

The background of the left side of the page features a large school of fish swimming in clear blue water. A white grid pattern, representing a sonar scan, is overlaid on the fish. The grid lines curve and warp as they move from left to right, illustrating the perspective of a sonar beam. The Furuno logo is positioned in the upper left corner of this graphic area.

**FURUNO®**

# **Sonar Tips**

Revised 2010

## ECHOSOUNDER vs SONAR

To understand what scanning sonar is, we must be sure of an echo sounder's function. In a typical echo sounder installation the transducer is fixed in one position and sends a sound beam downward at a 90-degree angle. The seabed and fish will send a reflected echo of sound back to the vessel. This reflection, or mechanical energy, is received back through the transducer, converted to electrical energy by the transducer, then amplified and displayed to the operator as target information. The first echo sounders recorded and displayed this target information on a paper graph. Later generations of sounders used flashers, Cathode Ray Tubes (CRT) video displays and today Liquid Crystal Displays (LCD) all showing seabed depth and fish targets.

The echo sounder's primary function is to give depth information, while the more sophisticated machines give excellent fish and ground discrimination. This information is vital in the fishing operation but is very limited because of the small area of search it provides. With sonar we have the ability to search around the vessel 360 degrees and tilt the sound beam from the seabed to the surface.

Furuno has three versions of sonar. The smallest is the Searchlight type, which uses a narrow sound beam that can be pointed (trained), in any desired direction. The largest is the Multi-beam Omni sonar; this sonar transmits a large area of sound energy and presents the received target information around the vessel all at once. The third type is Sector sonar, which is a mixture of the other two. It uses a Multi-beam transducer that can be trained in any direction.

The main reason for having sonar is its ability to search a wide area quicker than can be done with an echo sounder. Each of the three types of sonar has a different scan speed or time it takes to update its entire screen (360 degrees). On average, Searchlight sonar set to a range of 200m (600ft) will take 16 seconds to scan 360 degrees. Sector sonar updates every 5.4 seconds and Omni sonar in less than 2 seconds. The quicker sonar can update the information on the screen the easier it is for the operator to keep track of what is going on around the vessel. The scan speed or update rate will also coincide with the price tag of a sonar, with the quicker updating Omni being the most expensive and the Searchlight sonar being the least expensive.

All of the Furuno sonar models use an audio circuit giving the operator sound information from the various targets. Simply stated, the stronger the echo, the louder the sound. With the audio, the operator is allowed more free time to tend to the many other tasks in the fishing operation, since he doesn't have to watch the screen continuously. The more experienced sonar operators can pick out the various pitches of sound that represent different echo types.

While it may seem that sonar is the perfect answer for locating underwater objects of all sorts, sonar can only be an aid to you. Your experience and fishing ground knowledge are the vital ingredients to properly utilize the sonar information. For instance, if you know fish will be at a certain place during a particular time, you would use your GPS to travel to that location, and then use the sonar and echo sounder to find and identify the fish. When the fish are not visually present and the best spots are fished out, then a sonar can help increase your chances of a successful trip. PRACTICE using your sonar, it will greatly increase the knowledge you already have.

## Getting started

Congratulations on your purchase of a Furuno sonar. If you have used sonar before you probably already understand just how powerful a tool it can be. But like any other of your onboard tools (Radar, GPS, Fish finder, etc) initially there is a brief learning curve to go through.

This booklet contains some helpful information to start you pinging. The best way to get started is right at the dock. Here you can learn how easily your sonar will display a target. Unlike radar where you have the added benefit of seeing a target with your eyes and then being able to compare it to a target on the radar screen, with sonar you usually will not have that luxury (unless the target is floating on or near the surface). So while at the dock lower the soundome and take a look around you. What can you see? Piling, rows of docks, the breakwater or does the sonar screen look like a colorful blob? If it is the latter, let's spend a little time now to learn how to fine-tune and clean up the picture.

First set the sonar on the 200ft Range, 0 degree tilt, front panel Gain to 3 and scan 360 degrees. Since you are at the dock and probably in fairly shallow water, reset the sonar's output power to minimum and the pulse length to short. To do this press the MENU key and use the cursor to highlight the COM 1 menu. Use the arrow keys on the cursor pad to highlight and change the OUTPUT POWER from high to low and the PULSE LENGTH from long to short. **REMEMBER TO RESET THESE LEVELS TO HIGH AND LONG BEFORE YOU LEAVE THE DOCK.** Press the MENU key again to clear the menu from the screen. Watch the sonar display as the pulse length and power is lowered; after a few sweeps you should see much less red in the sonar picture. These next steps will be the most critical in the fine-tuning process; they are the GAIN, TVG and CLUTTER settings. The front panel Gain control sets the total system gain for the sonar and the two TVG controls (LEVEL and DISTANCE) are used to reduce short-range clutter. The rule-of-thumb on the TVG controls is "Less is more" or the lower the TVG settings the more short-range targets you will see. TVG stands for "Time Varied Gain" and acts the same as STC "Sensitively Time Constant" on your radar. To find these controls press the MENU key and use the cursor to highlight HORZ. Use the cursor pad to highlight and change both the TVG LEVEL and DISTANCE settings to "0". Once this is done press the MENU key to hide the menu. What happened to the targets on the sonar screen? Now turn both of the TVG controls to "9" to see what effect they have. With this high of TVG setting you probably have very few (if any) targets left on the screen. Now gradually lower the TVG levels and watch the targets as they return. Normally the TVG controls will end up with a setting of between 1-4. How are the targets now?

Now that you have cleaned up the screen with the TVG controls let see what effect the CLUTTER control has. Again as with the TVG settings "Less is more". Press the MENU key and find the CLUTTER control under the HORZ column. Use the cursor keys to set the CLUTTER at 0 and press the MENU key to look at the sonar display. Note the amount of blues and greens that are being displayed. Now press the MENU key again and set the CLUTTER to 3 and press the MENU key. See how most of the blues and green have been deleted from the sonar display leaving the harder orange and red targets? Normally once you find a good CLUTTER setting you will rarely need to change it.

Ok, were you able to fine-tune the sonar so you could see your current underwater surroundings? Great if not give me a call and we can walk through the controls again. If you were successful you are ready for the next step, using the sonar in open waters. Remember to use your sonar in conjunction with your echo sounder. When you see a target on the sonar, steer towards that target and confirm what you saw with the sonar on your echo sounder.

Hopefully this introduction will start you off in the right direction but if you should have any questions please give me a call. Good fishing.

Steve Bradburn  
Furuno USA  
Office 206-706-4093

# What to look for.

Now that you have a good idea of what settings to use, what are you supposed to be looking for?

