

# LMS-10

## Loran -C Receiver

  
INSTALLATION AND OPERATION  
INSTRUCTIONS

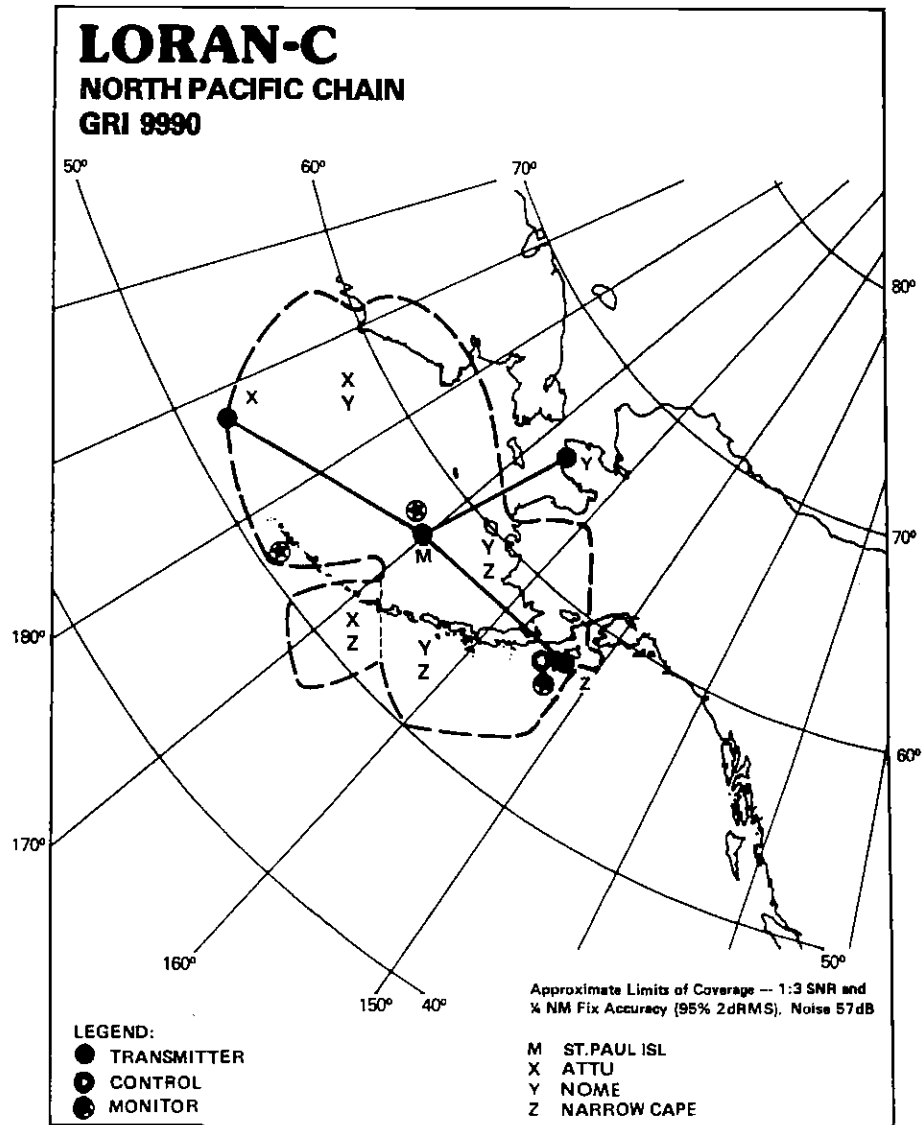
 **LOWRANCE ELECTRONICS, INC.**  
12000 E. SKELLY DR., TULSA, OK 74128

LITHO IN U.S.A.

988-0116-03

**WARNING!**  
 THIS LORAN SHOULD BE USED 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  
 BEFORE NAVIGATING WITH THIS PRODUCT. THE  
 POSITION MUST BE CORRECT FOR THE NAVIGA-  
 TION FEATURES IN THIS UNIT TO WORK  
 PROPERLY.



## TABLE OF CONTENTS

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.	CD/BLL (µs)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM E/C/D	NOTES
MASTER	ST. PAUL AK	57 09 12.3N 170 15 06.8W		AN/FPN-42	325	625 FT MONOPOLE	0.0	
KRAY	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/ 3068.95	AN/FPN-42	1000	1350 FT MONOPOLE	+0.6	
ZULU	NARROW CAPE, AK	57 26 20.2N 152 22 11.3W	43000/ 3590.45	AN/FPN-44A	400	625 FT MONOPOLE	0.0	DUAL RATE W/GR17960

