

LMS-150

INSTALLATION AND OPERATION INSTRUCTIONS

LITHO IN U.S.A.

988-0119-28

LOWRANCE ELECTRONICS, INC.
12000 E. SKELLY DR., TULSA, OK 74128

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All sonar and loran screens in this manual are simulated.

Features and specifications subject to change without notice.

CAUTION

This loran receiver (like all loran navigation equipment) will show the shortest, most direct path to a waypoint. It provides navigation data to the waypoint, regardless of obstructions. Therefore, the prudent navigator will not only take advantage of all available navigation tools, but will also visually check to make certain a clear, safe path to a waypoint is always available.

WARNING!

USE THIS LORAN RECEIVER ONLY AS AN AID TO NAVIGATION. A CAREFUL NAVIGATOR NEVER RELIES ON ONLY ONE METHOD TO OBTAIN POSITION INFORMATION.

NOTICE!

MAKE CERTAIN THE LORAN IS DISPLAYING THE CORRECT POSITION IN LATITUDE/LONGITUDE COORDINATES BEFORE NAVIGATING WITH THIS UNIT. THE POSITION MUST BE CORRECT FOR THE NAVIGATION FEATURES TO WORK PROPERLY.

NOTES:

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NOTES:

NOTES:

INTRODUCTION

The LMS-150 represents one of the best values in sportfishing sonar today. It rivals other sonar units costing much more in features and performance. With its menus, the LMS-150 offers easy-to-use operation at the touch of a button. The CLEARVISION™ screen shows the underwater world with high resolution and detail. The LMS-150 also displays boat speed, surface water temperature, and distance travelled (distance log). The Ioran module gives you a full featured Ioran receiver, complete with plotter and waypoint navigation capabilities.

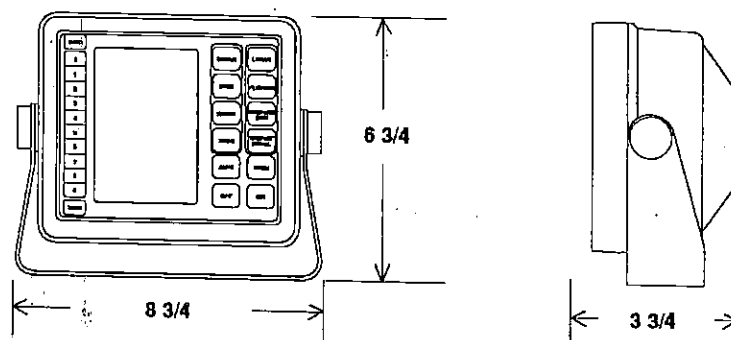
Although the LMS-150 has many features and functions, the "soft key" menu system makes it easy to use. Above all, don't be afraid to try different features and functions on the unit. You can't hurt it by pressing buttons!

MOUNTING

You can install the LMS-150 in any convenient location, provided there is clearance behind the unit. Place it in position first and tilt it for the best viewing angle. Then mark the holes in the bracket base. You can use wood screws or through-bolts to attach the bracket to the boat. You may need to place a piece of plywood on the back of thin fiberglass panels to secure the mounting hardware. Make certain there is enough room behind the unit to attach the power and transducer cables.

The smallest hole that will pass one power or transducer plug is one inch. After drilling the hole, pass the transducer connector up through the hole first, then pass the power cable down through it.

After routing the cables, fill the hole with a good marine sealing compound. Offset the bracket to cover the hole.



POWER CONNECTIONS

The LMS-150 works from a twelve-volt battery system only. For the best results, attach the power cable directly to the battery. You can attach the power cable to an accessory or power buss, however you may have problems with electrical interference. Therefore, it's safer to go ahead and attach the power cable directly to the battery. If the cable is not long enough, splice #18 gauge wire onto it. Attach the in-line fuse holder to the red lead as close to the power source as possible. For example, if you have to extend the power cable to the battery or power buss, attach one end of the fuse holder directly to the battery or power buss. This will protect both the unit and the power cable in the event of a short.

The power cable has three wires, red, white, and black. Red is the positive lead, black is negative or ground. The white wire is used for the NMEA interface. To use this feature, attach a shielded, twisted pair cable from the autopilot or other marine equipment's NMEA interface to the white wire on the LMS-150's power cable. Solder the twisted pair's ground wire and shield wire to the black wire on the LMS-150's power cable. Do not connect the shield wire to the autopilot. See your autopilot's manual for more instructions. If you're not going to use this feature, cut and tape the white wire to prevent a short.

The LMS-150 has reverse polarity protection. No damage will occur to the unit if the power wires are hooked up backwards. However, it won't work until the wiring is connected properly.

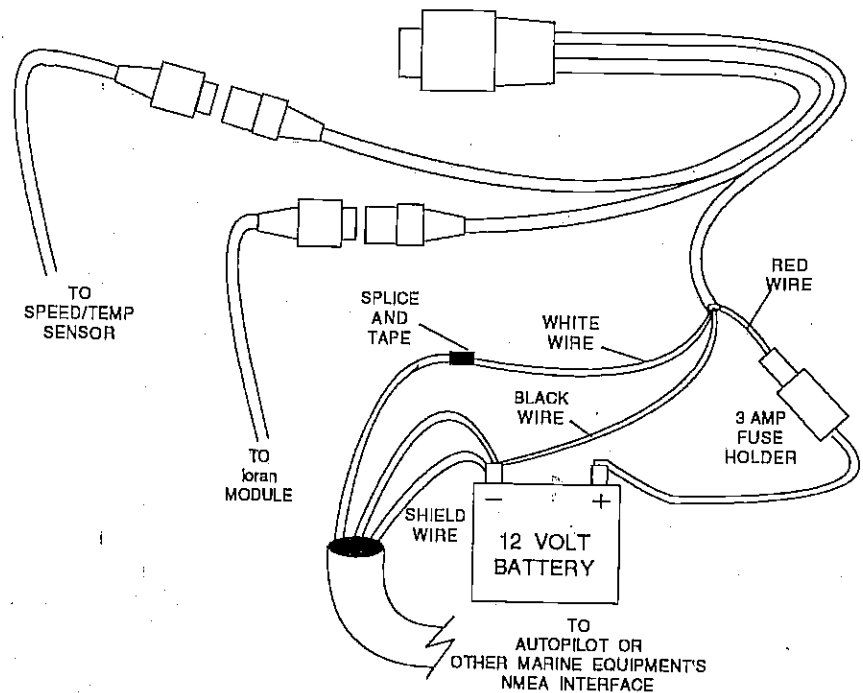
Minimize electrical noise by routing the power cable away from other possible sources of electrical interference. One of the largest noise generators is the engine's wiring harness. For best results, keep the power and transducer cables away from the engine wiring.

Attach the speed/temp sensor's and loran module's cable to the LMS-150's power cable. Tags on the cables identify both the loran and the speed/temperature sensor's connector.

INSTALLATION - LC-1 Loran-C MODULE

When choosing a mounting location, remember to install the ELC-1 where it's clear of other antennas, wires, masts, or other obstructions. A high location is preferred, however for lightning protection, the antenna shouldn't be the highest part of the boat. The antenna should be mounted vertically. Make certain it is as far away as possible from VHF radio antennas.

NOTES:



Improper performance can also occur if the antenna is mounted too close to metal objects such as tuna towers. Again, a location that places the Loran assembly in the clear is preferable to one that is high and obstructed.

You must purchase an eight foot stainless steel or fiberglass whip antenna. The threads are standard 3/8"-24 for the whip. A ratchet mount base is most commonly used to mount the Loran to the boat. The base mounting threads are conventional 1"-14 machine thread (NOT pipe thread). This allows the use of standard antenna mounting hardware. Tighten all hardware securely.

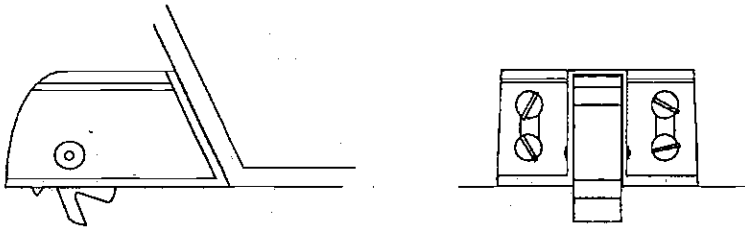
The cable supplied with the LC-1 is thirty feet long. Do not cut the cable if it's too long. Instead, coil and store it out of the way. An extension cable is available if the cable is too short. Ask your dealer or call your local service center or the Eagle Factory Customer Service department for more information.

The LC-1 can be attached to a swivel bracket or hollow extension mast, if desired.

SPEED/TEMPERATURE SENSOR INSTALLATION

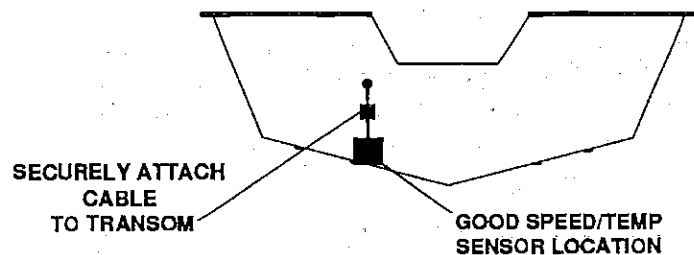
Mount the speed/temp sensor on the boat's transom in a location where the flow of water is smoothest. There should be a minimum amount of turbulence and air bubbles in the chosen location. The port (left) side of the transom is preferred, however the starboard (right) side can be used if necessary. Do not mount the speed sensor behind strakes, ribs, or thru-hull fittings that will disturb the flow of water to the speed sensor. In a typical installation, the speed sensor is mounted six to twelve inches from the centerline of the boat. The sensor must be in the water at all times to function properly. Make certain the chosen location is in the water even at high speed or when the boat is on plane.

Once the proper location has been determined, place the sensor on the transom with the bottom of the sensor flush with the bottom of the hull. Mark the transom in the center of each slot and drill a 5/32" mounting hole. Mount the sensor to the hull with #10 stainless steel screws (not included). Use a good grade of caulking compound to seal the screws. Adjust the sensor so it is flush with the underside of the hull and tighten the screws.



If the base of the transom has a radius, fill the gap between the transom and the sensor with caulking compound to insure a smooth water flow.

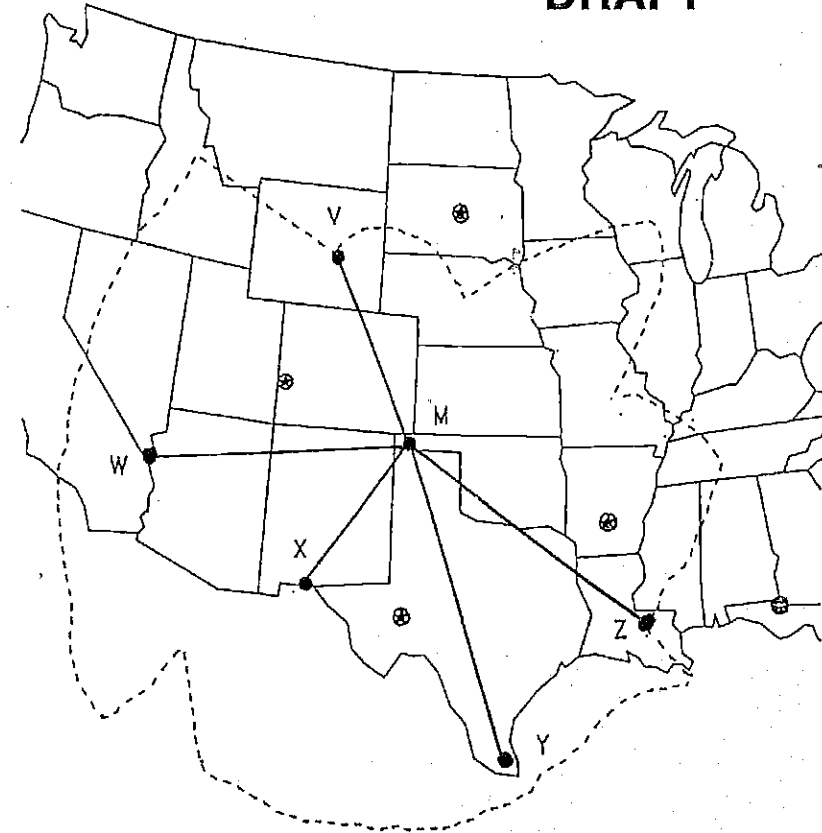
Route the sensor cable to the in-line connector on the sonar unit's power cable and attach it.



LORAN-C

SOUTH CENTRAL U.S. CHAIN (SOCUS) GRI 9610

DRAFT



LEGEND:

- TRANSMITTER
- ⊙ CONTROL
- ⊗ MONITOR

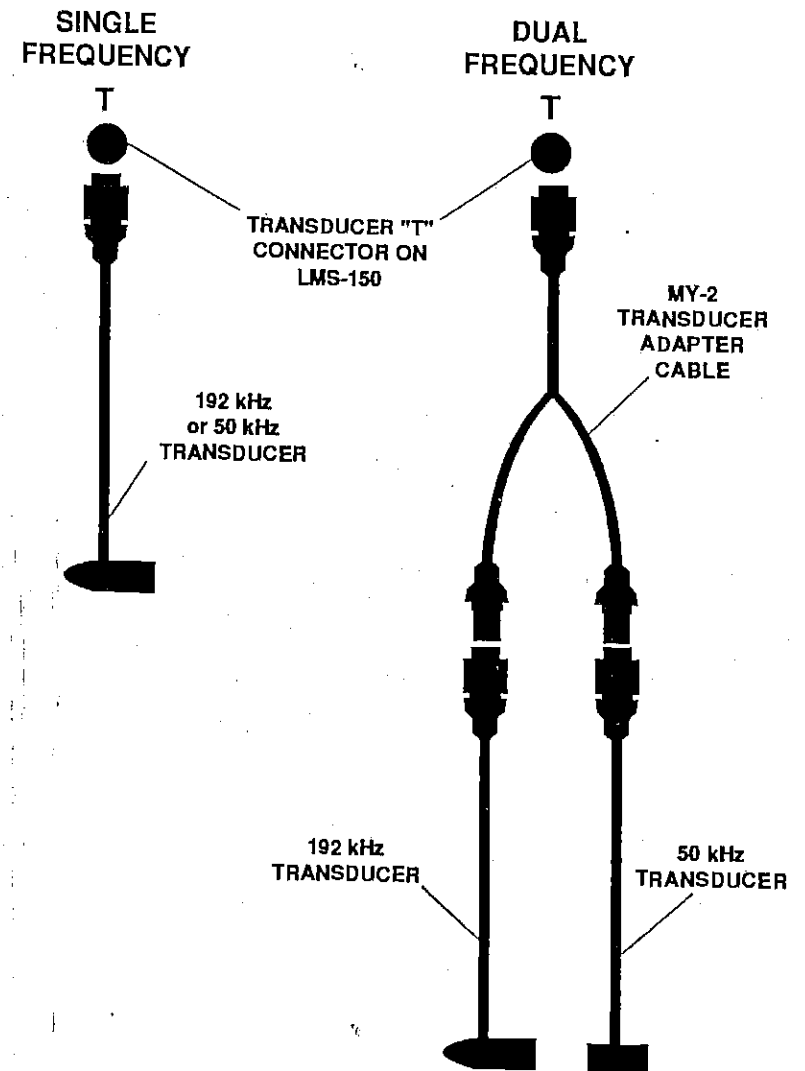
Approximate Limits of Coverage -- 1:3 SNR and
1/4 NM Fix Accuracy (95% 2 dRMS), Noise 53 db

- M BOISE CITY, OK
- V GILLETTE, WY
- W SEARCHLIGHT, NV
- X LAS CRUCES, NM
- Y RAYMONDVILLE, TX
- Z GRANGEVILLE, LA

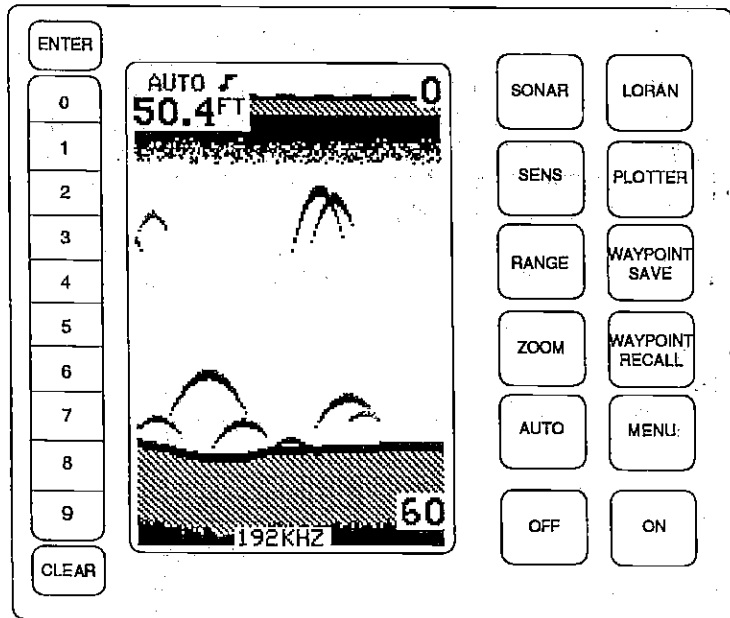
TRANSDUCER CONNECTIONS

The LMS-150 has dual frequency capability. It can operate from 192 kHz or 50 kHz. It will display echoes from either transducer, separately or at the same time in an unique split screen mode. The connection diagram below shows the proper method to attach the transducers to the LMS-150. Note: If dual frequency operation is desired, a MY-2 Transducer Adapter Cable must be used.

See your transducer owner's manual for installation instructions.



Note: This is an "Unofficial-Preliminary Coverage Diagram". Coverage was computed using conservative estimates of station range limits, atmospheric noise, and grid geometry.



KEYBOARD

The keyboard has keys arranged in three vertical columns. The keys in the far left column are used for menu selections and numeric entry. The keys in the middle column are for the basic sonar functions. The keys on the right select the loran, plotter, and waypoint features.

SONAR KEYS:

SONAR - Pressing this key switches the LMS-150 to the sonar display from the loran or Plotter screens. It also displays the frequency select menus.

SENS - Press this key to adjust the unit's sensitivity and GRAYLINE.

RANGE - This key lets you adjust the range when the unit is in the manual mode.

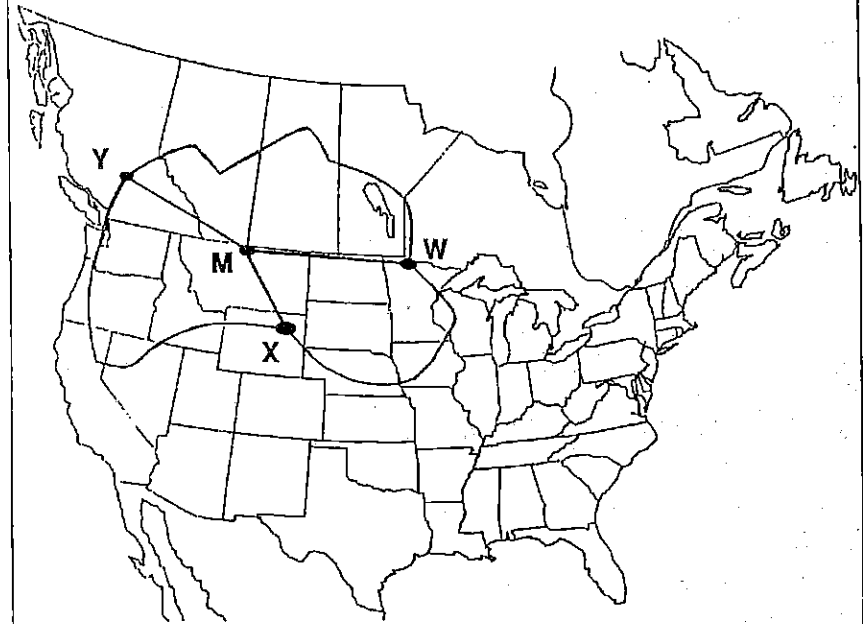
ZOOM - The LMS-150 gives you 2X and 4X zoom capability with this key.

AUTO - This turns the Sonar's automatic feature off and on.

ALARM - Activate and adjust the sonar alarms through this key.

LORAN-C NORTH CENTRAL U.S. CHAIN (NOCUS) GRI 8290

DRAFT



Approximate Limits of Coverage -- 1:3 SNR and
1/4 NM Fix Accuracy (95% 2 dRMS), Noise 53 db

- M HAVRE, MT
- W BAUDETTE, MN
- X GILLETTE, WY
- Y WILLIAMS LAKE, BC

Note: This is an "Unofficial-Preliminary Coverage Diagram". Coverage was computed using conservative estimates of station range limits, atmospheric noise, and grid geometry.

Loran KEYS:

LORAN - Press this key to switch to the loran displays.

PLOTTER - This key switches the LMS-150 to the plotter display.

WAYPOINT SAVE - Press this key to save waypoints.

WAYPOINT RECALL - This key activates the waypoint recall menus.

OTHER KEYS:

ENTER - This key is used to enter selections from menus.

CLEAR - Use this key to erase a previous keystroke or menu.

ON - The ON key turns the LMS-150 on.

OFF - The Off key turns the LMS-150 off.

NOTE. You must press and **hold** the OFF key to turn the unit off.

MENU KEY - This key activates the first menu screen for each of the three modes - sonar, loran, and plotter. For example, if you press the MENU key while the sonar screen is displayed, the first sonar menu appears. Pressing the MENU key while the plotter is displayed brings up the first plotter menu screen.

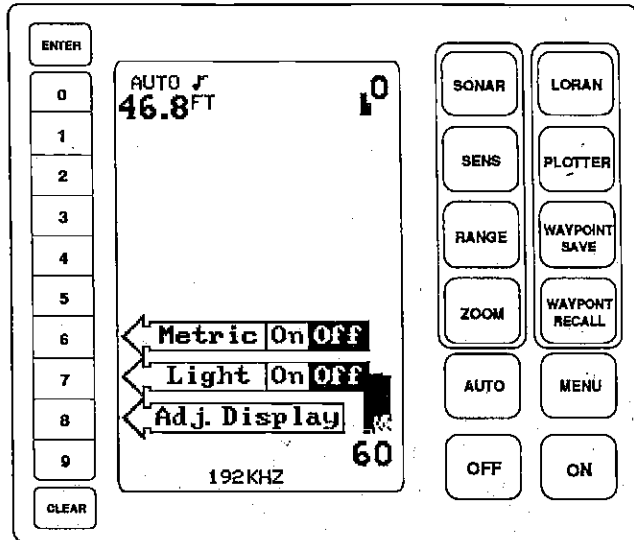
DISPLAY - General

The lights are on for about ten seconds when you first turn the LMS-150 on. Menus appear at the same time. To keep the lights on, press the key adjacent to the Light label. (See the picture on the next page.) It controls the backlighting used on the display and keyboard. If you don't want the lights on, wait ten seconds and the lights automatically turn off. The menus also disappear after ten seconds. You can turn them off at any time by pressing the CLEAR key.

The Metric menu works the same way. Press the key adjacent to the Metric label to change the depth from feet to meters. This also changes the temperature display to degrees Celsius, speed to knots, and log to nautical miles.

The ADJ Display label lets you adjust the display's contrast for the best viewing angle. Pressing this key gives you the contrast adjust menu. See the Display Contrast section for more information on this feature.

After the menus clear, the display appears similar to the one on the next page. The word "AUTO" in the display's upper left corner indicates the automatic feature is on. A small note symbol next to the "AUTO" indicator means the alarm speaker is enabled. The digital bottom depth displays immediately beneath the AUTO indicator.

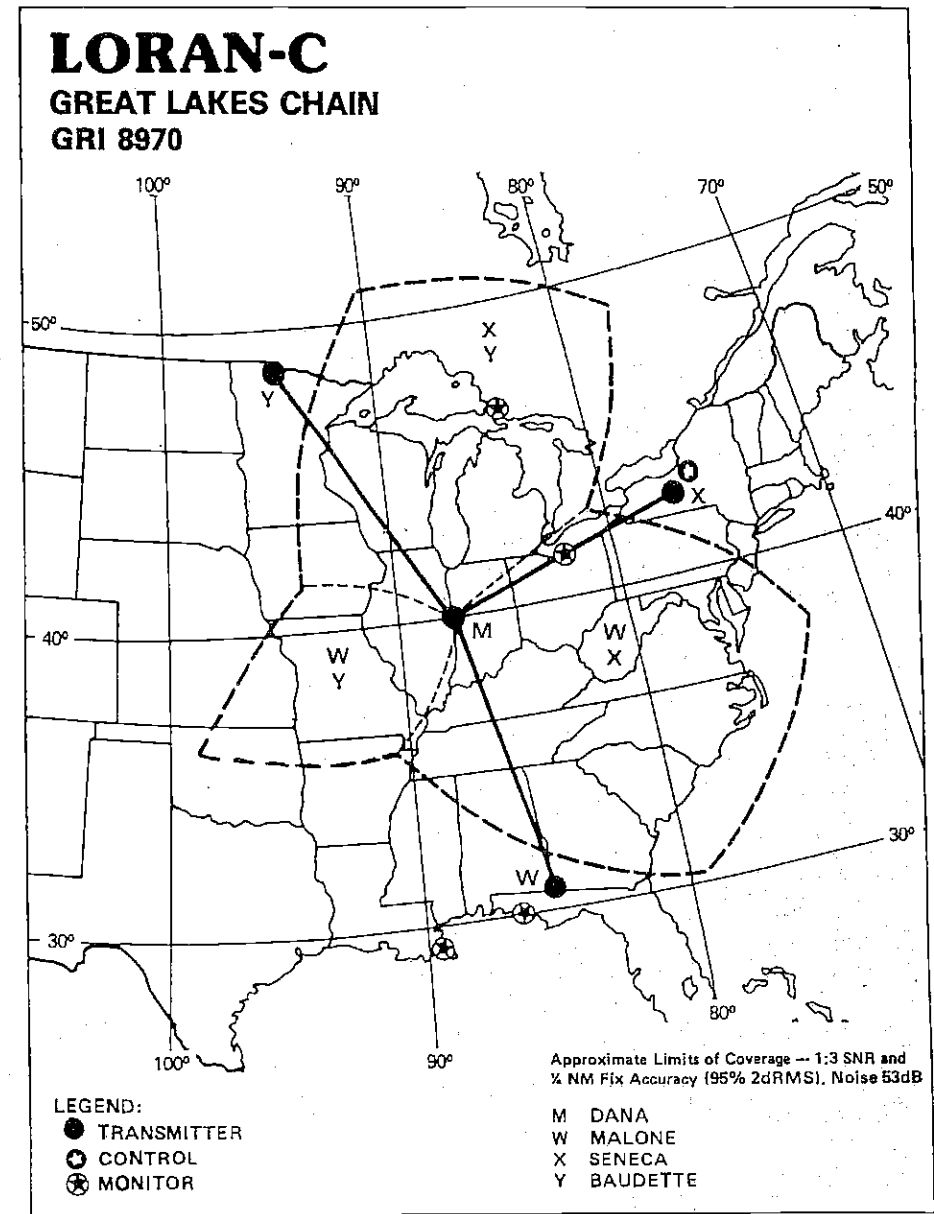


MEMORY-PRESET

The LMS-150 saves all settings such as sensitivity, chart speed, alarm settings, and more in battery backed-up memory. This memory is retained, even if the LMS-150 is removed from the boat.

To erase the settings, and return the LMS-150 to the factory settings, turn the unit off, then press *and hold the CLEAR key* and press the ON key at the same time. Hold the CLEAR key until you hear the starting beep, then release it. The LMS-150 will restart using the factory default settings. Note: This doesn't erase any waypoints or routes. There is also a menu selection that resets the LMS-150. See the Menu - Page 7 "Preset SONAR & loran" on page 40 for more information.

To turn the battery-backup feature off, see page 37.



Note: This is an "Unofficial-Preliminary Coverage Diagram". Coverage was computed using conservative estimates of station range limits, atmospheric noise, and grid geometry.

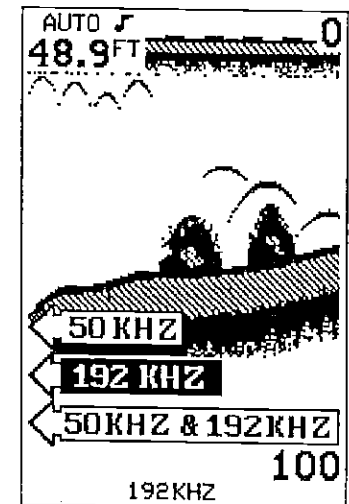
FREQUENCY SELECT

Lowrance offers both 50 and 192 kHz transducers for the LMS-150. The 192 kHz frequency typically has superior target resolution, showing fish, structure, and bottom definition better than 50 kHz. However, the 192 kHz doesn't penetrate water as well as 50 kHz, therefore it won't go as deep. Also, 192 kHz cone angles are typically narrower than the 50s. You can draw a few conclusions from these statements.