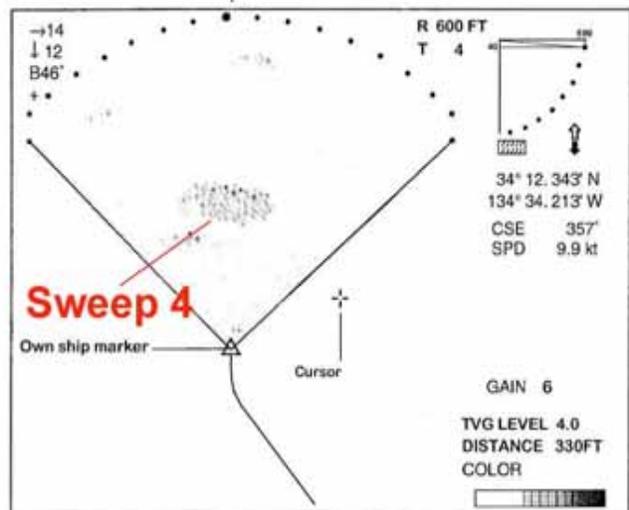
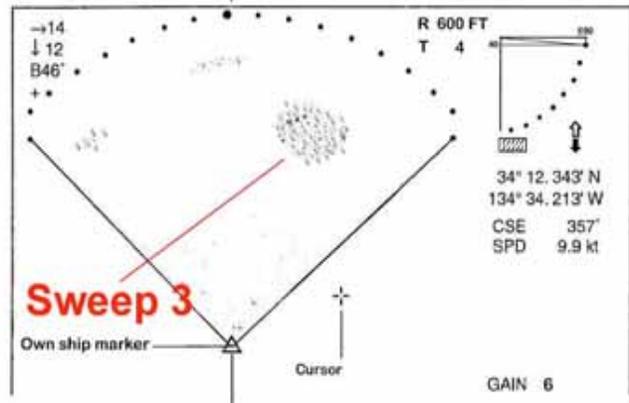
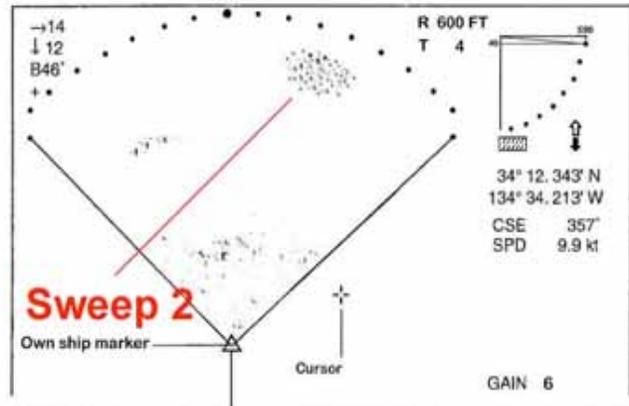
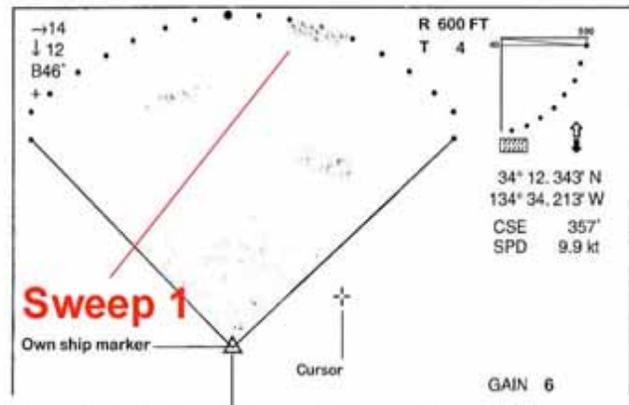
## For Fishing

You want to look for targets that are repeatable in roughly the same location or relative heading. Once you have painted a target 2 or 3 times it is worth turning your vessel and driving over it. This way can confirm what you have seen and get a more detailed look with your echo sounder.

## For Navigation

The opposite technique is applied to these targets when navigating. These type of targets are pretty shallow and you will need to steer away from them or risk grounding your vessel.