LORAN - General .....	1
ACCURACY .....	1
HOW LORAN-C WORKS .....	1
INSTALLATION - Display Unit .....	3
INSTALLATION - LC-1 Loran-C Module .....	4
POWER CONNECTIONS .....	5
LORAN OPERATION - INITIALIZATION .....	6
SELECT GRI .....	7
ENTERING INITIAL POSITION - LAT/LONG .....	8
CYCLE ERRORS AND SNR .....	9
AUTOMATIC AND MANUAL MODES .....	10
MANUAL STATION SELECTION .....	12
Viewing Stations in Use .....	12
Viewing Recommended Stations .....	12
Selecting Stations .....	13
PRIMARY AND ALTERNATE SOLUTIONS .....	14
DISPLAY - Overview .....	15
TD/LL .....	16
HEADING (HDG) .....	17
TIME TO GO (TTG) .....	17
DISTANCE TO GO (DTG) .....	18
SPEED OVER GROUND .....	18
VELOCITY MADE GOOD .....	19
TRUE/MAGNETIC BEARING .....	19
CROSS TRACK ERROR (XTE) .....	20
CROSS TRACK ERROR PER ARROW .....	21
SIGNAL TO NOISE RATIO (SNR) .....	21
FIX QUALITY .....	22
HOW TO SAVE A WAYPOINT .....	22
Saving Current Position (Quick Save Feature) .....	22
Enter New Waypoint - Latitude/Longitude .....	23
Enter New Waypoint - TD's .....	25
ERASING A WAYPOINT .....	26
WAYPOINT RECALL .....	27
WAYPOINT COUNTER OFFSET .....	28
GO TO WAYPOINT .....	28
VIEW DESTINATION WAYPOINT .....	29
VIEW STARTING WAYPOINT .....	29
ROUTES .....	29
Creating a Route .....	29
Following a Route .....	31
Cancelling a Route .....	31
Erasing a Route .....	31
ALARMS .....	31
Anchor Alarm .....	32
Arrival Alarm .....	32
ASF CORRECTION .....	33
NMEA OUTPUT .....	35
24 HOUR CLOCK - TIMER .....	36
LIGHTS .....	36
CLEAR LOWER DISPLAY .....	37
F1 and F2 .....	38
RESTART LORAN .....	39
Select New GRI .....	39
Enter New Initial Position .....	40
RESET .....	41
VIEWING T.D.'S IN USE .....	42
MAGNETIC VARIATION .....	42
VERSION NUMBER .....	42
STAT .....	42
SIMULATOR .....	43
HOW TO OBTAIN SERVICE .....	43
COMMAND LIST .....	44
KEYBOARD 2nd FUNCTION LIST .....	45
FACTORY DEFAULTS .....	45

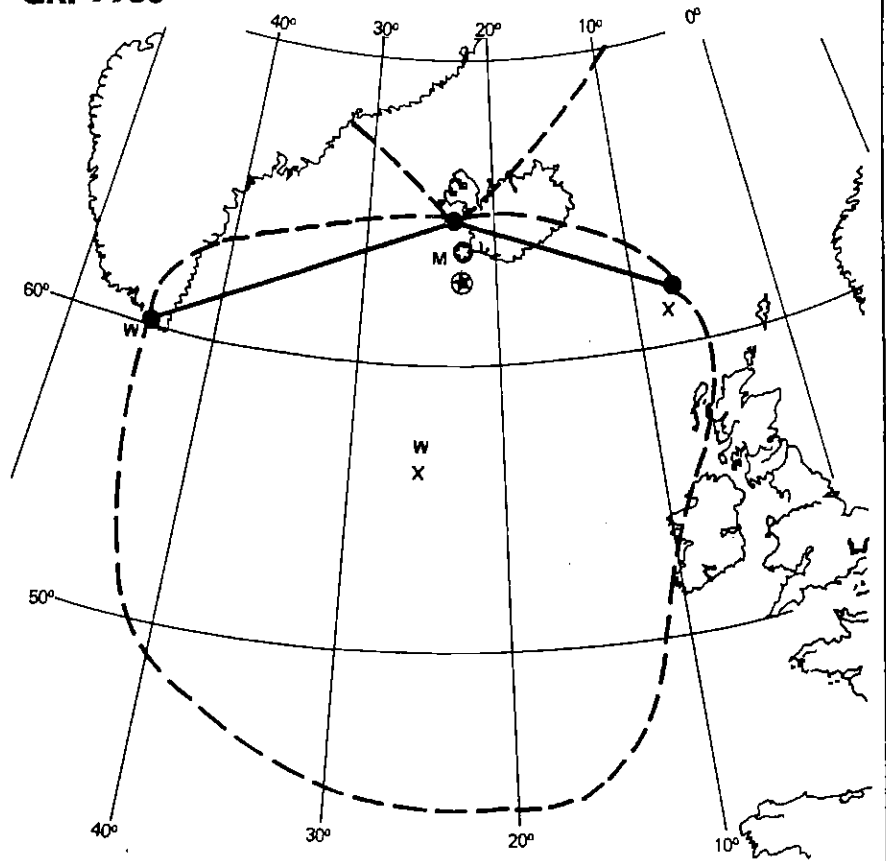
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All features and specifications subject to change without notice.

# LORAN-C

## ICELANDIC CHAIN

### GRI 9980



**LEGEND:**

- TRANSMITTING
- CONTROL
- ⊕ MONITOR

Approximate Limits of Coverage -- 1:3 SNR and  
 $\frac{1}{4}$  NM Fix Accuracy (95% 2dRMS). Noise 46dB

- M SANDUR
- W ANGISSOK
- X EJDE

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	NCM ECD	NOTES
MASTER	SANDUR ICELAND	64 54 26.6N 23 55 21.8W		AN/FPN-45	1800	1350FT MONOPOLE	0.0	
WHISKEY	ANGISSOO GREENLAND	59 59 17.3N 45 15 27.5W	11000/ 4088.03	AN/FPN-45 MONOPOLE	760	625 FT	+1.0	DUAL RATE W/GRI7930
XRAY	EJDE FAEROE IS., DENMARK	62 17 59.6N 07 04 26.5W	30000/ 2944.54	AN/FPN-44 MONOPOLE	325	625 FT	0.0	DUAL RATE GRI7970

## LORAN - GENERAL

The word "LORAN" is short for LOnG RAnge Navigation. It's a navigation system that uses powerful low frequency (100 kHz) radio transmitters and sensitive receivers. With this system, 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 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 place time after time.

