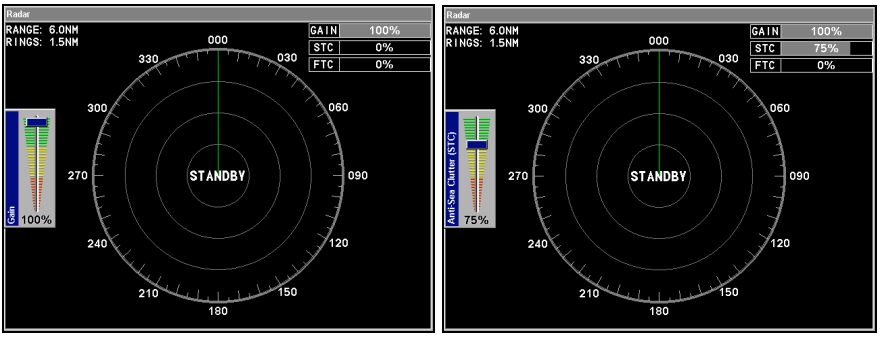
**NOTE:**

When adjusting Gain back to a useable level, increase the level until you see a light peppering of echoes on the display. Also remember, you will have to adjust gain every time you change ranges.

#### To adjust Gain:

1. Highlight **GAIN** on the radar menu and press **ENT**. That will launch the Gain vertical scrollbar.

2. Use ↑ ↓ to adjust the Gain to a desired level. Press **EXIT** to remove the scrollbar from the screen.




**Gain vertical scrollbar (left) with Anti-Sea Clutter scrollbar (right).**

### Anti-Sea Clutter (STC):

This lowers receiver sensitivity at shorter ranges to reduce or eliminate echoes that reflect back at the antenna due to wave action close to the vessel.

***Caution***

*Increasing STC may reduce or eliminate weak echoes, like small vessels. Use only the minimum amount needed, then check back periodically to see if the STC level may be decreased.*

#### To adjust Anti-Sea Clutter:

1. Select **ANTI-SEA CLUTTER** from the radar menu and press **ENT**. The Anti-Sea Clutter vertical scrollbar will appear.

2. Use ↑ ↓ to adjust Anti-Sea Clutter to a desired level. Press **EXIT** to remove the scrollbar from the screen.

### Anti Rain Clutter (FTC)

This is used to reduce or eliminate massive numbers of small echoes that clutter the display during rain or snow storms.

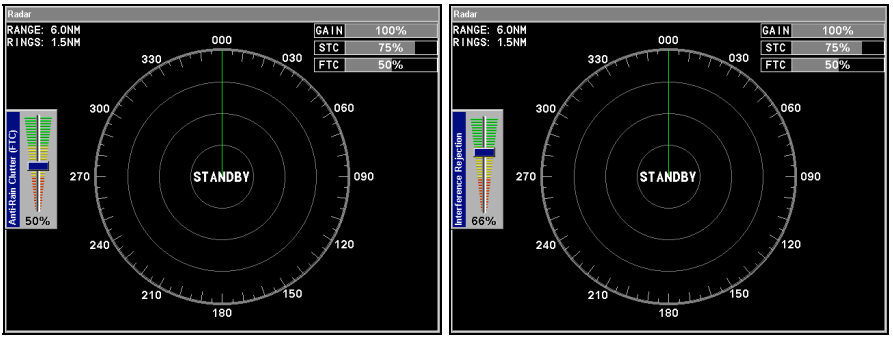
#### To adjust Anti-Rain Clutter:

1. Highlight **ANTI-SEA CLUTTER** on the radar menu and press **ENT**. The Anti-Sea Clutter vertical scrollbar will appear.

**WARNING:**

**Increasing FTC may reduce or eliminate weak echoes, like those from small vessels. Use only the minimum amount needed, then check back periodically to see if the FTC level may be decreased.**

2. Use ↑ ↓ to adjust the Anti-Rain Clutter setting to a desired level. Press **EXIT** to remove the scrollbar from the screen.




**Anti-Rain Clutter vertical scrollbar (left) with Interference Rejection scrollbar (right).**

### Interference Rejection

This feature filters out signals from other radars close to your location.

#### To adjust Interference Rejection:

1. Select **INTERFERENCE REJECTION** from the radar menu and press **ENT**. That will launch the Interference Rejection vertical scrollbar.

2. Use ↑ ↓ to adjust the Interference Rejection setting to a desired level. Press **EXIT** to remove the scrollbar from the screen.

### Radar Range

This feature allows you to expand the area shown on the display unit, which is helpful when you want to see targets a great distance from you. You also can decrease the range to focus on targets closing in on you.

**NOTE:**

When switching radar ranges, you likely will need to adjust Gain, STC and FTC settings to achieve optimum performance.

#### To adjust radar range:

1. Select **RADAR RANGE** from the radar menu and press **ENT**, which will launch the radar range list.

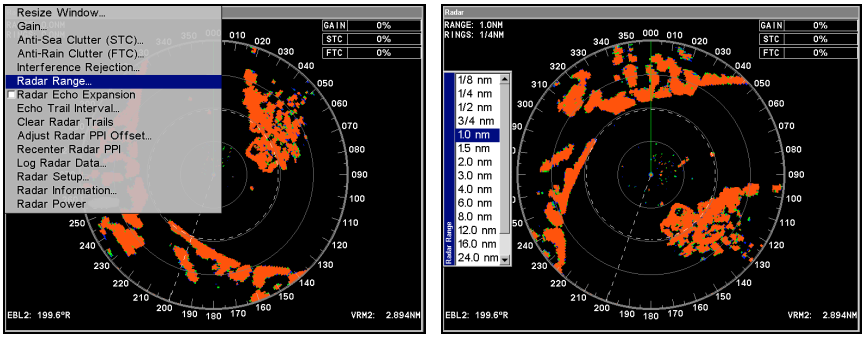
2. Use ↑ ↓ to select the desired range and press **ENT**. The range you chose is now in use on the radar display.

***Tip:***

Once you are comfortable with the various radar range options, you can more easily switch ranges by pressing the **ZIN** or **ZOUT** keys.

### Radar Echo Expansion

This feature will make weak signals more visible on the display by lengthening radar echoes.




**Radar Range selected (left). List of radar ranges (right).**

### To turn on or turn off Radar Echo Expansion:

Highlight **RADAR ECHO EXPANSION** on the radar menu, then press **ENT** to turn it on (check) or turn it off (uncheck). Press **EXIT** to clear the radar menu. Radar Echo Expansion is good for seeing weak echo returns — like birds — at a distance.

*Remember, when Echo Expansion is on, all signals on the display will be enlarged, including clutter.*

## Echo Trail Interval

This option allows you to compile a history (trail) of the movements of all radar targets via preset intervals.

### To adjust Echo Trail Interval

1. Select **ECHO TRAIL INTERVAL** from the radar menu and press **ENT**, which will launch the Echo Trail Interval menu.

2. The Echo Trail Interval menu will display a series of intervals with options ranging from Continuous to Off. Use ↑ ↓ to highlight the desired interval and press **ENT**. Press **EXIT** to get back to clear the menu.

**NOTE:**

This feature is best used in open water or when your vessel is stationary and you are tracking a moving target. If Echo Trail Interval is on and your vessel is moving, the display will be crowded with trails for every target, including stationary targets, like lighthouses and land.

## Clear Radar Trails

This feature is used to clear radar trails created with the Echo Trail Interval command.

### To clear radar trails:

Highlight **CLEAR RADAR TRAILS** on the radar menu and press **ENT**. All radar trails are now cleared off the radar display.

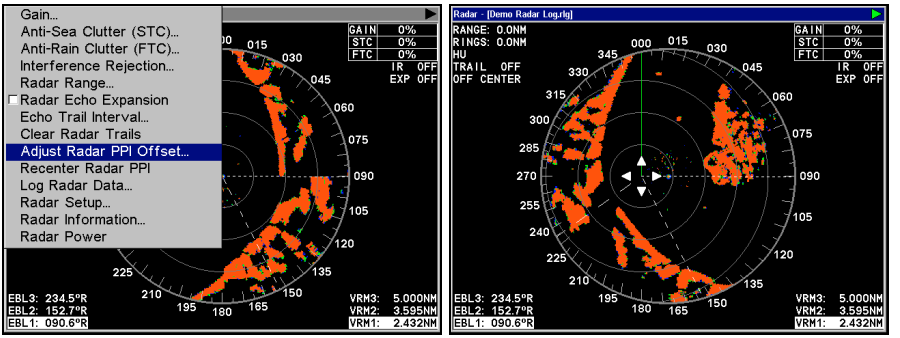
## Adjust Radar PPI Offset

Adjusts vertical and horizontal offset of the PPI, allowing you to see more of what is in front, behind or on either side of you.

### To Adjust Radar PPI Offset:

1. Select **ADJUST RADAR PPI OFFSET** from the radar menu and press **ENT**.

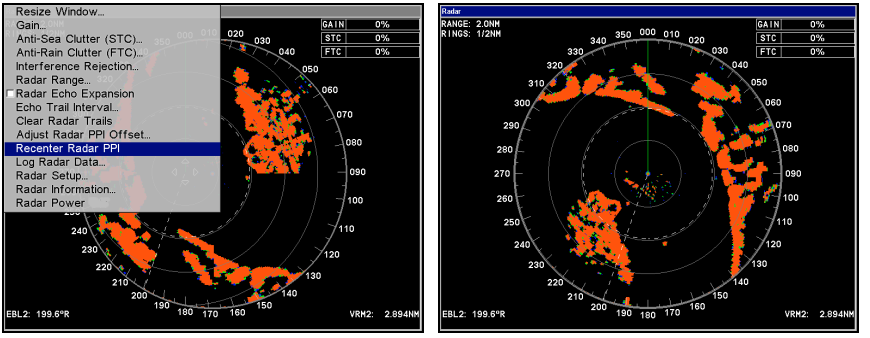
2. Four arrows will surround the PPI. Use ↑ ↓ , ← → to move the Plan Position Indicator (PPI) to the desired location. Press **ENT** to keep it at its new location or press **EXIT** to return the PPI to its default position.