1. Use 192 kHz (especially in shallow water) with a wide (20 degree) cone angle for the best resolution and target definition. Use a 192 kHz narrow cone angle transducer (8 degree) when operating in medium to deep depths.
2. Use the 50 kHz in deep water or where a very wide cone angle is desired. Using 50 kHz when fishing with downriggers generally lets you see the downrigger weights display on the screen. Lowrance offers both a 30 degree and 45 degree cone angles for 50 kHz.

The LMS-150 has the capability to operate at 192 kHz or 50 kHz. It can display echoes from either transducer or both at the same time in an unique split-screen mode. Once the transducers are connected to the LMS-150 (see the Transducer Connections section for more information), turn the unit on and press the SONAR key. A screen similar to the one shown at right appears.

Press the key adjacent to the desired frequency or press the key adjacent to the 50 kHz & 192 kHz label to display echoes from both transducers at the same time.



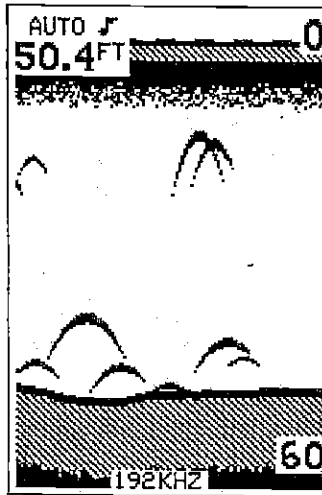
Anytime you wish to switch frequencies, simply press the SONAR key. This will cause the frequency switch menus to appear. They will disappear after a few seconds or you can press the CLEAR key to erase them.

AUTOMATIC

When the LMS-150 is first turned on, the Automatic feature is on. This is shown by the word "AUTO" at the top of the screen. The Automatic feature adjusts the sensitivity and range so the bottom signal always shows in the lower half of the screen.

To turn Automatic off, simply press the AUTO key. The word "MANUAL" appears, showing the unit is in the manual mode. To turn Automatic on, press the AUTO key again.

AUTOMATIC
MODE ON

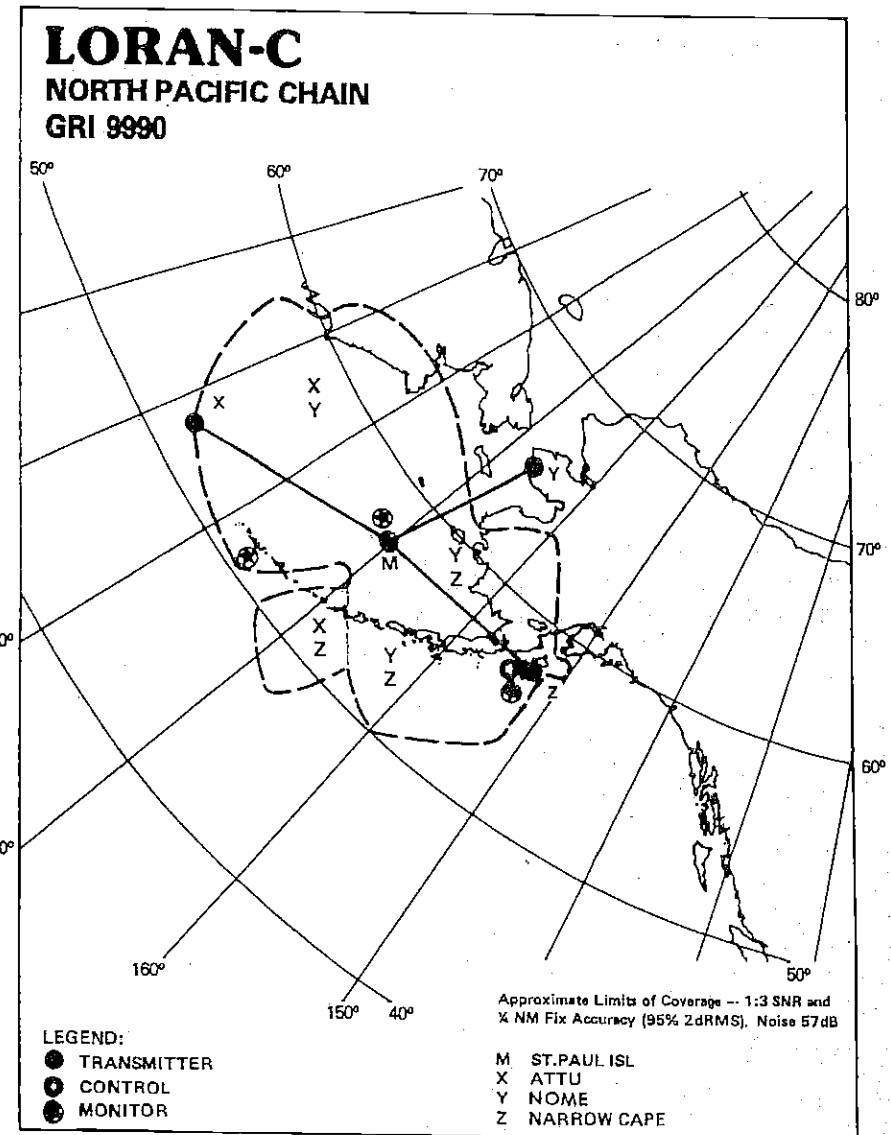


SENSITIVITY

The sensitivity key on the LMS-150 controls the unit's ability to pick up echoes. A low sensitivity level excludes much of the bottom information, fish signals, and other target information. High sensitivity levels enables you to see this detail, but it can also clutter the screen with noise. Typically, the best sensitivity level shows a good solid bottom signal with GRAYLINE® and some surface clutter.

The LMS-150 adjusts the sensitivity when it's in the automatic mode. This keeps a solid bottom signal displayed, plus the capability to show fish and other detail.

However, situations occur where it becomes necessary to increase or decrease the sensitivity. This typically happens when you wish to see more detail. The procedure to adjust it is the same whether the unit is in the automatic or manual mode.

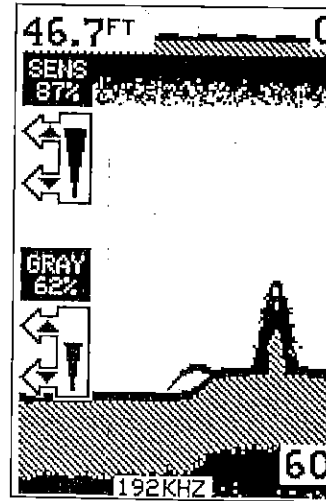


NORTH PACIFIC LORAN-C CHAIN GR1 9990
 REGIONAL MANAGER COMMANDER, PACIFIC AREA, ALAMEDA, CA
 CHAIN MANAGER: COMMANDER, 17TH COAST GUARD DISTRICT, JUNEAU, AK
 COORDINATOR OF CHAIN OPERATIONS LOCATION: LORMONSTA KODIAK, AK
 CONTROL SITE: LORMONSTA KODIAK, AK

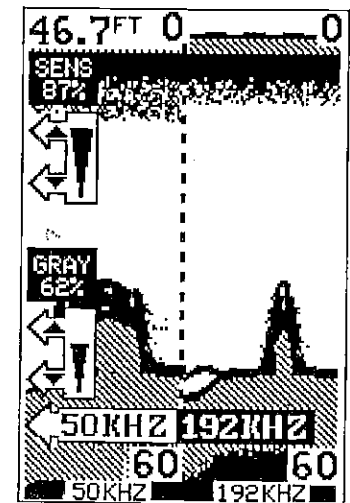
DESIG.	STATION	COORD.	CDBLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	ST. PAUL AK	57 09 12.3N 170 15 05.6W		AN/FPN-42	325	625 FT MONOPOLE	0.0	
XRAY	ATTU AK	52 49 44.0N 173 10 49.0E	11000/ 3875.25	AN/FPN-42	325	625 FT MONOPOLE	0.0	
YANKEE	PORT CLARENCE AK	65 14 40.3N 166 53 12.6W	29000/ 3058.95	AN/FPN-42	1000	1350 FT MONOPOLE	+0.6	
ZULU	NARROW CAPE, AK	57 26 20.2N 152 22 11.2W	43000/ 3590.45	AN/FPN-44A	400	625 FT MONOPOLE	0.0	DUAL RATE W/GR17960

To adjust the sensitivity, press the SENS key. The sensitivity adjust menu appears on the left side of the screen. The GRAYLINE® adjust menu is immediately beneath it.

The sensitivity menu has up and down arrows, plus a vertical bar graph. The graph gives an indication of the sensitivity level. The number above the up arrow shows the percentage of sensitivity in use.



SENSITIVITY ADJUST MENU
(Single Frequency)



SENSITIVITY ADJUST MENU
(Dual Frequency)

To increase the sensitivity level, press the key adjacent to the menu's up arrow on the left side of the unit. As you press the key, the menu's bar graph will grow taller and the percentage will increase in value. You can also see the difference on the chart record as it scrolls. When the sensitivity is at the desired level, release the key.

To decrease the sensitivity level, press the key adjacent to the down arrow. The bar graph and percentage will decrease. When the sensitivity is at the desired level, release the key.

When you reach either the maximum or minimum limit, the speaker will sound an alert tone.

To turn the menus off, press the key adjacent to the CLEAR key at the bottom left side of the unit.

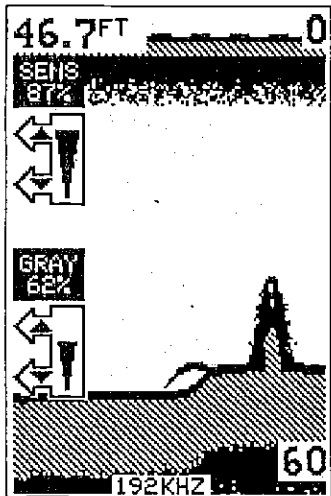
When using the LMS-150 in the dual frequency mode, a new menu appears that lets you adjust the sensitivity and GRAYLINE for both frequencies. Simply press the key adjacent to the 50kHz/192 kHz label to adjust each side.

GRAYLINE®

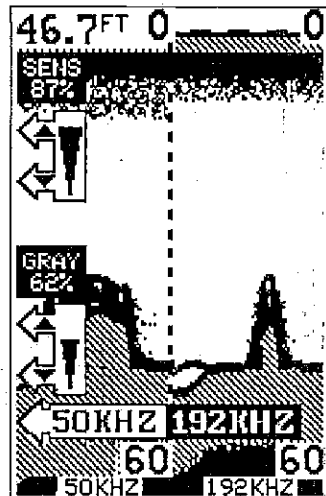
GRAYLINE® lets you distinguish between strong and weak echoes. It "paints" gray on targets that are stronger than a preset value. This allows you to tell the difference between a hard and soft bottom. For example, a soft, muddy or weedy bottom returns a weaker signal which displays with a narrow or no gray line. A hard bottom returns a strong signal which causes a wide gray line.

If you have two signals of equal size, one with gray and the other without, the target with gray is the stronger signal. This helps distinguish weeds from trees on the bottom, or fish from structure.

GRAYLINE® is adjustable. Since GRAYLINE® shows the difference between strong and weak signals, adjusting the sensitivity may require a different GRAYLINE® level, also. The level chosen by the LMS-150 at power on is usually adequate for most conditions. Experiment with your unit to find the GRAYLINE® setting that's best for you.



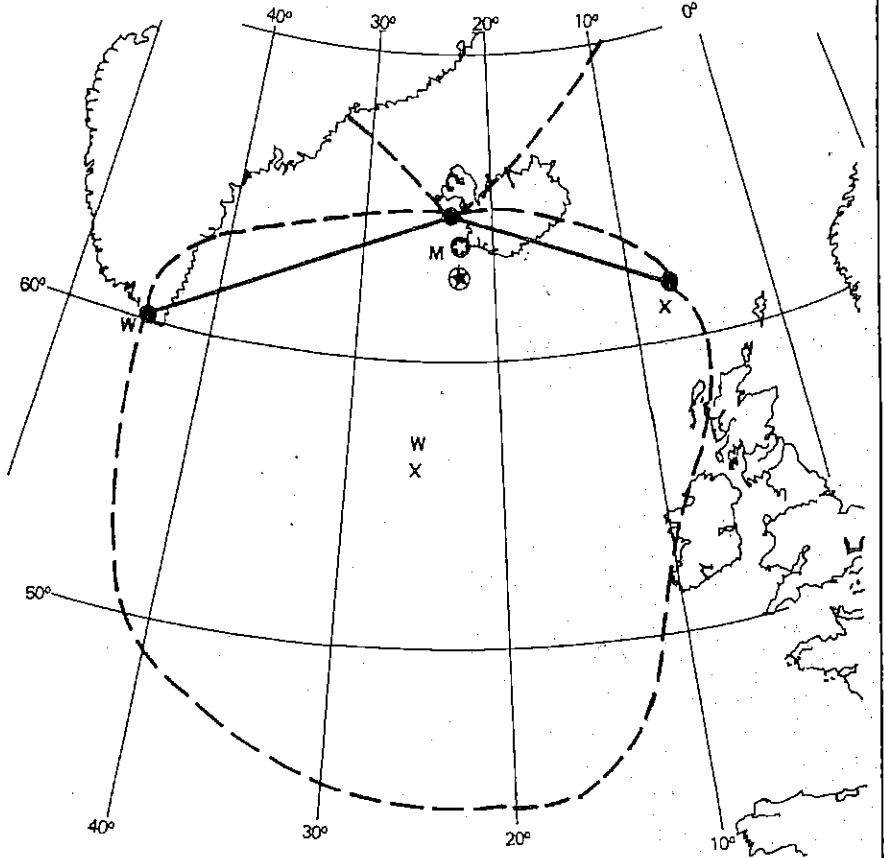
GRAYLINE® ADJUST MENU
(Single Frequency)



GRAYLINE® ADJUST MENU
(Dual Frequency)

To adjust GRAYLINE®, press the SENS key. The sensitivity menu appears in the upper left side of the display, while the GRAYLINE® label appears immediately beneath it. Now press the key adjacent to the GRAY up arrow to increase the gray level. Press the key adjacent to the down arrow to decrease it. The percentage of GRAYLINE® in use changes as you press the arrow keys. The bar chart also gives a graphical indication of the GRAYLINE® level.

LORAN-C ICELANDIC CHAIN GRI 9980



LEGEND:
● TRANSMITTING
⊙ CONTROL
⊗ MONITOR

Approximate Limits of Coverage --- 1:3 SNR and
¼ NM Fix Accuracy (95% 2dRMS). Noise 46dB

M SANDUR
W ANGISSOQ
X EJDE

You can see the change on the screen (both on the menu and on the chart record) as you press the keys. After you've made the adjustment, press the key adjacent to the CLEAR key to erase the menu.

RANGE - Automatic

When first turned on, the LMS-150 automatically places the bottom signal in the lower half of the screen. This is called Auto Ranging and is part of the automatic function. You cannot change the range while the unit is in automatic.

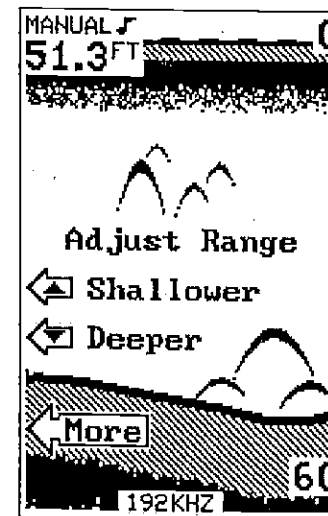
RANGE - Manual

The LMS-150 gives you control over the range when it's in the manual mode. Both the lower and the upper limit are adjustable.

To change the range, first make certain the LMS-150 is in the manual mode. If necessary, press the AUTO key to switch to the manual mode. Next, press the RANGE key. Two arrows appear in the lower left corner of the display. These are the range adjust arrows. Press the key corresponding to the Shallower or Deeper arrow to decrease or increase the range. The available ranges are 0-5, 10, 20, 40, 60, 100, 150, 200, 300, 500, 800, 1000, 1500, 2000, 3000, and 5000 feet. (Metric ranges are 3, 5, 10, 15, 20, 30, 40, 60, 100, 150, 250, 300, 400, 600, 1000, and 1500 meters.) After you've set the desired range, press the CLEAR key to erase the range arrows.

ICELANDIC LORAN-C CHAIN GR1 9980
 REGIONAL MANAGER, COMMANDER COAST GUARD ACTIVITIES EUROPE, LONDON, UK
 CHAIN MANAGER, COMMANDER COAST GUARD ACTIVITIES EUROPE, LONDON, UK
 COORDINATOR OF CHAIN OPERATIONS LOCATION LORMONSTA KEFLAVIK, ICELAND
 CONTROL SITE: LORMONSTA KEFLAVIK, ICELAND

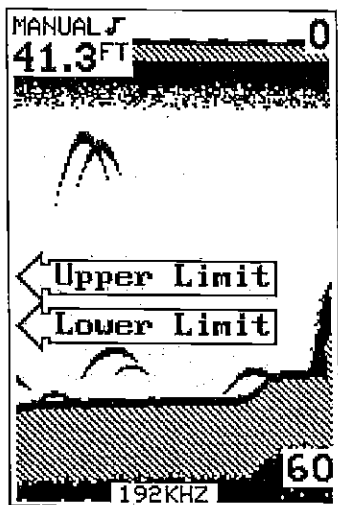
DESIG.	STATION	COORD.	CD/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	SANDUR ICELAND	64 54 26.8N 23 56 21.8W		AN/FPN-46	1500	1350FT MONOPOLE	0.0	
WHISKEY	ANGISSOO GREENLAND	59 59 17.3N 45 16 27.5W	11000V 4068.03	AN/FPN-46 MONOPOLE	760	625 FT	+1.0	DUAL RATE W/GRI7930
XRAY	EJDEFAEROE IS., DENMARK	62 17 59.6N 07 04 26.5W	30000V 2944.54	AN/FPN-44 MONOPOLE	325	625 FT	0.0	DUAL RATE GRI7970



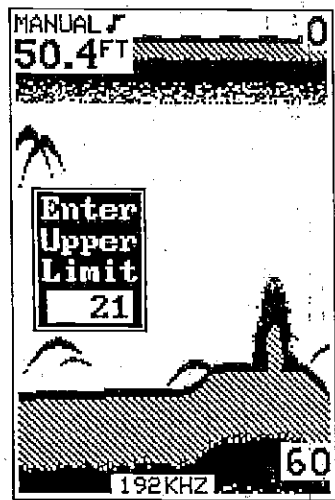
RANGE
 ADJUST
 MENU
 (MANUAL
 MODE
 ONLY)

← Shallower
 ← Deeper
 ← More

To adjust the upper or lower limit, press the key adjacent to the "More" label. The menus shown below appear. To adjust the upper limit, press the key adjacent to the "Upper Limit" arrow. A new menu appears: "Enter Upper Limit." Using the number keys at the display's left side, enter the desired upper limit. In this example, we used 21 feet. If you make an error, press the CLEAR key and start again. Now press the ENTER key. The LMS-150 changes the upper limit to the new value.

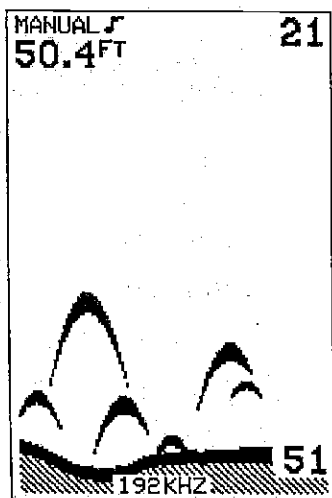


UPPER/LOWER LIMIT MENU



UPPER LIMIT ENTRY MENU

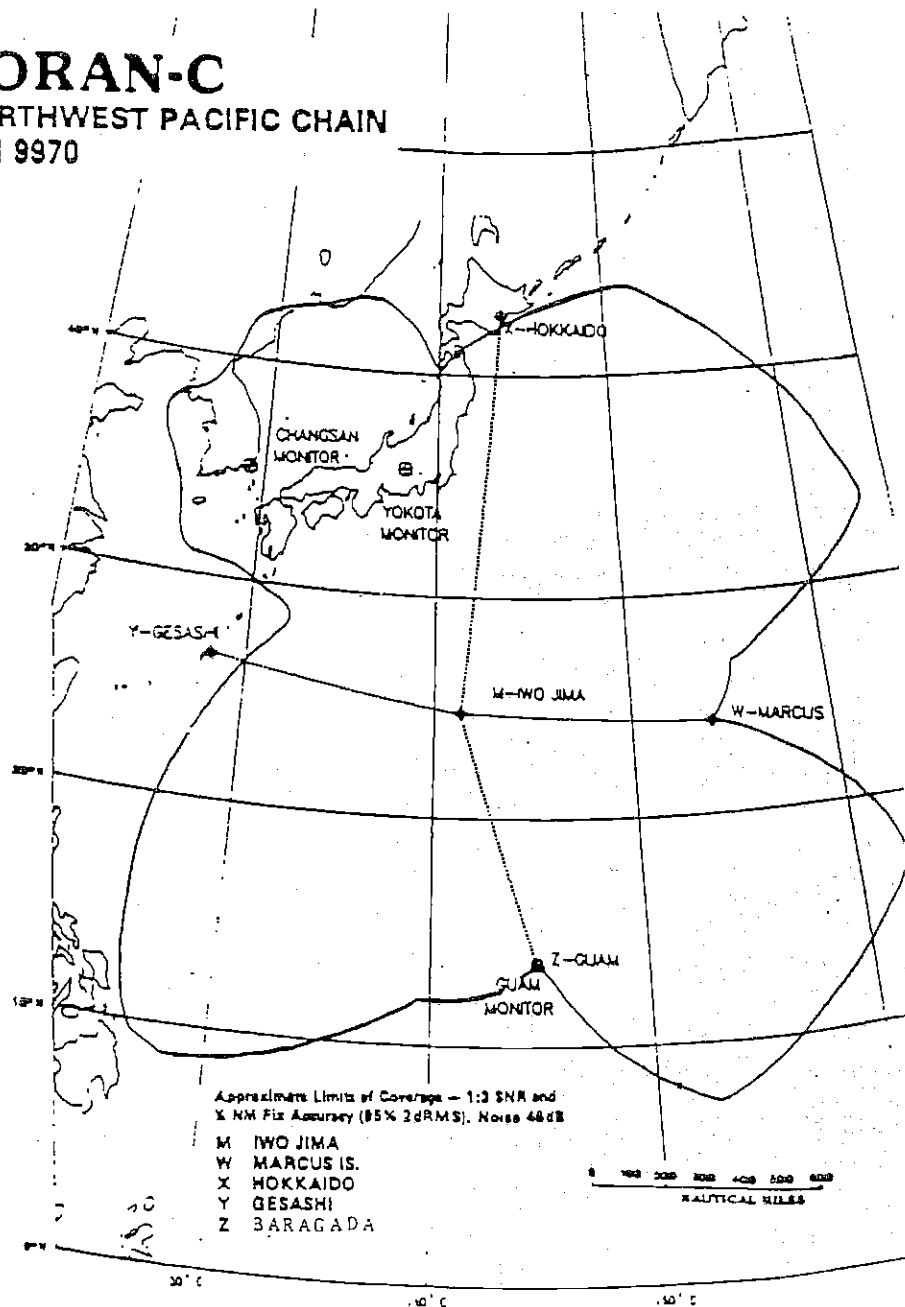
30 FOOT WINDOW
(21 FEET TO 51 FEET)



LORAN-C

NORTHWEST PACIFIC CHAIN

GRI 9970



The lower limit is adjustable in the same manner. You can choose any upper limit between zero and 4995 feet. The lower limit can be any range between 5 and 5000 feet.

The smallest "window" or distance between the upper and lower limit is five feet. For example, an upper limit of 21 feet and a lower limit of 51 feet gives a window of 30 feet. Upper and lower limits can be set in various combinations to show windows from the surface to the bottom and anywhere in between.

NOTE: The depth capability of the LMS-150 depends on the transducer installation, water and bottom conditions, and other factors. You can expect to read depths more than 350 feet in both fresh and salt water.

NORTHWEST PACIFIC LORAN-C CHAIN GR1 9970
 REGIONAL MANAGER COMMANDER, PACIFIC AREA, ALAMEDA, CA.
 CHAIN MANAGER COMMANDER, 14TH COAST GUARD DISTRICT, HONOLULU, HI
 COORDINATOR OF CHAIN OPERATIONS LOCATION, COMMANDER, FAR EAST SECTION, YOKOTA, JAPAN
 CONTROL SITE LORMONSTA YOKOTA, JAPAN

DESIGN	STATION	COORD.	CD/BELL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	IWO JIMA JAPAN	24 48 03.8N 141 19 30.3E		AN/FPN-45	1815	1350 FT MONOPOLE	0.0	
WHISKEY	MARCUS ISLAND JAPAN	24 17 07.8N 153 58 53.2E	11000/ 4283.98	AN/FPN-45	2160	1950 FT MONOPOLE	0.0	
XRAY	HOKKAIDO JAPAN	42 44 37.1N 143 43 08.2E	30000/ 6685.17	AN/FPN-45	600	625 FT MONOPOLE	0.0	DUAL RATE W/GR15970
YANKEE	OSASAKI JAPAN	26 35 25.0N 129 08 55.4E	55000/ 4483.29	AN/FPN-45	600	525 FT MONOPOLE	0.0	DUAL RATE W/GR15970
ZULU	BARRIGADA	13 27 50.1N 144 49 33.8E	2535.84/ 61000			750 FT		

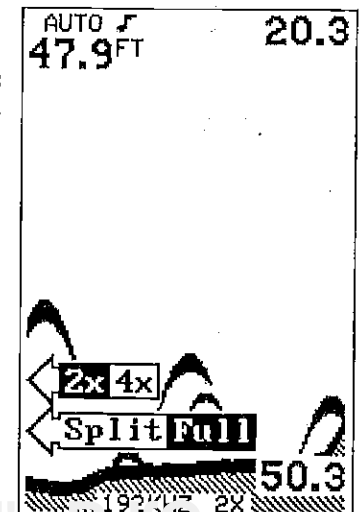
ZOOM

Enlarging or "zooming" the picture is a common method used to show small detail and fish signals. The LMS-150 gives you two different zoom sizes, plus a split screen zoom option. The zoom operation and adjustment is different in the automatic and manual modes.

ZOOM - AUTOMATIC MODE

To zoom the display in the automatic mode, first press the ZOOM key. All targets on the display are enlarged four times normal size automatically. The menus shown at right also appear.

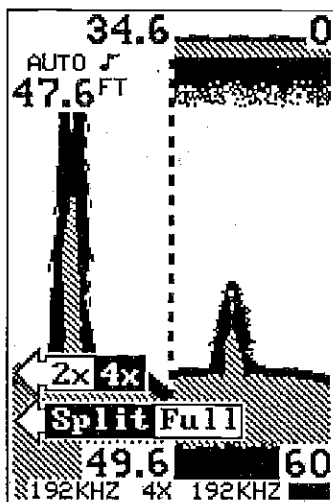
ZOOM
 MENUS
 (AUTOMATIC
 MODE)



To switch targets between twice their normal size and four times normal, press the key adjacent to the "2X/4X" label.

To switch between the split screen zoom and full screen zoom, press the key adjacent to the "SPLIT/FULL" label. The screen instantly splits into two sections. All targets on the left are shown at four times the size of the ones on the right. If you switch to the 2X zoom mode, echoes on the left side of the screen are shown at twice the size as the ones on the right. The echoes that scroll across the screen are the exact same echoes on both sides of the screen. They're simply enlarged on the left side. This feature tracks the bottom, always keeping it on the display while the automatic feature is on. Once you've set the zoom as desired, press the CLEAR key to erase the menus.