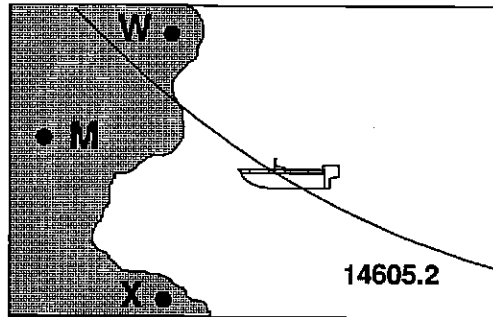
However, the accuracy you experience may not be as good as the numbers above suggest. The crossing angle of the lines of position affects the accuracy. The sharper the crossing angle, the more chance for position error. A ninety degree crossing angle is best, but it can be as low as thirty degrees without 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-10 to the chart. It should be very close.

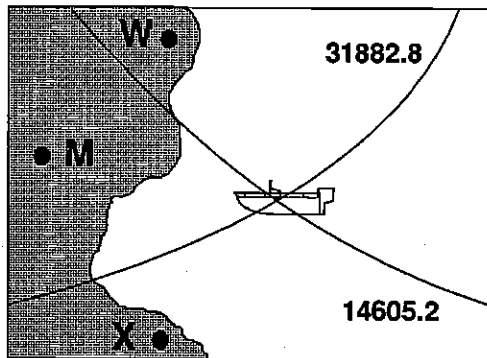
## HOW LORAN-C WORKS

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.

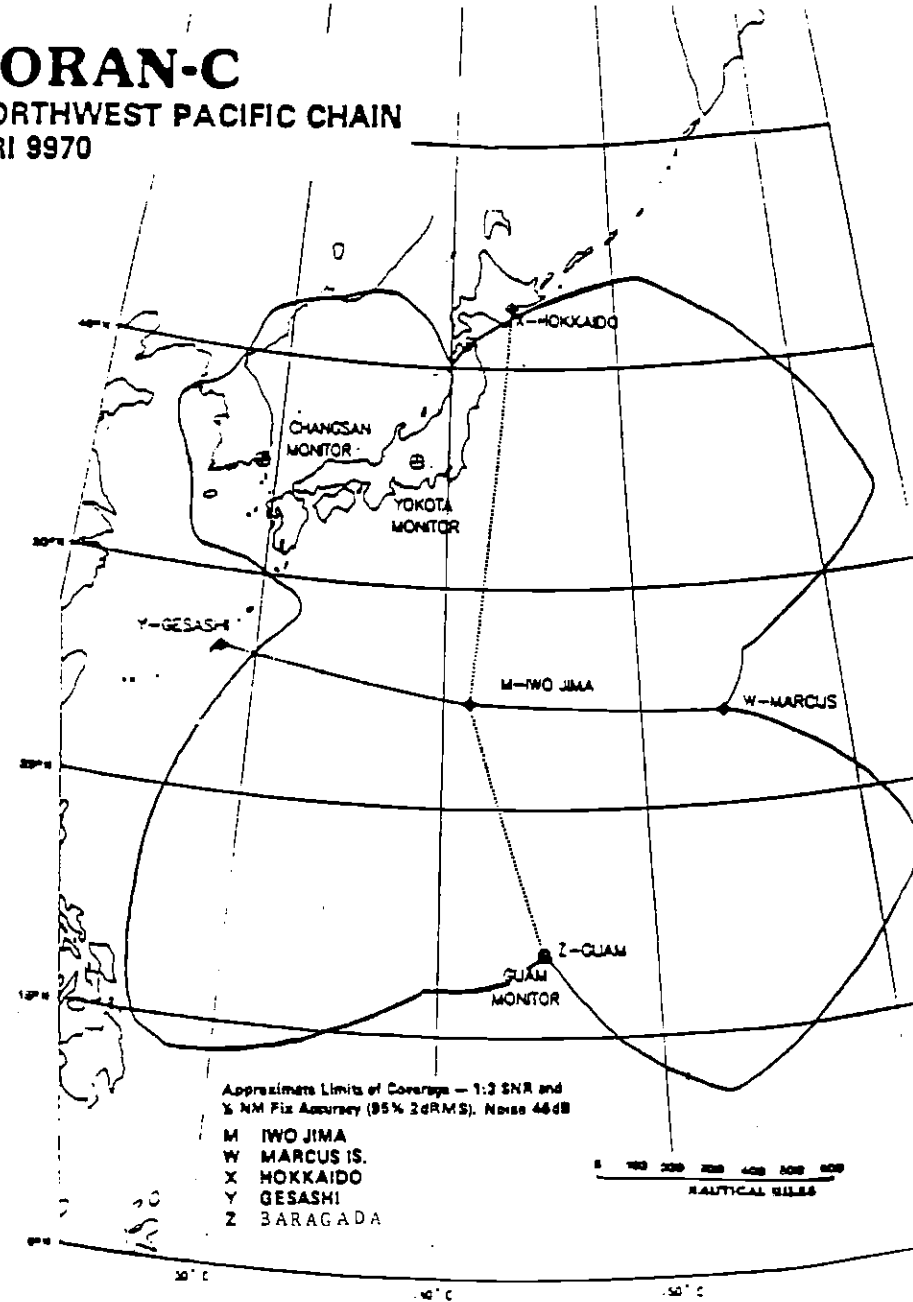
The secondary stations transmit at precise time intervals after the master station transmits. Since these transmitters are located hundreds of miles apart, it takes a different time for the signals from each transmitter to reach you. The Loran receiver measures this time difference between the master and two of the secondaries. The LMS-10 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 LOP.