**Remember  
Fishing--Steer to  
Navigation--Steer away**

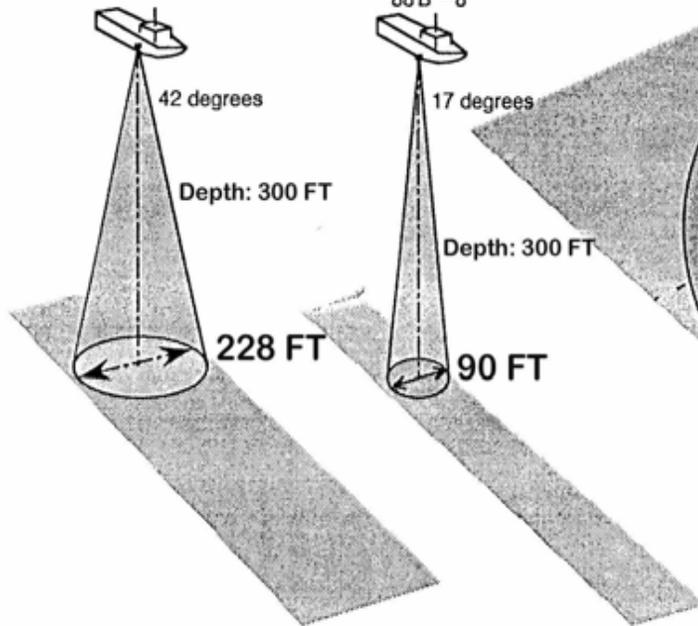


## Difference of detectable area between fish finder and sonar

### ● Fish Finder

Example

50 kHz  
50B-6

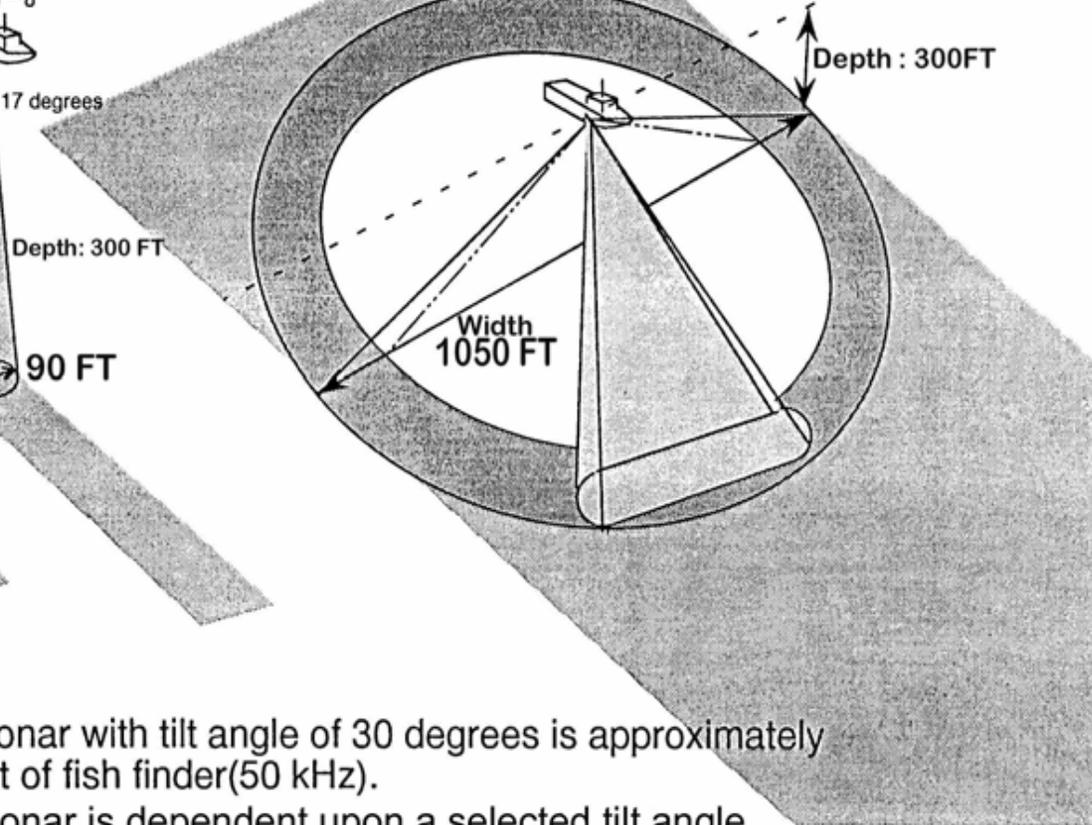


### ● Scanning Sonar and multi-sector sonar

Example: when tilt angle is 30 degrees,

Example

88 kHz  
88B-8

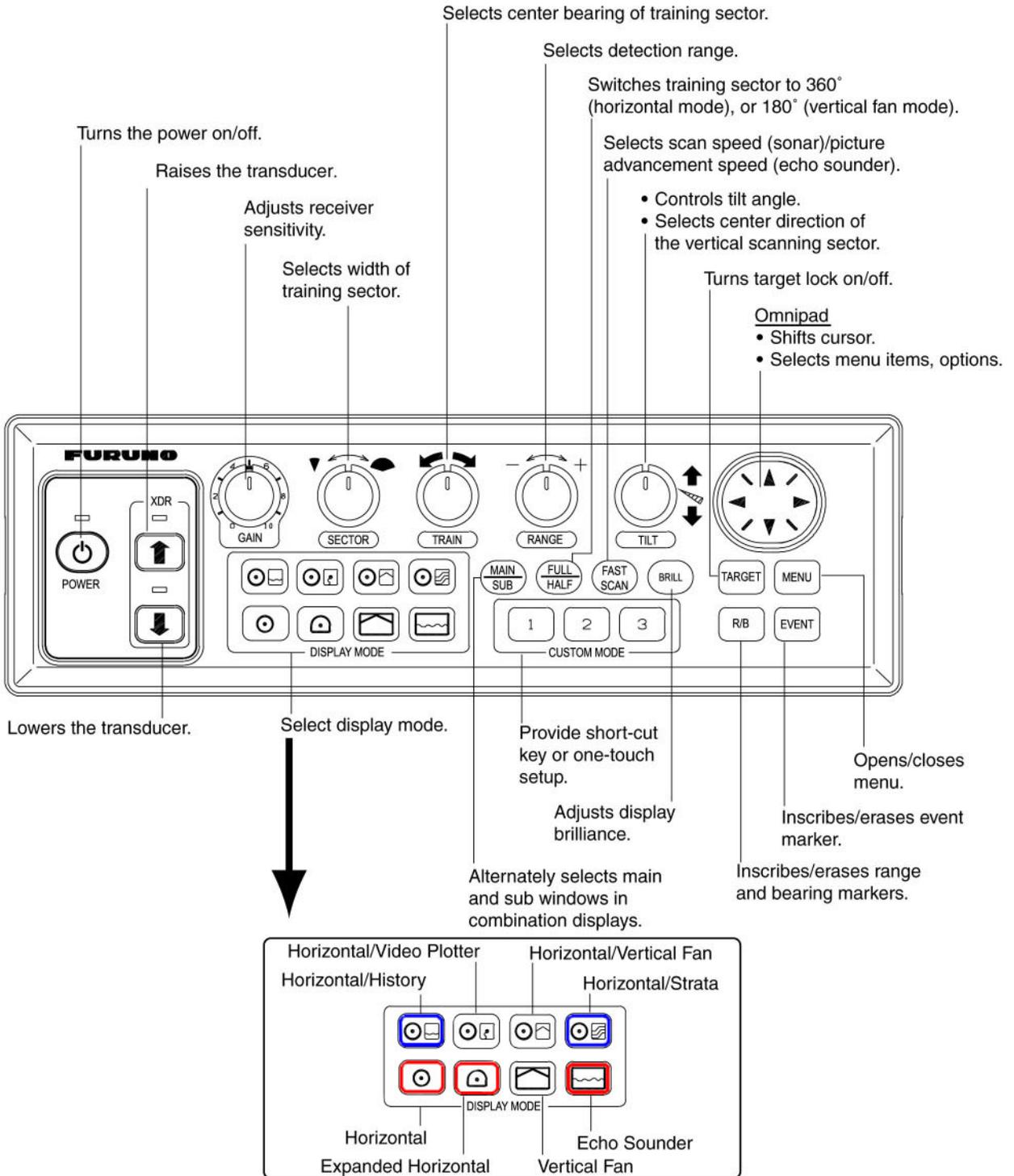


The detectable area of sonar with tilt angle of 30 degrees is approximately 4.6 times wider than that of fish finder(50 kHz).

The detectable area of sonar is dependent upon a selected tilt angle.

# CH-250/270 OPERATIONAL OVERVIEW

## Control Description

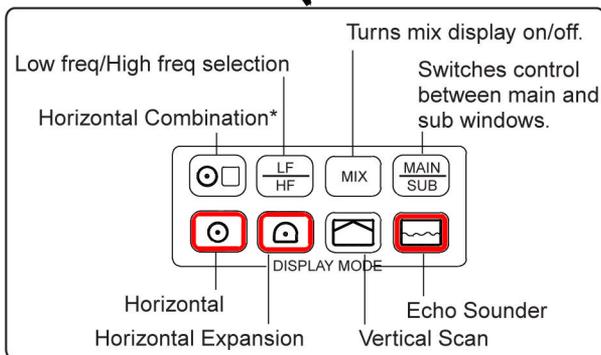
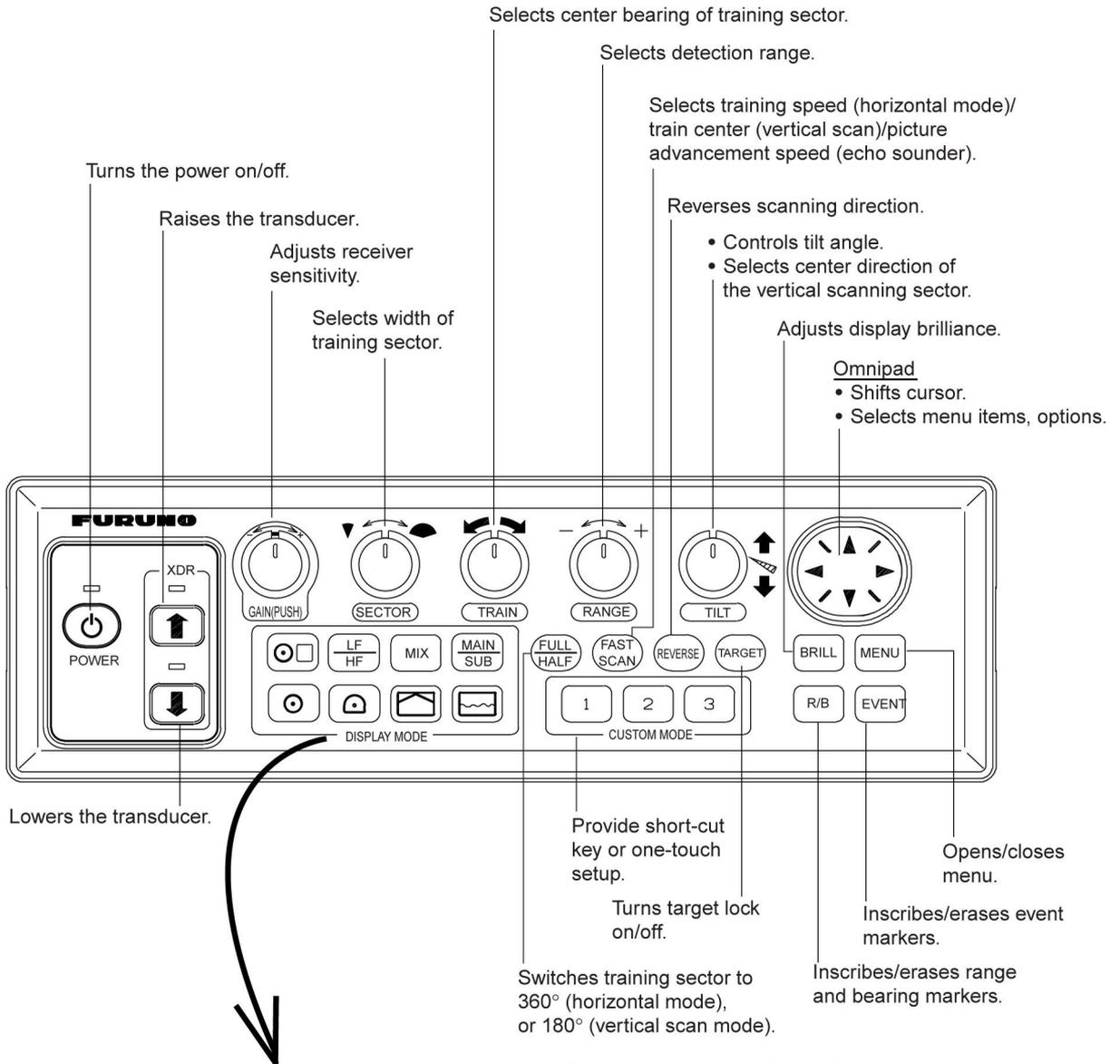


**The commonly used Displays will be the Horizontal, Expanded Horizontal and Echo Sounder.**

**The Horizontal/History and Horizontal/Strata are the least used.**

# CH-300 OPERATIONAL OVERVIEW

## Control Description



**The most commonly used Displays will be the Horizontal, Expanded Horizontal and Echo Sounder.**

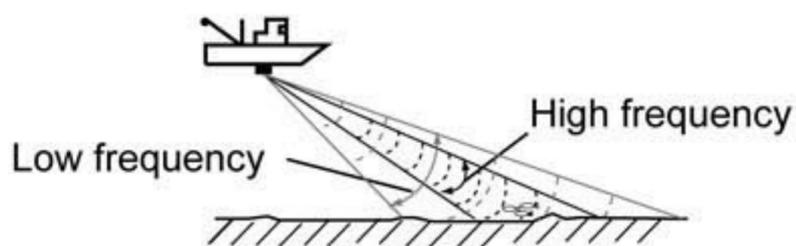
\* Horizontal/History, Horizontal/Vertical scan, Horizontal/Vertical zoom, Horizontal/Video plotter