SPLIT-SCREEN
ZOOM
(AUTOMATIC
MODE)

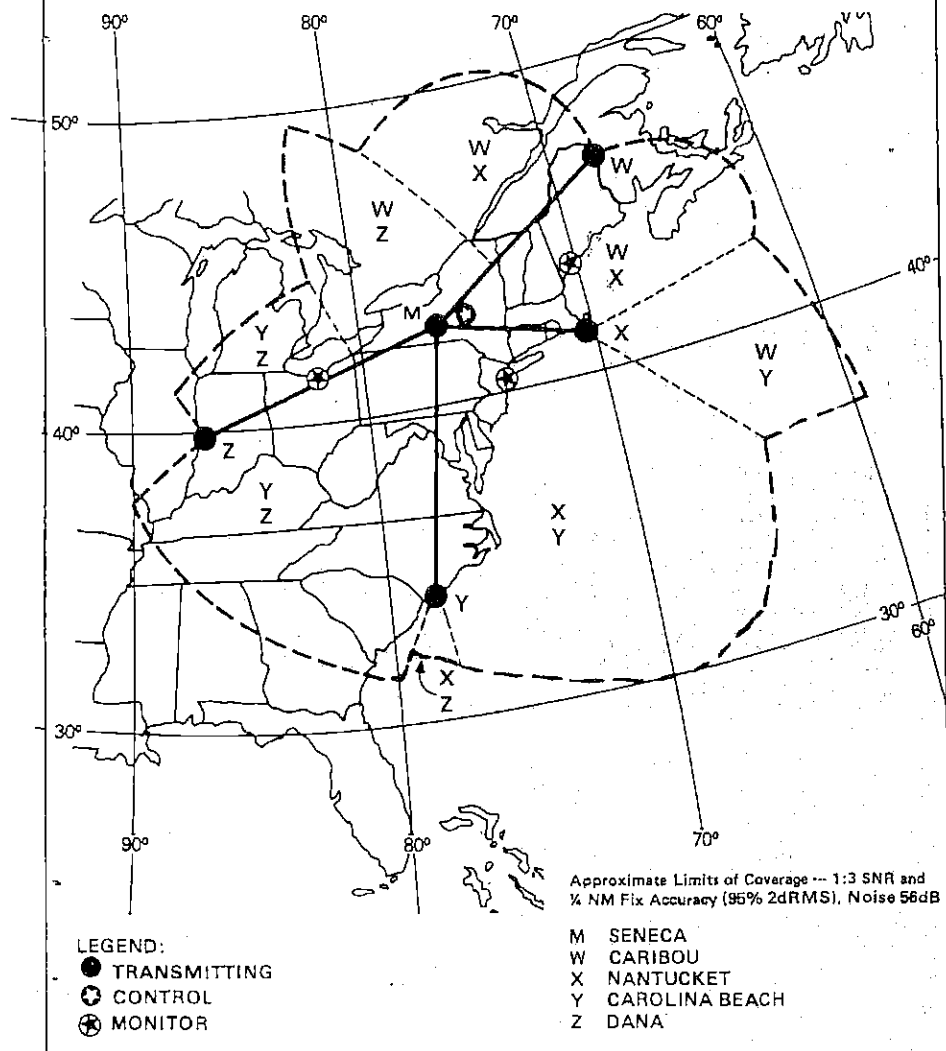


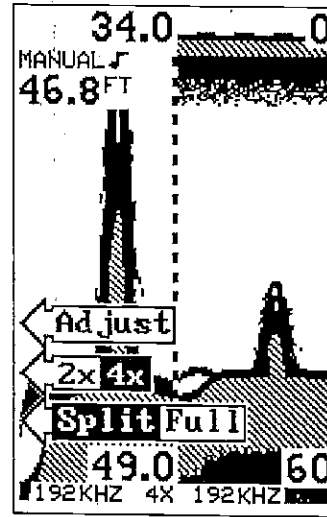
To turn the Zoom feature off, press the RANGE key.

ZOOM - MANUAL MODE

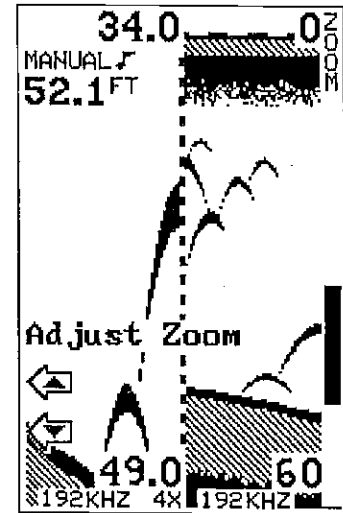
When you press the zoom key while the unit is in the manual mode, the screen shown at the top of the next page appears. The 4X zoom mode automatically appears. For a 2X zoom, simply press the key adjacent to the 2X/4X label. For a split screen zoom, press the key adjacent to the SPLIT/FULL label. Remember, the LMS-150 won't track the bottom signal while it's in the manual mode.

LORAN-C NORTHEAST U.S. CHAIN GRI 9960





SPLIT-SCREEN ZOOM
(MANUAL MODE)



ZOOM ADJUST MENU
(MANUAL MODE)

NORTHEAST U.S. LORAN-C CHAIN GRI 9960
REGIONAL MANAGER COMMANDER, ATLANTIC AREA, NEW YORK, NY.
CHAIN MANAGER COMMANDER, ATLANTIC AREA, NEW YORK, NY
COORDINATOR OF CHAIN OPERATIONS LOCATION: LORSTA SENECA, NY
CONTROL SITE: LORSTA SENECA, NY

DESIG.	STATION	COORD.	C/D/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NCM ECD	NOTES
MASTER	SENECA, NY	42 42 50.6N 76 49 33.9W		AN/FPN-64 (56 HCG'S)	600	700 FT MONOPOLE	0.0	DUAL RATE W/GRI8970
WHISKEY	CARIBOU, ME	45 45 27.2N 67 55 37.7W	11000/ 2797.20	AN/FPN-42	350	SLT	0.0	DUAL RATE W/GRI5900
XRAY	NANTUCKET MA	41 15 11.9N 69 50 39.1W	25000/ 1959.93	AN/FPN-42	325	525 FT MONOPOLE	0.0	DUAL RATE W/GRI5900
YANKEE	CAROLINA BEACH, NC	34 03 46.1N 77 54 45.7W	39000/ 3221.64	AN/FPN-42	550	TIP	0.0	DUAL RATE W/GRI7960
ZULU	DANA IN	39 51 07.5N 87 29 12.1W	54000/ 3152.06	AN/FPN-44	400	625 FT MONOPOLE	-0.5	DUAL RATE W/GRI8970

To adjust the zoom, press the key adjacent to the ADJUST label. A screen similar to the one at the upper right appears. A zoom bar appears at the top right side of the screen and adjust arrows appear at the bottom left. The echoes on the left side of the screen are the same ones that appear between top and bottom of the zoom bar. Press the keys adjacent to the arrows to move the zoom bar up or down. As you adjust the zoom bar, the echoes move on the left side of the screen at the same time. The zoom adjust menus and zoom bar automatically erase a few seconds after you've pressed the last key.

To keep the zoom bar on the screen, press the MENU key while the unit is in the manual mode. Next, press the key adjacent to the "More" label two times. The "Display Zoom Window Bar" menu appears at the bottom of the screen. This menu only appears when the LMS-150 is in the manual mode. Press the key adjacent to this menu to display the zoom bar. Repeat these steps to turn the zoom window bar off.

MENUS

The LMS-150 uses menus extensively to guide you through the functions and features of the unit. The menu key accesses many of these features, allowing you to customize the unit to your particular needs and water conditions. If you ever get lost in a menu, simply press CLEAR key. This returns the LMS-150 to the last used screen. There are seven menus on the sonar side. All of the following features are available through the menu key.

CHART SPEED

Chart speed is the rate echoes scroll across the screen. It's adjustable by first pressing the menu key, then pressing the key adjacent to the "ADJUST CHART SPEED" label. The chart speed menu appears on the left side of the screen. Increase the chart speed by pressing the key adjacent to the up arrow. Decrease it by pressing the key adjacent to the down arrow. The percentage of chart speed in use changes as the arrow keys are pressed. The bar chart also gives a graphical indication of the chart speed. You can see the change on the screen (both on the menu and on the chart record) as you press the keys. After you've made the adjustment, press the key adjacent to the CLEAR key to erase the menu.

The chart speed is preset to maximum when the LMS-150 is first turned on.

To stop the chart, press the key adjacent to the "START/STOP" label. Repeat this step to start the chart again. If desired, the chart can be stopped, then the CLEAR key pressed to erase the menus from the screen. This gives a clear view of the display.



MENU-1st PAGE

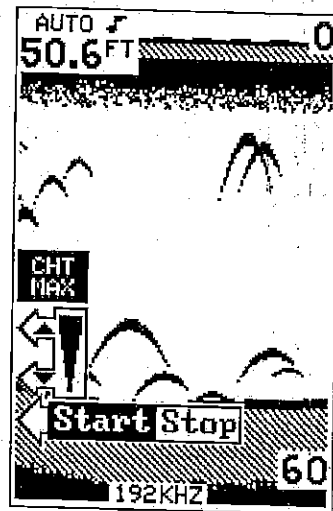
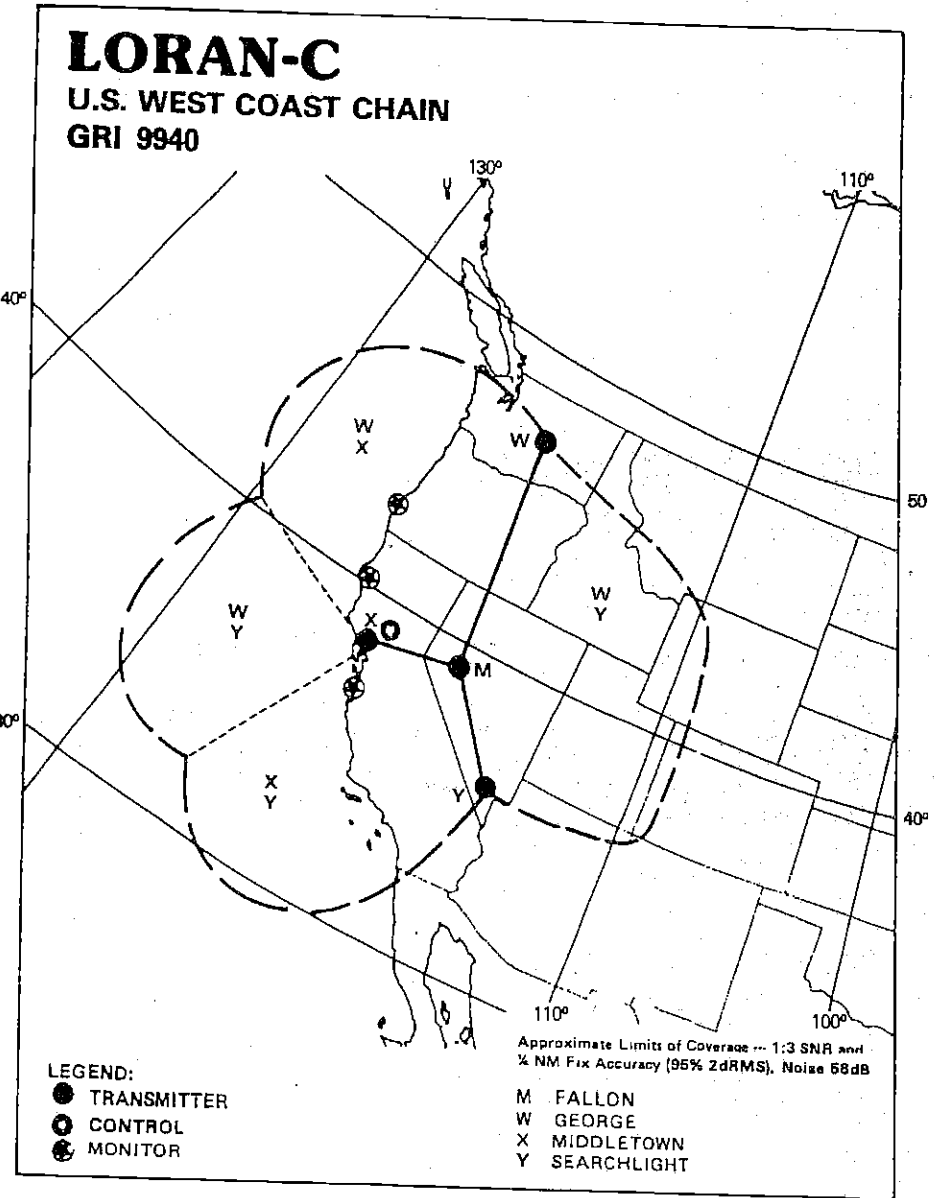


CHART SPEED ADJUST MENU



U.S. WEST COAST LORAN-C CHAIN GR1 9940
 REGIONAL MANAGER COMMANDER, PACIFIC AREA, ALAMEDA, CA
 CHAIN MANAGER COMMANDER, PACIFIC AREA, ALAMEDA, CA
 COORDINATOR OF CHAIN OPERATIONS LOCATION LORSTA MIDDLETOWN, CA
 CONTROL SITE: LORSTA MIDDLETOWN, CA

DESIG.	STATION	COORD.	CD/BELL (use)	TRANSMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	FALLON, NV	39 33 06.6N 118 49 56.4W		AN/FPN-44A	400	625 FT MONOPOLE	+1.0	
WHISKEY	GEORGE, WA	47 03 48.0N 119 44 39.5W	11000/ 2796.90	AN/FPN-45	1500	SLT	+0.5	DUAL RATE W/GRI6990
XRAY	MIDDLETOWN CA.	38 46 57.0N 122 29 44.5W	27000/ 1094.50	AN/FPN-44A MONOPOLE	400	625 FT	+0.5	
YANKEE	SEARCHLIGHT NV.	35 19 18.2N 114 48 17.4W	40000/ 1957.30	AN/FPN-44	540	SLT	0.0	

FISH I.D.

The Fish I.D. feature identifies targets that meet certain conditions as fish. The micro-computer analyzes all echoes and eliminates surface clutter, thermoclines, and other signals that are undesirable. In most instances, remaining targets are fish. The Fish I.D. feature displays symbols on the screen in place of the actual fish echoes. There are four fish symbol sizes: tiny, small, medium, and large. These show the relative size between targets. In other words, it displays a small fish symbol when it thinks a target is a small fish, a medium fish symbol on a larger target, etc.

The micro-computer is sophisticated, but it can be fooled. It can't distinguish between fish and other suspended objects such as trotlines, turtles, submerged floats, air bubbles, etc. Individual tree limbs extending outwards from a group of limbs is the hardest object for the Fish I.D. feature to distinguish from fish. You may see Fish I.D. symbols on the screen when actually, there are no fish. Practice with the unit in both the Fish I.D. mode and without to become more familiar with the Fish I.D. feature.

When the LMS-150 is turned on, the Fish I.D. feature is off. To turn the Fish I.D. feature on, first press the MENU key. Now press the key adjacent to the "Turn On Fish-ID" label. The menu immediately disappears and the sonar screen returns. Echoes will continue to scroll across the screen, however, the surface clutter no longer shows. Any



targets the micro-computer determines are fish show as fish symbols. To turn the Fish I.D. feature off again, first press the menu key. Next, press the key adjacent to the "Turn Off Fish-ID" label. Or press the AUTO key. This turns the Fish I.D. feature and automatic off at the same time.

Remember, you can't use the Fish I.D. feature when the LMS-150 is in the manual mode. If you turn the Fish I.D. feature on when the LMS-150 is in manual, the micro-computer will turn the automatic feature on. If you turn automatic off when the Fish I.D. feature is on, the Fish I.D. feature will be turned off also.

CHART CURSOR

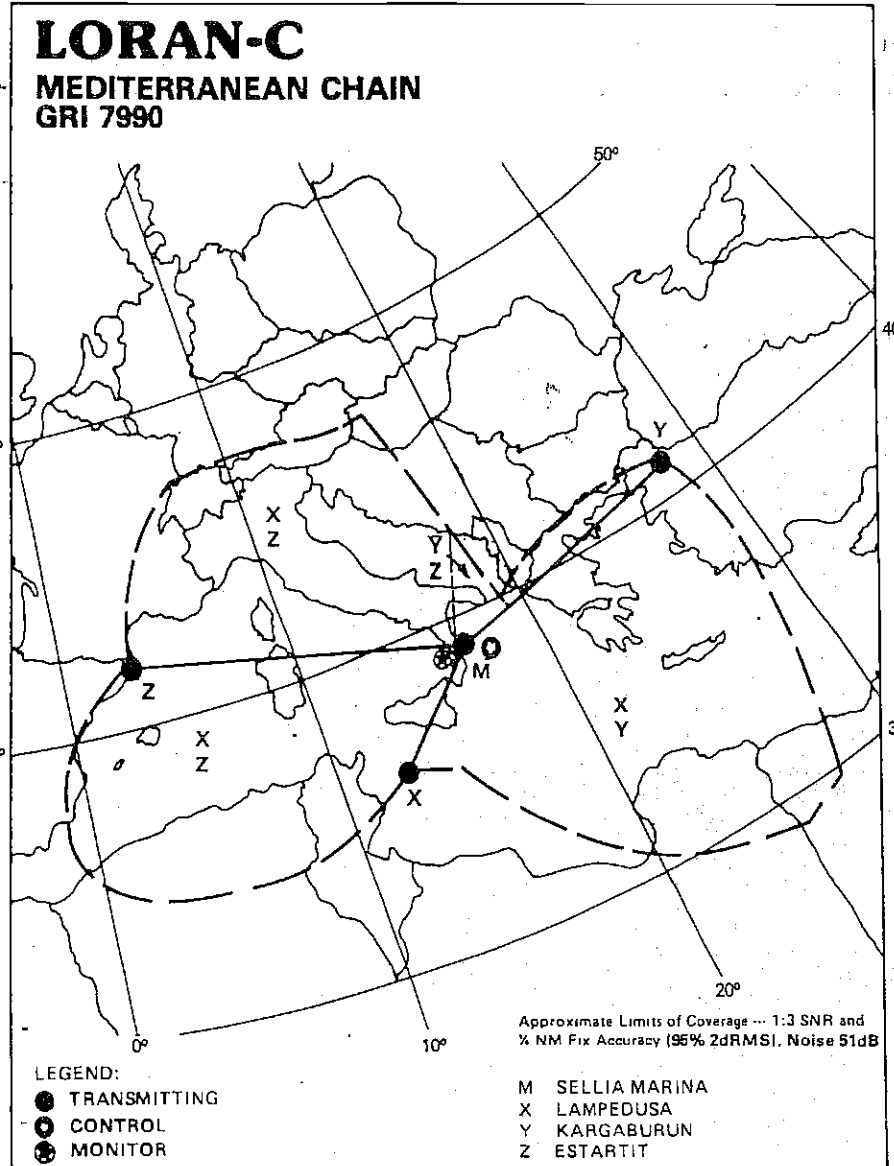
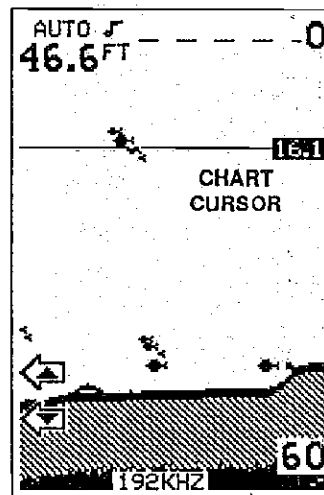
The LMS-150 has a chart cursor that allows you to pinpoint a target's depth. The cursor is simply a horizontal line that extends across the display from left to right. A depth box at the end of the line on the right side shows the line's depth. In the example below, the cursor (line) is at 16.1 feet.

To display the chart cursor, press the MENU key. Now press the key adjacent to the "Turn On Chart Cursor" label. A screen similar to the one below appears.

Use the keys adjacent to the up and down arrow to move the cursor up or down to the desired depth.

To turn the chart cursor off, press the MENU key. Now press the key adjacent to the "Turn Off Chart Cursor" label. The LMS-150 returns to the sonar screen without the chart cursor.

NOTE: You can't use the Chart Cursor when FASTRAK is on.



MEDITERRANEAN SEA LORAN-C CHAIN GRI 7990
 REGIONAL MANAGER COMMANDER, COAST GUARD ACTIVITIES EUROPE, LONDON, UK
 CHAN MANAGER COMMANDER, COAST GUARD ACTIVITIES EUROPE, LONDON, UK
 COORDINATOR OF CHAIN OPERATIONS LOCATION: LORSTA SELLIA MARINA, ITALY
 CONTROL SITE: LORSTA SELLIA MARINA, ITALY

DESIG.	STATION	COORD.	CODELL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	SELLIA MARINA, ITALY	38 52 20.8N 16 43 06.2E		AN/FPN-39	165	825 FT MONOPOLE	0.0	
XRAY	LAMPEDUSA ITALY	35 31 20.8N 12 51 30.2E	11000/ 1755.96	ATLS	325	825 FT MONOPOLE	0.0	
YAMKEE	KARGABURLUN TURKEY	40 58 21.0N 27 52 01.5E	25000/ 3273.29	AN/FPN-39	165	825 FT MONOPOLE	0.0	
ZULU	ESTAPTIT SPAIN	42 03 36.5N 03 12 15.5E	47000/ 3999.74	AN/FPN-39	165	825 FT MONOPOLE	0.0	

ALARMS

The LMS-150 has three different types of alarms. The Fish Alarm sounds when the Fish I.D. feature determines a group of echoes is a fish. Another alarm is the Zone Alarm which consists of a bar. Any echo that appears inside this bar triggers the alarm. The last alarm is the Bottom Alarm. Only the bottom signal will "trip" this alarm. This is useful as an anchor watch, a shallow water alert, or for navigation.

All of the alarms have a visual and audio signal. If desired, the audio signal can be turned off through the ALARM menu.

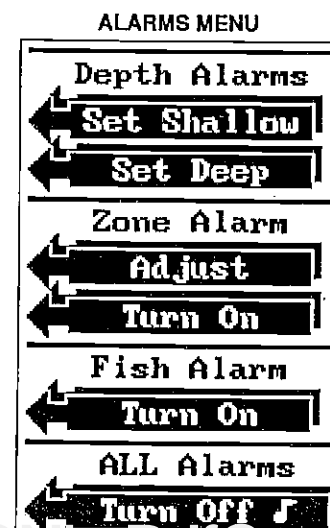
Depth Alarms

The Depth Alarms are only triggered from the bottom signal. No other echo will "trip" this alarm. The shallow alarm sounds a warning tone when the bottom signal goes shallower than the alarm set point. The deep alarm sounds when the bottom signal goes deeper than the alarm set point. Use the shallow alarm to warn you of shallow water. Use the deep alarm to alert you to deeper water, such as a drop-off.

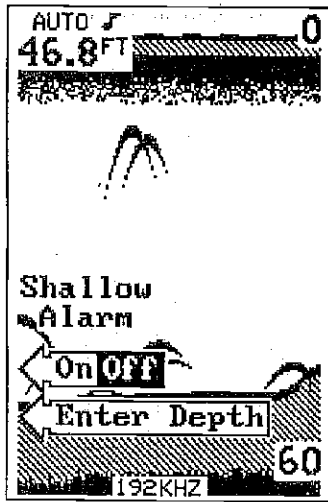
Shallow Alarm

To use the Shallow Alarm, first press the MENU key. Now press the key adjacent to the "Sonar Alarms" label. The screen below right appears.

The Shallow and Deep Alarm menus are at the top of this screen. Now press the key adjacent to the "Set Shallow" label. The screen similar to the one shown at the top of the next page appears.



Now press the key adjacent to the "Enter Depth" arrow. A new menu appears "Enter Shal Alarm", as shown above right. Now simply enter the desired shallow alarm depth using the keys on the left side of the screen.



SHALLOW ALARM MENU



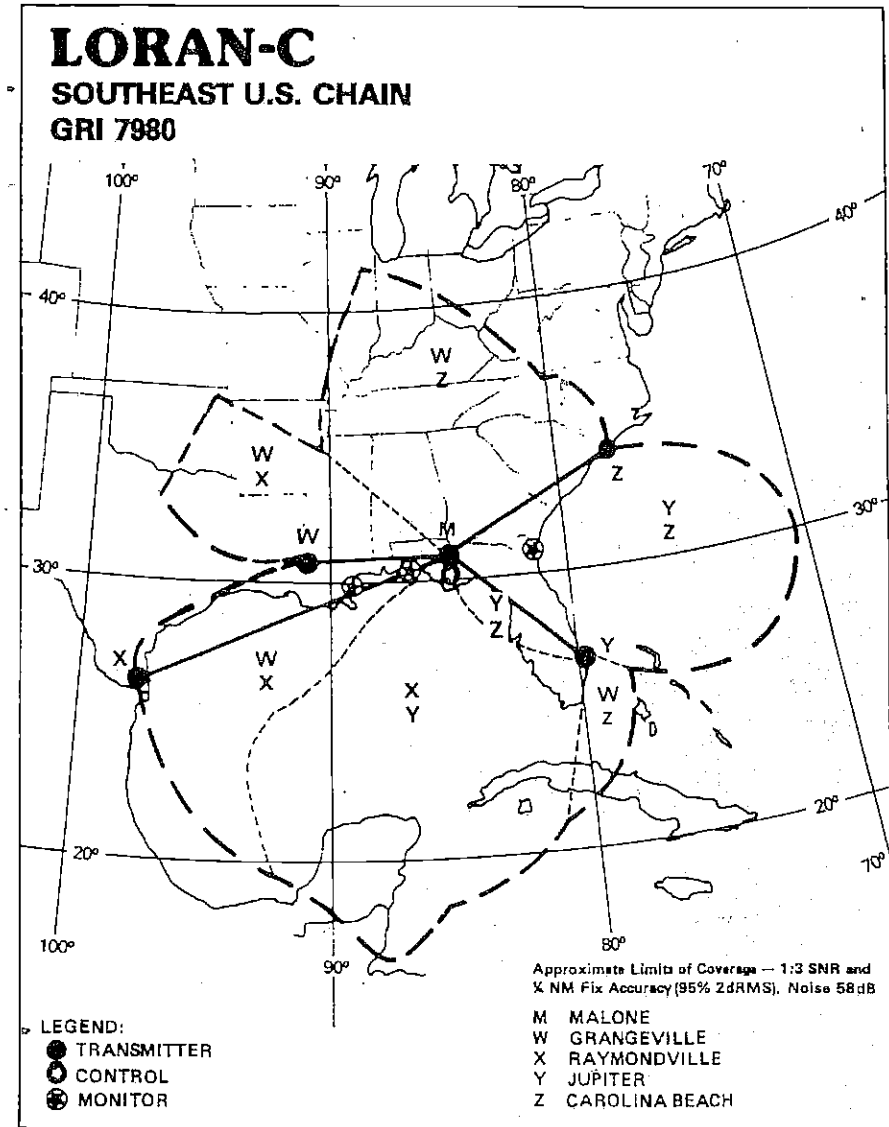
SHALLOW ALARM ENTRY MENU

This example uses a shallow alarm setting of ten feet. If the bottom depth goes shallower than ten feet, the alarm will sound. Now press the Enter key. The menu automatically erases and the words "SHAL ALARM" appear in the screen's lower left corner. This automatically turns the shallow alarm on. When the bottom signal triggers this alarm, a tone sounds and the words "SHAL ALARM" flash on the display. An arrow appears with the word "MUTE" inside. Pressing the key adjacent to this arrow temporarily turns the alarm's sound off. The next time the alarm trips, the tone will sound again.

To turn the shallow alarm off, first press the MENU key. Now press the key adjacent to the "Sonar Alarms" label. Then press the key adjacent to the "Set Shallow" label. Now press the key adjacent to the ON/OFF label. Another way to turn the shallow alarm off is to simply set the shallow alarm depth to zero.

Deep Alarm

The deep alarm adjusts and activates exactly like the shallow alarm except the initial setting. When you first set the deep alarm, the initial setting is 5000 feet. Setting the deep alarm to 5000 feet turns it off. The only other difference is the sound the deep alarm makes when the



bottom goes deeper than the alarm depth. This tone is different so you can tell by the sound which alarm was triggered.

Zone Alarm

To activate the Zone Alarm, first press the MENU key. Now press the key adjacent to the "Sonar Alarms" label. Next, press the key next to the Zone Alarm's ADJUST label. The words "ZONE ALARM" show at the screens top right side, signifying the Zone Alarm is active. The zone bar shows immediately beneath it. Any echo that appears between the top and bottom of this bar will trigger the alarm. This alarm will sound on fish, structure, bottom echoes, etc.

To adjust the zone alarm bar press the key adjacent to the up or down arrows. To adjust the top of the bar shallower or deeper, press the key adjacent to the Set Shal/Deep label until the word Shal is highlighted.

SOUTHEAST U.S. LORAN-C CHAIN FR1 7980
 REGIONAL MANAGER COMMANDER, ATLANTIC AREA, NEW YORK, NY
 CHAIN MANAGER COMMANDER, ATLANTIC AREA, NEW YORK, NY
 COORDINATOR OF CHAIN OPERATIONS LOCATION: LORSTA MALONE, FL
 CONTROL SITE: LORSTA MALONE, FL

DESIG.	STATION	COORD.	CDBLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	MALONE, FL	30 59 38.7N 85 10 09.3W		AN/FPN-64 (56 HCG'S)	800	700 FT MONOPOLE	0.0	DUAL RATE W/GRI 8970
WHISKEY	GRANGEVILLE LA	30 43 33.0N 90 49 43.6W	11000/ 1809.54	AN/FPN-64 (56 HCG'S)	800	700 FT MONOPOLE	-0.5	
XRAY	RAYMOND- VILLE, TX	26 31 55.0N 97 50 00.1W	23000/ 4443.38	AN/FPN-64 (32 HCG'S)	400	700 FT MONOPOLE	0.0	
YANKEE	JUPITER, FL	27 01 58.4N 80 06 53.4W	43000/ 2201.89	AN/FPN-42	325	625 FT MONOPOLE	0.0	
ZULU	CARCLINA BEACH, NC	34 05 46.1N 77 54 46.7W	53000/ 2542.73	AN/FPN-42	550	TIP	0.0	DUAL RATE W/GRI 8960

ZONE
ALARM
MENU



To adjust the bottom of the zone alarm bar, press the key until the Deep label is highlighted. Now simply press the key adjacent to the up arrow to move the end of the bar up. Press the key adjacent to the down arrow to move it down.