**Adjust Radar PPI Offset selected (left). PPI moved to the left of center of the radar display (right). Notice when the PPI is moved, Off Center will appear in the upper left-hand corner of the screen.**

## Recenter Radar PPI

Resets to zero the vertical and horizontal offset of the Plan Position Indicator (PPI), moving it back to the center of the display.




**Recenter Radar PPI highlighted (left). PPI has moved back into the center of the radar display (right).**

### To recenter radar PPI:

Select **RECENTER RADAR PPI** on the radar menu and press **ENT**. The PPI is moved back to the center of the display. Press **EXIT** to return to the main menu.

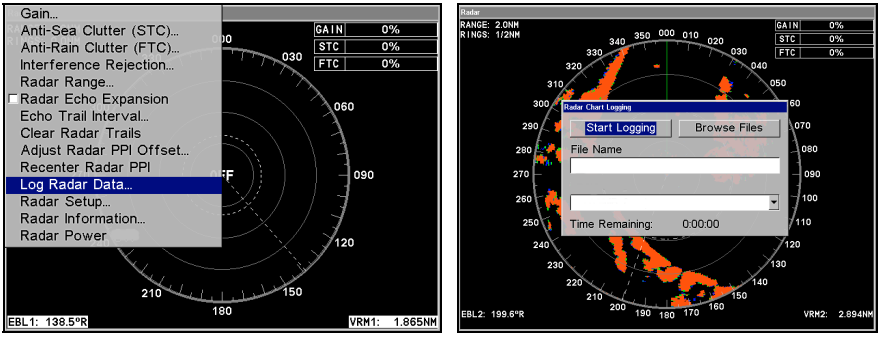
## Log Radar Data

If your unit has a hard drive (LCX-26cHD, LCX-111cHD, GlobalMap 6600cHD & GlobalMap 7600cHD) the Log Radar Data feature allows you to save radar logs. Saving a radar log allows you to reuse the log in the unit's simulator, which can aid you in being more proficient at radar interpretation.

### To record a radar log:

1. Select **LOG RADAR DATA** from the radar menu, then press **ENT**. The Radar Chart Logging menu will appear.

2. Press **ENT** to start logging.




**Log Radar Data selected from radar menu.**

**NOTE:**

Remember — you will NOT be able to log radar data, unless you have a unit with a hard drive. The following units can log radar data: LCX-26cHD, LCX-111cHD, GlobalMap 6600cHD & GlobalMap 7600cHD.

The Chart Logging menu also allows you to change the file name or browse through data files on your MMC or SD card.

### To change the file name:

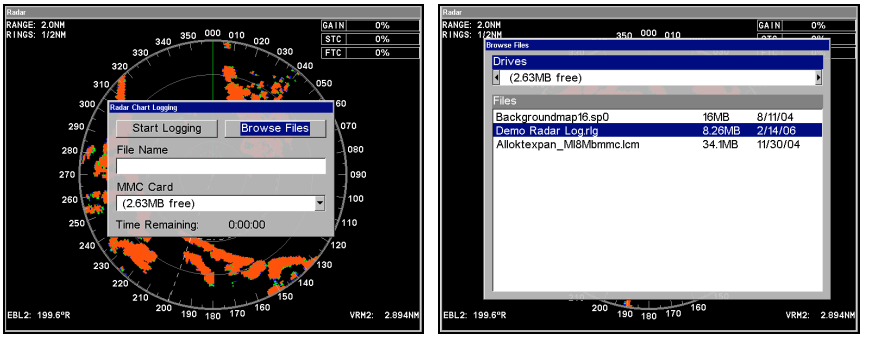
1. From the chart logging menu, press ↓ to File Name and press **ENT**.

2. Press ↑ ↓ to change the first letter, then press → to move to the next letter. Repeat these steps until the desired name has been entered. Press **ENT**. Press **EXIT** to return to the main page display.

### To browse data files:

1. Select **BROWSE FILES** from the chart logging menu and press **ENT**.

2. Use ↑ ↓ to scroll through the available files. Press **EXIT** | **EXIT** to return to the main page display.




**Browse Files selected from the Radar Chart Logging menu (left). Browse Files menu (right).**

When you select a file from the file browse menu, you can copy, delete, play or stop playing a data file.

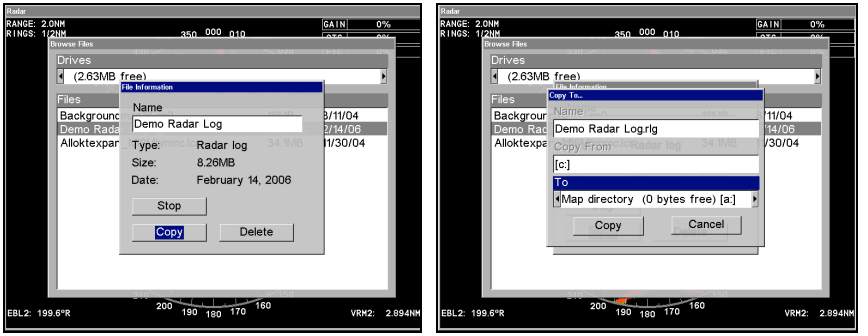
**To copy data files:**

1. Select the desired file from the Browse Files menu and press **ENT**.

2. The File Information window will appear with three buttons, copy, delete and either stop or play.

**NOTE:**

Stop will only appear in the File Information menu if the file is currently being used by the unit. Selecting **STOP** will bring to a halt the unit's use of the file. When the file is no longer being used, the stop button will be replaced with the play button. Select **PLAY** to reactivate the file.




**File Information window (left). The Copy To window (right).**

3. Select **COPY** to save the file to an MMC or SD card. That will launch the Copy To window, which allows you to choose where you want to save the file. Use ← → to select your MMC or SD card and press **ENT**.

4. Next use ↑ ↓ to highlight the **COPY FROM** dialog box. Select your unit's hard drive as the Copy-From location and press **ENT**.

5. Highlight the **COPY** button and press **ENT**.

**To delete a data file:**

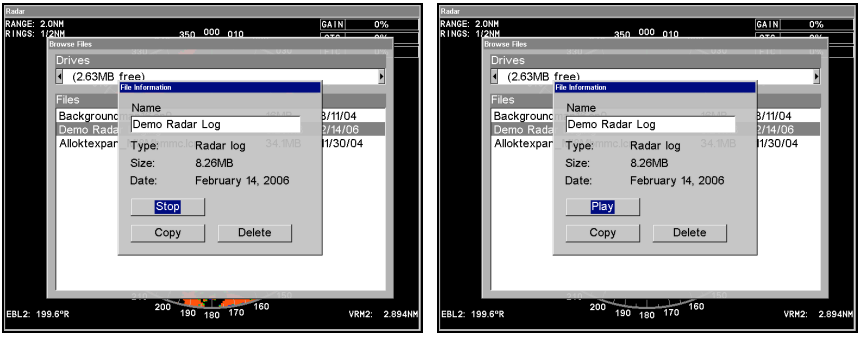
1. Highlight **DELETE** from the File Information window and press **ENT**.

2. A confirmation message will appear. Press ← to **YES** and press **ENT**.

**To stop or play a data file:**

1. Select the desired file from the Browse Files menu and press **ENT**.

2. If the file is currently in use, the Stop button will be on the menu. If the file is not in use or if you halt its use by activating the stop command, the Play button will be displayed.




**Stop button highlighted in File Information window (left). Play button selected in File Information window (right).**

3. To stop playing the chart currently in use, highlight **STOP** and press **ENT**. The play button will replace the stop button on the File Information window. Press **EXIT** to return to the main page display.

4. To play the chart again, highlight **PLAY** and press **ENT**. Press **EXIT** to return to the main page display. *The radar simulator will automatically be turned on if you play a chart from the File Information menu.*

**To rename a data file:**

1. Highlight **NAME** at the top of the File Information menu and press **ENT**.

2. Press ↑ ↓ to change the first letter, then press → to move to the next letter. Repeat these steps until the desired name has been entered.

3. Press **EXIT** repeatedly to get back to the main page display.

## Radar Setup

The Radar Setup menu allows you to set up and adjust basic radar settings, like Heading Line, Trigger Delay, Main Bang Suppression,

Transmit Off Zone and Tune, all of which are addressed in the section on Radar Setup. You can also modify Radar Orientation, Radar Color Scheme and Antenna Park from the Radar Setup menu.

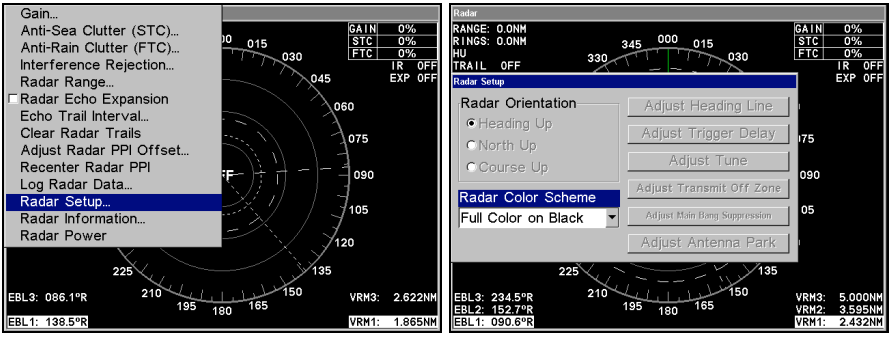
### Radar Orientation

Displays the orientation of your radar, which by default is set to Heading Up.