# CH-300 Choosing a Frequency

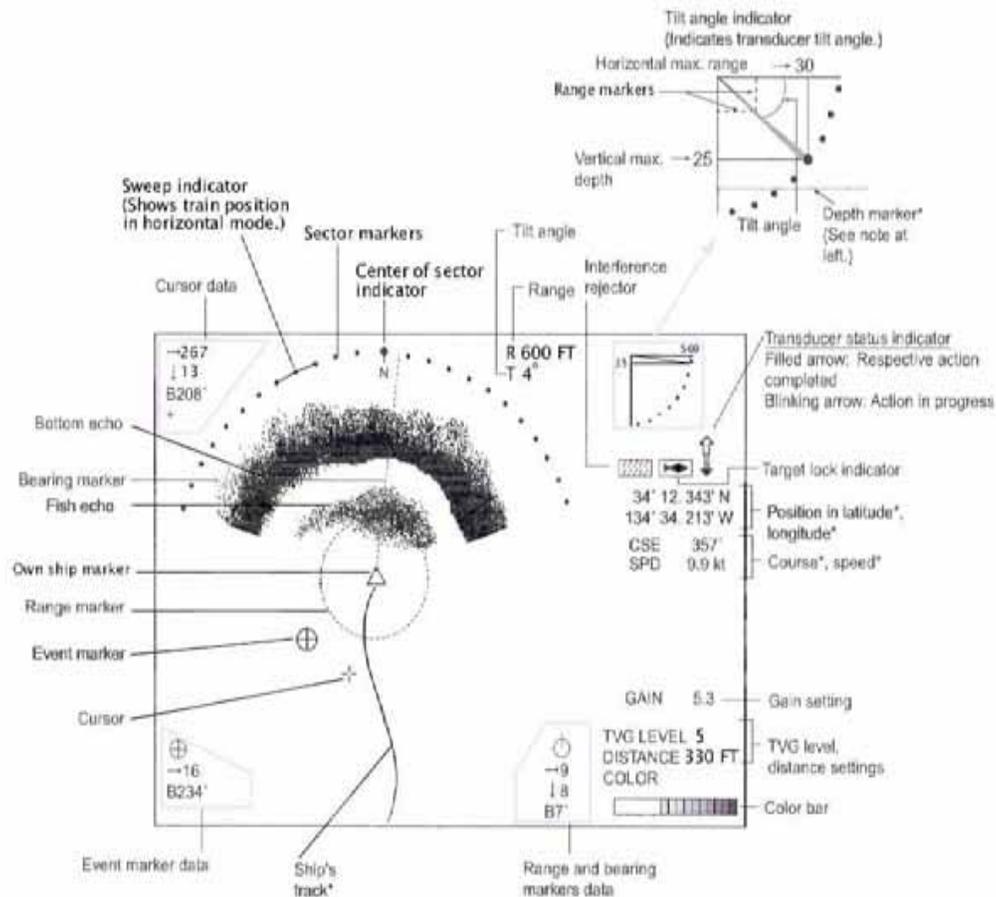
You may choose low frequency or high frequency, with the **LF/HF** key. The display shows HI or LO at the top of the screen depending on your selection. Use the table below to determine which frequency to use.

Item	Low Frequency 60-85Khz	High Frequency 153-215Khz
Long-range detection	<b>PREFERABLE</b> Attenuation loss is small on low frequency.	<b>NOT RECOMMENDED</b> Attenuation loss is great on high frequency.
Use in shallow waters	<b>NOT RECOMMENDED</b> Bottom echo is prominent because of wide beam width so fish echoes are hidden.	<b>PREFERABLE</b> Bottom echo is less prominent because of narrow beam width so fish echoes are easy to find.
Detection range	<b>PREFERABLE</b> Detection area is wide (beam width is wide).	<b>NOT RECOMMENDED</b> Detection area is narrow (beam width is narrow).
Detection of bottom fish	<b>NOT RECOMMENDED</b> Fish echo and bottom echo overlap. (Wide beam width)	<b>PREFERABLE</b> Fish echo and bottom echo are displayed separately. (Narrow beam width)
Detection of bait fish	<b>NOT RECOMMENDED</b> Not suited for this purpose. (Bait fish are not easily detected with low frequency.)	<b>PREFERABLE</b> Well suited for this purpose. (Bait fish are more easily detected with high frequency.)
Affected by air bubbles from other vessels	<b>NOT RECOMMENDED</b> Low frequency is easily interfered by cavitation from other vessels.	<b>PREFERABLE</b> High frequency is not easily interfered by cavitation from other vessels.

The dual-frequency display is useful for comparing the picture from one frequency against the other to overcome deficiencies in both. Use the single-frequency for objective-specific fishing.



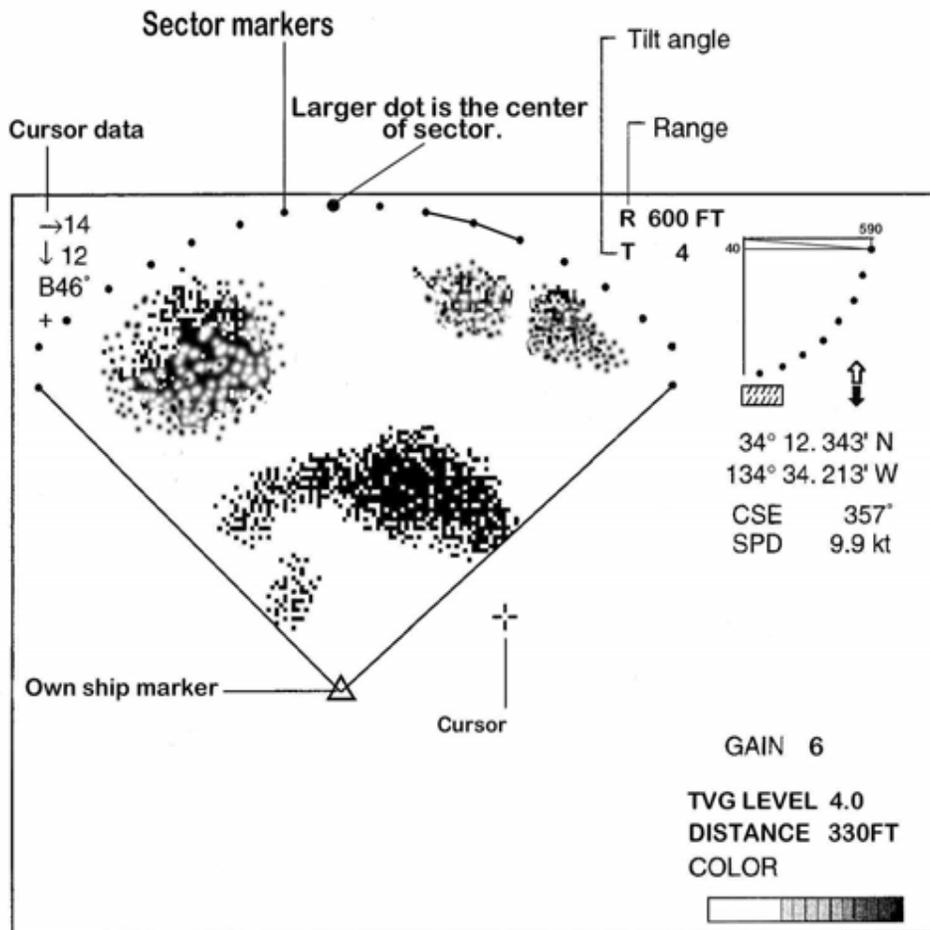
## Typical Horizontal Mode Display



When searching for fish in the Horizontal Display Mode, the most efficient sector widths are 144 and 120 degrees.

# Enlarge fish echoes by using the Expanded Horizontal Display.

When using this mode it is best to scan a Sector of 96 degrees.