Once you've made the adjustments, press the CLEAR key to erase the menus.

Fish Alarm

Use the fish alarm for a distinctive audible alarm when the Fish ID feature detects fish or other suspended objects. To use the Fish Alarm feature, first press the MENU key. Next, press the key adjacent to the "Sonar Alarms" label. Now press the key adjacent to the "Turn On" label in the Fish Alarm section. The screen will clear. Each time a fish symbol displays on the screen, a tone will sound. This will also turn the Fish I.D. feature on if it was off.

To turn the Fish Alarm off, again press the ALARM key. Now press the key adjacent to the "Turn Off" label. The alarm is now disabled.

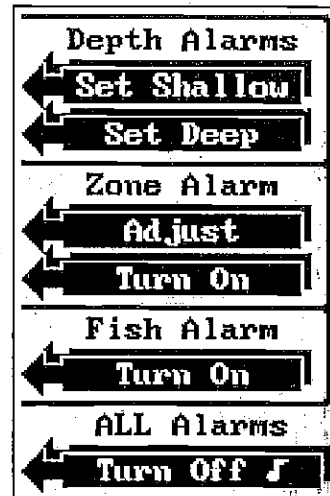
Audio Alarm On/Off

When the LMS-150 is first turned on, a note symbol at the top of the screen shows the audio alarm is enabled.

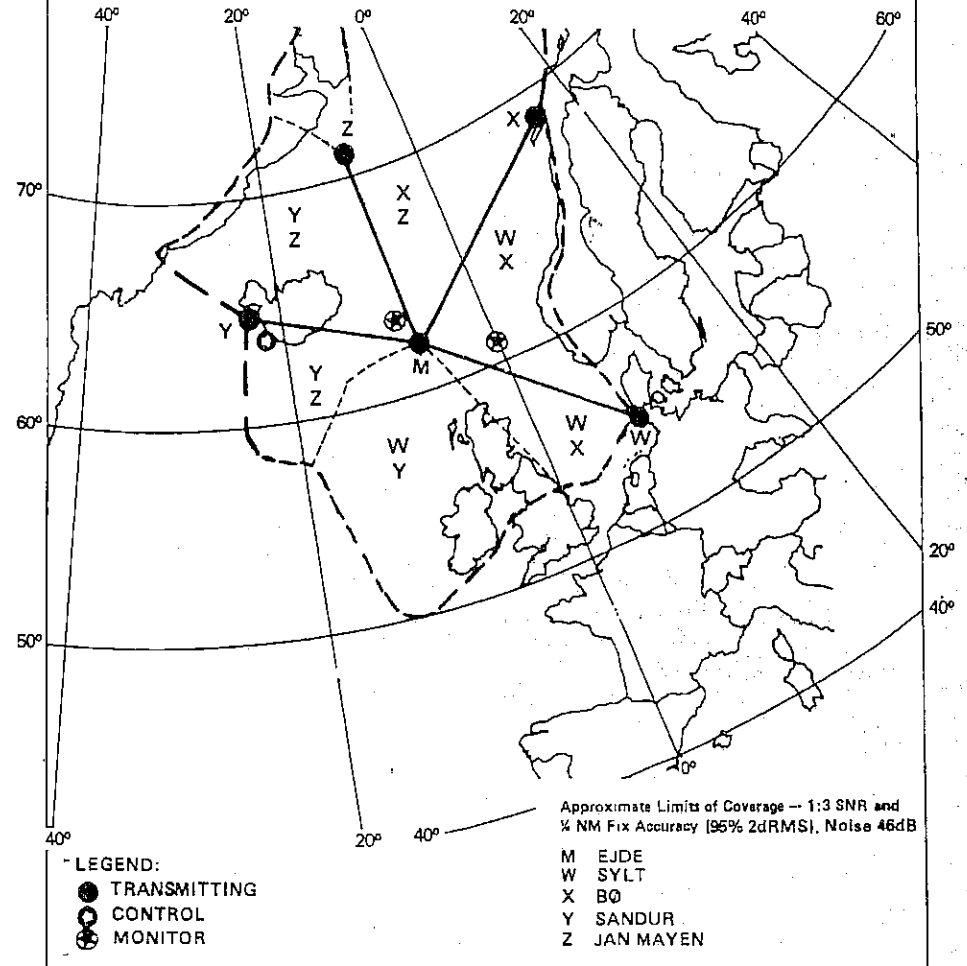
To turn the audio alarm on or off, press the MENU key. Now press the key adjacent to the "Sonar Alarms" label. Next, press the key adjacent to the "Turn Off" label in the "All Alarms" section. To turn the audio alarm on, press the ALARM key again. The label that was used to turn the sound off now reads "Turn On." Press the key adjacent to this label to turn the sound on.

NOTE:

The words corresponding to the alarm in use will still flash at the display's side when the alarm is triggered even if the speaker is turned off. For example, the words "ZONE ALARM" flash when the zone alarm trips.



LORAN-C NORWEGIAN SEA CHAIN GRI 7970



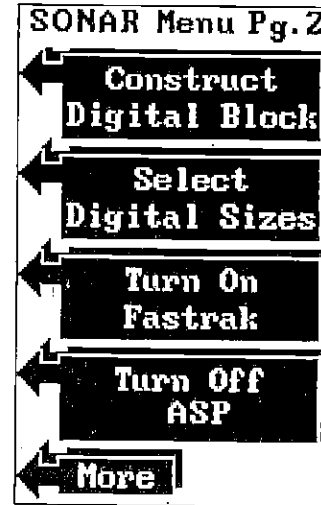
MENU - PAGE 2

CONSTRUCT DIGITAL BLOCK

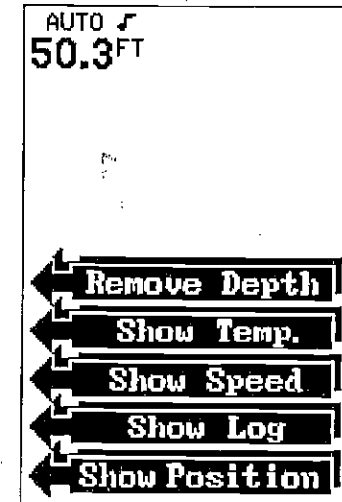
The LMS-150 can display the depth, speed, surface water temperature, distance log, and present position on the upper left portion of the screen. When the LMS-150 is first turned on, only the digital depth shows. You can turn each digital display on or off as desired. The battery backup will retain these settings.

NORWEGIAN SEA LORAN-C CHAIN GRI 7970
 REGIONAL MANAGER, COMMANDER, COAST GUARD ACTIVITIES EUROPE, LONDON, UK
 CHAIN MANAGER COMMANDER, COAST GUARD ACTIVITIES EUROPE, LOND, UK
 COORDINATOR OF CHAIN OPERATIONS LOCATION: LORAN-C DETAIL KEFLAVIK, ICELAND
 CONTROL SITE: LORMONSTA DEFIHAVIK, ICELAND

DESIG.	STATION	COORD.	CD/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NCM ECD	NOTES
MASTER	EJDE/FAEROE IS..DENMARK	62 17 59 GN 07 04 26.5W		AN/FPN-44	325	625 FT MONOPOLE	0.0	DUAL RATE W/GRI7930
XRAY	BO.NORWAY	68 38 05.2N 14 27 47.0E	11000/ 4040.10	AN/FPN-39	165	625 FT MONOPOLE	0.0	
WHISKEY	SYLT GERMANY	54 45 29.8N 08 17 36.8E	26000/ 4065.62	AN/FPN-42	325	625 FT MONOPOLE	0.0	
YANKEE	SANDUR ICELAND	54 54 26.8N 23 55 21.8W	46000/ 2944.54	AN/FPN-45	1500	1350FT MONOPOLE	0.0	DUAL RATE W/GRI7930
ZULU	JAN MAYEN NORWAY	70 54 52.7W 08 43 58.7W	50000/ 8215.31	AN/FPN-39	165	625 FT MONOPOLE	0.0	



MENU - 2nd PAGE



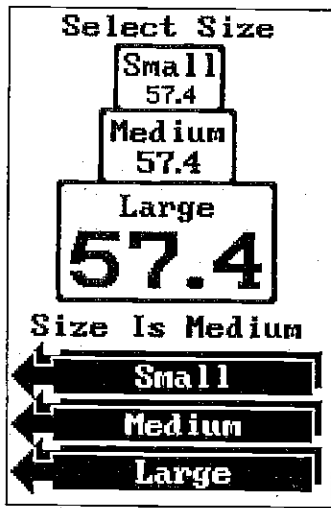
DIGITAL BLOCK MENU

To select the digital displays, first press the menu key, then press the key adjacent to the "More" label. Next, press the key adjacent to the "CONSTRUCT DIGITAL BLOCK" menu at the top of the screen. A screen similar to the one above appears.

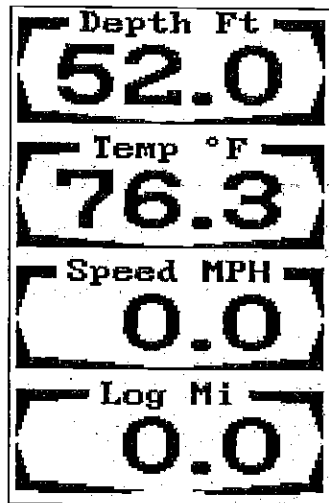
Now press the key adjacent to the desired display. For example, to turn the temperature display on, press the key adjacent to the "Show Temp." label. Once you do this, the display will show the temperature and read "Remove Temp." You can turn each display on or off individually.

To show the present position, press the key adjacent to the "Show Position" label. Note: If DTG and BRG is displayed on the loran side, then this label will say "Show DTG/BRG" instead.

Press the CLEAR key to exit from this menu or wait about ten seconds and the menus will automatically clear.



DIGITAL SIZE MENU



ALL DIGITAL DISPLAY
(LARGE DIGITAL SIZE)

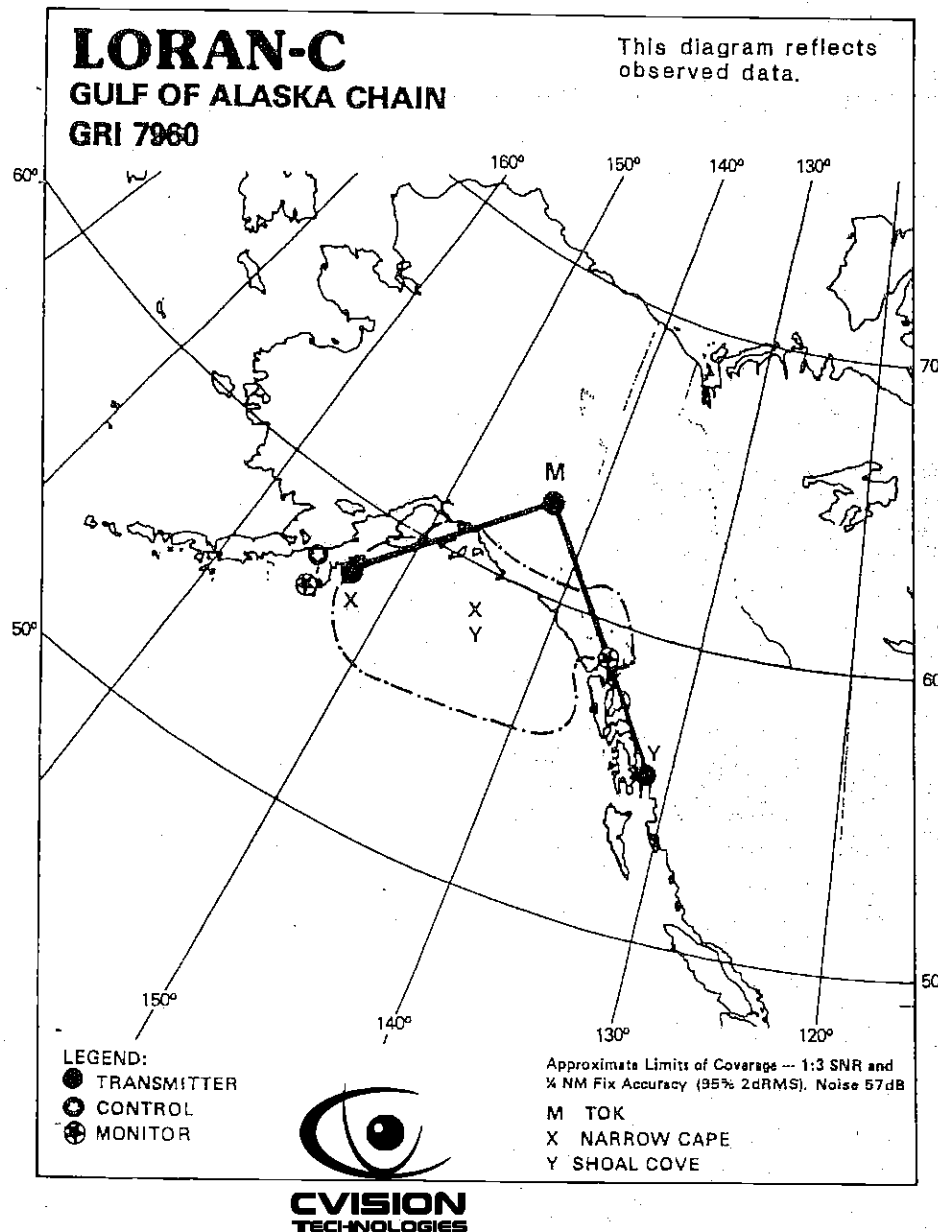
SELECT DIGITAL SIZES

The digital displays can show in three different sizes - small, medium, or large. When the LMS-150 is turned on, the digital depth shows in the medium digital size. To change the size of the digital display, first press the MENU key. Next, press the key adjacent to the "More" label. Now press the key adjacent to the "Select Digital Sizes" menu. The screen at the top of this page appears.

A sample of the digital sizes appears at the top of the display.

Now simply press the key adjacent to the desired label. For example, if you press the key adjacent to the "SMALL" label, the digital displays show in small numbers.

The large digital selection erases the chart and shows the digital displays in large numbers as shown above right. Pressing the menu key gives only one menu page which is different from other menus. This menu lets you go back to chart information, placing the digital display back in the medium size. It also lets you select digital displays and adjust the depth alarm. Returning to the chart restores the normal menu operation.

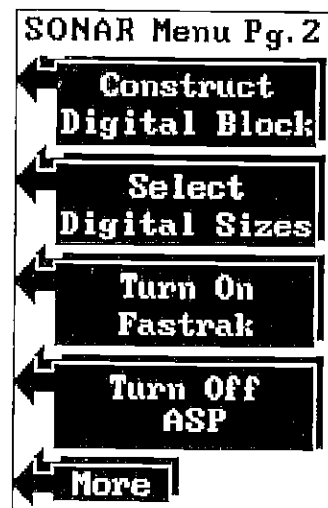


GULF OF ALASKA LORAN-C CHAIN GR1 7960
 REGIONAL MANGER COMMANDER, PACIFIC AREA, ALAMEDA, CA
 CHAIN MANAGER: COMMANDER 17TH COAST GUARD DISTRICT, JUNEAU, AK
 COORDINATOR OF CHAIN OPERATIONS LOCATION: LORMONSTA KODIAK, AK
 CONTROL SITE: LORMONSTA KODIAK, AK

DESIG.	STATION	COORD.	CD/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	TOK AK	63 19 42.8N 142 48 31.9W		AN/FPN-44A	540	SLT	+1.0	
XRAY	NARROW CAPE, AK	57 25 20.2N 152 22 11.3W	11000V 2004.45	AN/FPN-44A	400	625 FT MONOPOLE	0.0	DUAL RATE W/GRI/9990
YANKEE	SHOAL COVE AK	55 26 20.9N 131 15 19.6W	26000V 3051.14	AN/FPN-44A	540	SLT	0.0	DUAL RATE W/GRI/9990

FASTRAK

This feature converts all echoes to short horizontal lines on the display's far right side. The graph continues to operate normally. FASTRAK gives you a rapid update of conditions directly under the boat. This makes it useful for ice fishing, or when you're fishing at anchor.



MENU -2nd PAGE



Since the boat is not moving, fish signals are long, drawn out lines on a normal chart display. FASTRAK converts the graph to a vertical bar graph that, with practice, makes a useful addition to fishing at a stationary location.

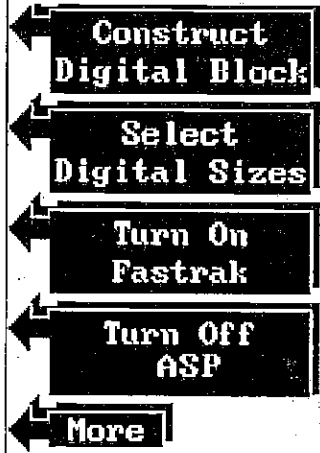
NOTE: Fish I.D. is automatically turned off when FASTRAK is on.

To turn FASTRAK on, press the menu key, then press the key adjacent to the "More" label. Now press the key adjacent to the "Turn On Fastrak" label. To turn it off, repeat the same steps. The "Turn Off Fastrak" label appears instead of the "Turn On Fastrak" label.

ASP (Advanced Signal Processing)

The LMS-150 has ASP, a proprietary method of noise reduction. This advanced system effectively reduces or eliminates noise displayed on the screen. When the unit is turned on for the first time, ASP is enabled. To turn it off, press the MENU key, then press the key adjacent to the More label until sonar menu number 2 appears as shown above. Now press the key adjacent to the "Turn Off ASP". The screen will clear and return to the sonar display. To turn ASP on again, simply repeat the above steps. The screen will now show "Turn ON ASP".

SONAR Menu Pg: 2



MENU - PAGE 3

NOISE REJECTION

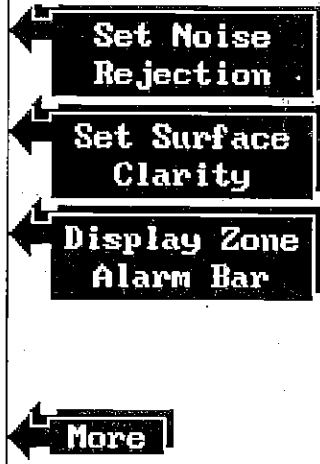
The LMS-150GPS's noise rejection feature is an effective tool in combating noise. In sonar terms, noise is any undesired signal. It is caused by electrical and mechanical sources such as bilge pumps, engine ignition systems and wiring, air bubbles passing over the face of the transducer, even vibration from the engine. In all cases, noise produces unwanted marks on the display.

The LMS-150 has a two step noise rejection system. When the unit is turned on, the noise rejection is normal. If you have noise problems (identified by random lines or dots on the display), try changing the noise rejection level to high.

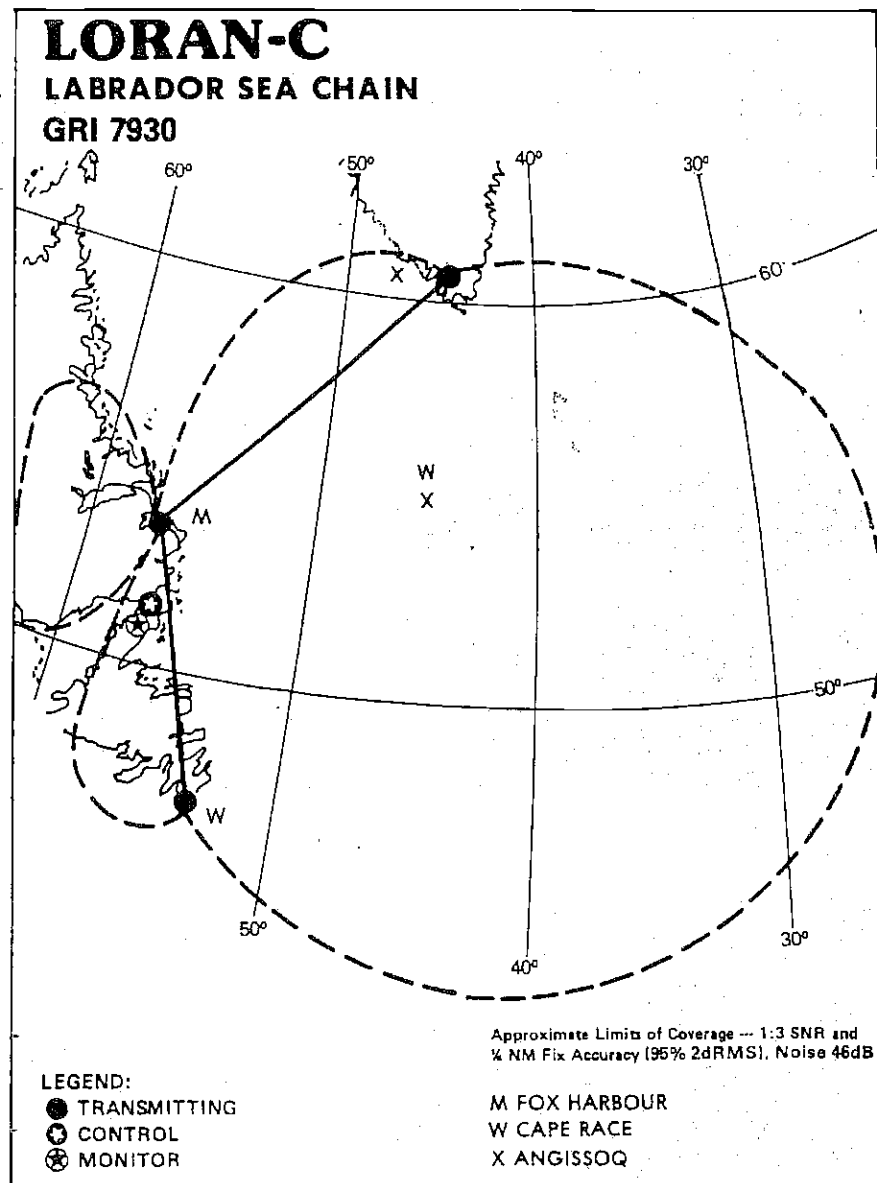
To do this, first press the MENU key, then the key adjacent to the "More" label two times. The screen at right appears.

Now press the key adjacent to the "Set Noise Rejection" label. The screen at

SONAR Menu Pg.3



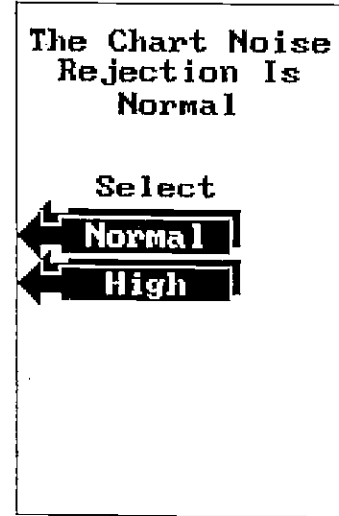
MENU - 3rd PAGE
(AUTOMATIC ON)
(FISH ID OFF)



LABRADOR SEA LORAN-C CHAIN GRI 7930
 REGIONAL MANAGER COMMANDER ATLANTIC AREA NEW YORK, NY
 CHAIN MANAGER COMMANDER, ATLANTIC AREA, NEW YORK, NY
 COORDINATOR OF CHAIN OPERATIONS LOCATION: LORMONSTA ST. ANTHONY, NEWFOUNDLAND, CANADA
 CONTROL SITE: LORMONSTA ST. ANTHONY, NEWFOUNDLAND

DESIG.	STATION	COORD.	CO/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM EDD	NOTES
MASTER	FOX HARBOUR Nfld, CANADA	52 22 35.2N 55 42 25.4W		AN/FPN-64 (56 HCB'S)	800	700 FT MONOPOLE	0.0	DUAL RATE W/GRI5930
WHISKEY	CAPE RACE Nfld, CANADA	46 46 32.2N 53 10 25.2W	11000/ 2157.31	AN/FPN-45	1500	1350 FT MONOPOLE	0.0	DUAL RATE W/GRI5930
XRAY	ANGISSOO GREENLAND	59 59 17.2N 45 10 27.5W	26000/ 3505.39	AN/FPN-45	760	625 FT MONOPOLE	0.0	DUAL RATE W/GRI9980

right appears. Now press the key adjacent to the "High" label. The screen will clear and return to the chart screen. The noise should clear from the display as new echoes scroll across the screen. If it doesn't, you may have a problem with electrical wiring, engine, or transducer installation. Check with your local dealer, Lowrance service center, or the Lowrance factory customer service department for help.



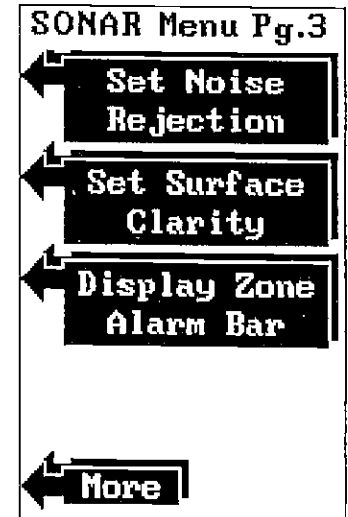
NOISE REJECTION MENU

SET SURFACE CLARITY (SCC)

The markings extending downwards from the zero line can extend many feet below the surface. These markings are called surface clutter and are caused by wave action, boat wakes, temperature inversions, or other activity.

Surface Clarity Control (SCC) reduces or eliminates undesired signals from the display. SCC varies the sensitivity of the receiver, decreasing it near the surface and gradually increasing it as the range increases. Typically, the maximum depth that SCC affects is 75% of the range. For example, on a 0-60 foot range with maximum SCC, surface clutter is reduced from the surface to about 45 feet.

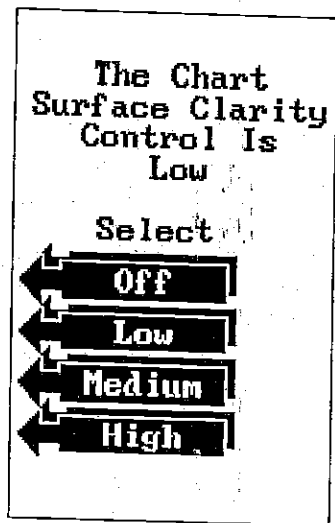
There are three levels of SCC; low, medium, and high. Note that SCC is not available when the Fish I.D. feature is on. The SCC menu doesn't show until the Fish I.D. feature is turned off.



MENU - 3rd PAGE
 (AUTOMATIC ON)
 (FISH ID OFF)

To adjust the SCC level, first make certain that the Fish I.D. feature is off. Now press the MENU key, then the key adjacent to the "More" label two times. Now press the key adjacent to the "Set Surface Clarity" label.

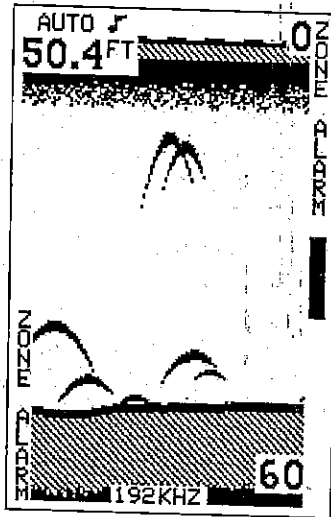
The menu shown at right appears. Simply press the key adjacent to the desired SCC level, either Off, Low, Medium, or High. The LMS-150 clears the display, and returns to the chart mode using the SCC level you entered.