The Loran receiver then measures the time difference between the master and another secondary. In this example it's 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.



## LORAN-C NORTHWEST PACIFIC CHAIN GRI 9970



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-10 to determine your position.

If you wish to know more about Loran-C, order the United States Coast Guard's book "Loran-C USER HANDBOOK." It's an excellent book that describes Loran in greater detail.

Loran-C User's Handbook  
 COMDTINST M16562.3  
 Superintendent of Documents  
 U.S. Government Printing Office  
 Washington, D.C. 20402  
 Code #050-012-00171-5, 1980

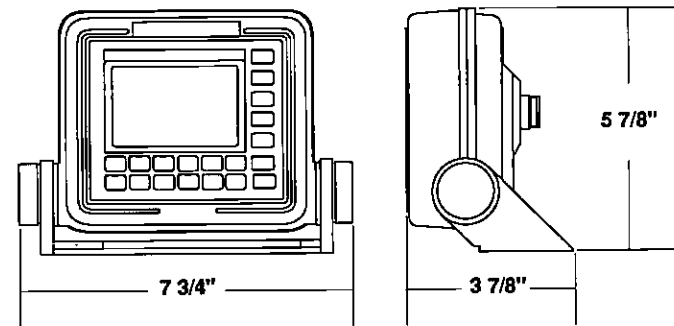
There is a small charge for the book.

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

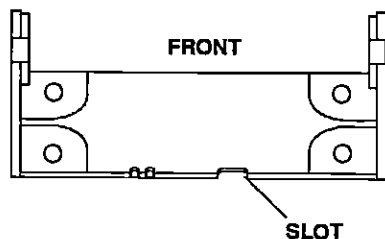
DESIG.	STATION	COORD.	CD/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	TWOJIMA JAPAN	24 48 03.6N 141 19 30.2E		AN/FPN-45	1815	1350 FT MONOPOLE	0.0	
WHISKEY	MARCUS ISLAND JAPAN	24 17 07.9N 153 58 53.2E	11000/ 4283.98	AN/FPN-45	2160	1350 FT MONOPOLE	0.0	
XRAY	HOKKAIDO JAPAN	42 44 37.1N 143 43 09.2E	30000/ 8685.17	AN/FPN-45	600	625 FT MONOPOLE	0.0	DUAL RATE W/GRI5970
YANKEE	GESASHI JAPAN	26 36 25.0N 128 08 55.4E	55000/ 4483.29	AN/FPN-45	600	625 FT MONOPOLE	0.0	DUAL RATE W/GRI5970
ZULU	BARRIGADA	13 27 50.1N 144 49 33.0E	2536.84/ 81000			750 FT		

## INSTALLATION - Display Unit

Mount the display unit in any convenient location, provided there is clearance when it's tilted for the best viewing angle. Holes in the bracket's base allow wood screw or through bolt mounting. Place a piece of plywood on the back of thin panels to secure the mounting hardware. Make certain there is enough room behind the unit to attach the power and Loran module cables.



You can route the cables through a three-quarter inch hole in the mounting surface. First, bring the Loran module's cable up through the hole, then pass the power cable down it. After routing the cables, fill the hole with silicone rubber adhesive (RTV). Offset the bracket to cover the hole. Route the cables through the slot in the bracket.