### Radar Color Scheme

Your radar has eight color options: Full Color on Black, Full Color on Gray, Full Color on White, Green on Black, Yellow on Black, Yellow on Blue, Night Viewing and Green CRT.

When using full color mode on the radar display, the strongest targets will be displayed in red, weaker targets will be shown in green and the weakest returns will be colored blue.




**Radar Setup selected on System Setup menu (left). Radar Color Scheme highlighted on Radar Setup menu (right).**

#### To adjust the Radar Color Scheme:

1. From the Radar Setup menu, press ↓ to **RADAR COLOR SCHEME** and press **ENT**. The Radar Color Scheme menu will appear.

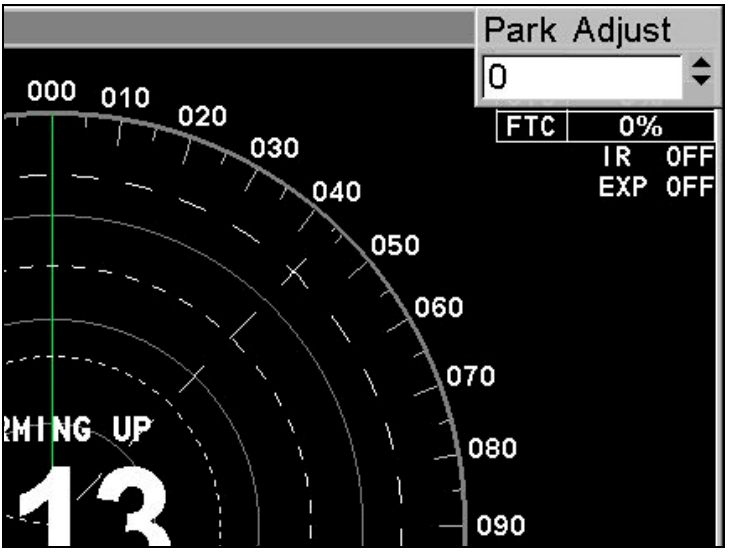
2. Press ↑ ↓ to select the desired color scheme, then press **ENT**. Press **EXIT** to return to the main page display.

### Adjust Antenna Park

This feature allows users to adjust their open array antenna so it will come to a stop in a desired position.

**NOTE:**

Each antenna is different, so there is no recommended setting for Antenna Park. You must use the trial and error method of making an adjustment, then check the result. Repeat that process until the antenna comes to a stop in the desired position.




**Selecting Adjust Antenna Park will place a dialog box in the upper right-hand corner of the screen. Use Arrow keys to adjust it.**

**To adjust Antenna Park:**

1. Make sure the vessel is not moving, then, from the Radar Setup menu, press →|↓ to **ADJUST ANTENNA PARK** and press **ENT**. That will display the Adjust Antenna Park dialog box in the upper right-hand corner of the screen.

2. Use ← → to input the desired setting.

3. Test your settings by putting the radar into STANDBY Mode. Observe the location where the antenna stops. Repeat the steps above until the desired location is achieved. Press **EXIT** to return to the main page display.

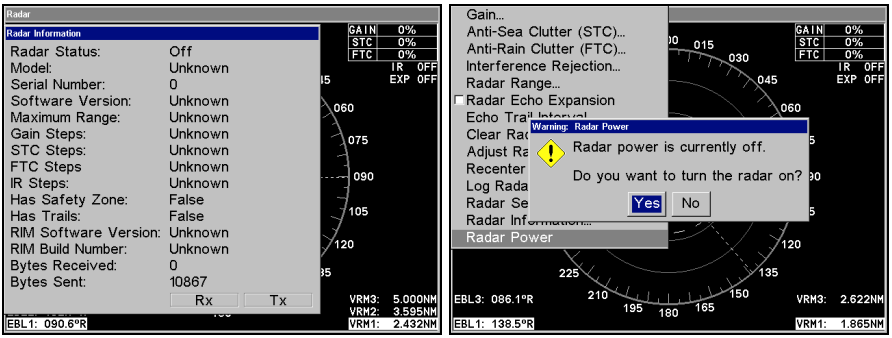
*Remember; you must not be moving when attempting to adjust Antenna Park settings. Your vessel must be stationary for the antenna to stop in the desired position. If you attempt to adjust Antenna Park while the vessel is underway or if the antenna stops in the desired position and you begin moving, the wind will move the antenna out of position.*

### Radar Information

Displays information about the radar, like radar model, radar status and software information.

**To access radar information:**

1. Select **RADAR INFORMATION** on the radar menu, then press **ENT**.




**Radar Information screen (left). Radar Power confirmation message (right).**

## Radar Power

Turns the radar on and off.

### To turn radar on or off:

1. To turn the radar on or off, highlight **RADAR POWER** on the radar menu and press **ENT**.

2. A confirmation message will appear. Press ← to **YES** to continue. Press **EXIT** to get back to the main page display.

## Radar Simulator

Your unit has a simulator that gives you the opportunity to get familiar with radar operation before heading out on the water.

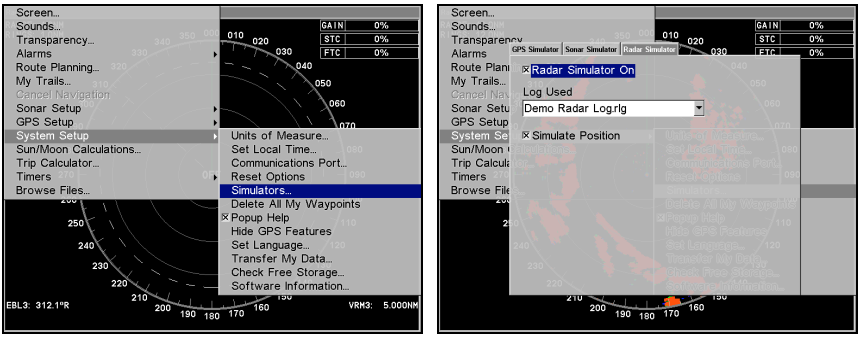
### To access the Radar Simulator:

1. From a radar page, press **MENU | MENU**, use ↑ ↓ to highlight **SYSTEM SETUP** and press **ENT**.

2. Use ↑ ↓ to highlight **SIMULATORS**, then press **ENT**.

3. Press ← → to scroll to the **RADAR SIMULATOR** tab, then press **ENT**.

4. If you have more than one Radar log loaded on your MMC or SD card, press ↓ to Log Used and press **ENT**. (If you have only one radar log, proceed to Step 5.) Use ↑ ↓ to select the desired radar log and press **ENT**.



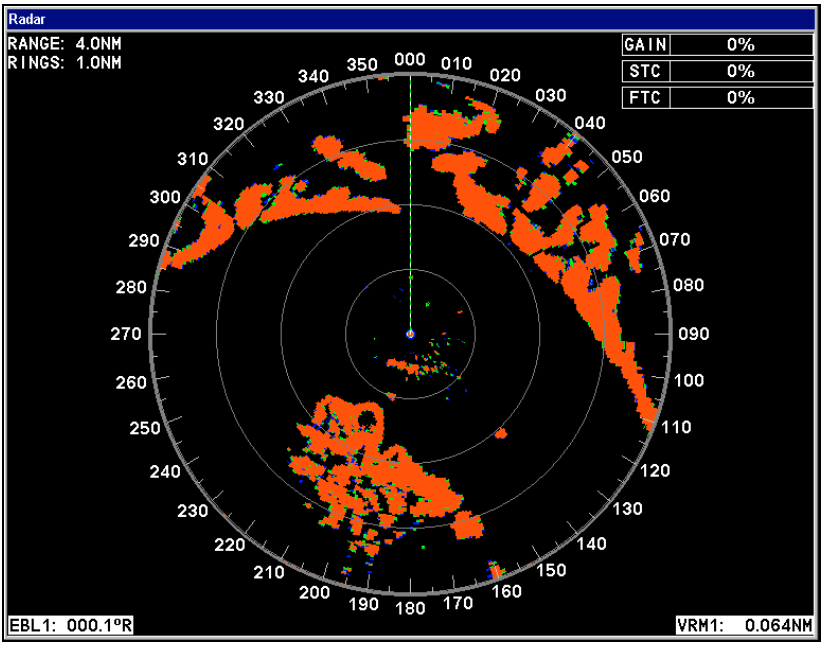

**Simulators highlighted on the System Setup menu (left). Radar Simulator On selected on Radar Simulator menu (right). Notice the simulator has not been turned on, since the checkbox is unchecked.**

5. Press ↓ to **RADAR SIMULATOR ON** and press **ENT** to turn on (check) the simulator checkbox. Repeat these steps to turn off the simulator. Press **EXIT** repeatedly to get back to the main page display.

**NOTE:**

You can turn on the GPS Simulator from the Radar Simulator menu. Press ↓ to **SIMULATE POSITION**, then press **ENT**, which will check the Simulate Position checkbox. Repeat these steps to turn off the GPS Simulator.

# Section 4: Advanced Operation




**Radar Only page display.**

## Reading the Display

The radar page displays digital information on the screen which covers, Range Rings, Gain, Anti-Sea Clutter (STC), Anti-Rain Clutter (FTC) and when active, Electronic Bearing Lines (EBL) and Variable Range Markers (VRM).

### Gain

The percentage listed next to Gain, displays the current Gain setting for your radar display.

**NOTE:**

When adjusting Gain back to a useable level, increase the level until you see a light peppering on the display. Also remember, you will have to adjust gain every time you change ranges.

### Range Rings

The Range Ring display in the upper left-hand corner of your radar screen, shows the current range ring setting. In the example above, Range represents the displayed radar range, 4 nautical miles. Rings display the distance between each ring, 1 nautical mile.