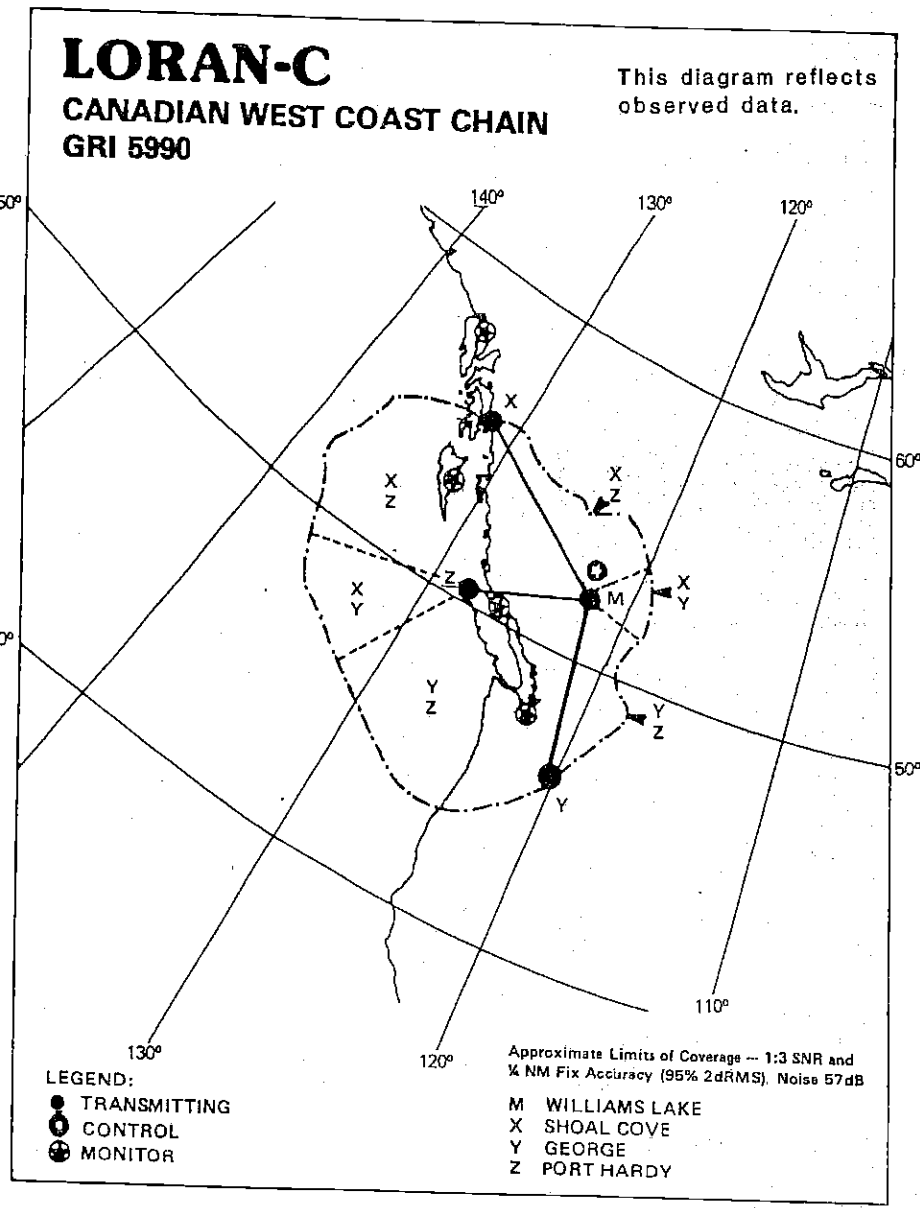
SCC ADJUST
MENU

DISPLAY ZONE ALARM BAR

The bar used in the zone alarm normally disappears after setting the alarm. You can turn it on continuously, if desired. To turn the zone alarm on, press the MENU key, then the key adjacent to the "More" label three times. Now press the key adjacent to the "DISPLAY ZONE BAR" label. The menu screen disappears and the zone alarm bar displays on the screen's right side. This will also turn the zone alarm on if it wasn't already on. Repeat these steps to turn the zone alarm bar off or use the ALARM menu. Turning the Zone Alarm bar off also turns the zone alarm off.



ZONE ALARM
ON

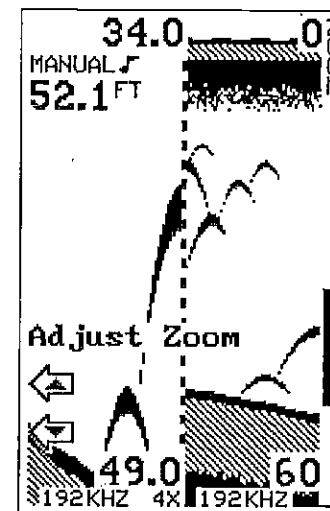


CANADIAN WEST COAST LORAN-C CHAIN GR1 5990
 REGIONAL MANAGER COMMANDER, PACIFIC AREA, ALAMEDA, CA
 CHAIN MANAGER COMMANDER, PACIFIC AREA, ALAMEDA, CA
 COORDINATOR OF CHAIN OPERATIONS LOCATION: LORSTA MIDDLETOWN, CA
 CONTROL SITE: LORSTA WILLIAMS LAKE, BC, CANADA

DESIG.	STATION	COORD.	CDBLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	WILLIAMS LAKE, BC, CANADA	51 57 58.8N 122 22 02.2W		ANFPN-44A	400	825 FT MONOPOLE	+ 1.0	
XRAY	SHOAL COVE AK	55 25 29.9N 131 15 19.7W	11000/ 2343.60	ANFPN-44A	64G	SLT	0.0	DUAL RATE W/GRI 7850
YANKEE	GEORGE, WA	47 03 48.0N 119 44 39.5W	27000/ 1927.36	ANFPN-45	1600	SLT	+0.5	DUAL RATE W/GRI 9940
ZULU	PORT HARDY BC, CANADA	50 36 29.7N 127 21 29.0W	41000/ 1266.51	ANFPN-54 (32 HCG'S)	400	825 FT MONOPOLE	0.0	ALERT BAY



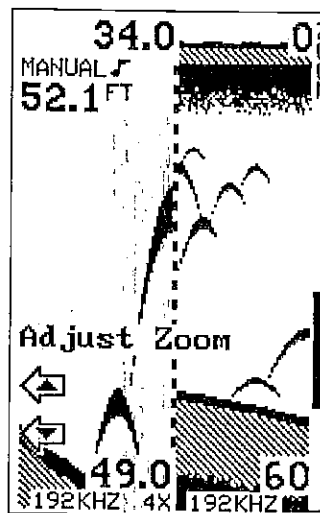
MENU - 4th PAGE
(AUTOMATIC OFF)



ZOOM ADJUST MENU
(MANUAL MODE)

DISPLAY ZOOM WINDOW BAR

The bar used to adjust the zoom window in the manual mode normally disappears after setting the zoom window. You can turn it on continuously, which keeps the unit in the split screen zoom mode. To turn the zoom window bar on, first make certain the LMS-150 is in the manual mode. Next, press the MENU key, then the key adjacent to the "More" label two times. Now press the key adjacent to the "DISPLAY ZOOM WINDOW BAR" label. The menu screen disappears and the zoom window bar displays on the right side of the screen. Repeat these steps to turn the zoom window bar off.



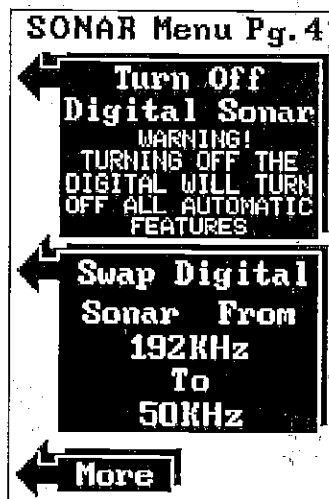
ZOOM WINDOW BAR

DIGITAL SONAR

When the LMS-150 is turned on for the first time, the digital depth display shows at the screen's top left corner. This display comes from a separate digital sonar built into the LMS-150. It displays only the bottom depth. If it loses the bottom, the last known depth will flash on the display. When the digital finds the bottom, it will automatically display the bottom depth again.

You can turn the digital sonar off, however this also turns all automatic features off also, such as auto sensitivity, auto ranging, and Fish I.D.

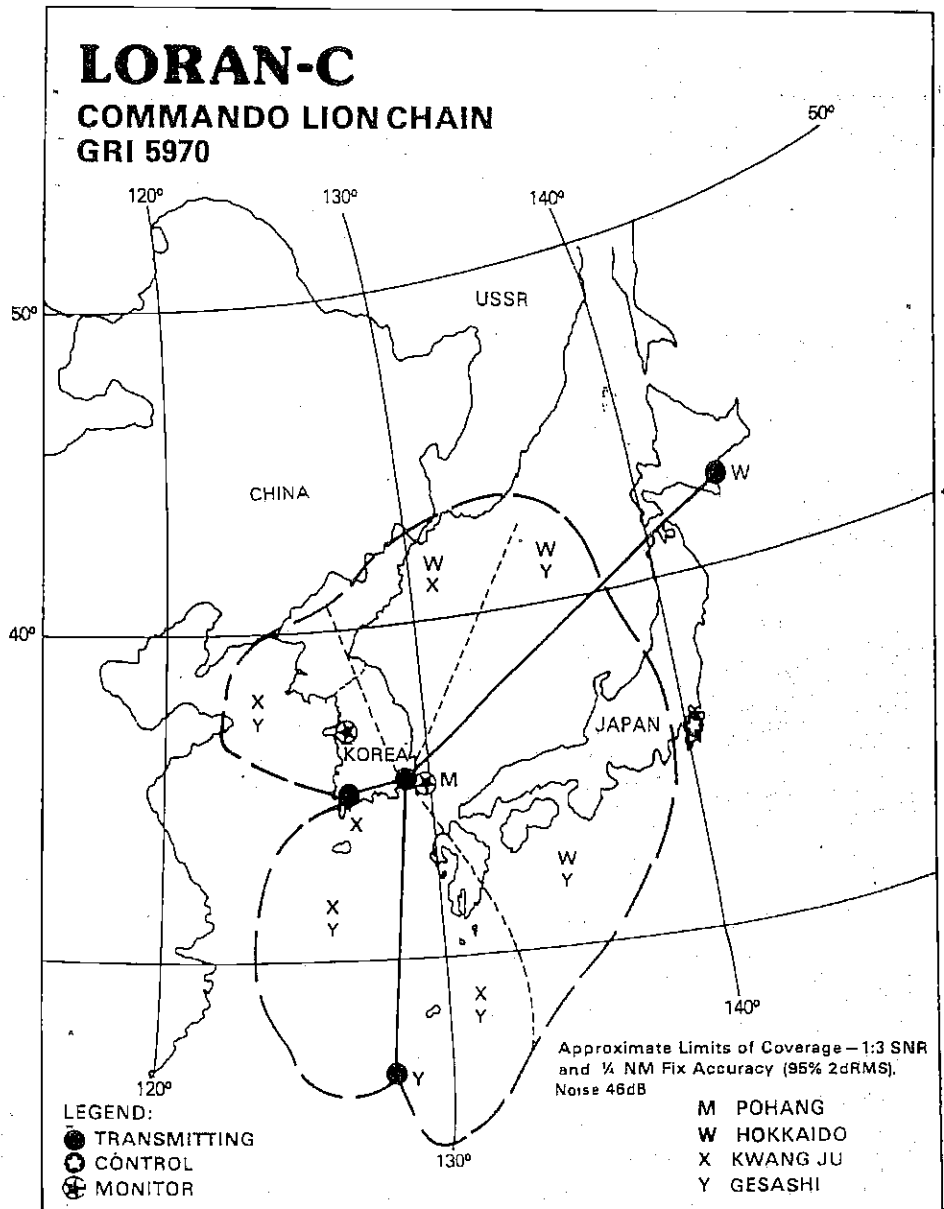
To turn the digital sonar off, press the MENU key, then the key adjacent to the "More" label three times. Now press the key adjacent to the "TURN OFF DIGITAL SONAR" label. Repeat the same steps to turn it on again.



DIGITAL SONAR FREQUENCY

The digital sonar can operate at 50 or 192 kHz if both 50 kHz and 192 kHz transducers are connected to the LMS-150. Using the 50 kHz frequency for the digital sonar allows the LMS-150 to reach greater depths. However, typically the 50 kHz doesn't work as well as the 192 kHz at high speed. The LMS-150 lets you switch between frequencies, using the best one for conditions.

To change the digital sonar's frequency, press the MENU key, then press the key adjacent to the "More" label until Sonar Menu 4 appears. Now press the key adjacent to the "Swap Digital Sonar From 192 kHz To 50 kHz" label. The digital sonar will immediately use the 50 kHz frequency and transducer. To switch back to 192 kHz, simply repeat the above steps and press the key adjacent to the "Swap Digital Sonar From 50 kHz To 192 kHz" label.



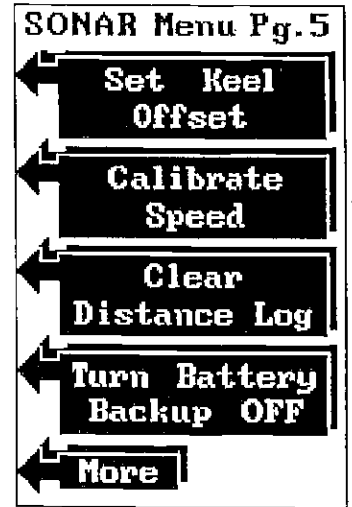
MENU - PAGE 5

KEEL OFFSET

Keel Offset is a term used to describe the difference between the digital depth reading and the actual bottom water depth. All depth sounders (including the LMS-150) measure the water depth from the face of the transducer to the bottom of the lake, river, or ocean. There is both a positive and a negative Keel Offset. The positive offset is used to correct the small error between the face of the transducer and the water's surface. For example, if the face of the transducer is two feet below the surface of the water, *adding* two feet to the digital bottom depth reading will give you the actual water depth.

The negative offset is used to show the distance between the lowest part of the boat and the bottom. For example, if the rudder of the boat is two feet deeper than the face of the transducer, *subtracting* two feet from the digital bottom depth reading will give you the actual distance from the bottom of the boat to the bottom. This can be useful if you operate much of the time in shallow water.

To set the Keel Offset, press the MENU key, then press the key adjacent to the "More" label until the Sonar Menu Pg. 5 appears as shown above. Then press the key adjacent to the "Set Keel Offset" label. The menu shown at right appears.

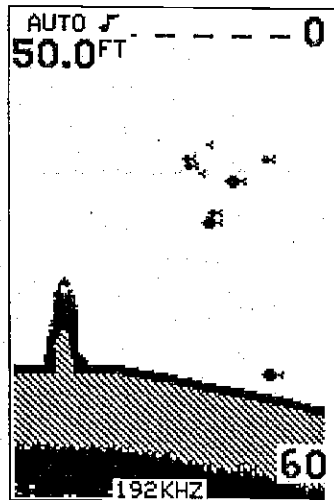


COMMANIDOLION LORAN-C GRI 5970
 REGIONAL MANGER COMMANDER, PACIFIC AREA, ALAMEDA, CA
 CAIN MANAGER COMMANDER, 14TH COAST GUARD DISTRICT, HONOLULU, HI
 COORDINATOR OF CHAIN OPERATIONS LOCATION: COMMANDER, FAR EAST SECTION, YOKATA, JAPAN
 CONTROL SITE: LORMONSTA YOKOTA, JAPAN

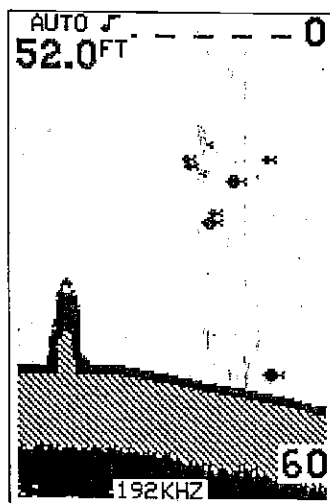
DESIG.	STATION	CDOR.	CD/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	POHANG KOREA	36 11 05.8N 129 20 27.3E		AN/TRN-38	35	400 FT MONOPOLE	-1.5	USAF MANNED
WHISKEY	HOKKAIDO JAPAN	42 44 37.1N 143 43 09.2E	11000/ 4783.68	AN/FPN-45	1000	625 FT MONOPOLE	+0.5	DUAL RATE W/GRI 5970
XRAY	KWANG JU KOREA	35 02 23.9N 126 32 26.7E	31000/ 847.02	AN/TRN-38	35	400 FT MONOPOLE	-1.75	USAF MANNED
YANKEE	GESASHI JAPAN	26 36 25.0N 126 04 56.4E	42000/ 3585.56	AN/FPN-45	1000	625 FT MONOPOLE	0.0	DUAL RATE W/GRI 5970

Use the numbered keys on the left side of the screen to enter the desired keel offset. Press the AUTO key to switch from negative to positive. In this example, a positive keel offset of 2.5 feet is used. When the desired keel offset is shown in the window, press the ENTER key to activate the selection. The LMS-150's digital sonar shows the keel offset. In other words, if the digital bottom depth was 50 feet, and a positive keel offset of 2 feet





BEFORE
KEEL OFFSET



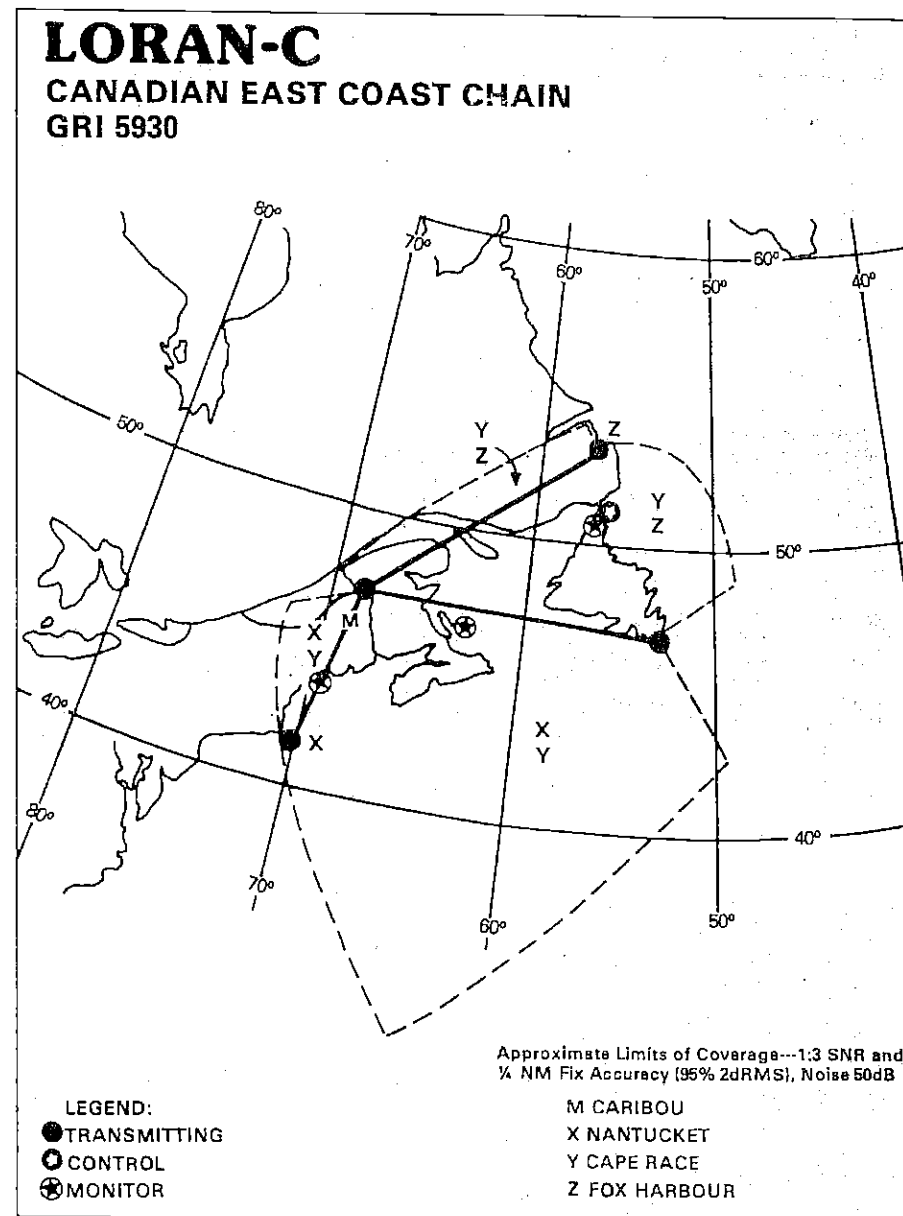
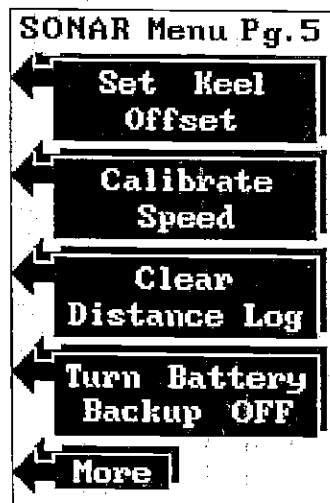
2 FEET POSITIVE
KEEL OFFSET

was entered, the new digital depth reading would be 52 feet. The chart scales are not affected by the keel offset.

CALIBRATE SPEED

Due to many factors, such as placement of the speed/temp sensor and boat shape, the LMS-150's speedometer may not be accurate. The Calibrate Speed menu selection on the fifth sonar menu page lets you compensate for any inaccuracy.

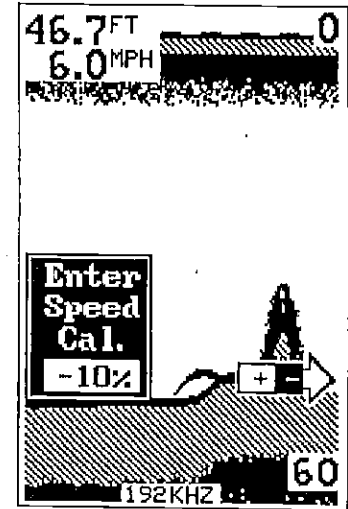
To adjust the speedometer, press the MENU key, then press the key adjacent to the "More" label until the fifth sonar menu page appears. Now press the key adjacent to the "Calibrate Speed" label. A screen similar to the one at the top of the next page appears.



CANADIAN EAST COAST LORAN-C CHAIN GR1 5930
 REGIONAL MANAGER COMMANDER ATLANTIC AREA, NEW YORK, NY
 CHAIN MANAGER COMMANDER ATLANTIC AREA, NEW YORK, NY
 COORDINATOR OF CHAIN OPERATIONS LOCATION LORMONSTA ST ANTHONY,
 NEWFOUNDLAND, CANADA
 CONTROL SITE: LORMONSTA ST. ANTHONY, NEWFOUNDLAND, CANADA

DESIG.	STATION	COORD.	C/D BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	CARIBOU ME	46 48 27.2N 67 55 37.7W		ANFPN-42	350	SLT	0.0	DUAL RATE W/GRI9960
XRAY	NANTUCKET MA	41 15 11.9N 69 58 39.1W	11000/ 2131.88	ANFPN-42	325	625 FT MONOPOLE	0.0	DUAL RATE W/GRI9960
YANKEE	CAPE RACE N.F.L.D CANADA	46 46 32.2N 53 10 28.2W	25000/ 3755.02	ANFPN-45	1500	1350 FT MONOPOLE	0.0	DUAL RATE W/GRI7930
ZULU	FOX HARBOUR N.F.L.D CANADA	62 22 35.2N 66 42 28.4W	3800/ 3594.59	ANFPN-64 (56 HCS'S)	800	700 FT MONOPOLE	0.0	DUAL RATE W/GRI7930

Now enter the desired percentage change to the speedometer's display using the numeric keys on the left side of the screen. For example, if your boat speed is actually ten miles per hour, but the LMS-150 is displaying 11 miles per hour, then it is reading 10% high. Enter a speed calibration of -10% to correct the LMS-150's speedometer. To change from + to -, press the AUTO key.



After entering the desired speed correction, press the ENTER key. The LMS-150 will adjust the digital speedometer by the amount you entered.

CLEAR DISTANCE LOG

To reset the distance log to zero, press the MENU key, then press the key adjacent to the "More" label four times. Now press the key adjacent to the "Clear Distance Log" label. This resets the distance log and returns to the chart display.

TURN BATTERY BACKUP OFF

The battery backup feature stores all settings. When the unit is turned off and back on again, it returns to the last used screen, complete with range or zoom settings, position and alarm settings, etc. This feature is on when the LMS-150 is turned on for the first time. To turn the battery-backup feature off, press the MENU key, then press the key adjacent to the "More" label until the "Turn Battery Backup OFF" label appears on sonar menu #5. Press the key adjacent to this label. To turn it on again, repeat these steps. The label now reads "Turn Battery Backup ON". Press the key adjacent to this label to turn the battery backup feature on.

MENU - PAGE 6

SELECT UNIT OF MEASURE

The LMS-150 can display the water depth in feet, fathoms, or meters, and surface water temperature in degrees Fahrenheit or Celsius. It also shows speed in miles per hour, kilometers per hour, or knots and distance (log) in miles, kilometers, or nautical miles.

To change the units of measure, first press the MENU key, then press the key adjacent to the "More" label until the sixth sonar menu appears. Next, press the key adjacent to the "SELECT UNITS OF MEASURE" label. The menu shown below left appears. Now press the key next to the label you wish to change. In this example, the key next to the "Depth" label was pressed. The menu shown below right appears.

Now press the key adjacent to either the "Feet", "Fathoms", or "Meters" labels. The unit of measure will change accordingly and the LMS-150 will return to the sonar display.

SONAR Menu Pg. 6

- ← Select Units Of Measure
- ← Adjust Display
- ← Set Speaker Volume Low
- ← Turn On Backlight
- ← More

MENU - 6th PAGE

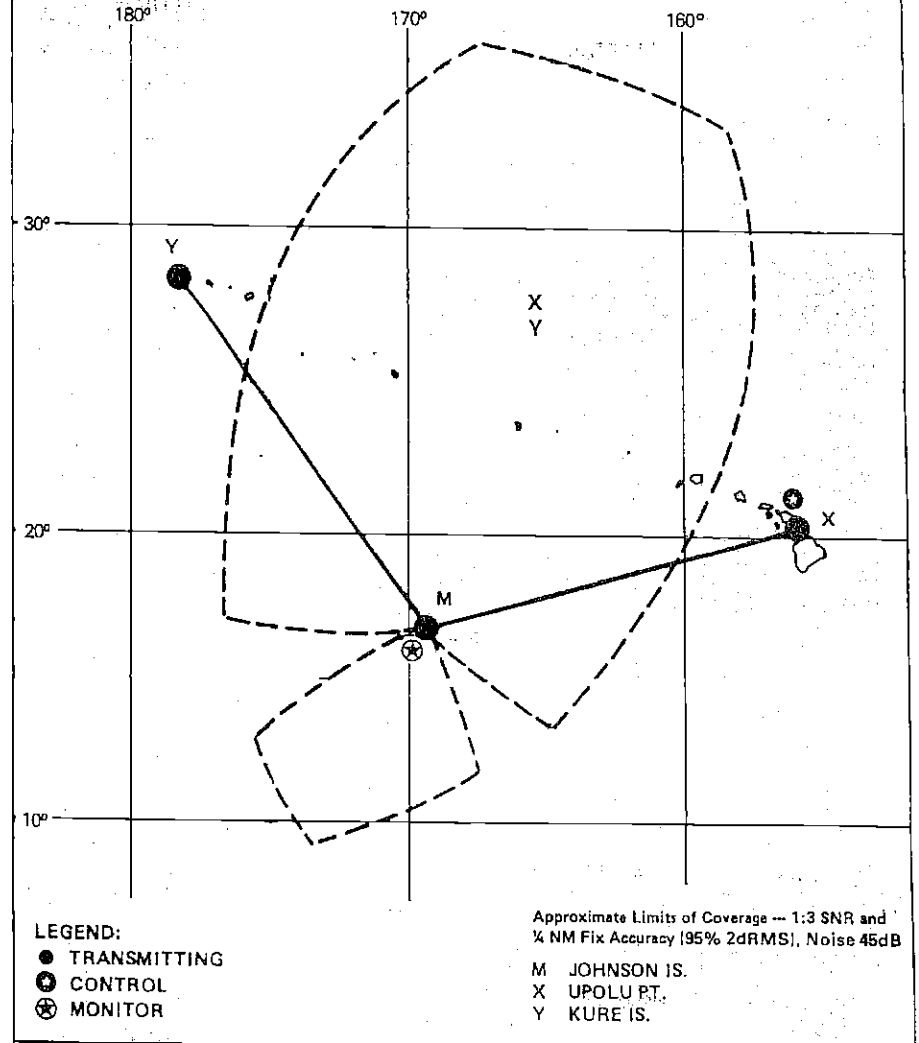
Select Units of Measure for

- ← Depth
- ← Temperature
- ← Speed
- ← Distance

The Depth Is In Feet

- ← Feet
- ← Fathoms
- ← Meters

LORAN-C CENTRAL PACIFIC CHAIN GRI 4990



- LEGEND:
- TRANSMITTING
 - ⊕ CONTROL
 - ⊛ MONITOR

Approximate Limits of Coverage --- 1:3 SNR and
¼ NM Fix Accuracy (95% 2dRMS), Noise 45dB

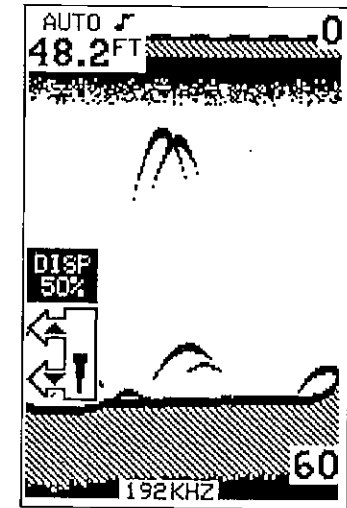
M JOHNSON IS.
X UPOLU PT.
Y KURE IS.