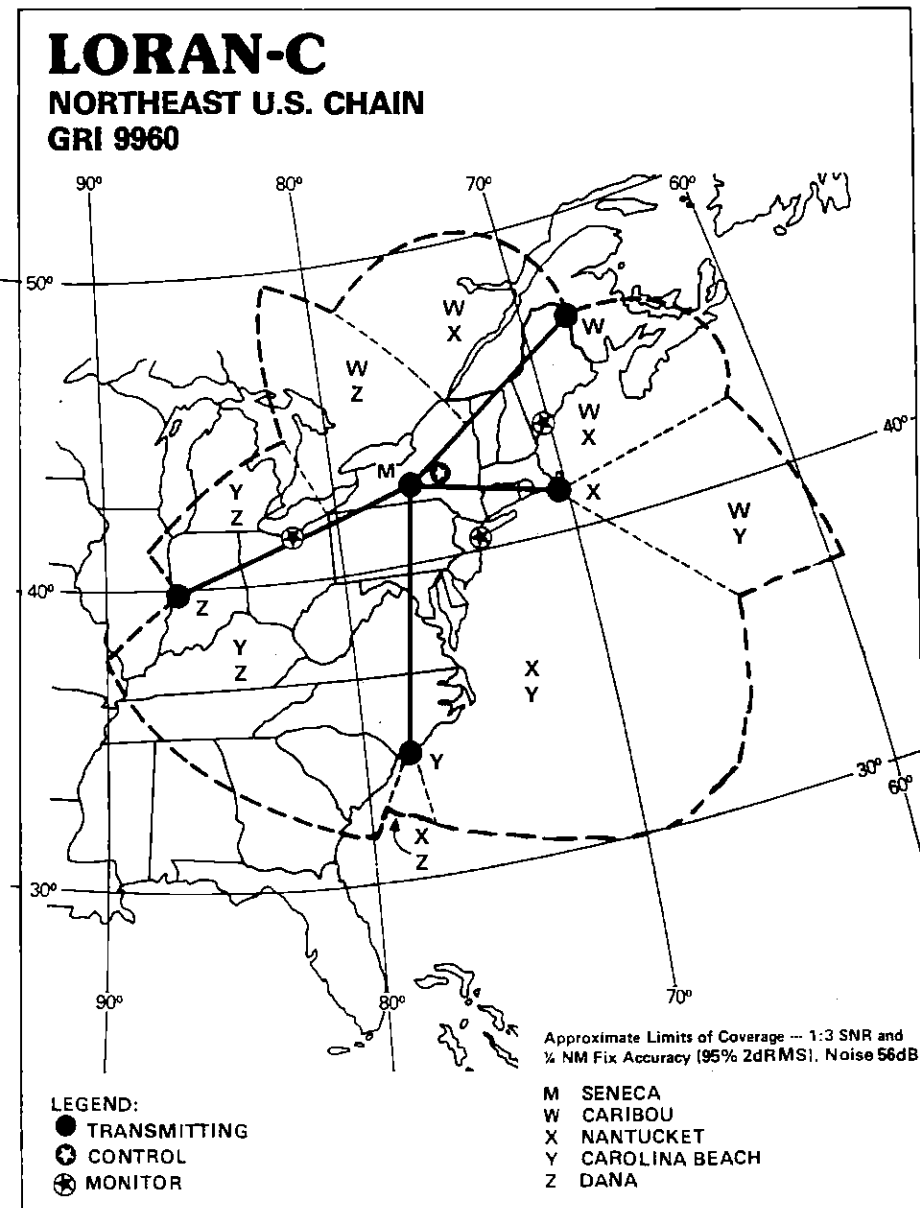
#### INSTALLATION - LC-1 Loran-C MODULE

Enclosed with your the LMS-10 is a LC-1 Loran-C module. This contains the complete loran receiver. When choosing a mounting location for the LC-1, remember to install the LC-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.

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.



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.	CDBLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	SENECA, NY	42 42 50.6N 76 49 33.9W		AN/FPN-64 (56 HCG'S)	800	700 FT MONOPOLE	0.0	DUAL RATE W/GRI8970
WHISKEY	CARIBOU, ME	46 48 27.2N 67 55 37.7W	11000/ 2797.20	AN/FPN-42	350	SLT	0.0	DUAL RATE W/GRI5930
XRAY	NANTUCKET MA	41 15 11.9N. 69 56 39.1W	25000/ 1969.93	AN/FPN-42	325	625 FT MONOPOLE	0.0	DUAL RATE W/GRI5930
YANKEE	CAROLINA BEACH, NC	34 03 46.1N 77 54 46.7W	39000/ 3221.64	AN/FPN-42	550	TIP	0.0	DUAL RATE W/GRI7950
ZULU	DANA IN	39 51 07.5N 67 29 12.1W	64000/ 3162.06	AN/FPN-44	400	625 FT MONOPOLE	-0.5	DUAL RATE W/GRI8970

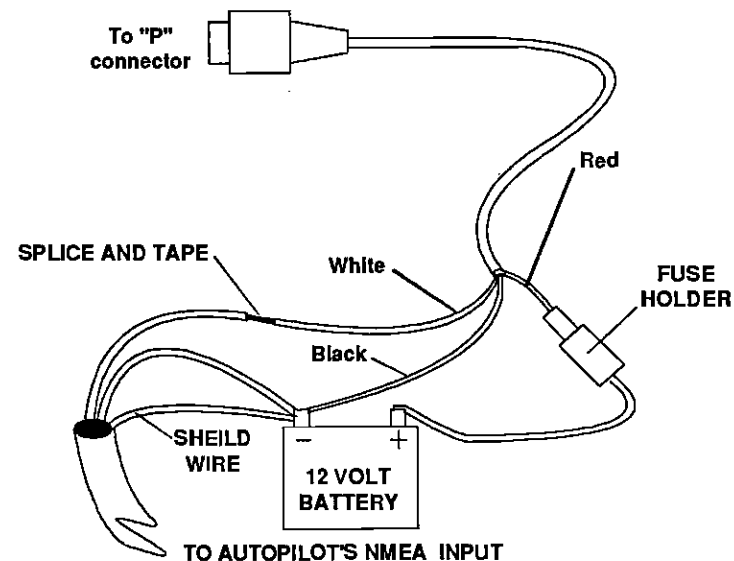
The cable supplied with the LC-1 is thirty feet long. Do not cut the cable if it's too long. Instead, coil and store it out of the way. An extension cable is available if the cable is too short. Ask your dealer or call your local service center or the Lowrance Factory Customer Service department for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

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

## POWER CONNECTIONS

The LMS-10 works from a twelve-volt battery system only. You can attach the power cable to an accessory or power buss, however if you have problems with electrical interference, then attach the power cable directly to the battery. If the cable is not long enough, splice #18 gauge wire onto it.

The power cable has three wires; red, white, and black. Red is the positive lead, black is negative or ground. 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 the fuse holder to the battery or power buss. This will protect both the unit and the power cable in the event of a short. The white wire is for a NMEA interface. The LMS-10 sends steering data for an autopilot through this wire. If the white wire is not used, tape the end so that it cannot short.



To connect an autopilot to the LMS-10, attach a shielded, twisted pair cable from the autopilot's NMEA input to the white wire on the Nav-Guide's power cable. Solder the ground conductor of the twisted pair and the shield to the black wire on the power cable. Do not connect the shield to the autopilot. See your autopilot's manual for more wiring instructions.