### Anti-Sea Clutter (STC)

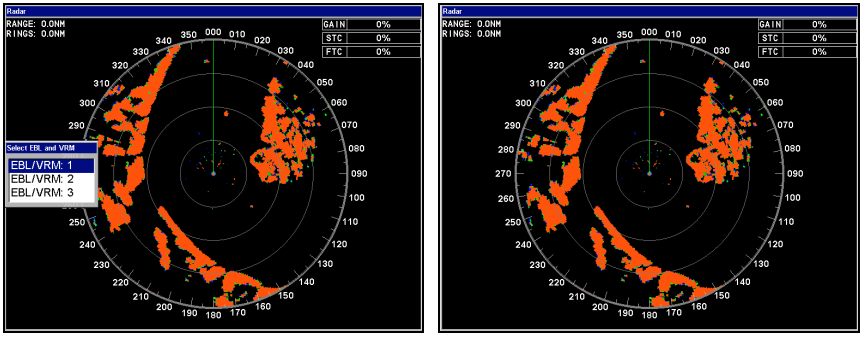
The STC percentage displays the current Anti-Sea Clutter setting on your radar screen.

### Anti-Rain Clutter (FTC)

The FTC percentage displays the current Anti-Rain Clutter setting on your radar screen.

### Electronic Bearing Line (EBL)

A radial line that can be rotated 360°, the electronic bearing line is used to monitor the bearing of a radar target in relation to your location.




**The EBL and VRM selection menu appears in a small box on the left side of the radar display (left). Once activated, the EBL and VRM dialog boxes appear in the bottom corners of the screen (right).**

### Variable Range Markers

A range ring used to measure the precise distance to a target, the variable range marker may be adjusted to measure any distance within the radar's range.

#### To select an EBL and VRM:

1. From any of the radar pages, press ↓ to call up the EBL and VRM selection menu.

**NOTE:**

If you are on a page where the screen is split between radar and another page display, make sure the radar is the active page. With the exception of the map page, the active page on the screen will be denoted by a blue bar at the top of its window. (The Map Page will display "Active Map" at the top of the map.)

2. Use ↑ ↓ to select the desired EBL and VRM, then press **ENT**.
3. Use ↑ ↓ to increase or decrease the circular Variable Range Marker.

To find the distance to a radar target, increase the size of the VRM until it is lined up with the target. Check the display in the bottom right-hand corner to see your distance from the target in nautical miles.

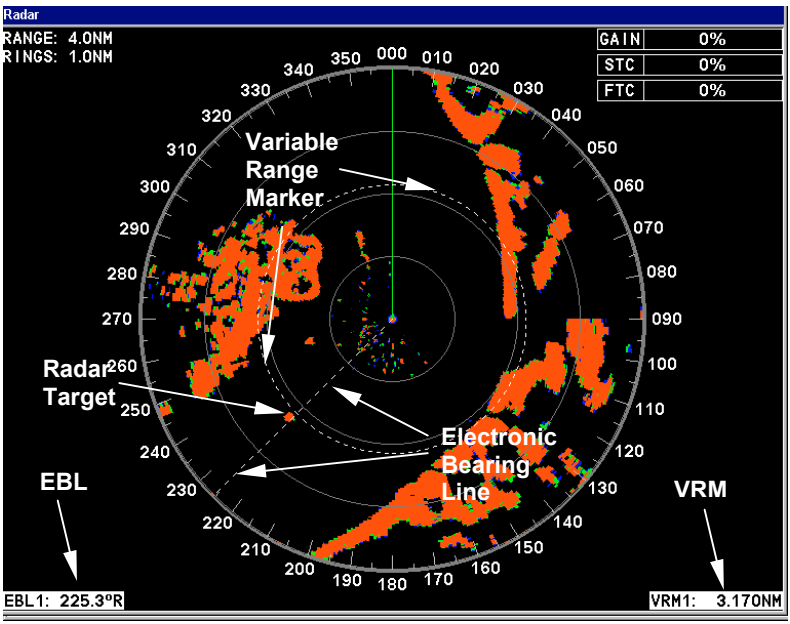
4. Use ← → to move the Electronic Bearing Line around the display.

Line up the EBL with a radar target to determine the target's relative bearing. Check the display in the lower left-hand corner to see the target's relative bearing displayed digitally.

You can use one EBL-VRM option at a time or all three at once. To use more than one EBL-VRM option at time, make sure the radar page is the active page, press **ENT**, then press ↓ to launch the EBL and VRM menu.

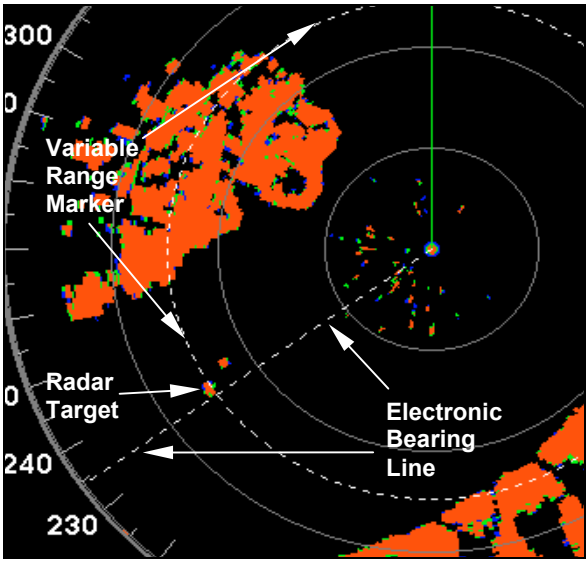
1. Select the first EBL-VRM and press **ENT**. Press ↑|→ to make the VRM and EBL visible on the screen, then press **ENT**.

2. Press ↓ to call up the EBL-VRM menu. Select the second EBL-VRM and press **ENT**. Press ↑|→ to make the VRM and EBL visible on the screen, then press **ENT**.




**The Variable Range (VRM) shows the target is 3.17 nautical miles away. The Electronic Bearing Line (EBL) displays the target's bearing as 225.3°R.**

3. Press ↓ to call up the EBL-VRM menu. Select the last EBL-VRM option and press **ENT**. Press ↑ | → to make the VRM and EBL visible on the screen, then press **ENT**.




**This is a zoomed in view from the previous image, clearly showing the radar target, Variable Range Marker and Electronic Bearing Line.**

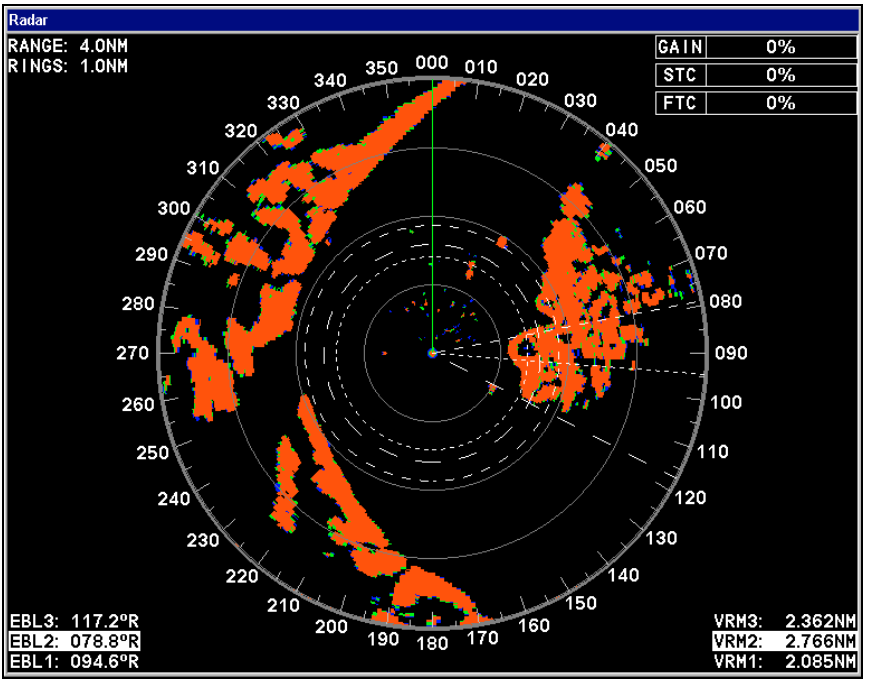
**To reposition EBL and VRM:**

1. Press ↓ to launch the EBL-VRM selection menu.

2. Select the EBL-VRM you want to reposition and press **ENT**.

3. Use ↑ ↓, ← → to move the EBL and VRM to the desired location. Press **ENT**.

4. If you have more than one EBL-VRM on the radar display, repeat these steps to reposition each EBL-VRM on the display.



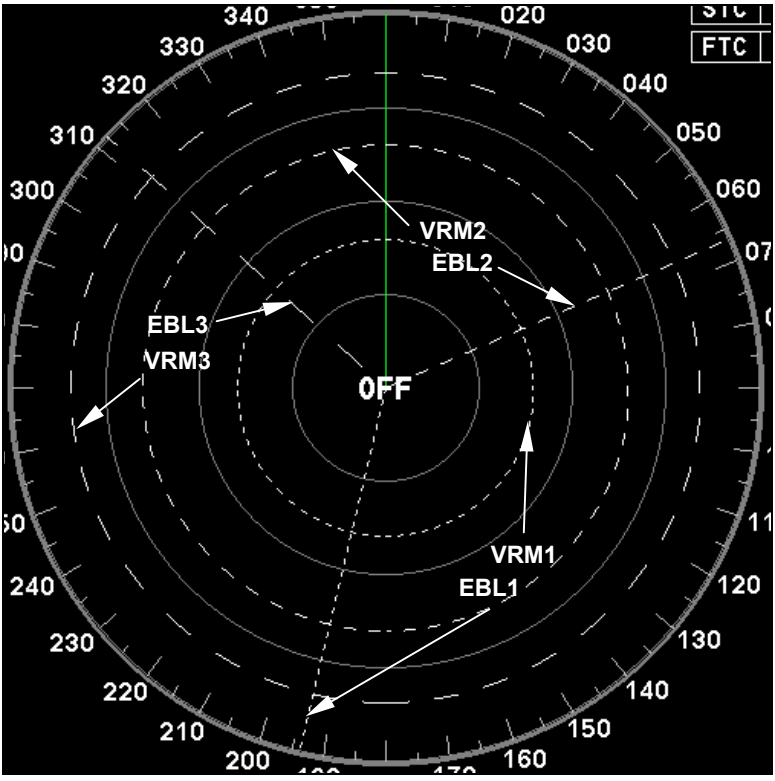

**Radar screen with all three EBL-VRM options visible on the display. Notice the EBL and VRM readings in the bottom left and right-hand corners of the screen.**