CENTRAL PACIFIC LORAN-C CHAIN GRI 4990
 REGIONAL MANAGER: COMMANDER, PACIFIC AREA, ALAMEDA, CA
 CHAIN MANAGER 14TH COAST GUARD DISTRICT, HONOLULU, HI
 COORDINATOR OF CHAIN OPERATIONS LOCATION: OMSTA KANEEOHE, HI
 CONTROL SITE: OMSTA KANEEOHE, HI

DESIG.	STATION	COORD.	ODBLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	JOHNSTON ISLAND, HI	16 44 44.0N 169 30 31.2W		AN/FPN-42	325	625 FT MONOPOLE	0.0	
XRAY	UPOLU POINT HI	20 14 19.2N 156 53 09.7W	11000/ 4972.23	AN/FPN-42	325	625 FT MONOPOLE	0.0	
YANKEE	KURE ISLAND HI	28 23 41.0N 176 17 30.2W	29000/ 5253.18	AN/FPN-42	325	625 FT MONOPOLE	0.0	

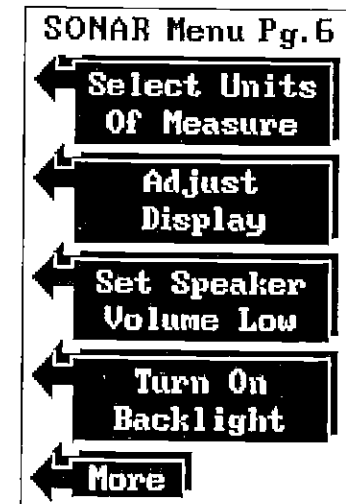
DISPLAY CONTRAST

The unit's display contrast is adjustable to suit different lighting or viewing angles. To adjust it, press the MENU key, then press the key adjacent to the "More" label until "Sonar Menu Pg. 6" appears. Now press the key adjacent to the "Adjust Display" label. The display contrast arrows appear on the left side of the screen. To increase the contrast, press the key adjacent to the up arrow. To decrease it, press the key adjacent to the down arrow. Press the CLEAR key to erase the menu, or wait about ten seconds and it will automatically clear.



SPEAKER VOLUME

The speaker volume has two steps - low and high. The speaker volume is high when the unit is first turned on. To change it, first press the MENU key, then press the key adjacent to the "More" label until "Sonar Menu Pg. 6" appears. Now press the key adjacent to the "Set Speaker Volume Low" label. To switch back to the high volume, repeat the above steps.



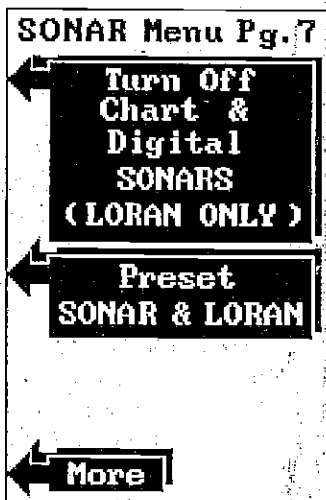
MENU - 6th PAGE

BACKLIGHTS

The LMS-150 has internal lights for the display and keyboard. To turn these on, first press the menu key then press the key adjacent to the "More" label until "Sonar Menu Pg. 6" appears. Now press the key adjacent to the "TURN ON BACKLIGHT" label. To turn the backlights off, repeat the same steps.

SUSPEND SONAR OPERATION

The unit's digital and chart sonar operation can be stopped, if desired. This turns the LMS-150 into a loran navigation only device. To stop the sonar operation, first press the MENU key, then press the key adjacent to the "More" label until the seventh sonar menu page appears. Now press the key adjacent to the "Turn Off Chart & Digital SONARS (loran ONLY)" label. This stops the chart and digital sonar at the same time.



To turn the sonar operation on, repeat the above steps. The label at the top of page 7 now says "Turn On Chart & Digital SONARS". Press the key adjacent to this label.

PRESET SONAR and LORAN

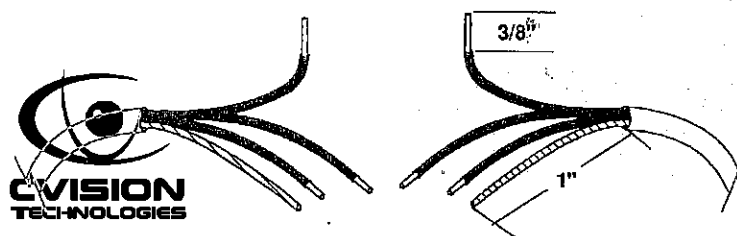
The settings stored in the LMS-150's battery backed-up memory can be erased and reset to the factory defaults. However, this doesn't erase any waypoints or routes.

Presetting the LMS-150 will reset the loran to the factory settings. This stops the loran from navigating. You will have to re-initialize the loran after a preset.

To reset the LMS-150, press the MENU key, then press the key adjacent to the "More" label until Sonar Menu, Page 7 appears. Now press the key adjacent to the "Preset SONAR & LORAN" label.

LORAN CABLE SPLICING INSTRUCTIONS

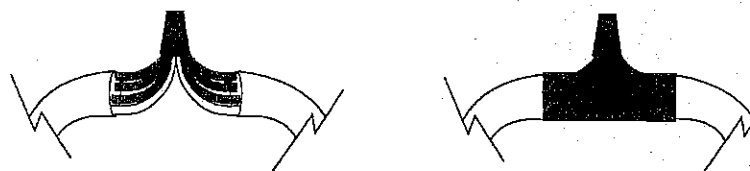
1. Cut the cable in a location that will be in a protected area in the boat. The splice shouldn't be exposed to rain or spray, nor should it be allowed to lay in the bilge. Route the cable as desired.
2. Carefully cut and strip the outer jacket 1" from the end of each cable. Unwrap the shield from the four wires. Remove the shield, as it isn't needed. You should have four wires remaining; three insulated and one uninsulated.



3. Strip the insulation from the wires about 3/8" from the end. Twist one wire from each cable together, making sure that you match the colors of the wires. Damage can occur to the loran module or the display unit if you wire the cable incorrectly. Solder the connection, then wrap it with a good quality electrical tape. Do the same for the other three wires.



4. Finally, wrap the entire splice with electrical tape. Wrap the cables together at the same time. This creates a strain relief for the splice. The loran is now ready for use.



LMS-150 SONAR SPECIFICATIONS

LMS-150 Dimensions	6.75"H x 8.75"W x 3.75"D
Input Voltage	10 - 15 vDC
Current	600 ma (lights off) 750 mz (lights on)
Transmitter	
Frequency	192 & 50kHz
Output Power	3000 watts (peak-to-peak) (typical)
.....	375 watts (RMS)
Display Size	4"H x 2.6"W
Pixels	200 H x 128 W 25,600 Total

NMEA 0183 SENTENCES

RMA	Minimum Recommended Sentence, Part A
RMB	Minimum Recommended Sentence, Part B
GLL	Present Position - Latitude/Longitude
APA	Autopilot Steering Data
DBK	Water Depth
MTW	Water Temperature (°C)
VHW	Speed Through Water (KPH)
VLW	Distance Travelled/LOG (NM)

EAGLE ELECTRONICS

P O BOX 669
CATOOSA, OKLAHOMA 74015
(918) 234-1452

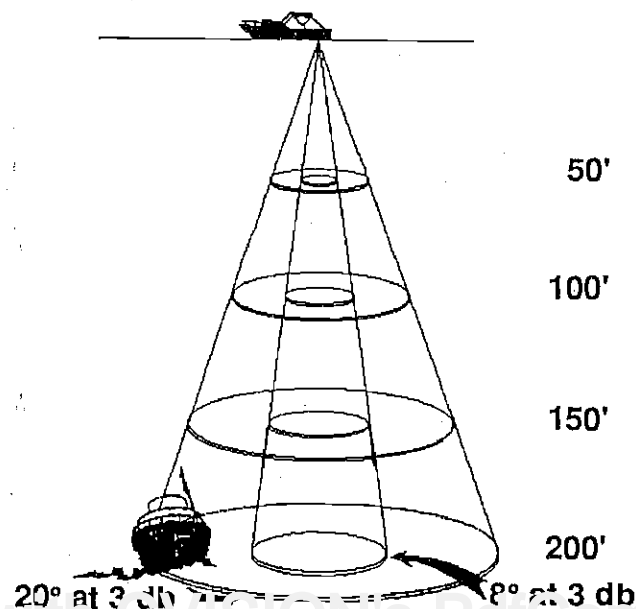
TRANSDUCER CONE ANGLES

The sound waves from the transducer spread out into the water in a cone shaped beam. This looks much like the beam from a flashlight. The angle between the outside edges of the cone is the cone angle.

Lowrance offers a choice of transducers with either an 8 or 20 degree cone angle. The transducer supplied with the LMS-150 has a 20 degree cone angle. Typically, wide cone angle transducers (20 degrees) are ideal for operating in shallow to medium water depths. The 20 degree cone angle allows you to see more of the underwater world. In 15 feet of water the 20 degree cone covers an area about six feet across. The 8 degree transducer covers only about a two foot circle.

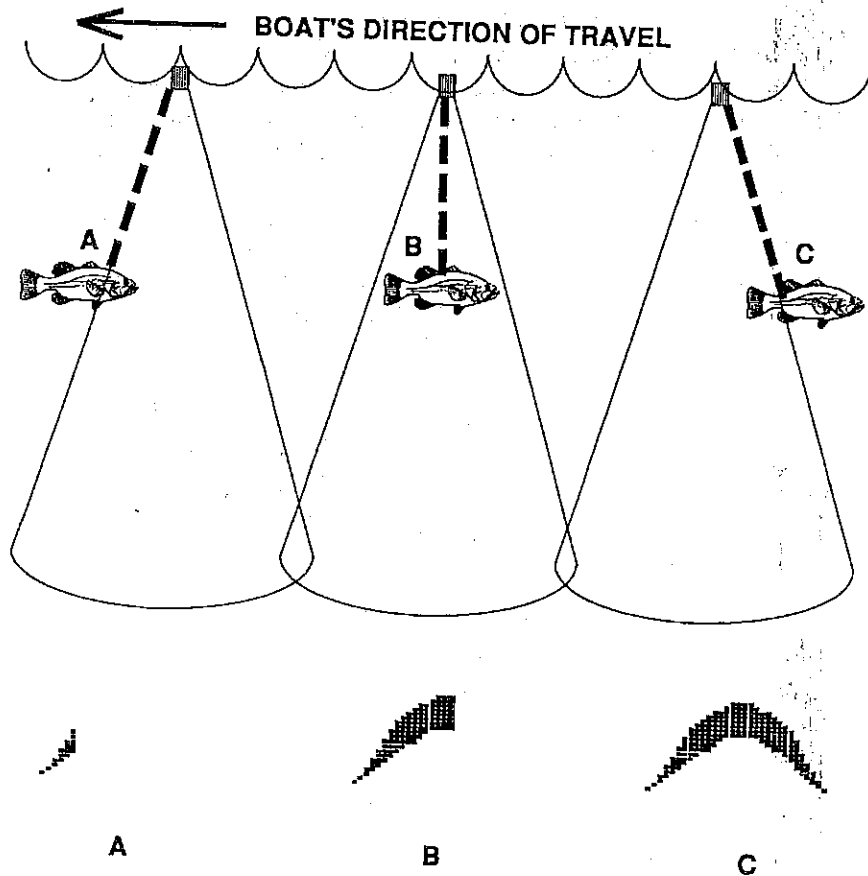
The 20 degree transducer is almost always the best to use in fresh water, the 8 degree mostly in salt water. In a deep water environment, (300 feet - fresh water, 100 feet - salt water) the narrow cone angle is more desirable. Since the sound energy is concentrated in a smaller area, it can penetrate to much deeper depths.

Both 8 degree and 20 degree transducers give accurate bottom readings, even though the bottom signal is much wider on the 20 degree model. This is because you are seeing more of the bottom. Remember, the shallow edge of the signal shows you the true depth. The rest of the signal tells you whether you are over rocks, mud, etc.



FISH ARCHES

Fish arches are created when the cone of sound passes over a fish. The distance to a fish when the cone first strikes it is shown as "A" below. When the center of the cone strikes the fish, the distance is shorter as shown "B". As the cone leaves the fish, the distance increases again as shown in "C".



When the Fish I.D. mode is off, the depth of the water will affect the size and shape of the fish arch due to the cone angle diameter. For example, if the cone passes over a fish in shallow water, the signal displayed on the LMS-150 may not arch at all. This is due to the narrow cone diameter and the resolution limitations of the display.

LORAN MODULE EXTERNAL GROUND INSTRUCTIONS

A ground lug is attached to the side of the Loran module. To use the external grounding system, the following grounding techniques are listed in order of their preference.

1. The best technique is to use a grounding plate with the external ground attached to this plate placed in the water.
2. The next preferred is to externally ground to the lower unit of the motor or inboard/outboard.
3. The ground on the boat battery may also be used for external grounding.
4. Any part of the hull of the boat that is metallic and in contact with water is also acceptable for attaching the external ground.

We do not recommend that you ground under the console of the boat.

To test the degree of improved function of the Loran, the following test should be conducted:

1. Start your unit with the external ground of the coupler disconnected. At a known latitude and longitude, allow the unit to lock onto the known stations (check to make sure that the TD's are correct for this known location) and acquire and convert to the known latitude and longitude of your location.
2. Allow the unit to run for several minutes and make note of the strengths (SNR's) of the stations you are using.
3. Connect the external ground according to a technique listed above and power up your unit. Allow the unit to again run for 3 to 5 minutes and make note of the strengths of the stations you are using. If the signal strengths increase, the external ground is preferred. If you notice no change in signal strengths or the signals decrease, you should recheck where you have the external ground connected. If you see no difference with or without the external grounding, you really do not need this added ground.

Boat Sources:

1. Boat engine. Resistor spark plugs help, alternator noise filter may also be required.
2. Power cable routed to fuse panel instead of directly to battery. Route the power cable directly to the battery.
3. Bad antenna placement. The antenna should be placed in an open area on the boat, away from other antennas or structure.
4. Fluorescent lights.

Symptoms of noise or interference problems:

1. Loran won't lock on to stations
2. Accuracy is not repeatable or erratic
 - a. Try using the manual mode
3. XTE, Bearing, Heading, SOG, or TTG erratic or inaccurate
4. Cross Track arrows move too much
 - a. Waypoint must be recalled to use cross track error feature.
5. Loses lock while boat is moving:
 - a. Try resistor spark plugs
 - b. Attach the UltraNav's power cable directly to the battery
 - c. Try an alternator filter
 - d. Attach ground wire to ELC-1 loran module. (See page 81.)

Very small fish probably will not arch at all. Medium sized fish will show a partial arch, or a shape similar to an arch if they're in deep water. Large fish will arch, but turn the sensitivity up in deeper water to see the arch. Because of water conditions, such as heavy surface clutter, thermoclines, etc., the sensitivity sometimes cannot be increased enough to get fish arches.

One of the best ways to get fish arches is to expand or "zoom" a segment of the water. For example, from 45 to 60 feet. The smaller the segment, the better the screen resolution will be. The easiest way to do this on the LMS-150 is with the Zoom feature. Use the 2x or 4x zoom mode to expand the echoes, making it easier to see detail. For the best results, turn the sensitivity up as high as possible without getting too much noise on the screen. In medium to deep water, this method should work to display fish arches.

If you see fish signals when the unit is in the manual mode, but don't get fish symbols when the Fish I.D. feature is on, try increasing the sensitivity.

IMPORTANT SERVICE INFORMATION!

If your unit is not working, or if you need technical help, please use the following troubleshooting section before contacting a service center or the factory customer service department. It may save you the trouble of returning your unit.

SONAR TROUBLESHOOTING

Unit won't turn on:

1. Check the power cable's connection at the unit. Also check the wiring.
2. Make certain the power cable is wired properly. The red wire connects to the positive battery terminal, black to negative or ground.
3. Check the fuse.
4. Measure the battery voltage at the unit's power connector. It should

be at least 11 volts. If it isn't, the wiring to the unit is defective, the battery terminals or wiring on the terminals are corroded, or the battery needs charging.

Unit freezes, locks up, or operates erratically:

1. Electrical noise from the boat's motor, trolling motor, or an accessory may be interfering with the sonar unit. Re-routing the power and transducer cables away from other electrical wiring on the boat may help. Route the sonar unit's power cable directly to the battery instead of through a fuse block or ignition switch
2. Inspect the transducer cable for breaks, cuts, or pinched wires.
3. Check both the transducer and power connectors. Make certain both are securely plugged in to the unit.

Weak bottom echo, digital readings erratic, or no fish signals:

1. Make certain transducer is pointing straight down. Clean the face of the transducer. Oil, dirt, and fuel can cause a film to form on the transducer, reducing its effectiveness. If the transducer is mounted inside the hull, be sure it is shooting through only one layer of fiberglass and that it is securely bonded to the hull. Do NOT use RTV silicone rubber adhesive or Marinetex™.
2. Electrical noise from the boat's motor can interfere with the sonar. This causes the sonar to automatically increase its Discrimination or noise rejection feature. This can cause the unit to eliminate weaker signals such as fish or even structure from the display.
3. The water may be deeper than the sonar's ability to find the bottom. If the sonar can't find the bottom signal while it's in the automatic mode, the digital will flash continuously. It may change the range to limits far greater than the water you are in. If this happens, place the unit in the manual mode, then change the range to a realistic one, (for example, 0-100 feet) and increase the sensitivity. As you move into shallower water, a bottom signal should appear.

LORAN TROUBLESHOOTING

1. You must have an 8' antenna. Preferably, the entire length of the antenna should be higher than anything else on the boat.
2. For best results, wire the power cable directly to the battery, preferably the main engine's cranking battery. This assures the boat will be grounded, since the lower unit is in the water. If you're using an isolated battery, wire a grounding plate to the ground side of the battery. The loran will work better if it's grounded to water.
3. If you're using the loran on land, keep away from trees, buildings, and (most important) power lines. The loran will not work inside a building, or under a metal carport, shed, etc.

(NOTE: These units are designed for marine (boating) purposes and generally work best on the water.)

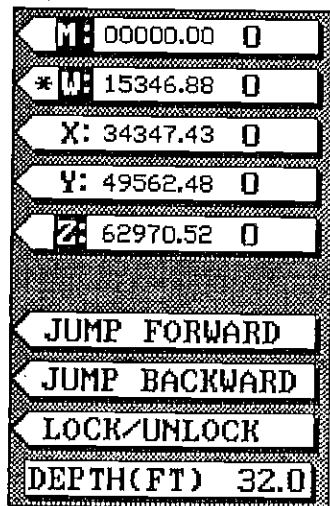
4. If you're having trouble with the unit locking on to the stations, you may have a piece of gear such as a radio, bilge pump, or engine that is causing interference. First turn everything in the boat off, then try initializing the unit. Enter the initial position first. If that doesn't work, then try the GRI. If the unit still doesn't lock on, then look for other sources of interference. (see below)

INTERFERENCE SOURCES or BAD RECEPTION

Land Sources:

1. Military Installations. (High power transmitters in the loran band.)
2. Hydro-electric plants. (Dams)
3. High voltage power lines. These radiate noise at high levels.
4. Storms. A storm between you and the loran station can interfere with the signals, even if it's many miles away.
5. Mountains, trees, buildings. These reflect the signals. Try to stay in an open area.

selected. When the cycle change is at the desired setting, press the ENTER key. The LMS-150 will calculate a new TD after a short wait. If you wish to lock the TD to the displayed value, first press the key adjacent to the stations' letter that you wish to change, then press the key next to the "LOCK/UNLOCK" label. If you wish to unlock the change, simply repeat the above steps to get the jump and lock menu, then press the key next to the station's letter. Now press the key next to the "LOCK/UNLOCK" label. The LMS-150 will lock the TD at the number shown on the display.



Remember, turning the unit off, resetting the unit, or entering a new GRI or initial position erases all cycle jumps and locks.

Weak bottom echo, digital readings erratic, or no fish signals (cont.):

4. Check the battery voltage. If the voltage drops, the unit's transmitter power also drops, reducing its ability to find the bottom or targets.

Bottom echo disappears at high speeds or erratic digital reading or weak bottom echo while boat is moving

1. The transducer may be in turbulent water. It must be mounted in a smooth flow of water in order for the sonar to work at all boat speeds. Air bubbles in the water disrupt the sonar signals, interfering with its ability to find the bottom or other targets. The technical term for this is 'Cavitation'.

2. Electrical noise from the boat's motor can interfere with the sonar. This causes the sonar to automatically increase its Discrimination or noise rejection feature. This can cause the unit to eliminate weaker signals such as fish or even structure from the display. Try using resistor spark plugs or routing the sonar unit's power and transducer cables away from other electrical wiring on the boat.

No fish arches when the Fish ID feature is off:

1. Make certain transducer is pointing straight down. This is the most common problem if a partial arch is displayed. See the Fish Arch section in your owner's manual for more information.

2. The sensitivity may not be high enough. In order for the unit to display a fish arch, it has to be able to receive the fish's echo from the time it enters the cone until it leaves. If the sensitivity is not high enough, the unit displays the fish only when it is in the center of the cone.

3. Use the Zoom feature. It is much easier to display fish arches when zoomed in on a small range of water than a large one. For example, you will have much better luck seeing fish arches with a 30 to 60 foot range than a 0 to 60 foot range. This enlarges the targets, allowing the display to show much more detail.

4. The boat must be moving at a slow trolling speed to see fish arches. If the boat is motionless, fish stay in the cone, showing on the display as straight horizontal lines.

ELECTRICAL NOISE

A major cause of sonar problems is electrical noise. This usually appears on the sonar's display as random patterns of dots or lines. In severe cases, it can completely cover the screen with black dots, or cause the unit operate erratically, or not at all.

To eliminate or minimize the effects of electrical noise, first try to determine the cause. With the boat at rest in the water, the first thing you should do is turn all electrical equipment on the boat off. Make certain the engine is off, also. Turn on your sonar unit, then turn ASP (Advanced Signal Processing) off. There should be a steady bottom signal on the display. Now turn on each piece of electrical equipment on the boat and view the effect on the sonar's display. For example, turn on the bilge pump and view the sonar display for noise. If no noise is present, turn the pump off, then turn on the VHF radio and transmit. Keep doing this until all electrical equipment has been turned on, their effect on the sonar display noted, then turned off.

If you find noise interference from an electrical instrument, trolling motor, pump, or radio, try to isolate the problem. You can usually re-route the sonar unit's power cable and transducer cable away from the wiring that is causing the interference. VHF radio antenna cables radiate noise when transmitting, so be certain to keep the sonar's wires away from it. You may need to route the sonar unit's power cable directly to the battery to isolate it from other wiring on the boat.

If no noise displays on the sonar unit from electrical equipment, then make certain everything except the sonar unit is turned off, then start the engine. Increase the RPM with the gearshift in neutral. If noise appears on the display, the problem could be one of three things; spark plugs, alternator, or tachometer wiring. Try using resistor spark plugs, alternator filters, or routing the sonar unit's power cable away from engine wiring. Again, routing the power cable directly to the battery helps eliminate noise problems. Make certain to use the in-line fuse supplied with the unit when wiring the power cable to the battery.

When no noise appears on the sonar unit after all of the above tests, then the noise source is probably cavitation. Many novices or persons with limited experience make hasty sonar installations which function perfectly in shallow water, or when the boat is at rest. In nearly all cases, the cause of the malfunction will be the location and/or angle of the transducer. The face of the transducer must be placed in a location that has a smooth flow of water at all boat speeds. Read your transducer owner's manual for the best mounting position.

JUMP AND LOCK

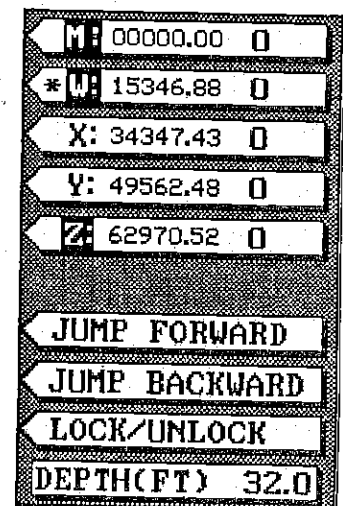
All Loran receivers have to lock onto the third cycle of the signal transmitted from the stations. The LMS-150 may have trouble finding the third cycle if you operate the unit under high noise conditions, or at the extreme limit of its range.

You can force the unit to jump to the proper cycle. You can do this using the "Jump and Lock" menu selection. However, we caution you that it requires an intimate understanding of Loran signals and shouldn't be used carelessly. Basically, you have to know precisely what the TD's for your exact location should be. If the TD for each station you wish to use is off by ten or more micro-seconds, you can move it using the jump and lock menu. You move the TD by ten micro-seconds each time you jump one cycle. For example, suppose the LMS-150 displays a TD of 45349.33 micro-seconds for station X. If the correct value for that station at your location is 45359.33, then the displayed TD is ten micro-seconds or one cycle low. Using the Jump and Lock stations menu, you jump the station by +1 cycle. This causes the LMS-150 to display the correct value of 45359.33. The unit will now track the station using this cycle correction.

The LMS-150 will stop using the cycle data you used in the jump and lock menu if you do a new GRI or initial position initialization, a reset, or when you turn the unit off.

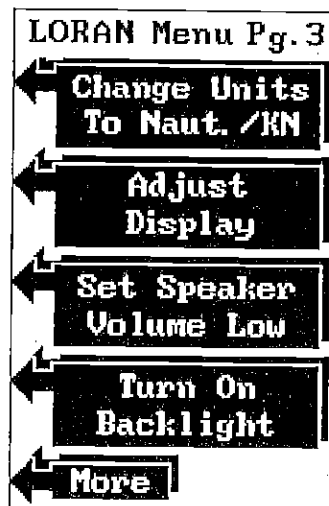
To change the cycle, first press the MENU key, then press the key adjacent to the "Change LORAN Setup" label. Press the key adjacent to the "More" label until the "Jump and Lock Stations" label appears. Press the key next to that label. The screen shown below appears.

Press the key next to the station letter that you wish to change. For example, to jump the cycle on station W, press the key adjacent to the letter "W". An asterisk (*) appears next to the letter, showing that it is selected. Now press the key next to the "JUMP FORWARD" or "JUMP BACKWARD" labels increase the cycle, or the down arrow to decrease it. As you press the key, the number at the far right in the station's label will reflect the change. An "L" appears, showing that the TD is locked in to the setting you



SELECT UNITS

The LMS-150's loran displays can show distance in nautical or statute miles and speed in knots or miles per hour. When the LMS-150 is turned on for the very first time, distance is in statute miles and speed is in statute miles per hour. To change the units of measure, press the MENU key while a loran screen is displayed, then press the key adjacent to the "More" label until the screen shown at right appears.

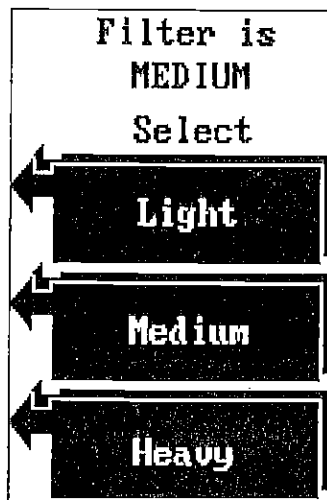


Now press the key adjacent to the "Change Units to Naut./KN" label. The LMS-150 will return to the last used loran screen, showing the new units of measure.

To switch back to nautical miles and knots, repeat the above steps. The menu will now read "Change Units to Miles/MPH". Press the key adjacent to that menu to switch the units of measure.

SPEED CONSTANT

The speed constant is the amount of filtering done by the receiver. There are three levels: light, medium, and heavy. If you select light, the amount of "jitter" shown on the plotter and navigation displays will increase, however this will also give you the fastest updates. Consequently, medium and heavy gives less jitter and slower update times. The receiver will default to the medium mode. To change the speed constant, press the MENU key, then press the key adjacent to the "Change LORAN Setup" label. Now press the key next to the "MORE" label until the "CHANGE SPEED CONSTANT" label appears. Press the key adjacent to that label. The screen shown at right appears. Simply press the key next to the desired speed constant. The LMS-150 returns to the last position or navigation screen using the speed constant you selected.



LMS-150 LORAN OPERATION

REQUIRES OPTIONAL LC-1 LORAN MODULE

WARNING!
USE THIS LORAN RECEIVER ONLY AS AN AID TO NAVIGATION. A CAREFUL NAVIGATOR SHOULD NEVER RELY ON ONLY ONE METHOD TO OBTAIN POSITION INFORMATION.

NOTICE!
MAKE CERTAIN THE LORAN IS DISPLAYING THE CORRECT POSITION IN *LATITUDE/LONGITUDE* COORDINATES BEFORE NAVIGATING WITH THIS UNIT. THE POSITION MUST BE CORRECT FOR THE NAVIGATION FEATURES TO WORK PROPERLY.

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If you're east of Greenwich, England (east longitude), press the key adjacent to the EAST/WEST label. Otherwise, if everything on the screen is correct, press the key adjacent to the ENTER label. The LMS-150 will return to the last used loran screen, using the position offset you entered.

ASF CORRECTION
N 38°25.40'
W 81°34.10'
TOGGLE EAST/WEST
INSTRUCTIONS
ENTER ASF
CORRECTION IN
LAT/LON. PUSH
CLEAR TO EXIT
DEPTH(FT) 32.0

TD ASF CORRECTION

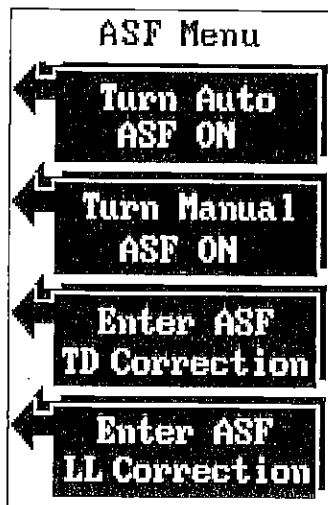
To change the ASF using the TD offset method, press the key adjacent to the "Enter ASF TD Correction" label on the ASF menu. The screen shown below appears.