# MENU OPERATION

## COM1 Menu

### Displaying the COM1 menu

1. Press the [MENU] key to open the menu.
2. Press ▲ to choose MENU, and then press ◀ to choose COM1.

MENU	COM1	COM2	HORZ	VERT	ES	PRESET	SYS
TX POWER	MAX						
PULSELENGTH	LONG						
TX RATE	10						
INT REJECT	OFF						
AGC	OFF						
AUDIO LEVEL	0						

▲▼ : SELECT ◀▶ : CHANGE MENU: END

*COM1 menu*

### COM1 menu description

**TX POWER:** Chooses transmitter output power to maximum or minimum.

**PULSELENGTH:** Chooses pulselength to short or long.

**TX RATE:** The Tx rate may be set between 1-10 in the case of the internal transmitter, or an external synchronous signal may be used. The higher the number the greater the number of transmissions. For operation in shallow waters, choose the Tx rate which displays the second reflection from the bottom between the sea surface and bottom. For use of an external video sounder or sonar, choose EXT.

**INT REJECT:** Turns the interference rejector on or off.

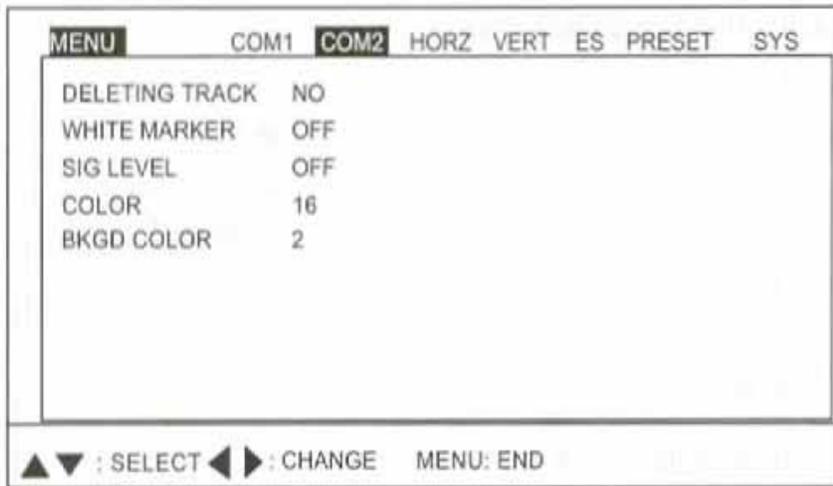
**AGC:** Automatically lowers sensitivity against strong echoes (such as those from the bottom and large fish schools) to emphasize weak echoes such as those from fish close to the bottom.

**AUDIO LEVEL:** Adjust the volume of the optional speaker.

## COM2 Menu

### Displaying the COM2 menu

1. Press the [MENU] key to open the menu.
2. Press ▲ to choose MENU, and then press ◀ or ▶ to choose COM2.



*COM2 menu*

### COM2 menu description

**DELETING TRACK:** Choose ON to delete all ship's track (from horizontal and horizontal/video plotter displays).

**WHITE MARKER:** Displays desired echo in white. It is useful for discriminating bottom fish from the bottom echo. The setting range for the 8-color display is OFF, 1-7, and for the 16-color display, OFF, 1-15.

**SIG LEVEL:** Refer to page 2-17.

**COLOR:** Chooses 8- or 16-color display.

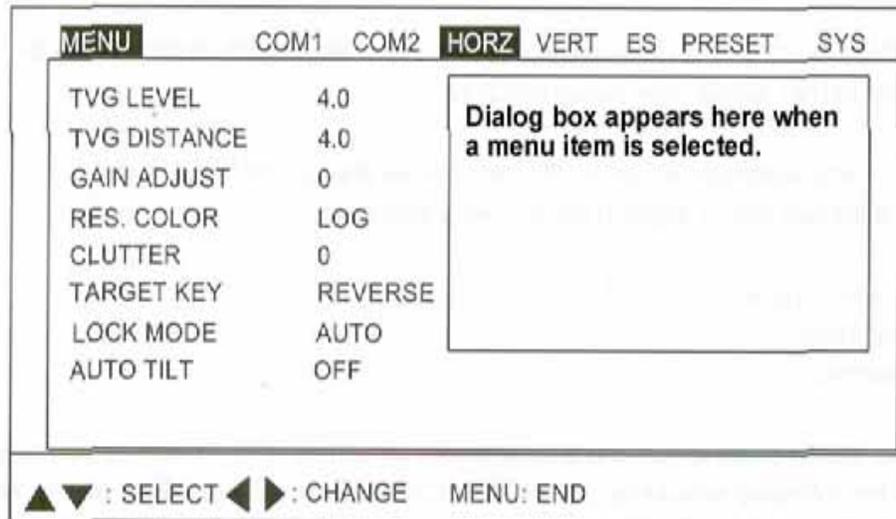
**BKGD COLOR:** Chooses color of background, text and menu. Three choices are available and these are shown in the table below.

BKGD COLOR	Background	Text	Menu
1	Black	Gray	Dark-blue
2	Dark-blue	White	Medium blue
3	White	Black	Gray

## Horizontal Menu Overview

This section presents an overview of the items on the HORZ menu.

1. Press the [MENU] key to open the menu.
2. Press ▲ to choose MENU and then press ◀ or ▶ to choose the HORZ menu.



*HORZ menu*

### Horizontal menu description

**TVG LEVEL:** Compensates for propagation loss of sound in water.

**TVG DISTANCE:** Sets distance at which TVG works.

**GAIN ADJUST:** Adjust the gain here when there is disparity in gain level between the main and sub windows.

**RES. COLOR:** Sets transfer characteristics of input signal level versus display echo level. Echo strength is emphasized in order of CUBE, SQUARE, LINEAR, LOG, and you can observe the characteristics of each by watching the color bar as you change the setting.

**LOG:** Displays weak to strong echoes in their respective levels. This is the default setting, and is suitable for general use.

**LINEAR:** Downplays the weak echoes when compared with LOG. Effective for suppressing weak echoes such as plankton.

**SQUARE:** Strong echoes are emphasized more than in LINEAR.

**CUBE:** Strong echoes are emphasized even more than in SQUARE.

## HORIZONTAL MODE

**CLUTTER:** Low intensity echoes, often caused by sediments in water, are painted on the screen as a large number or random dots. This noise can be suppressed. The higher the number (setting) the weaker the echoes which are erased.

**TARGET KEY:** Chooses target lock function among reverse, position and echo.

**LOCK MODE:** Chooses how to track fish echo in "echo" target lock, automatically or manually.

**AUTO TILT:** Turns automatic tilt on or off. The choices are  $\pm 2^\circ$ ,  $\pm 4^\circ$ ,  $\pm 6^\circ$ , and  $\pm 10^\circ$ . Automatic tilt adjusts the tilt angle in the following sequence:

$B \rightarrow (B-A) \rightarrow B \rightarrow (B+A) \rightarrow B \rightarrow (B-A) \rightarrow B \rightarrow (B+A) \dots$

B: Current tilt angle

A: Auto tilt setting

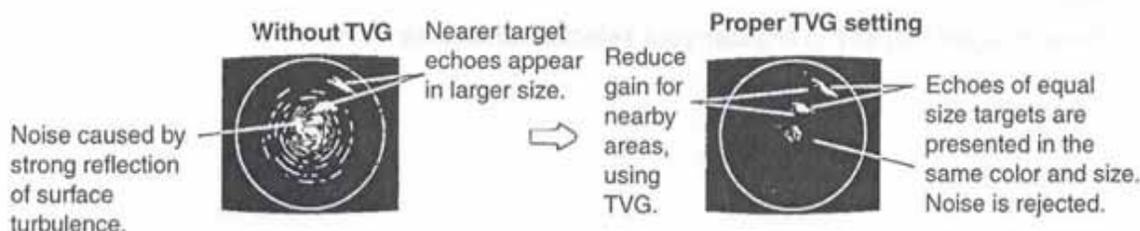
For example, the tilt angle is  $30^\circ$  and the automatic tilt setting is  $4^\circ$ . Then, the tilt angle is changed in the following sequence:  $30^\circ \rightarrow 26^\circ \rightarrow 30^\circ \rightarrow 34^\circ \rightarrow 30^\circ \rightarrow 26^\circ \rightarrow 30^\circ \rightarrow 34^\circ \dots$



## Displaying weak echoes clearly

Echoes from targets (such as the bottom or a fish) return to the transducer in order of the distance to them, and when their intensities are compared at the transducer face, those from nearer targets are generally stronger when their reflecting properties are nearly equal. The sonar operator will be quite inconvenienced if these echoes are directly displayed on the screen, since he won't be able to judge the actual size of the target from the size of echoes displayed on the screen. To overcome this inconvenience, use the TVG function. It compensates for propagation loss of sound in water: amplification of echoes on short range is suppressed and gradually increased as range increases, so that similar targets are displayed in similar intensities irrespective of the ranges to them.