**To remove EBL-VRM from the display:**

1. Press ↓ to call up the EBL-VRM menu. Select the EBL-VRM you want to remove and press **ENT**.

2. Press **EXIT** and the desired EBL-VRM will be removed from the screen.

3. Repeat these steps to remove each EBL-VRM from the display.




**VRMs and EBLs allow you to track the distance and bearing of multiple radar targets.**

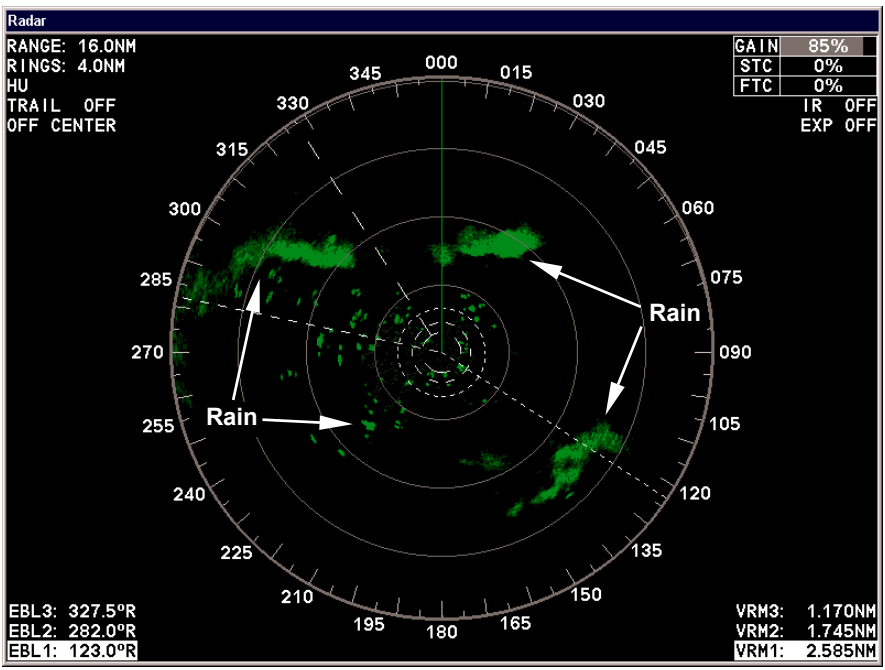
# Section 5: Radar Interpretation

Interpreting images on your radar screen involves as much art as it does science. If you want to be confident with your radar at night, you need to practice in daylight. To be ready for fog or a blinding rain squall, you must practice in fair weather.

Making you an expert radar reader is beyond the scope of this operation manual. We strongly suggest you seek additional sources of information. For a start, the following pages will show you a few basic radar returns and how to interpret them. See the end of this section for other information sources that go into much greater detail.

## Anti-Rain Clutter (FTC or Fast Time Constant)

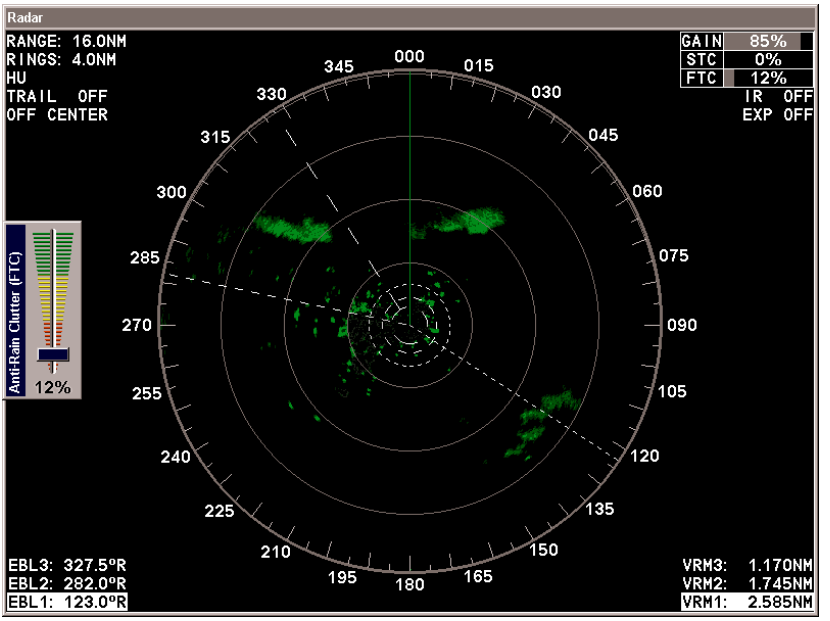
The following five figures show how boosting the FTC level can cut through display clutter caused by rain or snow. Note how these areas of intense rainfall gradually grow fainter as FTC increases.



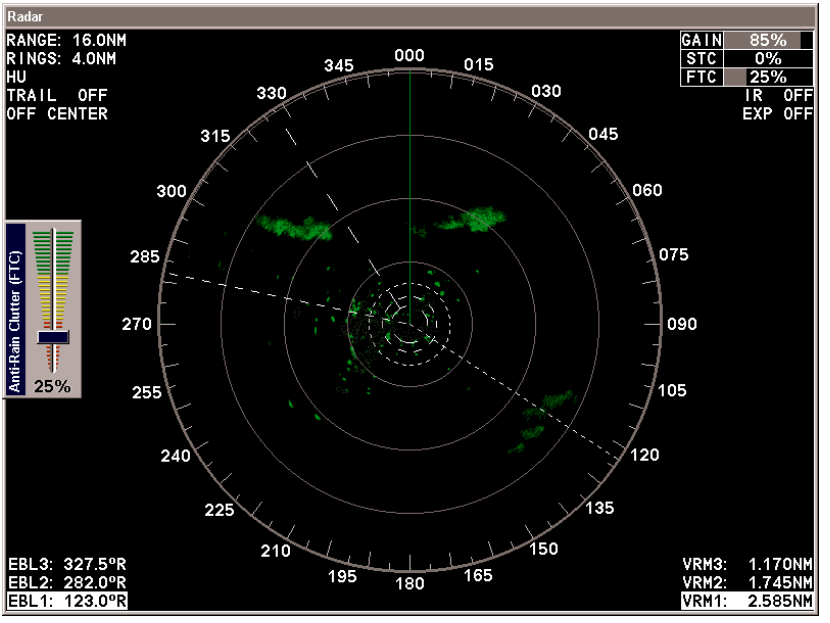

**Anti-Rain Clutter (FTC) fig. 1. FTC set to zero. In these examples, we are using a color mode other than default full-color.**

**WARNING:**

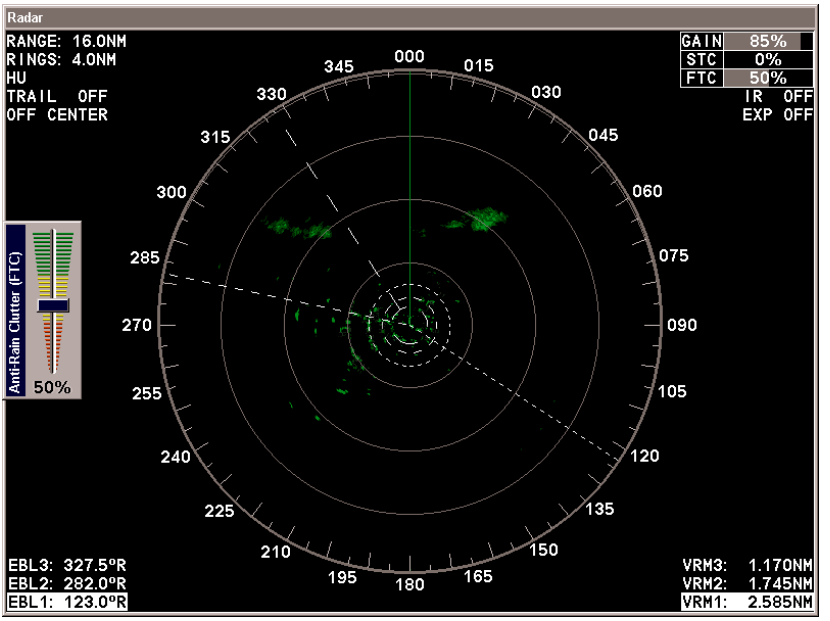
**Increasing FTC may reduce or eliminate weak echoes, like those from small vessels. Use only the minimum amount needed, then check back periodically to see if the FTC level may be decreased or turned off.**