Station letters surrounded by a black box are the ones currently used by the unit to calculate a latitude/longitude. The TD for the station shows to the right of the station's letter. The ASF offset in micro-seconds shows to the right of the TD. To change the offset for a station, press the key adjacent to the station's letter. An asterisk (*) appears showing that this station has been selected. In this example, station W will be changed. Press the key adjacent to the up or down arrows at the bottom of the screen to change the TD offset. Press the key adjacent to the up arrow to increase the value, or the down arrow to decrease it. The ASF numbers for the station being adjusted will change as you press the keys.

ADJUST OFFSETS
* W 15346.88 0.00
X: 34347.43 0.00
Y: 49562.48 0.00
Z: 62970.52 0.00
INSTRUCTIONS
SELECT STATION.
USE ARROWS TO
ADJUST OFFSETS.
DEPTH(FT) 32.0

Once the desired values are entered, press the ENTER key. The LMS-150 will return to the last used loran screen, using the corrections you entered. Switch to the position screen to see if ASF's are in use. The letters "ASF" appear in the upper left corner of the screen, immediately below the automatic/manual mode indicator.

If you wish to use the automatic ASF feature, simply press the key adjacent to the "AUTO ASF ON" label. If you're in an area that is covered by the ASF table built into the LMS-150, it will automatically add the ASF's to your present position. The ASF indicator will also appear on the position screen. See page 59 for details. If the LMS-150 doesn't have ASF tables for your location, the ASF indicator won't show and ASF will be off. A message appears warning you that ASF's are not available. You will have to manually enter the ASF as shown below.

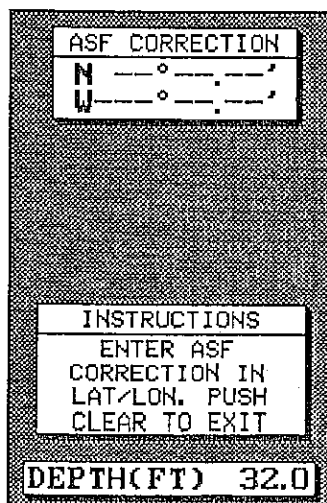


NOTE:
This sections covers the LMS-150's loran operation. The ELC-1 loran module must be attached to the LMS-150 for position information.

Latitude/Longitude ASF Correction

Use the lat/long ASF correction if the latitude/longitude position shown on the display is slightly different than your known, precise position. (If the displayed position is off by a large margin, the Alternate/Primary feature may need to be switched.) For example, suppose your actual latitude/longitude is 38-25-40/81-34-10, but the LMS-150 displays 38-24-30/81-35-20. Simply enter your actual position, and the LMS-150 will handle the rest.

To change the ASF using the latitude/longitude correction, *you first must be in the location you are changing.* Next, press the key adjacent to the "Enter ASF Correction" label. The screen shown at right appears.



Now enter the exact latitude/longitude for your position. Remember to enter a zero at the beginning of the longitude if it's less than 100 degrees. The screen at the top of the next page appears after the last longitude number is entered.

LORAN - General

Loran is short for LONg RANGE Navigation. It's a navigation system that uses powerful low frequency (100 kHz) radio transmitters and sensitive receivers. Thus, you can determine your position over long distances.

Loran was developed and used during World War II. At that time it was called Loran-A and operated at a higher frequency. Research and development continued during the fifties. The current Loran version, Loran-C, was introduced in the sixties. It works over longer distances than Loran-A and it's easier to use.

ACCURACY

The absolute accuracy of Loran is between 0.1 and 0.25 nautical miles, depending on your location. Repeatable accuracy (your ability to return to the same spot) is 100 feet or better. The difference between the two types of accuracy is important. Absolute accuracy tells you where you are on the map. Repeatable accuracy lets you find your way back to the same site time after time.

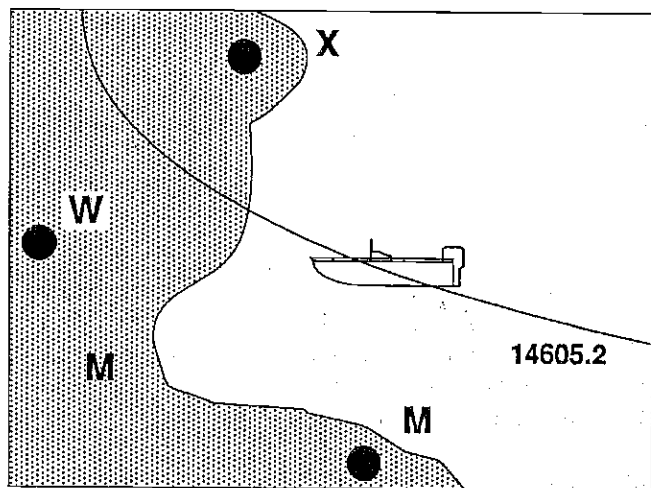
However, the accuracy you experience may not be as good as the numbers above suggest. The crossing angle of the lines of position affects the accuracy. The sharper the crossing angle, the more chance for position error. A ninety degree crossing angle is best, but it can vary down to thirty degrees without a large position error.

If you wish to double check your Loran, first pick a spot on the chart that is clearly marked with latitude/longitude marks. Then go to it. Once you arrive, let the Loran settle, then compare the position information on the LMS-150 to the chart. It should be very close.

HOW LORAN-C WORKS

The Loran system consists of three to five transmitter stations. These are called a "chain." The letter "M" designates the master station inside the chain. The other stations in the chain are the secondaries. Their names are W, X, Y, and Z, although not all chains have four secondary stations. The secondary transmitters are synchronized with the master which transmits at precise time intervals. This time interval is called the Group Repetition Interval or GRI. Each chain has a different GRI.

The secondary stations transmit at precise time intervals after the master station transmits. Since these transmitters are located hundreds of miles apart, it takes a different time for the signals from each transmitter to reach you. The Loran receiver measures this time difference between the master and two of the secondaries. The LMS-150 automatically chooses the best master-secondary pairs for your location. The time difference or (TD) is measured in micro-seconds. Plotting the TD on a chart with Loran-C lines results with your position somewhere on a line of position (LOP). A line of position is an imaginary line on which the time delay between the master and one of the secondaries is the same. In this example the boat is located somewhere on the 14605.2 Line Of Position.



The Loran receiver then measures the time difference between the master and another secondary. The example on the next page is 31882.8. If you plot this LOP on a chart, you'll notice that it crosses the first line-of-position. Your position is at the intersection of the two lines.

ASF Correction

Loran signals are affected by the terrain they travel over. Plains, lakes, mountains, and cities affect the signal and they each affect it in different ways. This effect is called the additional secondary phase factor, or ASF. It's usually factored in when a loran chart is made. However, ASF's vary from place to place, so there can be differences between the chart and the real world.

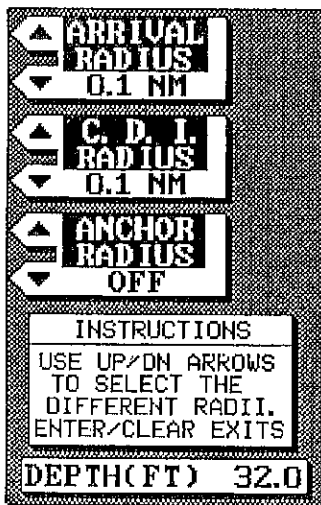
There can also be a difference in your actual position and the one displayed by the loran, due to ASF. In this case, the loran signals are distorted from their theoretical position. Since the measured TD's are shifted, the loran shows a TD or latitude/longitude that is not the actual position.

The LMS-150 has an correction feature that lets you change the ASF. This forces the loran to use a new ASF instead of the one that resides in its memory. You can shift the ASF by changing the TD offset or by entering your actual latitude/longitude position.

IMPORTANT!

ASF corrections entered by the user are good only for the stations in use at the time and location being corrected. If you travel away from the area, the ASF correction may not be valid. ASF corrections may not be usable if you change stations, or if the unit automatically changes stations. This especially holds true if you enter a latitude/longitude position to change ASF. The LMS-150 will only apply the ASF correction to the stations in use - not all of them. Remember, if you change stations, especially if you change GRI's, the ASF will have to be re-entered.

To change the ASF, first press the MENU key. Now press the key adjacent to the "Change LORAN Setup" label. Now press the key adjacent to the "Enter ASF Correction" label. The screen shown at the top of the next page appears. This menu lets you change the ASF using TD offsets or latitude/longitude correction. If you enter the ASF correction, the ASF feature is automatically tuned on and put in the manual mode. This menu also lets you turn on the automatic ASF feature.



C.D.I.'s alarm menu to increase it, the down arrow to decrease it or turn it off. If the alarm is turned off, the C.D.I. indicator's limits are preset to .1 nautical mile. Press the CLEAR key to return to the loran screen.

ANCHOR ALARM

The anchor alarm sounds an alert if you travel outside the alarm's radius. For example, suppose you're anchored in a cove, and the anchor alarm's radius is set to .1 mile. If your anchor line breaks and the boat drifts over .1 mile, the alarm will

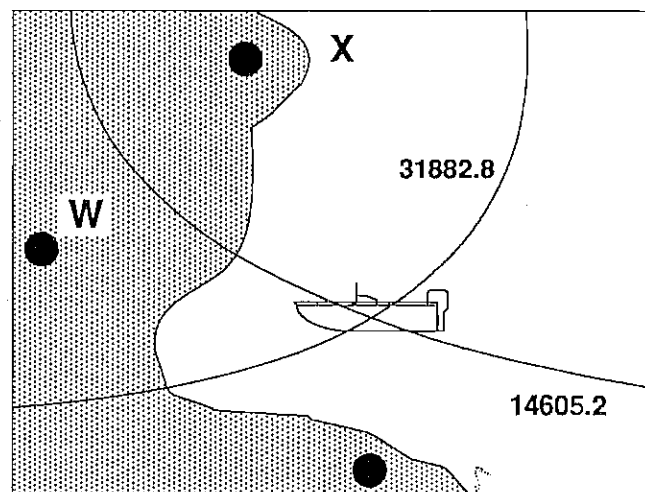
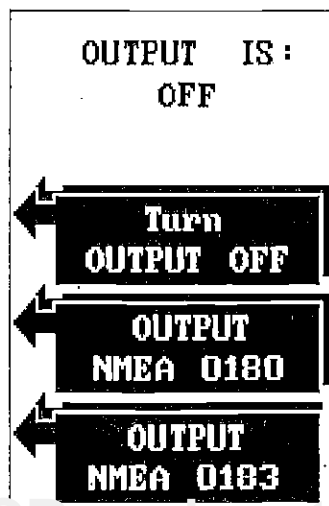
sound a tone. To set the anchor alarm, press the key next to the up or down arrows in the "ANCHOR RADIUS" section on the loran alarms menu. Press the CLEAR key when finished.

NMEA INTERFACE

The LMS-150 can send data out according to NMEA 0180 or 0183 formats. The NMEA output is turned off when the LMS-150 is turned on for the very first time.

To select the NMEA output, press the MENU key while a loran screen is displayed. Now press the key adjacent to the "Change LORAN Setup" label. Next, press the key adjacent to the "More" label two times. Finally, press the key adjacent to the "Select NMEA Output" label. The screen shown at right appears.

Simply press a key adjacent to the desired output. The LMS-150 will return to the last loran screen and output data on the white serial data wire. (See the Power Connections section for wiring instructions.)



All Loran-C receivers work on this principle. Most modern receivers also display latitude/longitude. The receiver takes the TD information and, using a complex mathematical formula, converts it to latitude/longitude position data. You can display both TD's and latitude/longitude on the LMS-150 to determine your position.

GETTING STARTED - INITIALIZATION

The LMS-150 must be initialized or "told where it is" the first time it's turned on. Once it locks on to the proper stations and shows a position, the initialization process won't have to be repeated. The LMS-150 stores the present position, GRI, and stations used in memory each time it's turned off. Therefore, the next time it's turned on it has the necessary data to search for the proper stations for the area you're in. If you travel a long distance with the LMS-150 turned off (over 100 miles), you will need to re-initialize the unit.

There are three different ways to initialize the LMS-150. You can give it a GRI only, a position only, or both. There are advantages and disadvantages to each.

INITIAL POSITION ONLY

If you initialize the LMS-150 using the Initial Position only starting mode, the unit will first pick the best GRI to use in your location. It then looks for the loran stations in that GRI chain. Once it finds them, the LMS-150 will automatically switch stations until it can give a good "fix" and posi-

tion. This is the most automatic initialization format. It requires only the entry of the present position from the operator. You don't have to know which stations are best or the GRI to use the initial position only startup.

However, when the LMS-150 is in the automatic mode, it can change stations at any time if it decides one or more stations are better to use than others. This can result in small position inaccuracies. For example, suppose you use the loran one day and save a waypoint. The next day you decide to navigate to that waypoint. If the LMS-150 uses a different set of stations on the second day than the ones used on the first, you could end up at a location that is a small distance away from the desired one. You can avoid this by switching the LMS-150 into the manual mode after it has locked on to the stations in the chain and has both a good fix and shows a position. Using the manual mode forces the unit to use the ones it is currently using or ones you choose. (See the Manual Station Selection section for more information.)

GRI ONLY INITIALIZATION

This method of starting the LMS-150 requires the most thought from the user. Not only will you need to select the best GRI to use for your area, but you will also have to choose the stations for the LMS-150 to use. Using the GRI only method forces the LMS-150 into the manual mode.

PRESENT POSITION AND GRI INITIALIZATION

Giving the LMS-150 both your present position and the GRI typically lets it find the stations faster. Therefore, it can give you a position faster using this initialization procedure. However, you may need to select stations, since the unit could start in the manual mode.

The reason for this is there are areas of the world that are covered by more than one GRI. One of the GRIs is better to use than the others (depending on your location), due to crossing angles and signal strengths. If the GRI you enter happens to be the preferred GRI for your location, the LMS-150 will switch to automatic and choose the stations to use. If the GRI is not preferred, then the unit will switch to the manual mode and you will have to choose the stations. Based upon the GRI used, you can always switch the LMS-150 into the manual mode, but you can't always use automatic.

Maps of most loran coverage areas are listed in the back of this manual to help you choose a GRI. Many of the maps show the preferred stations to use within the GRI for different locations. Use these stations when initializing the LMS-150 for the best results.

Erasing a Route

To erase a route, press the MENU key, then press the key adjacent to the "More" label. Now press the key adjacent to the "Route Planning" label. The route selection menu appears as shown on page 68. Select the route number that you wish to erase. The screen shown at the top of the previous page appears. Now press the key adjacent to the "Erase A Route" label. This erases the selected route and returns you to the last used loran or plotter screen.

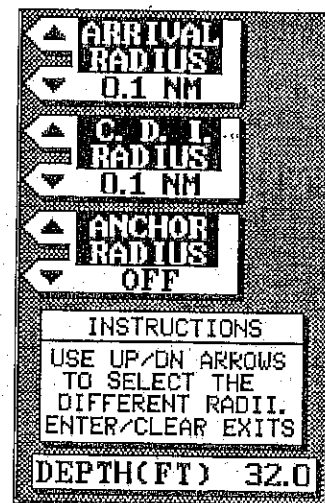
LORAN ALARMS

The LMS-150 has three loran alarms. One is an arrival alarm that sounds when you come within a preset distance to a waypoint. Another is a C.D.I. alarm that sounds when you move off course more than the alarm's set point. The last alarm is the anchor alarm that sounds a tone when you move outside the alarms' radius.

ARRIVAL ALARM

The arrival alarm sounds a tone when your position is within the alarm's radius of a recalled waypoint. For example, the alarm will sound if you come within .1 nautical miles of a waypoint if the arrival alarm's setting is .1 nautical mile.

To adjust the arrival alarm, press the MENU key, then press the key next to the "More" label. Now press the key next to the "LORAN Alarms" label. The screen shown at right appears. Press the key adjacent to the up arrow on the arrival alarm's menu to increase the radius, the down arrow to decrease it or turn it off. Press the key adjacent to the EXIT label to return to the loran screen.

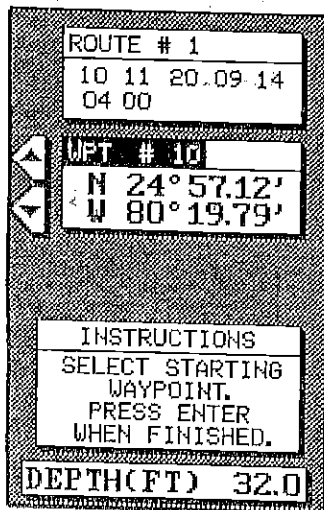
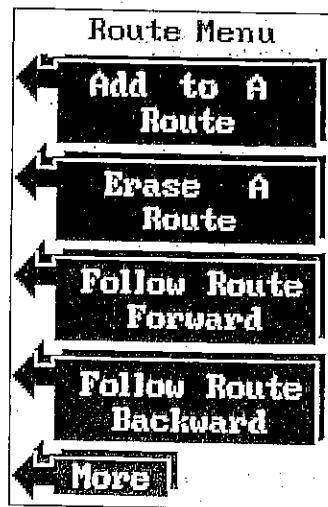


C.D.I. ALARM

The C.D.I. alarm sounds when you are off course by the same amount as the alarm setting. For example, if the alarm setting is .1 nautical miles, then the alarm will sound if you're off course by .1 nautical miles. The C.D.I. alarm adjust also changes the C.D.I. range on the Steering Screen.

To adjust the C.D.I. alarm, press the key adjacent to the up arrow on the

Now press the key adjacent to the "Follow Route Forward" to follow a route from the first waypoint to the last, or "Follow Route Backward" to follow a route from the last waypoint to the first. The screens are virtually identical, and instructions for both are the same. In this example, route forward is used. The screen below appears next.

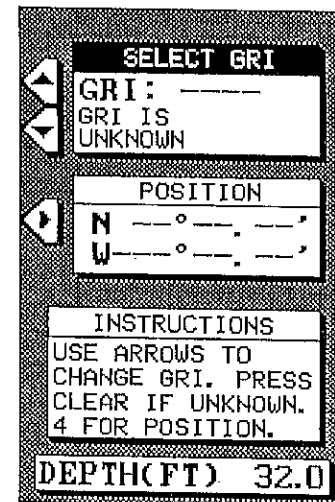


Press the keys adjacent to the up or down arrows to move through the list of waypoints that are in the route. When the waypoint that you wish to travel to first appears in the box, press the ENTER key to choose the waypoint and start the route. In this example, waypoint number 10 will be the first waypoint. The LMS-150 will show navigation data to each consecutive waypoint in the route after the first waypoint is selected. As you come within the arrival alarm's radius of each waypoint, the LMS-150 will automatically switch to the next waypoint on the list. This continues until you've travelled the entire route.

Canceling a Route

To stop the LMS-150 from navigating a route, press the MENU key, then press the key adjacent to the "More" label until the "Cancel Navigation" label appears. Now press the key next to that label. The LMS-150 will stop showing navigation data to the waypoint. It will also stop sequencing through the waypoints on the route.

When the LMS-150 is turned on for the very first time, and you press the LORAN key, the screen shown at right appears. To initialize the loran using the GRI search, press the keys adjacent to the "SELECT GRI" arrows. If you know your present position, and you want the loran to choose the GRI, press the key adjacent to the "POSITION" arrow.

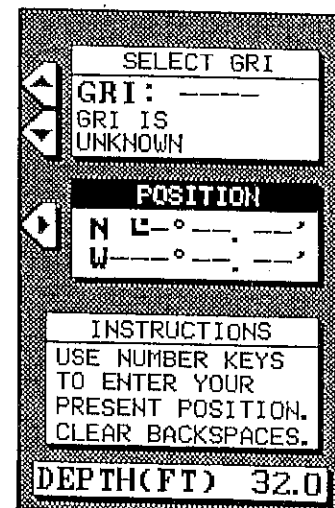


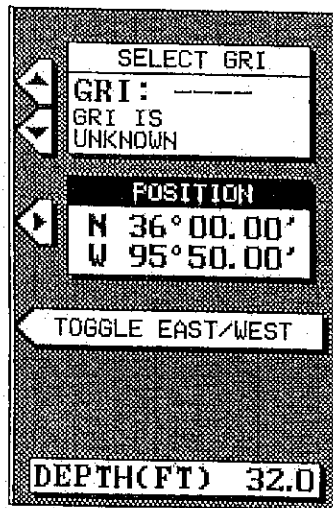
(Note: You can re-initialize the loran at any time. The "INITIAL GRI OR POSITION" is a menu item.

HOW TO INITIALIZE THE LORAN

CHANGE INITIAL POSITION

To initialize the LMS-150 using the initial position method, press the key adjacent to the "POSITION" arrow. The screen shown at right appears. Now enter your present position in latitude/longitude coordinates. Remember to enter a zero at the beginning of the longitude if it is less than one hundred degrees. The screen shown at the top of the next page appears after the last longitude number is entered. If you are east of Greenwich, England (east longitude), press the key





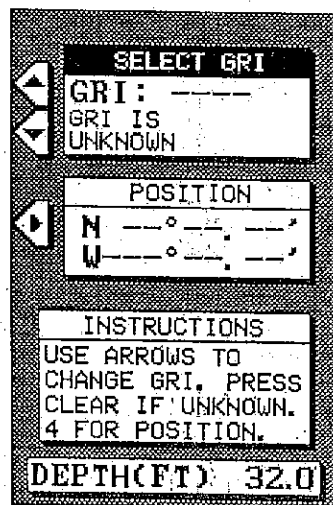
adjacent to the "TOGGLE EAST/WEST" label. Otherwise, if everything on this screen is correct, press the ENTER key. The unit will start searching for the preferred GRI and place the following message in a window on the screen; "Module is Searching for GRI". The LMS-150 then looks for the stations within the preferred GRI. Once it finds the stations, it processes the signals until it "locks on" to each station in the chain. It doesn't need to find and lock onto all the stations in a chain to determine the latitude/longitude. However, it does need to lock onto three stations with good signals to calculate a latitude/longitude. Since using the Initial Position startup places the LMS-150 in the

automatic mode, it will choose the best stations to use. To view the LMS-150's station acquisition and signal strengths, see the "STATION SCREEN" section in this manual. Until the loran finds all of the necessary stations in the chain and locks onto them, it flashes the latitude/longitude. This means the data on the LMS-150's screens are not usable. When the position stops flashing, the loran is ready for use.

WARNING: DO NOT NAVIGATE WHEN THE POSITION DISPLAY (EITHER LAT/LONG OR TD'S) IS FLASHING!

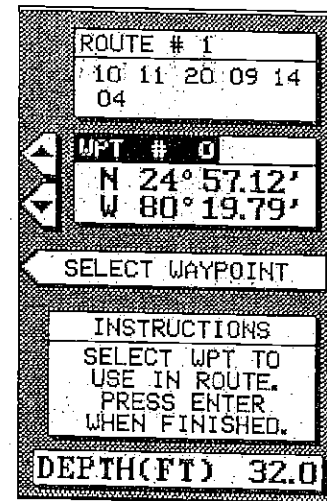
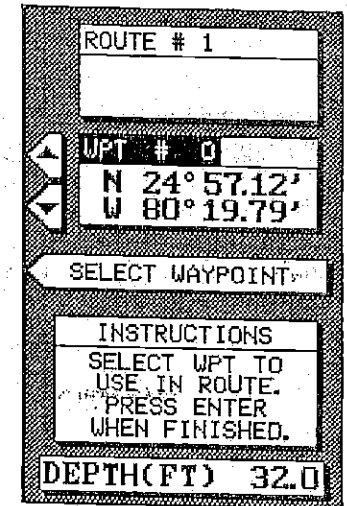
CHANGE GRI

Use this function if you don't know your position. You will need to know both the proper GRI and stations to use. The LMS-150 will calculate your present position using the chain you select. See the maps in the back of this manual for the proper chain and stations to use in your area. Using this initialization procedure switches the LMS-150 into the manual mode. Once you know the chain's number, press the key adjacent to the up or



This is the waypoint selection menu. It lets you pick the waypoints for the route. Press the keys adjacent to the up or down arrows to scroll through the list of waypoints. When the first waypoint that you want to use in the route appears in the selection box at the top of the screen, press the key adjacent to the "SELECT WAYPOINT" label. The waypoint's number appears in the box at the top of the screen. This lets you know that this is the first waypoint in the route.

Continue selecting waypoints *in the order you wish to travel* in the route until all of the desired waypoints have been picked for the route. For example, suppose you want a route that consists of waypoint numbers 1, 3, and 5. But you want to travel to 3 first, then 1, and finally 5. In this case, you must select waypoints 3, 1, and 5 in that order when making the route.



Each route can have up to ten waypoints. If you make a mistake and add an undesired waypoint to a route, press the CLEAR key. This erases the last waypoint entered in the route. After selecting all of the route's waypoints, press the ENTER key. The LMS-150 returns to the last used loran display.

Following a Route

To follow a saved route, press the MENU key, then the key adjacent to the "More" label. Next, press the key adjacent to the "Route Planning" label. Now select the route number that you wish to use by pressing the keys next to the up or down arrows until the desired route number is in the black box as shown on the previous page. Then press the ENTER key. The screen at the top of the next page appears.

ROUTES

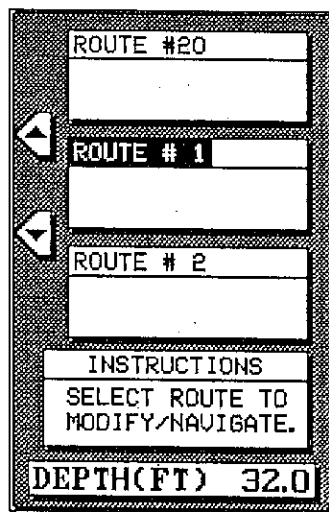
The LMS-150 gives you the ability to go to several waypoints in a row. This feature is called Routes. A route consists of two or more waypoints. When you run a route, the LMS-150 gives you navigation information to the first waypoint in the route. As you reach the first waypoint, the arrival alarm sounds, then the next waypoint is automatically selected by the unit. Navigation information is displayed for this waypoint until the arrival alarm sounds and the process repeats for the next waypoint. This happens until you've travelled to all the waypoints in the route.

There are two steps necessary to create a route. First, you must select the route number. Then pick the waypoints to use in the route. To follow a route, you simply determine the starting waypoint, then decide whether to follow the route forward or backward. After these steps are completed, the LMS-150 will start navigating on the route.

Creating a Route

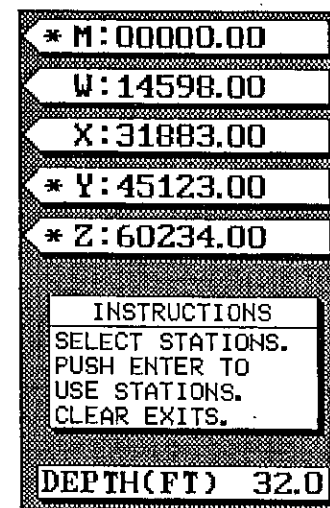
To create a route, first press the MENU key. Next, press the key next to the "More" label. Now press the key adjacent to the "Route Planning" label. The screen shown below appears.

The LMS-150 has the capability to store twenty routes. Three route numbers are displayed on this screen. Press the key adjacent to the up or down arrows to move the desired route number into the black box in the center of the screen. Once the desired route number is in the box, press the ENTER key. In this example, route number one is used. The screen shown at the top of the next page appears next.



down labels. This scrolls the chains through the display window. When the desired chain is displayed in the window, press the ENTER key. The LMS-150 then looks for the stations within the selected chain. The station selection screen shown below automatically appears next.

Since using the "Change GRI" mode puts the LMS-150 into the manual mode, you have to select the stations used in the chain. Arrows with the station letters appear on this screen. To select a station, simply press the key next to the desired station's letter. An asterisk (*) appears next to the station's letter, showing that it has been selected. In this example, stations M, Y, and Z were selected. When you're finished, press the ENTER key. The unit will start searching for the selected GRI and place the following message in a window on the screen; "Module is Searching for GRI". The LMS-150 returns to the position screen. If you simply press the CLEAR key, the LMS-150 will use stations M, W, and X. Once it locks on to the stations, it should show the proper latitude/longitude on the position display after a short time. To view the station's signal strength and other data, see the "Station Data" section on the next page.



SELECT BOTH INITIAL POSITION AND GRI

As described earlier, using both the position and GRI can help the LMS-150 find and lock on to the loran stations faster. This should allow it to display a position quicker. However, the unit may switch from automatic to manual if a non-preferred GRI is selected. If this happens, you will have to switch to the "Select Loran Stations" screen and choose the proper stations for your location.