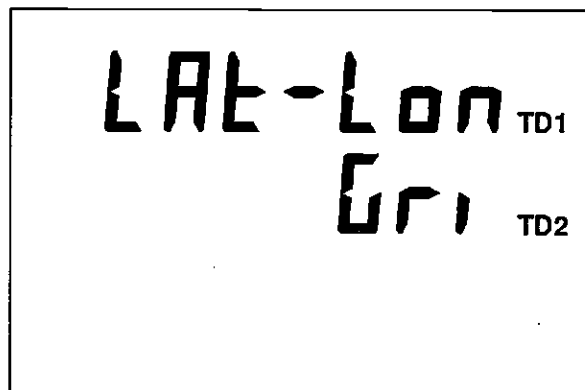
Once the cable is connected, the proper output must be selected. See the NMEA Output section for more information.

## LORAN OPERATION

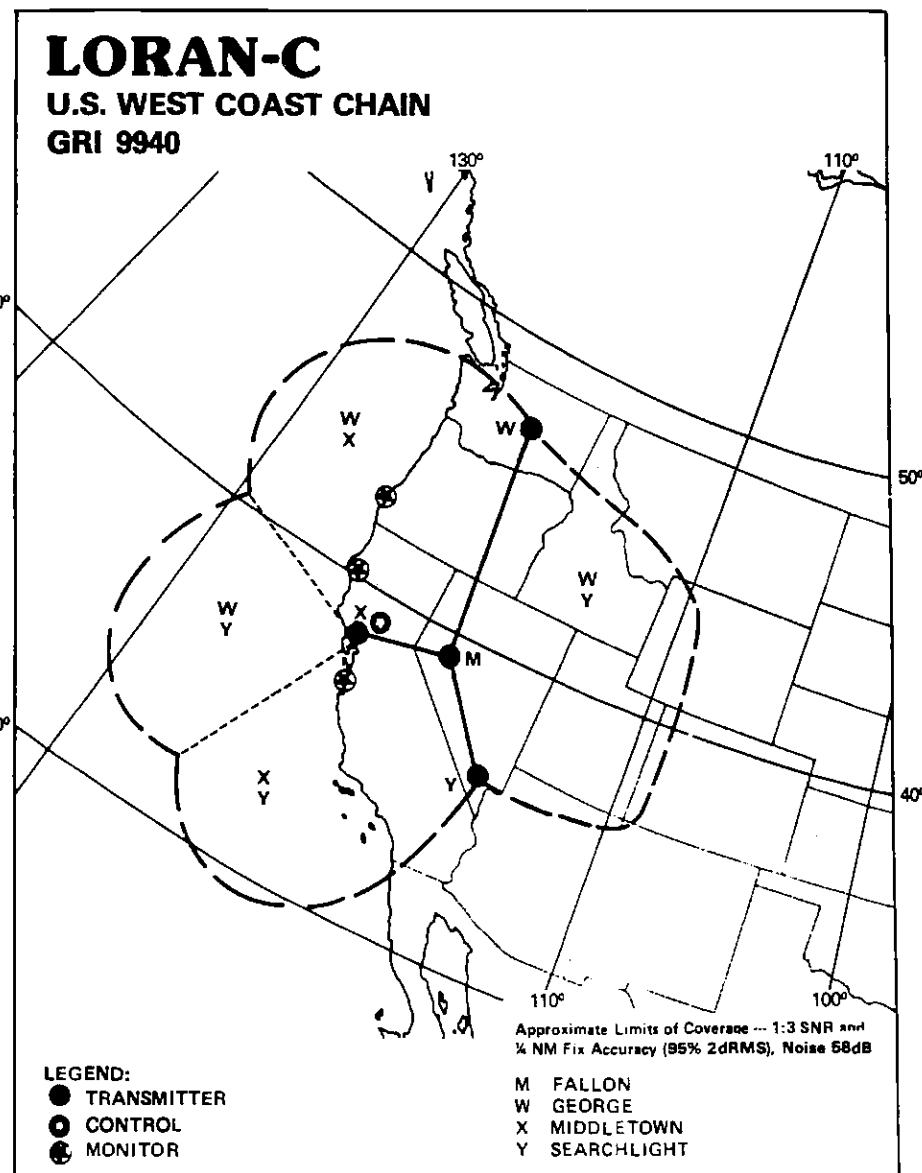
### Initialization

The Loran must be initialized or "told where it is" the very first time it's used. It then retains its position in memory each time power is turned off. If you don't travel over a hundred miles from the last time you used the Loran, you shouldn't have to repeat this step.

To initialize the Loran, first press the ON key. You should see the message "initial coupler", then the following screen appears:

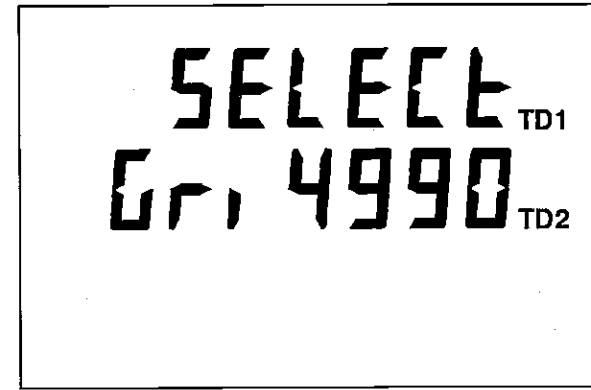


You can initialize the loran either by entering your present position in latitude/longitude coordinates, or by entering the GRI for your area. Press the TD1 key to select the initial position, or the TD2 key to use the GRI. Operation instructions for the "Select GRI" menu and "Select Initial Position" are shown next.