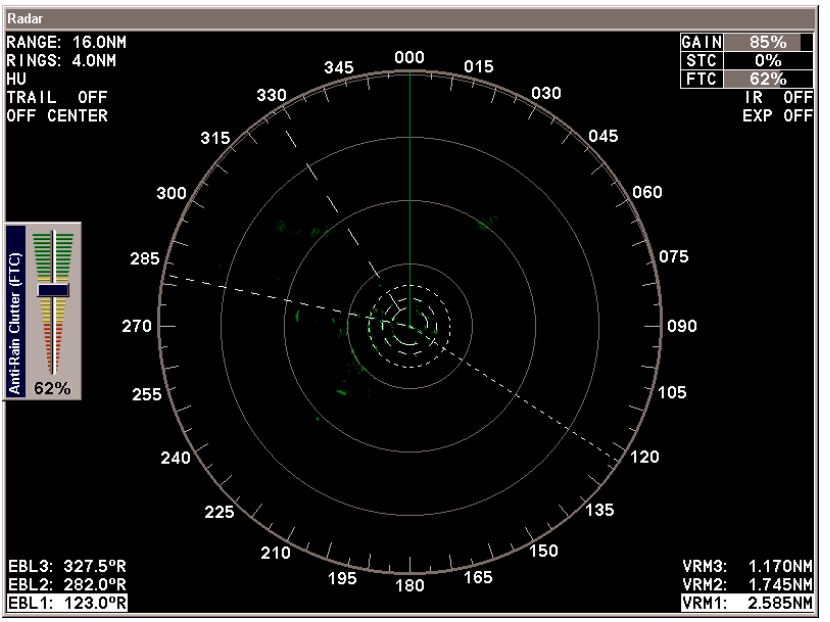

**Anti-Rain Clutter (FTC) fig. 2. FTC set to 12%**




**Anti-Rain Clutter (FTC) fig. 3. FTC set to 25 %.**



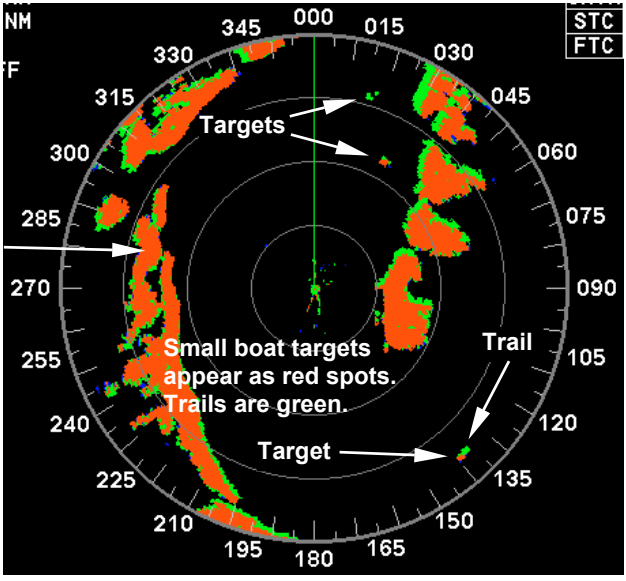

**Anti-Rain Clutter (FTC) fig. 4. FTC set to 50%.**



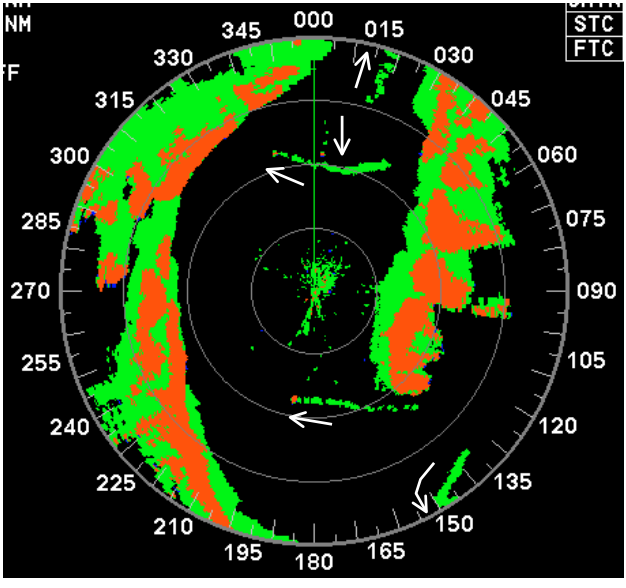

**Anti-Rain Clutter (FTC) fig. 5. FTC set to 62%.**
**The rain has virtually disappeared from the screen.**

## Echo Trails

This four-figure sequence shows how Echo Trails tracks target movement over time. The boat is stationary. Several boats will be trailed. Color mode is default. Echo Trail update interval set to 30 seconds.

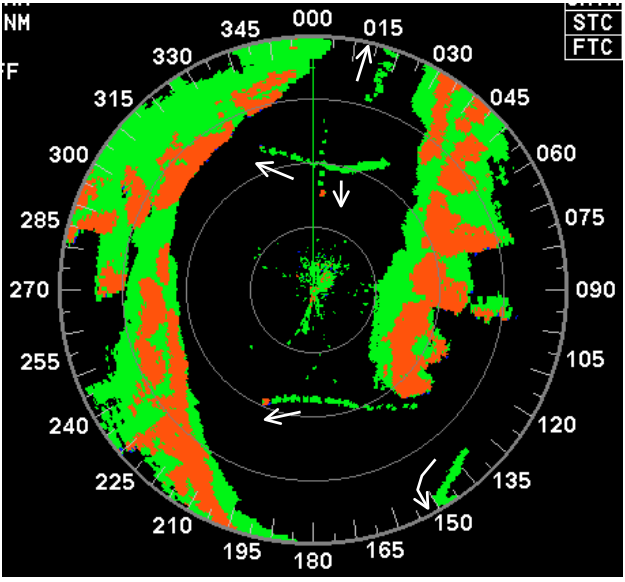



**Echo Trails fig. 1. Elapsed time = zero.**

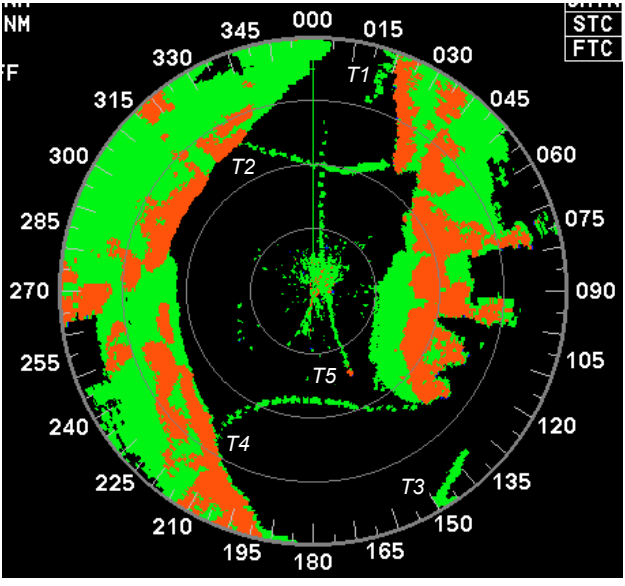



**Echo Trails fig. 2. Elapsed time = 5 seconds. Arrows show travel direction.**

In fig. 3, note the target off the bow approaching at high speed from the north. The "dotted" trail indicates higher speed than targets with more solid trails. Be alert; this boat is a collision risk.

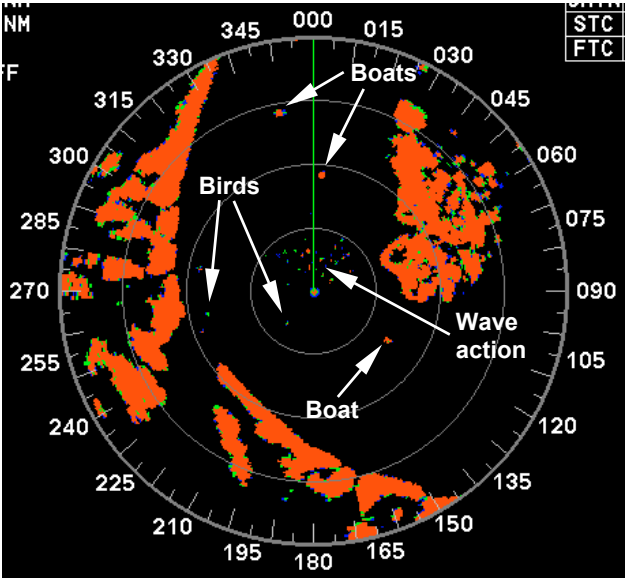



**Echo Trails fig. 3. Elapsed time = 8 seconds.**

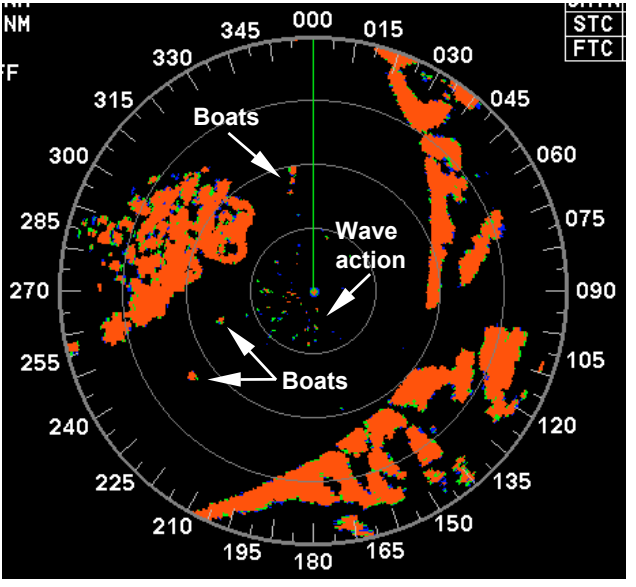



**Echo Trails fig. 4. Elapsed time = 12 seconds. Target 5 veered by your starboard side and is now astern. Targets 1-4 reached port or left the area.**