To use this feature, first enter the GRI, then enter your present position. Use the methods previously described in the "SELECT INITIAL POSITION" and "SELECT GRI" sections. After entering these data, the screen shown at the top of the next page appears.

SELECT GRI

GRI: 8970
GREAT LAKES

POSITION

N 36° 00. 00'
W 95° 50. 00'

INSTRUCTIONS

USE NUMBER KEYS
TO ENTER YOUR
PRESENT POSITION.
CLEAR BACKSPACES.

DEPTH(FT) 32.0

Now press the ENTER key. The message "Module is Searching For GRI" appears until the LMS-150 finds the stations in the selected GRI. The Position Screen appears beneath the "Searching" message.

To determine if you need to select stations, watch the indicator on the left side of the screen. If it stays in "AUTO", you won't need to select stations. However, if it switches to "MAN", then you'll need to tell the unit which stations to use. To do this, first press the MENU key, then press the key next to the "CHANGE LORAN SETUP" label. Now press the key next to the "Select LORAN Stations" label. Now

select the best stations for your position. See the "Manual Station Selection" section for more information on selecting stations.

STATION DATA

The LMS-150's Station Data Screen displays all of the technical data for the stations in the current GRI. To view this screen, first press the MENU key. Now press the key next to the "Station Screen". The screen shown below appears. The TD's for the master station and all of the secondaries in the chain display at the top of each station's box. If the Loran recommends the station for use, the letters "REC" appear beneath the station's letter. In this example, stations M, Y, and Z are recommended. Stations that are currently in use are shown in reverse lettering. In this example, the master and stations Y and Z are in use. The letters on the far right side of the screen are an abbreviation for the station status. The status is as follows:

M:00000.00 LOCK
REC 99

W:14598.12 LOCK
REC 90

X:31883.24 CYC
10

Y:45123.67 LOCK
REC 93

Z:60223.23 LOCK
REC 86

DEPTH(FT) 32.0

SRCH - SEARCH Searching for the station's signal. Don't use this TD for navigation.

CYC- CYCLE ERROR The receiver is trying to "lock on" to the proper cycle. Don't use this TD for navigation.

everything on this screen is correct, press the ENTER key. The screen at the top of the previous page appears next.

This is the View and Save menu. If you want to save this position under a number other than the one displayed, simply press the key adjacent to the up or down arrows. This moves the list of waypoint numbers up or down. When the desired waypoint number is surrounded by the black box, press the ENTER key. The waypoint displayed at the top of the screen will be saved under this number, then the LMS-150 will return to the Loran screen. To exit from this screen without saving a waypoint, simply press the CLEAR key.

WAYPOINT RECALL

You must recall a waypoint to use the Steer Indicator or Navigation screens. To recall a waypoint, first press Waypoint Recall key. The menu shown at right appears.

Three waypoints display on this screen. To recall one of these waypoints other than the one at the top of the screen, simply press the key adjacent to the up or down arrows. This moves the list of waypoint numbers up or down. When the desired waypoint number appears in the black box, press the ENTER key. The waypoint will be recalled and the LMS-150 will return to the Loran screen. To exit from this screen without recalling a waypoint, simply press the CLEAR key.

WPT # 0

N 32° 21.28'
W 80° 45.50'

WPT # 1

N 32° 22.01'
W 80° 45.16'

WPT # 2

N 32° 20.57'
W 80° 45.30'

INSTRUCTIONS

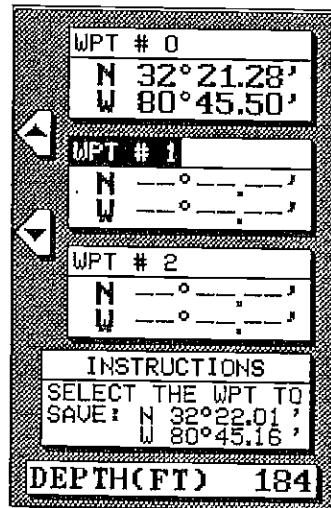
SELECT THE WPT TO
NAVIGATE

DEPTH(FT) 329

ERASE A WAYPOINT

To erase a position from the waypoint list, first press the WAYPOINT SAVE key. Now press the key adjacent to the "ERASE A WAYPOINT" label. A screen similar to the one above appears. Simply press the keys adjacent to the up or down labels to move the list of waypoints up or down until the desired waypoint is in the black selection box. Now press the ENTER key. This will erase the waypoint from the LMS-150's memory. To return to the last used Loran screen, press the CLEAR key.

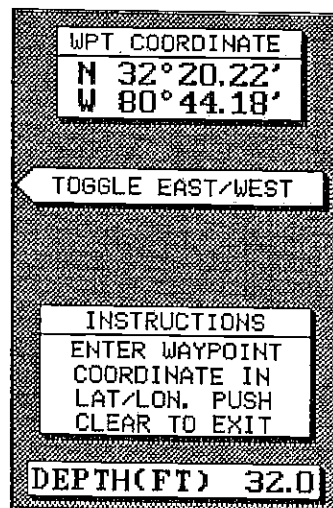
displayed, simply press the key adjacent to the up or down arrows. This moves the list of waypoint numbers up or down. When the desired waypoint number is surrounded by the black box, press the ENTER key. The waypoint displayed at the top of the screen will be saved under this number, then the LMS-150 will return to the loran screen. To exit from this screen without saving a waypoint, simply press the CLEAR key.



Enter New Waypoint and Go To Waypoint

To go to a position without saving it, first press the MENU key, then press the key next to either the "GO TO LAT-LON" or "GO TO TD" labels. A screen similar to the one below appears. Now simply enter the position and press the ENTER key. The unit will show navigation information to that position.

To save a waypoint other than your present position, first press the Waypoint Save key. The waypoint save menu appears. If you wish to save the waypoint using latitude/longitude, press the key adjacent to the "INPUT LL WPT" label. To save a waypoint using TD's, press the key adjacent to the "INPUT TD WPT" label. The steps to save a waypoint are identical. For this example, we'll use the latitude/longitude method. A screen similar to the one at right appears.



Now enter the waypoint location. Remember to add a zero to the longitude if it's less than 100 degrees. The "TOGGLE EAST/WEST" label appears after the last longitude number is entered.

If you are east of Greenwich, England (east longitude), press the key adjacent to the EAST/WEST label. Otherwise, if

LOCK - LOCKED The receiver has locked on to the station. Use a TD only when the "LOCK" indicator displays.

SNR - LOW SNR The receiver has a low signal to noise ratio for this station. Don't use this TD for navigation.

BLI - BLINK The station transmits a signal called "Blink" when it's signal is not usable. Don't use this TD for navigation.

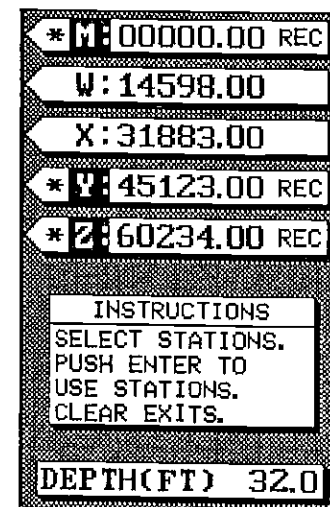
Below the station's TD's are the bar graphs showing the signal strength for each station. The number at the right of the bar graph shows the relative signal strength with 99 the maximum, or best and 0 the worst.

To exit from this screen, press the MENU key, then select either the Position, Navigation, or Steering screens.

MANUAL STATION SELECTION

The LMS-150's manual station selection feature lets you decide which stations to use. This also locks the unit in the manual mode.

To manually change stations, first press the MENU key, then press the key adjacent to the "Change LORAN Setup" label. Now press the key adjacent to the "Select LORAN Stations" label. The screen shown below appears. To select stations, simply press the keys adjacent to the desired stations. After each key is pressed, an asterisk "*" displays next to the station's letter, showing that station is selected. Press the keys for all stations that you intend to use. In this example, the keys adjacent to stations M, Y, and Z were pressed. If you started the loran using the initial position, or if the loran is showing a latitude/longitude position, then it can recommend stations to use. The letters "REC" appear to the right of the station's TD. The TD (time difference) for each station appears to the right of the station's letter. After selecting the desired stations, press the ENTER key. This activates your selection and returns the LMS-150 to a loran screen. If the stations you've chosen are locked with good crossing angles, the unit should show a latitude/longitude position after a short wait.



AUTOMATIC and MANUAL MODES

The LMS-150's Loran has both automatic and manual modes. This means the unit will select the stations to use when it's in automatic. You must select the stations when it's in the manual mode.

The LMS-150 chooses the stations with the best crossing angles and signal strengths when it's in the automatic mode. It does this by continually monitoring the stations signals to determine the best ones to use. If the unit determines one or more stations are better to use than the current ones, it will automatically switch to the new stations.

However, there are times when you don't want the unit to switch stations. When you're navigating using waypoints is one. You must use the same stations when travelling to a waypoint as the ones used when the waypoint was saved. For example, if the loran was using M,X, and Y when the waypoint was saved, you must use M,X, and Y to navigate back to that waypoint. Otherwise, navigation errors can occur. Placing the unit in the manual mode keeps the LMS-150 from changing stations.

To place the LMS-150 in the manual mode, first press the MENU key. Next, press the key adjacent to the "Change LORAN Setup" label. Now press the key adjacent to the "Select MANUAL Mode" label. The menu will disappear, switching to the last used loran screen. The word "MAN" appears at the top of the position screen, showing which mode is in use.

Although you can switch from automatic to manual at any time, you can't always switch to automatic. The LMS-150 must be using the preferred GRI for your area in order to use the automatic mode. If you try switching from manual to automatic while a non-preferred GRI is in use, the LMS-150 will simply switch itself back to the manual mode. (A preferred GRI is one the LMS-150 determines is the best one to use based on your location.) If you are in a location that is covered by multiple GRIs, you won't know which one is the preferred one. However, if the LMS-150 won't let you switch into automatic, you can be certain that you're not using the preferred GRI.

PRIMARY and ALTERNATE SOLUTIONS

The loran normally determines its position by measuring the time difference between the master and two other secondary stations. Each time difference results in a line of position. Your present position is the intersection of the lines of position. This is called a "fix"

A mathematical formula in the loran receiver uses TD's to determine the latitude/longitude position. Due to the nature of loran, your position in

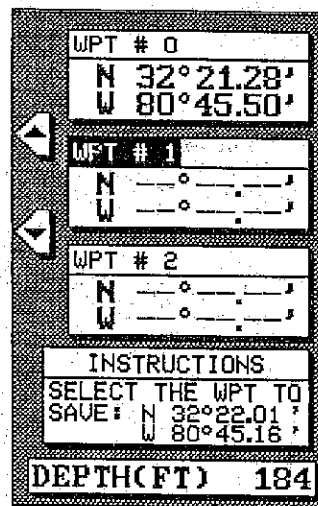
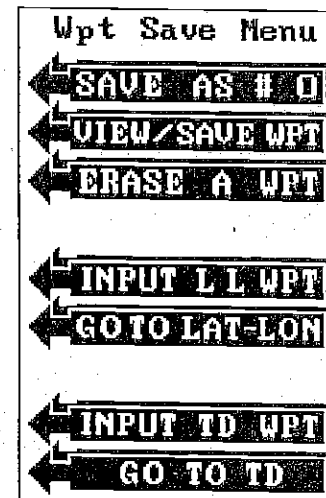
WAYPOINT NAVIGATION

HOW TO SAVE A WAYPOINT

Waypoints are locations that you save in the UltraNav's memory. You can then navigate to these positions using the Steer Indicator, Navigation, or Plotter screens. Waypoints are useful for marking shipwrecks, hot fishing spots, and other fishing or navigational locations. The LMS-150 can store up to 100 waypoints. You can store your present position as a waypoint, or enter TD's or latitude/longitude positions.

Saving Present Position as a Waypoint (Save As #)

To save your present position using this feature, first press the Waypoint Save key. The menu shown at right appears. Now press the key adjacent to the "SAVE AS #" label. The LMS-150 stores your present position under the waypoint number shown on the label. The waypoint number increments to the next available waypoint number each time you save a waypoint, so you don't have to keep track of the waypoint numbers. Once you've stored the waypoint, the LMS-150 returns to the loran display.



Saving Present Position - View and Save Method

The "Quick Save" and "Save As #" features don't allow the selection of a waypoint number. You have to use the next available number when using that method. To save your present position under any waypoint number, first press the Waypoint Save key, then press the key adjacent to the "VIEW/SAVE" label. The screen shown at left appears.

Your present position displays at the top of the screen. If you want to save this position under a number other than the one

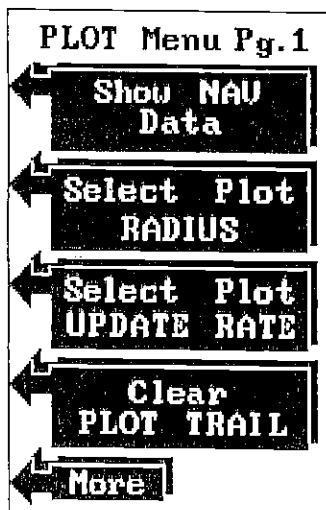
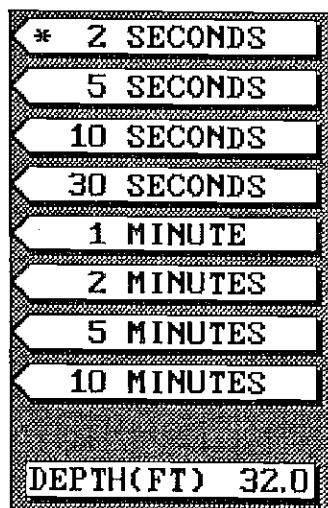
Select Update Rate

The plotter shows your track by drawing a solid line behind your present position. When the unit is turned on for the very first time, the position is updated once every ten seconds. You can vary this time from 2 seconds to 20 minutes.

As each dot is placed on the track line, one is erased from the end after a certain length has been achieved. This shortens the plotted line, but still shows the history of your passage. If you plot a course that's a long distance away and use a short update time, the line may not reach from the starting location to the destination.

To keep a continuous line plotted, you may want to experiment with the update interval. Lengthening the interval between plots gives you a better chance to see more history.

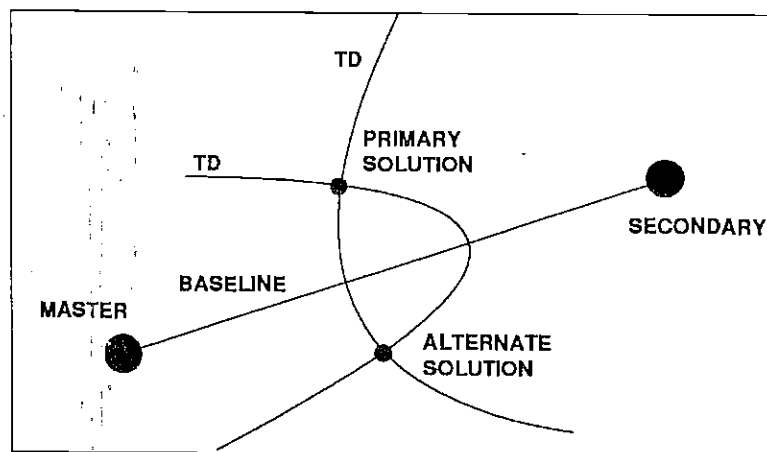
To change the plotter time, press the key adjacent to the "Update Rate" label on the plotter menu screen. The screen shown at right appears. To select an update interval, simply press the key adjacent to the desired time. The screen will clear, returning to the plotter with the new time. The available times are: 2, 5, 10, 20, and 30 seconds and 1, 2, 5, and 10 minutes.



Clear Plot

The "Clear Plot" label clears the solid track line. The plotter will continue to draw your track after this key is pressed, however the location of your present position will be centered on the screen.

latitude/longitude can be on either side of a baseline. (The baseline is an imaginary straight line connecting the master and each secondary station.) It's possible for the loran to lock onto the stations, give good fix qualities and signal strengths, but show the latitude/longitude on the other side of the baseline from your present position. These two positions (your present position and the one on the other side of the baseline) are called the primary and alternate solutions. They're usually far apart, making it easy to tell if the loran is displaying a position far from your actual location. However, if you're close to the baseline, the difference between the alternate and primary solution could be only a few miles, or less. For this reason alone, it's always important to know your approximate position when initializing or using a loran.

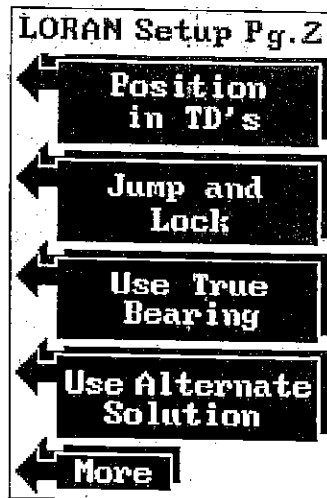


To switch from the primary to the alternate solution, first press the MENU key. Next, press the key adjacent to the "Change LORAN Setup" label, then press the key next to the "More" label. Now press the key adjacent to the "Use Alternate Solution" label. The LMS-150 returns to a loran screen after this selection. If you're using a screen with the latitude/longitude displayed, the lat/long will flash until a new position displays. If the unit doesn't show the proper latitude/longitude position, you may have to change stations, then try switching the primary and alternate solutions.

The solution currently in use by the LMS-150 is displayed at the top of the position screen. See the "Position Screen" section for more information. Check your position against the loran after it displays a new latitude/longitude. They should be the same. To switch back from the alternate to the primary solution, repeat the above steps. The only difference is the label now reads "Use Primary Solution".

SHOW TD'S

The LMS-150 shows either latitude/longitude or time differences (TD's) on most screens. To switch between latitude/longitude and TD's, first press the MENU key, then press the key adjacent to the "Change LORAN Setup" label. Now press the key next to the "MORE" label until the menus shown at right appear. In this example, the LMS-150 is displaying the position in latitude/longitude. To change to TD's, press the key adjacent to the "Position in TD'S" label. The LMS-150 will revert to the last loran screen and show the position in time differences. To switch the display again, simply repeat the above steps. The menu will now read "POSITION DISPLAYED IN LAT/LON". Press the key adjacent to this menu to get latitude/longitude displays.



TRUE and MAGNETIC POSITION

Most navigators realize there is a difference between true and magnetic north. True north is the top of the world. It's where all lines of longitude converge. Magnetic north is the location our compasses point. It lies several hundred miles to the south of true north, at a location in Canada.

Charts are usually laid out according to a Mercator projection which uses true north. If you plot a course on a chart using the Mercator projection, you'll either have to convert magnetic readings to true or use true readings.

The LMS-150 can display navigation information in magnetic or true. When it's turned on for the very first time, magnetic is used. To switch to true, press the MENU key, then press the key adjacent to the "Change LORAN Setup" label. Now press the key adjacent to the "More" label. The menu shown above appears. In this example, magnetic position effect.

Press the key adjacent to the "Use True Bearing" label. The screen will clear and return to the last used loran screen, showing all navigation information in degrees true. Repeat these steps to switch back to magnetic. The menu that originally said "Use True Bearing" now reads "Use Magnetic Bearing".

present position, and the "D" is the destination. The destination is the recalled waypoint position. If you are using a route, it's the first waypoint location in the route. The dotted line is the direct path or course from the starting location to the destination. Follow this line to get to the waypoint.

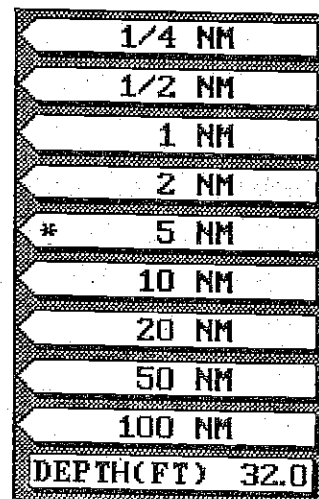
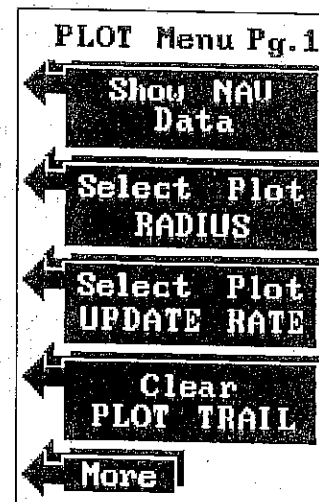
The destination waypoint number is displayed in the plotter's upper right corner. In this example, waypoint number 5 is the destination.

PLOTTER MENUS

Pressing the MENU key while the plotter is displayed gives you a new set of menus, relating only to the plotter. A description of the menu functions follows.

Show NAV Data

The LMS-150 can show either the present position or distance to go and bearing in the box at the top of the plotter screen. To switch this display, press the MENU key while the plotter is on. Now press the key next to the "Show NAV Data" label. The display returns to the plotter screen with the distance and bearing to the waypoint showing at the top of the screen.



Select Plot Radius

Press the key next to the "Select Plot Radius" on the Plot Menu screen to change the circle's radius on the plotter screen. The screen shown at left appears. The plot radius is 1/4 nautical mile when the LMS-150 is turned on for the very first time. The available plot radii are: 1/4, 1/2, 1, 2, 5, 10, 20, 50, and 100 miles. This lets you zoom in or zoom out the plotter's display. To select a radius, simply press the key adjacent to the desired radius size. The screen will clear, returning you to the plotter with the new radius.

PLOTTER

The plotter lets you easily see your course and direction of travel on the screen. The plotter will also show your starting position and destination if you are travelling to a waypoint or on a route.

To use the plotter, simply press the PLOTTER key. A screen similar to this one appears.

The flashing cross is your present position. The solid line is your track, or path you have travelled. The circle is a compass rose with north, south, east, and west marked. The circle's radius is displayed at the bottom of the screen. Your present position is displayed at the top of the screen.

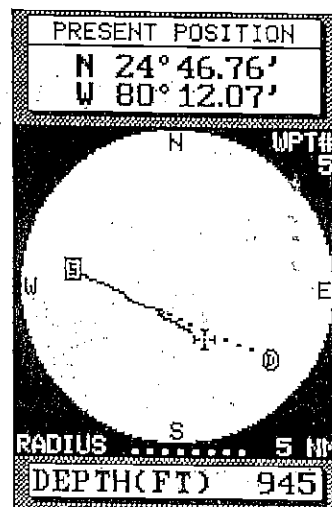
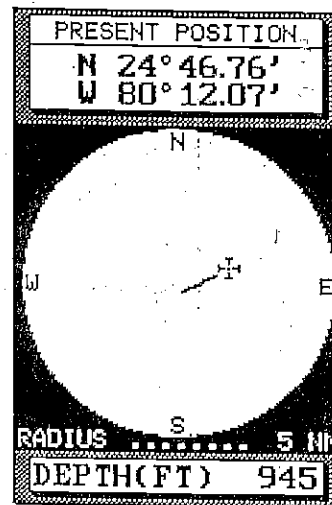
If your present position starts to move outside of the circle, the LMS-150 will first clear the display for an instant. Then it will redraw your present position along with a portion of your track near the center of the screen. Your present position will always be on the plotter at all times. You do not have to recall a waypoint to use the plotter.

To clear the plotter, see the Plotter Menu section.

Using the Plotter with a Waypoint

Using the plotter with a recalled waypoint or route is an easy way to see the effects of wind and current on your boat. To use the plotter in this manner, simply recall a waypoint (see the Waypoint Recall section for more information), then press the PLOTTER key. A screen similar to the one at right appears.

The "S" is your starting location. This was your position when you recalled the waypoint. The flashing cross is your

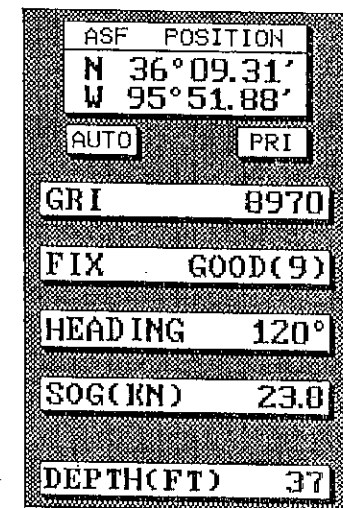


POSITION DISPLAY

The position display shows your present position (POSITION), GRI in use, fix quality (FIX), heading, speed over ground (SOG), water depth (DEPTH), and status displays.

The present position display shows at the top of the screen. It shows your present position in either latitude/longitude or TD's. To the left of the word "POSITION" is the ASF indicator. It only shows when ASF's are in use. Beneath the position display are the automatic/manual mode and the primary/alternate solution indicators. If the unit is in the automatic mode, the letters "AUTO" appear. When the loran is in the manual mode, the letters "MAN" show. On the far right is the primary/alternate solution display. If the unit is in the primary mode, the letters "PRI" appear. "ALT" appear if the unit is in the alternate mode. Beneath these indicators is the GRI box. The GRI currently in use shows in this box. The fix quality indicator is next. Fix quality is a measure of the lines of position's crossing angles. If the fix quality is poor, use the displayed information with caution. The position display flashes the last known position when the fix quality is not usable. A number to the right of the fix quality message shows the fix quality's value. It's range is from zero (0) to nine (9), with zero the worst and nine the best.

Beneath the fix quality message is your Heading display, or direction the boat is travelling. Speed over ground (SOG) shows your actual speed, regardless of the speedometer reading. For example, if you're travelling at ten knots directly against a two knot current, then your speed over ground is eight knots. You will typically need to travel some distance in a straight line before the SOG feature "settles down" and gives an accurate reading. The last display on this screen is the water depth (DEPTH) display.

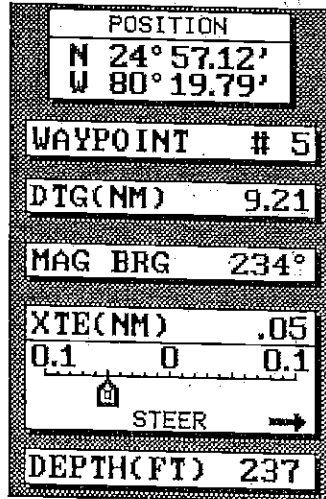


Remember, do not use the loran for navigation when the position display flashes! Find and correct the problem before navigating with the unit.

NAVIGATION DISPLAY

The navigation screen shows the present position, distance to waypoint (DTG), bearing to waypoint (BRG), and cross track error. A waypoint must be saved and recalled to use this display.

Your present position shows at the top of the screen. The recalled waypoint number, distance to waypoint, and bearing to waypoint appear beneath the present position. The cross track error (XTE) displays right above the C.D.I. display. This is the same distance as shown by the C.D.I. display, only in digital numbers. When the LMS-150 is first turned on, the cross track error displays in statute miles. Beneath it is the course deviation indicator (C.D.I.). This shows the cross track error distance in statute miles you are to the side of your desired course. (The course is an imaginary line drawn between your starting location and the destination.) For example, you are a tenth of a mile to the left of course if the C.D.I. arrow points to the 0.1 mark on the left side of the scale. A message also appears "STEER >", telling you which direction to steer the boat to get back on course.



The C.D.I. range is zero when the LMS-150 is turned on for the first time. To set it to a different distance, use the C.D.I. alarm adjust menu. The C.D.I. range and alarm are the same. For example, if the C.D.I. range is one mile, then the C.D.I. alarm will sound if you are off course by one mile or more. See the ALARMS section for more information on setting the C.D.I. alarm. The C.D.I. range and alarm is .1 mile on the screen shown above.

Distance To Go (DTG) is displayed just below the waypoint number. This is the distance from your present position to the waypoint. When the LMS-150 is first turned on, the distance is shown in statute miles.

The bearing to the waypoint from your present position displays just above the C.D.I. indicator in the middle of the screen. The bearing is shown in degrees magnetic (MAG BRG) when the LMS-150 is turned on for the first time.

NAVIGATION SUMMARY SCREEN

This screen shows all navigation information to a waypoint in digital numbers. To display this screen, press the MENU key, then press the key next to the "More" label twice while the LMS-150 is in the Loran mode. Now press the key adjacent to the "NAV SUMMARY SCREEN". The following screen appears.

(Note: All features are in statute miles, degrees magnetic, and statute miles per hour when the LMS-150 is turned on for the very first time.)

The recalled waypoint number currently used for navigation is at the top of the screen.

Distance To Go (DTG) shows the distance from your present position to the waypoint shown at the top of the screen.

Bearing To Waypoint (BEARING) is the third display, showing the direction from your present position to the recalled waypoint.

Course Over Ground (COG) shows your direction of travel.

Cross Track Error (XTE) is the distance to the side of your desired course. A letter "L" or "R" appears showing which side of the course you are on.

The GRI currently used by the LMS-150 shows beneath the cross track error display.

Speed Over Ground (SOG) is the averaged speed over ground that you are making. For example, if your boat speedometer says you are travelling at ten knots, but you're going head-on into a two knot current, then your speed over ground is eight knots.

Time To Go (TT) is the time the LMS-150 calculates it will take you to reach the recalled waypoint, travelling at the current speed.

Water depth (DEPTH) is the distance from the face of the transducer to the bottom.