The TVG also functions to suppress unwanted echoes and noise which appear in a certain range area on the screen.



*How TVG works*

**NOTE: Excessive TVG may eliminate short-range echoes.**

### To adjust TVG:

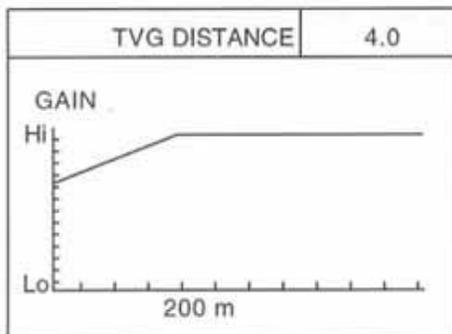
1. Press the [MENU] key to open the menu.
2. Press ▲ to choose MENU and then press ◀ or ▶ to choose HORZ.

MENU	COM1	COM2	HORZ	VERT	ES	PRESET	SYS
TVG LEVEL	4.0		Suggested settings between 2 and 5				
TVG DISTANCE	4.0		Suggested settings between 1.5 and 3.5				
GAIN ADJUST	0						
RES. COLOR	LOG						
CLUTTER	0						
TARGET KEY	REVERSE						
LOCK MODE	AUTO						
AUTO TILT	OFF						

▲▼ : SELECT ◀▶ : CHANGE MENU: END

*HORZ menu*

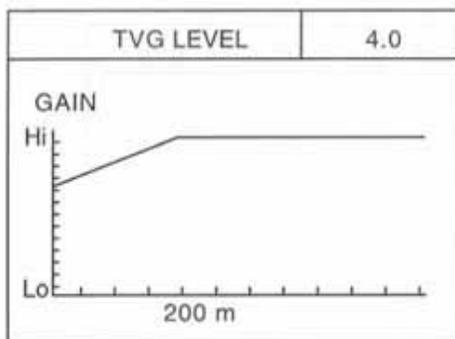
- Press ▲ or ▼ to choose TVG DISTANCE and then press ►. The following dialog box appears.



- Press ◀ or ▶ to set TVG distance between **1.5 and 3.5 (130-520ft)** to decrease amplification of echoes on short range. As a general rule, use a higher setting for low frequency transducer; a lower setting for high frequency transducer. The larger the figure the greater the distance at which TVG works. When you change a TVG setting (DISTANCE or LEVEL), the TVG line changes from solid to dashed; the solid line denotes current TVG setting.

TVG Distance Setting	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	....	10.0
Meters	3	8	20	40	60	100	130	160	200	250	320	....	1000
Feet	10	30	70	130	210	330	410	520	660	820	1040		3280
Passi/braza	2	5	10	20	40	60	80	100	120	150	180		600
Fathoms	2	5	10	20	40	60	80	100	110	140	170		550

- Press the [MENU] key to register your selection and close the menu.
- To suppress reflections from the sea surface or plankton, choose TVG LEVEL and then press ►.

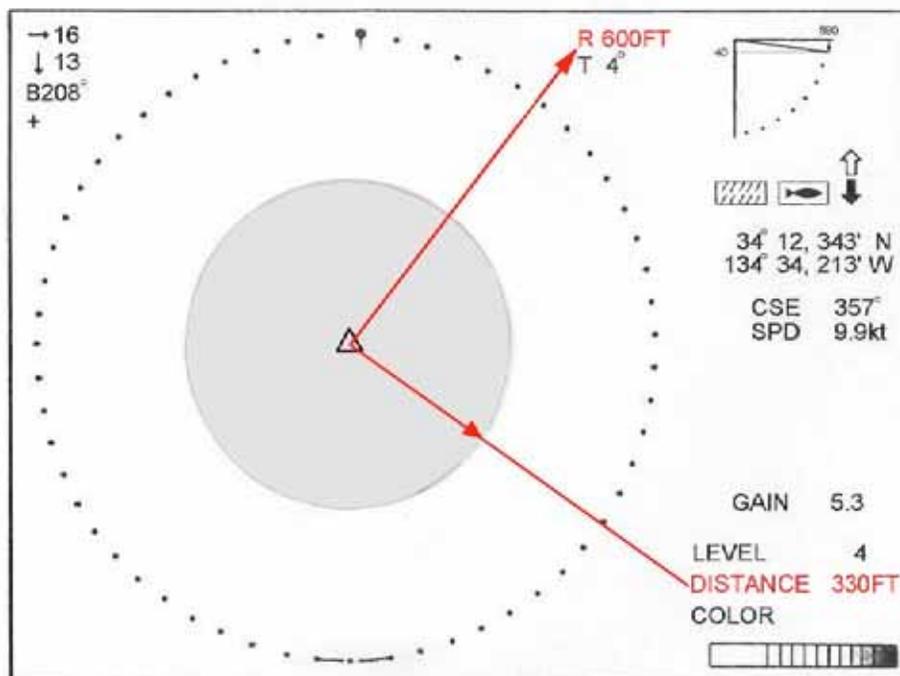


- Press ◀ or ▶ to adjust TVG LEVEL, considering sea conditions. The setting range is 0 to 10, however a setting between **2.0 and 5.0** should provide satisfactory results. The higher the figure the less the gain over distance.
- Press the [MENU] key to register your selection and close the menu.

Watch a distant fish echo which is approaching own ship. Observe the color of the fish echo while adjusting tilt angle so the fish echo is within the sounding beam. If the color and size of the echo stay the same as the echo approaches own ship, the TVG setting is proper. If the echo suddenly becomes smaller, the TVG level may be too high.

## TVG (Time Varied Gain)

The TVG controls help suppress unwanted echoes and noise which appears in a certain range area on the screen.



The sonar's TVG controls work in the same manner as your radar's Sea Clutter control does. The higher it's set the more targets it will suppress. If the TVG levels are set too high they can override the front panel gain control.

**Suggestion: Try to keep the TVG distance setting about half the sonar range.**

### 3.11.5 Suppressing clutter

Low intensity echoes, often caused by sediments in water, are painted on the screen as a large number or random dots. This noise can be suppressed.

1. Press the [MENU] key to open the menu.
2. Press ▲ to choose MENU at the top of the screen.
3. Press ◀ or ▶ to choose the HORZ menu.
4. Press ▲ or ▼ to choose CLUTTER.
5. Press ▶ to open the dialog box.
6. Press ◀ or ▶ to choose 0, 1, **2 or 3** as appropriate. The higher the number (setting) the weaker the echoes which are erased.
7. Press the [MENU] key to register your selection and close the menu.

MENU	COM1	COM2	HORZ	VERT	ES	PRESET	SYS
TVG LEVEL		4.0					
TVG DISTANCE		4.0					
GAIN ADJUST		0					
RES. COLOR		LOG					
CLUTTER		0					
TARGET KEY		REVERSE					
LOCK MODE		AUTO					
AUTO TILT		OFF					

▲▼ : SELECT ◀▶ : CHANGE MENU: END

*HORZ menu*

## Selecting the Training Speed

The training speed selects how fast the transducer scans the sounding sector. Two choices are available, normal speed (default setting) and high speed, select a speed by using the [FAST SCAN] key. Each time the key is pressed "NORM" (normal speed) or "FAST" (high speed) momentarily appears at the screen top.

NORM (6°): 60 transmissions required to complete full 360° picture (default setting).

FAST (12°): 30 transmissions required to complete the full 360° picture.

The time necessary to train a full circle depends on range and transducer used. The table below shows the time required to complete one full circle in the horizontal mode using the 150 kHz transducer.