## SELECT GRI

Use this menu if you don't know your position in latitude/longitude coordinates. After you pressed the TD2 key from the initialization menu, the screen below should appear. Use the TD1 and TD2 keys to step through the GRI's until you arrive at the desired GRI. Press the ENT (enter) key to select the GRI in the window.



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/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECCD	NOTES
MASTER	FALLON, NV	38 33 06.6N 116 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	1600	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 10.2N 114 48 17.4W	40000/ 1967.30	AN/FPN-44	540	SLT	0.0	

Remember, if you have a problem, you can always press the CLR (clear) key to exit from any menu.

After the ENT key is pressed, a message on the screen appears next:

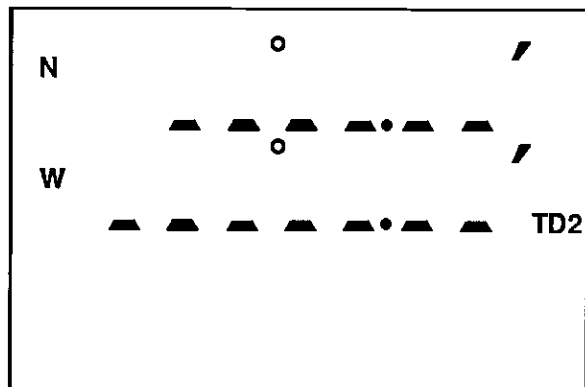
LORANCE COUPLER

The LMS-10 then flashes numbers on the Lat/Long display. The unit is not usable for position information while it flashes the Latitude/Longitude. The LMS-10 is actually searching for the stations in the chain you selected. Once the Loran "locks on" to the stations and computes your position, it will stop flashing. Your present position in latitude/longitude coordinates should be displayed. The Loran is now ready for navigation.

If the unit displays a Latitude/Longitude that is not your actual position, see the section on Primary/Alternate solutions.

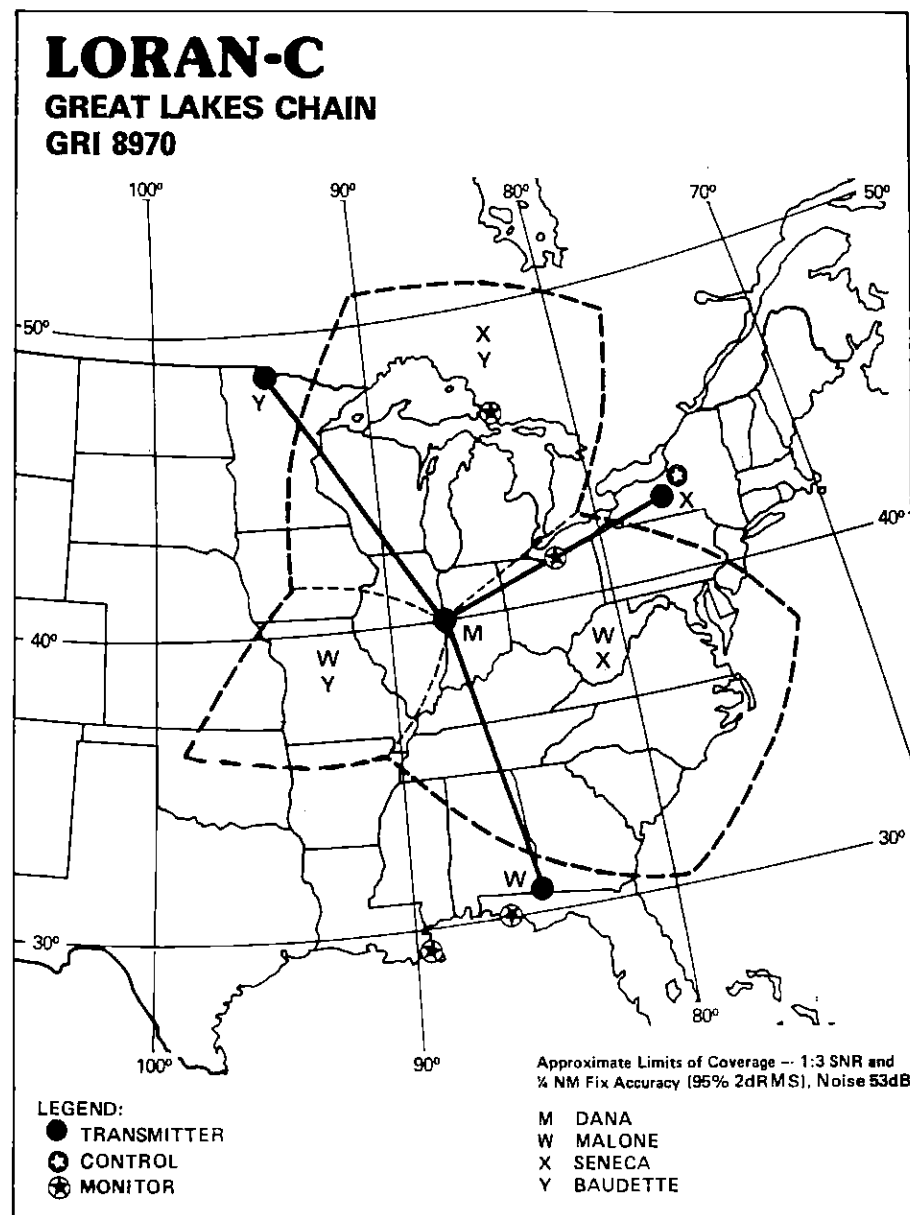
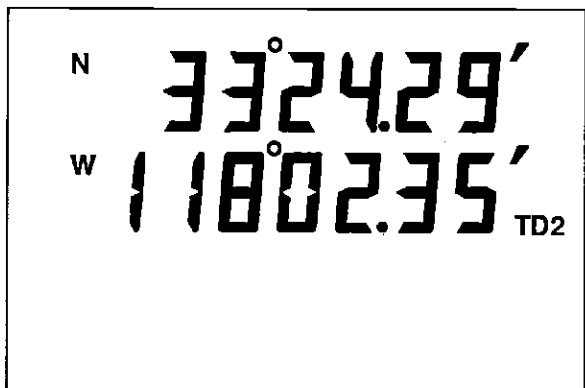
## ENTERING THE INITIAL POSITION - LATITUDE/LONGITUDE