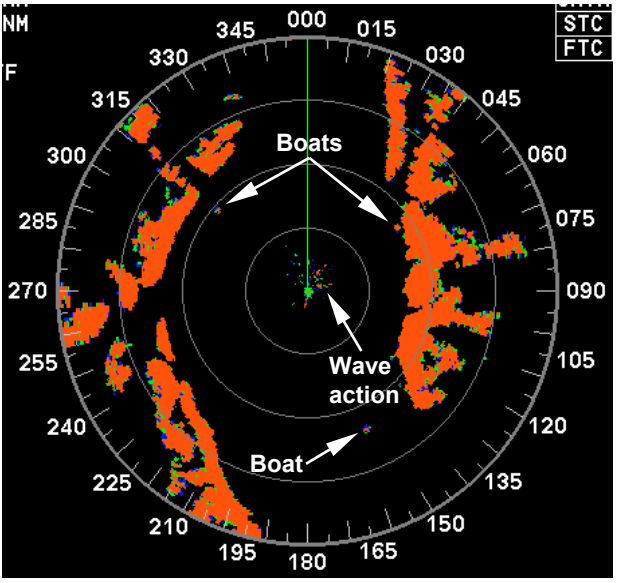
## Typical Small Boat Targets



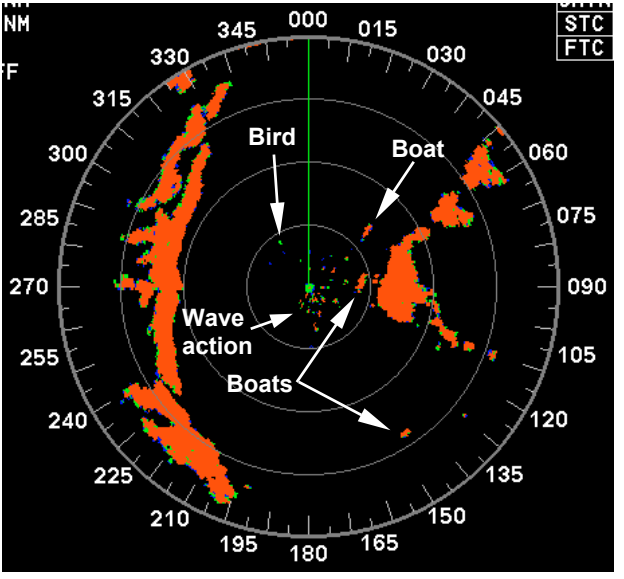

**Small boat targets fig. 1. Bow is headed into the wind. Here, boats appear as larger red targets. Birds are smaller green targets.**




**Small boat targets fig. 2. Boat has turned, with the wind (and wave clutter) off port quarter.**




**Small boat targets fig. 3. Landmasses return a strong echo and thus appear red in default color mode.**

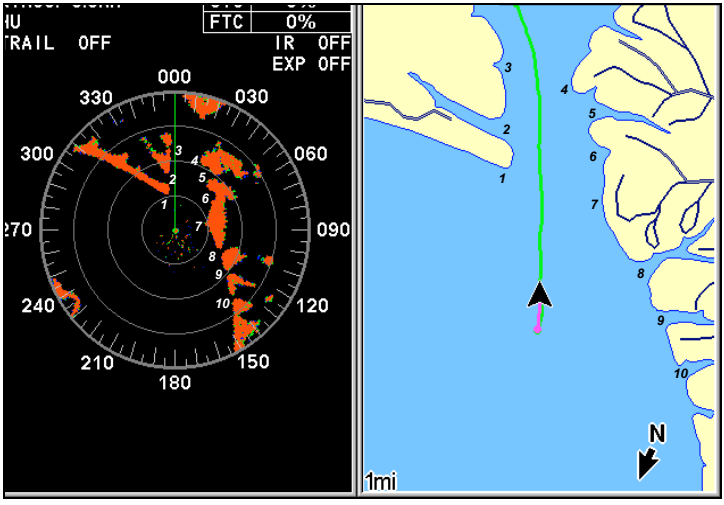



**Small boat targets fig. 4. Three targets, with one boat just offshore.**

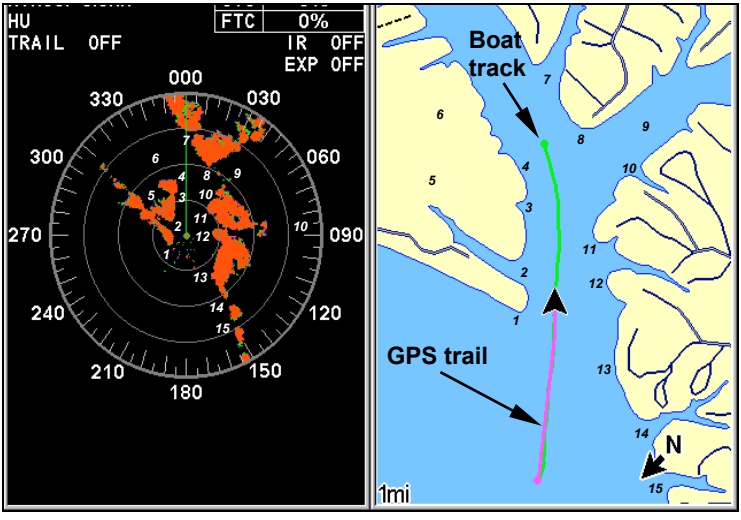
## Shoreline Images

This sequence illustrates a boat entering a channel. The green line is the track the vessel will take. The magenta line from the stern is a GPS trail. Study these radar returns with their corresponding maps and you'll get a feel for how radar displays a shoreline. This channel is surrounded by steeply sloping, rocky hills. Radar signals are strictly line-of-sight, so this causes land further inland to show no return.

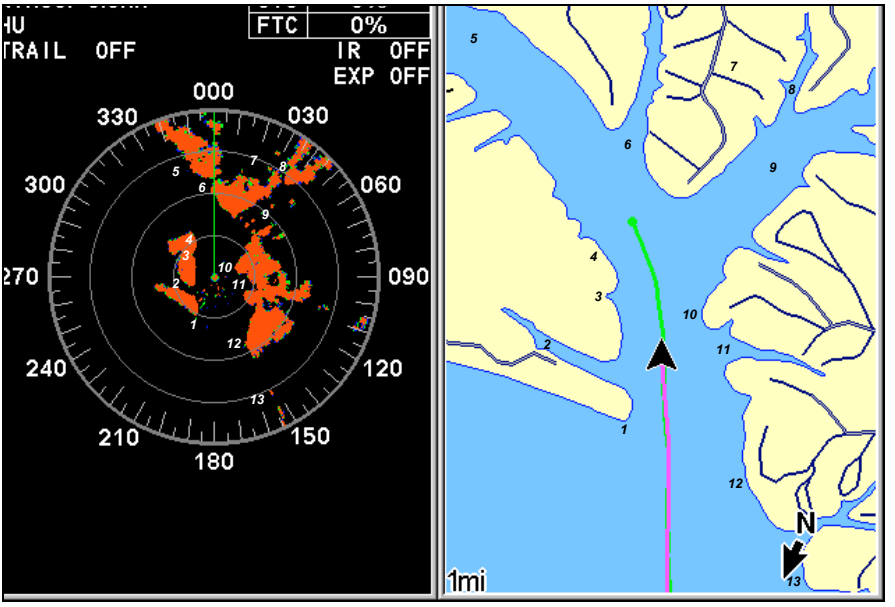
Numbered features on the radar correspond to the same position number on the map.



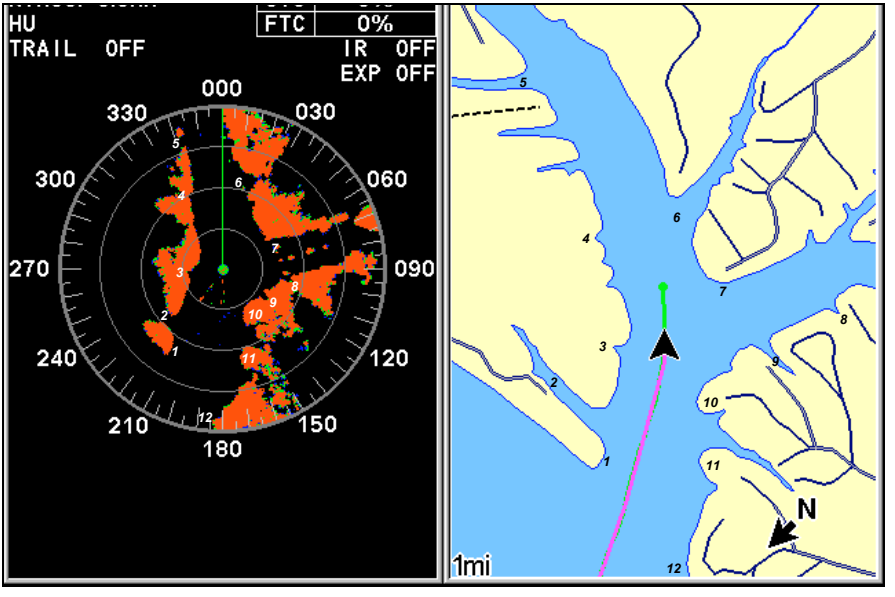

**Shoreline fig. 1.**




**Shoreline fig. 2.**




**Shoreline fig. 3.**




**Shoreline fig. 4.**

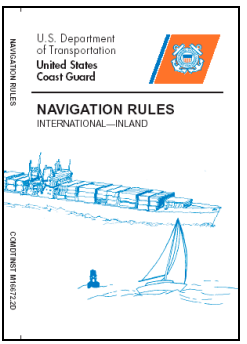
## Recommended Reading

For additional instruction check out these two books and a U.S. government manual:

*The Radar Book: Effective Navigation and Collision Avoidance*, by Kevin Monahan. ISBN 1-932310-05-3, 235 pages, paperback. Published in 2003 by FineEdge.com LLC, 14004 Biz Point Lane, Anacortes, WA 98221 USA.