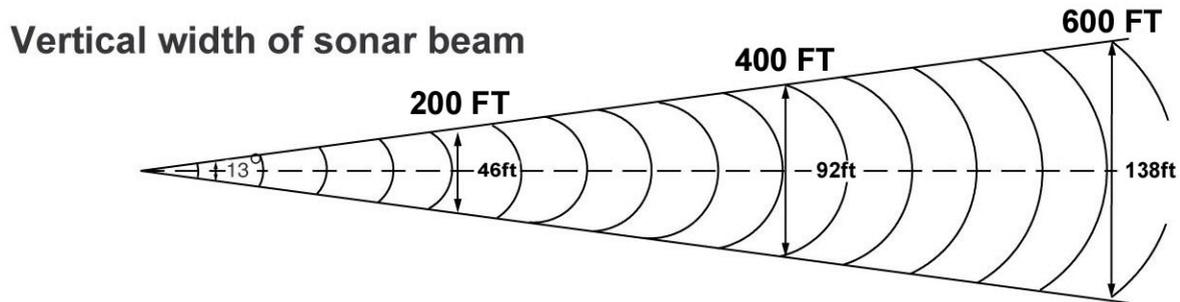
Ranges		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Unit	m	10	20	40	60	80	120	160	200	250	300	400	500	600	800	1000
	ft	40	80	120	200	300	400	500	600	700	800	1000	1500	2000	2500	3500
Time required (sec) for one full circle	Norm	7	7	7	7	7	10	13	16	20	24	32	40	48	64	81
	Fast	7	7	7	7	7	9	11	13	15	17	21	25	28	36	45

**Note 1:** Above data for soundome having serial no. 1000 and higher.

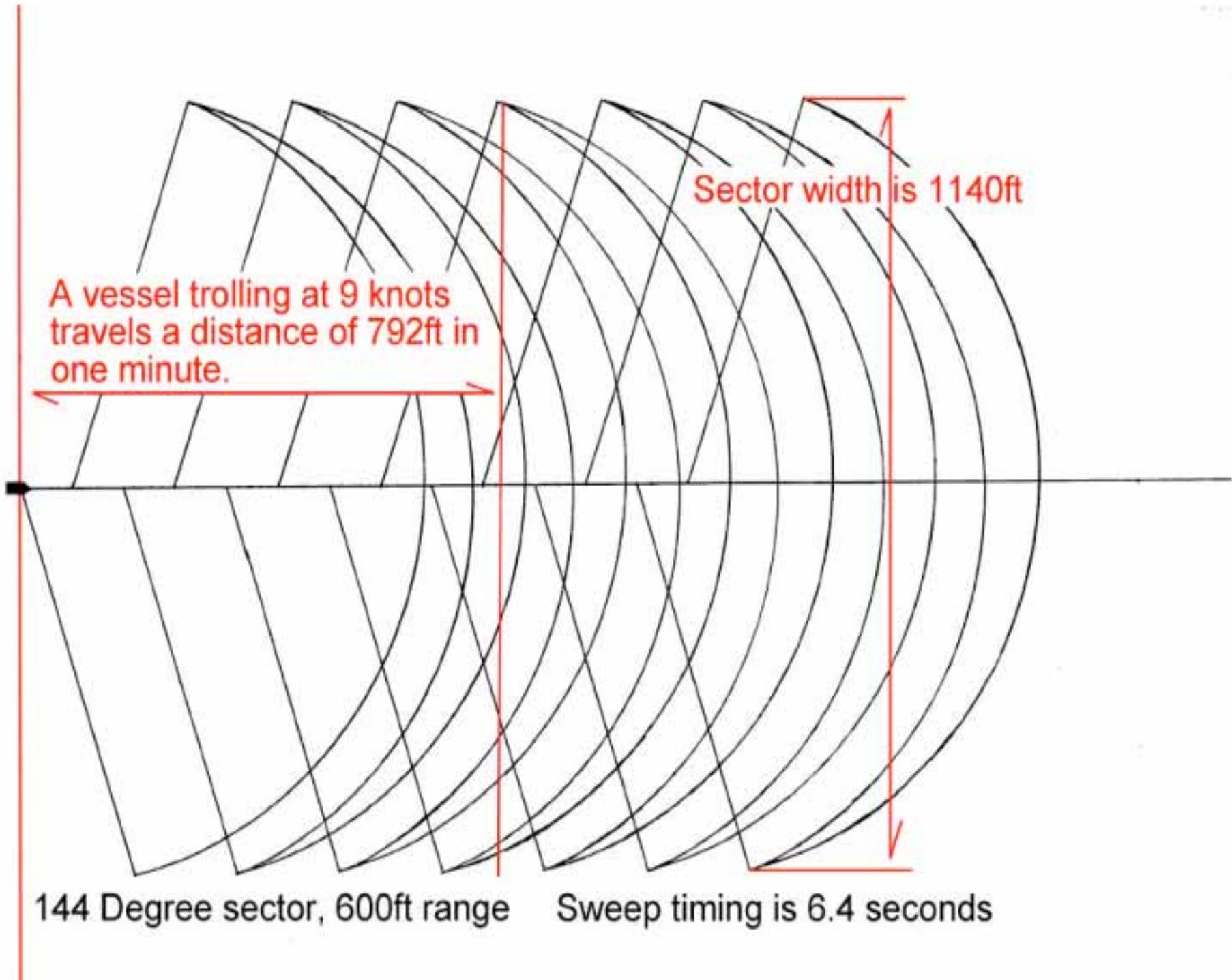
**Note 2:** The range setting must be at least 160 m to activate high speed training, using the 150 kHz transducer. The [FAST SCAN] key is inoperative when the range setting is less than 160 meters.

### Important Note:

Since the CH-270, CH-250 (150Khz) and CH-300 (156 & 215Khz) have narrow beam angles we suggest that a **NORM** (Normal Train Speed) setting be used for optimum performance. The CH-250 (60 or 88Khz) and CH-300 (60 or 85Khz) can be used at either train speed, however your best resolution will be with the **NORM** setting.



Sonar model	Frequency	Vertical beam angle in degrees	Distance from vessel								
			200 ft	400ft	600 ft	800 ft	1000 ft	1500 ft	2000 ft	2500 ft	3000 ft
CH-250	60 Khz	12	42 ft	84 ft	126 ft	168 ft	210 ft	315 ft	420 ft	525 ft	630 ft
	88 Khz	9.5	33 ft	66 ft	99 ft	132 ft	166 ft	249 ft	332 ft	415 ft	498 ft
	150 Khz	6.5	23 ft	46 ft	69 ft	92 ft	113 ft	170 ft	227 ft	284 ft	340 ft
CH-270	180 Khz	8	28 ft	56 ft	84 ft	112 ft	140 ft	210 ft	280 ft	350 ft	420 ft
CH-300L	60 Khz	14	49 ft	98 ft	147 ft	196 ft	246 ft	369 ft	492 ft	614 ft	737 ft
	153 Khz	5	17 ft	34 ft	52 ft	70 ft	87 ft	131 ft	175 ft	218 ft	262 ft
CH-300H	85 Khz	10	35 ft	70 ft	105 ft	140 ft	175 ft	262 ft	350 ft	437 ft	525 ft
	215 Khz	4	14 ft	28 ft	42 ft	56 ft	70 ft	105 ft	140 ft	175 ft	210 ft
CH-37	60 Khz	13	46 ft	92 ft	138 ft	184 ft	230 ft	345 ft	460 ft	575 ft	690 ft
	113 Khz	7	24 ft	48 ft	72 ft	96 ft	120 ft	180 ft	240 ft	300 ft	360 ft
	162 Khz	6	21 ft	42 ft	63 ft	84 ft	105 ft	157 ft	210 ft	262 ft	315 ft