*Radar for Mariners*, by David F. Burch. ISBN 0-07-139867-8, 248 pages, paperback, includes CD-ROM with a radar simulator and other radar resources. Published in 2005 by The McGraw-Hill Co. To order, write Customer Service Dept., P.O. Box 547, Blacklick, OH 43004 USA.

*Navigation Rules, International-Inland*, by the United States Coast Guard. COMDTINST M16672.2D; ISBN 0-16-050057-5, 229 pages. Published in 1999 by U.S. Government Printing Office, Superintendent of Documents, Mail Stop SSOP, Washington, DC 20402-9328 USA.




**Navigation rules are for sale at U.S. government printing offices, or can be downloaded free from the U.S. Coast Guard web site.**

This manual contains the International Regulations for Prevention of Collisions at Sea, 1972 (72 COLREGS). It also contains the Inland Navigation Rules, which govern all inland U.S. waters. Several of these rules address the use of radar in collision avoidance.

The document is available free in PDF format at the Coast Guard's Navigation Center web site. Log-on to www.navcen.uscg.gov and click the Nav Rules link near the top of the page.

# Appendix I: Glossary

**Anti-Rain Clutter (FTC)**: used to reduce or eliminate massive number of small echoes that clutter the display during rain or snow storms.

**Anti-Sea Clutter (STC)**: lowers receiver sensitivity at shorter ranges to reduce or eliminate sea clutter echoes, which are most prevalent around the vessel.

**ARPA**: automatic radar plotting aid; **MARPA**: mini automatic radar plotting aid. **ARPA** allow you to monitor multiple targets, providing updates on the target's course and speed, then plotting them in vector format on the display. **MARPA** does the same thing, but can only monitor a small number of targets. These navigation aids usually are available in only North-Up stabilized mode.

**Beam**: focused rays of microwave energy

**Beam width**: measured in degrees, the width of a beam, both horizontally and vertically.

**Clutter**: undesirable echoes created by rain, snow, waves and other intermittent causes.

**Course Up**: a mode in which the direction travel is represented at the top of the radar display.

**EBL (Electronic Bearing Line)**: A radial line that can be rotated 360º, the electronic bearing line is used to monitor the bearing of a radar target in relation to your location.

**Echo**: reflected radio frequency pulse picked up by radar. It is also another name for a target image detected on the radar display.

**Echo trail**: a history (trail) of the echoes for a particular radar target.

**Gain**: used to adjust the sensitivity of the receiver to increase or decrease the intensity of images on the display.

**Ghost Echo**: an undesirable image created when returns are reflected off other structures.

**Guard Zone**: an area selected by the radar user, that when activated, will sound an alarm if any echo passes into the zone.

**Heading Flash**: the green line on the radar display that shows the direction you are heading.

**Heading Line Adjustment:** the Heading Line is used to make sure the green heading line (zero point) on your radar display is lined up the bow of your vessel.

**Heading Up**: when your heading is displayed at the top of the screen, you are in Heading Up mode.

**Interference Rejection**: filters out signals from other radars close to your location.

**North Up**: when North is set at the top of the radar display, you are in North Up mode.

**Offset EBL**: an electronic bearing line originating from a location other than the PPI sweep origin.

**Offset Mode:** moving the sweep origin (center of the PPI) to a location other than the center of the radar display.

**Open Array Antenna**: a radar antenna which has an external rotating scanner.

**PPI (Plan Position Indicator)**: The PPI provides a map-like representation of target echoes.

**Radar Overlay**: radar display images laid over an electronic chart.

**Radome**: a single housing containing a radar antenna and transceiver.

**Rain Clutter**: undesirable echoes caused by rain or snow.

**Range**: distance to a particular target.

**Range Rings**: fixed rings on the radar display designed to show the distance from the antenna.

**Sea Clutter**: undesirable returns caused by smaller waves and water movement.

**Standby**: radar mode that follows warm-up and precedes the start of transmission.

**Sweep Origin**: the origin of EBL and VRM, the sweep origin is located at the center of the PPI.

**Target**: an item picked up by a radar.

**Target Acquisition**: process of locking on and starting to track a target with an ARPA radar.

**Time Base**: line that rotates around the radar display, updating images on the display.

**Transmit Off Zone**: an area set up in the radar transmission path where the radar will not transmit a microwave pulse.

**Tuning**: intermediate frequency adjustment that enhances the performance of the radar.

**VRM (Variable Range Marker)**: a range ring used to measure the precise distance to a target, the variable range marker may be adjusted to measure any distance within the radar's range.

# FCC Compliance

This device complies with Part 15 and Part 80 of the U.S. Federal Communications Commission (FCC) Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

**Note:**
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 and part 80 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the factory customer service department for help.

## LOWRANCE ELECTRONICS
## FULL ONE-YEAR WARRANTY

"We," "our," or "us" refers to LOWRANCE ELECTRONICS, INC., the manufacturer of this product. "You" or "your" refers to the first person who purchases this product as a consumer item for personal, family or household use.

We warrant this product against defects or malfunctions in materials and workmanship, and against failure to conform to this product's written specifications, all for one (1) year from the date of original purchase by you. WE MAKE NO OTHER EXPRESS WARRANTY OR REPRESENTATION OF ANY KIND WHATSOEVER CONCERNING THIS PRODUCT. Your remedies under this warranty will be available so long as you can show in a reasonable manner that any defect or malfunction in materials or workmanship, or any non-conformity with the product's written specifications, occurred within one year from the date of your original purchase, which must be substantiated by a dated sales receipt or sales slip. Any such defect, malfunction, or non-conformity which occurs within one year from your original purchase date will either be repaired without charge or be replaced with a new product identical or reasonably equivalent to this product, at our option, within a reasonable time after our receipt of the product. If such defect, malfunction, or non-conformity remains after a reasonable number of attempts to repair by us, you may elect to obtain without charge a replacement of the product or a refund for the product. THIS REPAIR, OR REPLACEMENT OR REFUND (AS JUST DESCRIBED) IS THE EXCLUSIVE REMEDY AVAILABLE TO YOU AGAINST US FOR ANY DEFECT, MALFUNCTION, OR NON-CONFORMITY CONCERNING THE PRODUCT OR FOR ANY LOSS OR DAMAGE RESULTING FROM ANY OTHER CAUSE WHATSOEVER. WE WILL NOT UNDER ANY CIRCUMSTANCES BE LIABLE TO ANYONE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, OR OTHER INDIRECT DAMAGE OF ANY KIND.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty does NOT apply in the following circumstances: (1) when the product has been serviced or repaired by anyone other than us; (2) when the product has been connected, installed, combined, altered, adjusted, or handled in a manner other than according to the instructions furnished with the product; (3) when any serial number has been effaced, altered, or removed; or (4) when any defect, problem, loss, or damage has resulted from any accident, misuse, negligence, or carelessness, or from any failure to provide reasonable and necessary maintenance in accordance with the instructions of the owner's manual for the product.

We reserve the right to make changes or improvements in our products from time to time without incurring the obligation to install such improvements or changes on equipment or items previously manufactured.

This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

REMINDER: You must retain the sales slip or sales receipt proving the date of your original purchase in case warranty service is ever required.

**LOWRANCE ELECTRONICS**
**12000 E. SKELLY DRIVE, TULSA, OK 74128**
**(800) 324-1356**

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We back your investment in quality products with quick, expert service and genuine Lowrance parts. If you're in the United States and you have technical, return or repair questions, please contact the Factory Customer Service Department. Before any product can be returned, you must call customer service to determine if a return is necessary. Many times, customer service can resolve your problem over the phone without sending your product to the factory. To call us, use the following toll-free number:

**800-324-1356**

8 a.m. to 5 p.m. Central Standard Time, M-F

*Lowrance Electronics may find it necessary to change or end our shipping policies, regulations, and special offers at any time. We reserve the right to do so without notice.*

## ...in Canada:

If you're in Canada and you have technical, return or repair questions, please contact the Factory Customer Service Department. Before any product can be returned, you must call customer service to determine if a return is necessary. Many times, customer service can resolve your problem over the phone without sending your product to the factory. To call us, use the following toll-free number:

**800-661-3983**

**905-629-1614 (not toll-free)**

8 a.m. to 5 p.m. Eastern Standard Time, M-F

## ...outside Canada and the USA:

If you have technical, return or repair questions, contact the dealer in the country where you purchased your unit. To locate a dealer near you, visit our web site, www.lowrance.com and look for the Dealer Locator.

# Accessory Ordering Information for all countries

To order Lowrance accessories for your unit, please contact:

**1)** Your local marine dealer or consumer electronics store. Most quality dealers that handle marine electronic equipment or other consumer electronics should be able to assist you with these items.

To locate a Lowrance dealer near you, visit our web site, www.lowrance.com and look for the Dealer Locator. Or, you can consult your telephone directory for listings.

**2)** U.S. customers: LEI Extras Inc., PO Box 129, Catoosa, OK 74015-0129 Call 1-800-324-0045 or visit our web site www.lei-extras.com.

**3)** Canadian customers can write:
Lowrance/Eagle Canada, 919 Matheson Blvd. E. Mississauga, Ontario L4W2R7 or fax 905-629-3118.

# Shipping Information

If it becomes necessary to send a product for repair or replacement, you must first receive a return authorization number from Customer Service. Products shipped without a return authorization will not be accepted. When shipping, we recommend you do the following:

**1.** Please do not ship the knobs or mounting bracket with your unit.

**2.** If you are sending a check for repair, please place your check in an envelope and tape it to the unit.

**3.** For proper testing, include a brief note with the product describing the problem. Be sure to include your name, return shipping address and a daytime telephone number. An e-mail address is optional but useful.

**4.** Pack the unit in a suitable size box with packing material to prevent any damage during shipping.

**5.** Write the Return Authorization (RA) number on the outside of the box underneath your return address.

**6.** For your security, you may want to insure the package through your shipping courier. Lowrance does not assume responsibility for goods lost or damaged in transit.

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