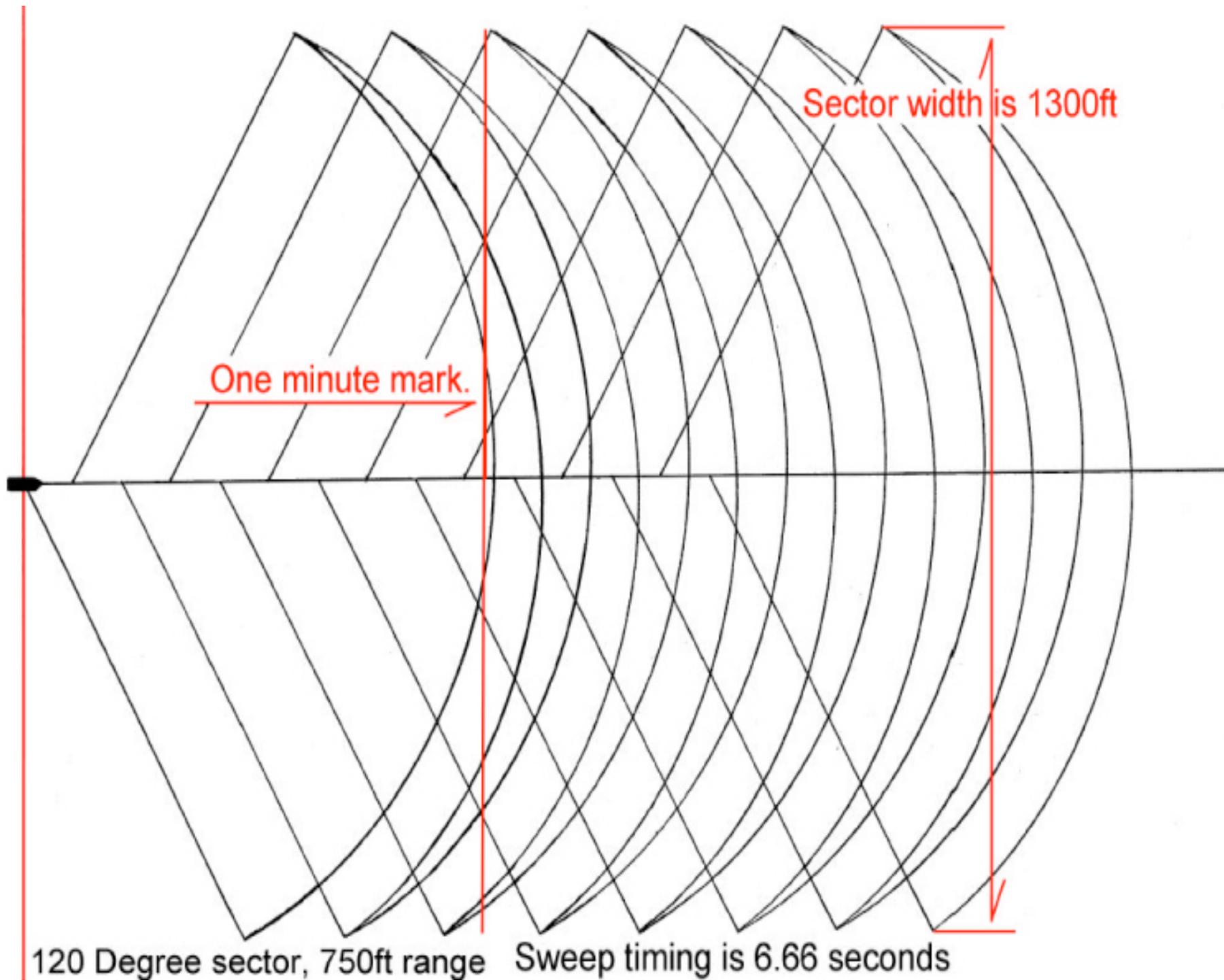


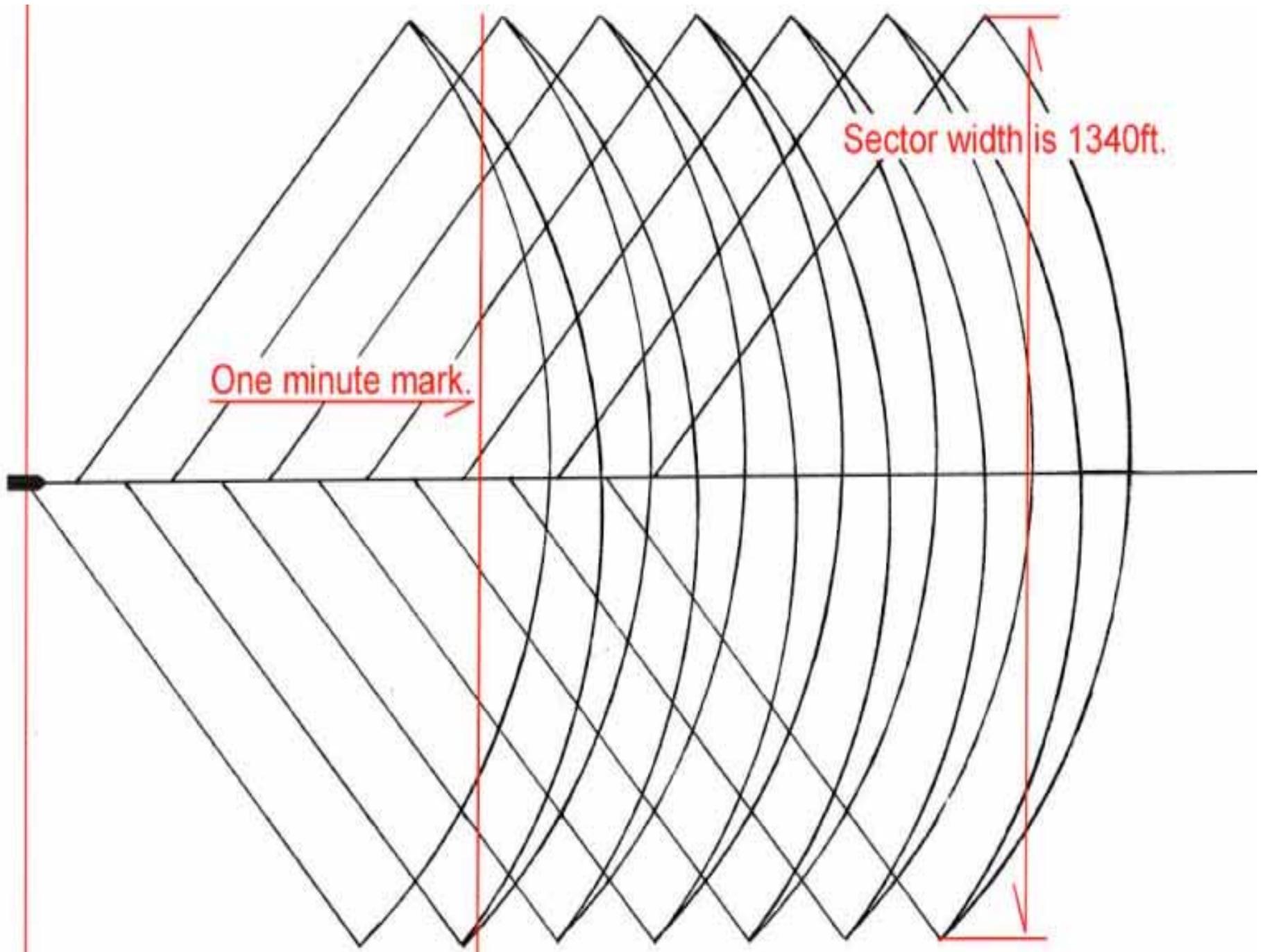
A vessel trolling at 9 knots travels a distance of 792ft in one minute.

Sector width is 1140ft

144 Degree sector, 600ft range

Sweep timing is 6.4 seconds





96 Degree sector, 900ft range. Sweep timing is 6.4 seconds.

# Favorite sonar settings

	Recommended starting settings	#1	Additional user settings			#4
			#2	#3		
<b>COM 1</b>						
TX Power	MAX					
Pulselength	Long					
TX Rate	10					
INT Reject	On (if needed)					
AGC	Off					
Audio level	3					
<b>COM 2</b>						
Deleting track	No					
White marker	Off					
Sig Level	Off					
Colors	16					
BKGD color	1,2 or 3					
<b>HORZ</b>						
TVG Level	Between 2 to 5					
TVG Distance	Between 1.5 to 3.5					
Gain Adjust	0					
RES. Color	Log					
Clutter	2 or 3					
Target key	Reverse					
Lock mode	Auto					
Auto tilt	Off					
<b>Gain</b>						
Range	4 to 6					
Tilt	600ft					
Sector size	Between 6 to 10 degrees					
Scan speed	144 or 120 degrees					
	NORM					