The LMS-10 selects the proper GRI to use when you input your position. To enter the initial position the very first time the LMS-10 is turned on, press the TD1 key at the initialization menu. You should see the screen below.



Now enter your present latitude, using the numeric keys at the bottom of the display. If you make a mistake, press the CLEAR key and re-enter the numbers from the beginning. (Note: Press the CLR key twice to return to the GRI/LAT/LONG selection menu.)

After you've entered the latitude, do the same with the longitude. Remember to enter a zero as the first number in the longitude if it's less than 100 degrees. For example, if your longitude is 85 degrees, enter 0850000.



GREAT LAKES LORAN-C CHAIN GR1 8970  
 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.	CD/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECC	NOTES
MASTER	DANA, N	39 51 07.5N 87 29 12.1W		AN/FPN-44	400	625 FT MONOPOLE	0.0	DUAL RATE W/GRI9960
WHISKEY	MALONE, FL	30 59 38.7N 85 10 09.9W	11000/ 3355.11	AN/FPN-64 (56 HCG'S)	800	700 FT MONOPOLE	0.0	DUAL RATE W/GRI7960
XRAY	SENECA, NY	42 42 50.6N 76 49 33.9W	28000/ 3162.06	AN/FPN-64 (56 HCG'S)	800	700 FT MONOPOLE	0.0	DUAL RATE W/GRI9960
YANKEE	BAUDETTE	46 36 49.2N	44000/	AN/FPN-42	500	730 FT	0.0	

## NOTE

The LMS-10, like most Loran receivers, uses degrees, minutes, and hundredths of a minute. Charts typically use degrees, minutes, and seconds. It's not necessary to convert seconds to hundredths of a minute for your initial position.

You don't have to use your exact position to initialize the Loran; one that is close by is usually sufficient. If you don't know your approximate position, call the airport closest to you and ask their position in latitude/longitude. Then use the position they give you as a initial position.

Your screen should look like the one at the bottom of page 8 after you've entered the position. If your longitude is west of Greenwich, England, no change is necessary. If it's east longitude, press the "TD2" key. This switches the longitude to east.

Once you've entered the correct latitude/longitude position, press the ENTER key. The LMS-10 then flashes numbers on the Lat/Long display. The unit is searching for the stations in the loran chain. Once the LMS-10 "locks on" to the stations and computes your position, the numbers stop flashing and your unit is ready for navigation. This may take up to five minutes, perhaps longer. Typically, the LMS-10 takes about two to three minutes to "lock on" to your position.

Remember, the Loran is not usable for navigation during the time it flashes the latitude/longitude.

Now that you've come this far, you shouldn't need to do it again, unless you move a long distance with the Loran off. The LMS-10 stores the last known position in its memory, so each time you turn the unit on, it will use the last GRI and position that was in use.

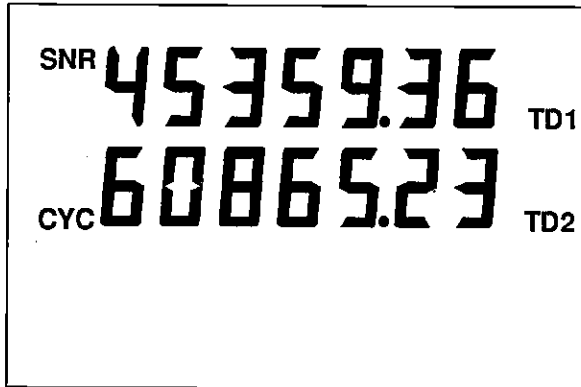
If you need to re-initialize the loran, either by entering a new GRI or Initial Position, see the RESTART LORAN section on page 39.

## CYCLE ERROR AND SNR

The LMS-10 displays cycle errors and low signal to noise ratios (SNR) and cycle errors with labels on the display.

NOTE: These errors won't be shown if latitude/longitude are displayed. Press the TD/LL key to show TDs and error labels (if activated).

If a low signal to noise ratio or cycle error is found, the LMS-10 displays the CYC label. In this example, the SNR label shows next to the top line. Press the TD1 or TD2 key to rotate through the TDs to see which one(s) have low signal to noise ratios. Do not navigate with a TD that has a poor SNR. If the unit is in automatic, the LMS-10 should choose another station automatically.

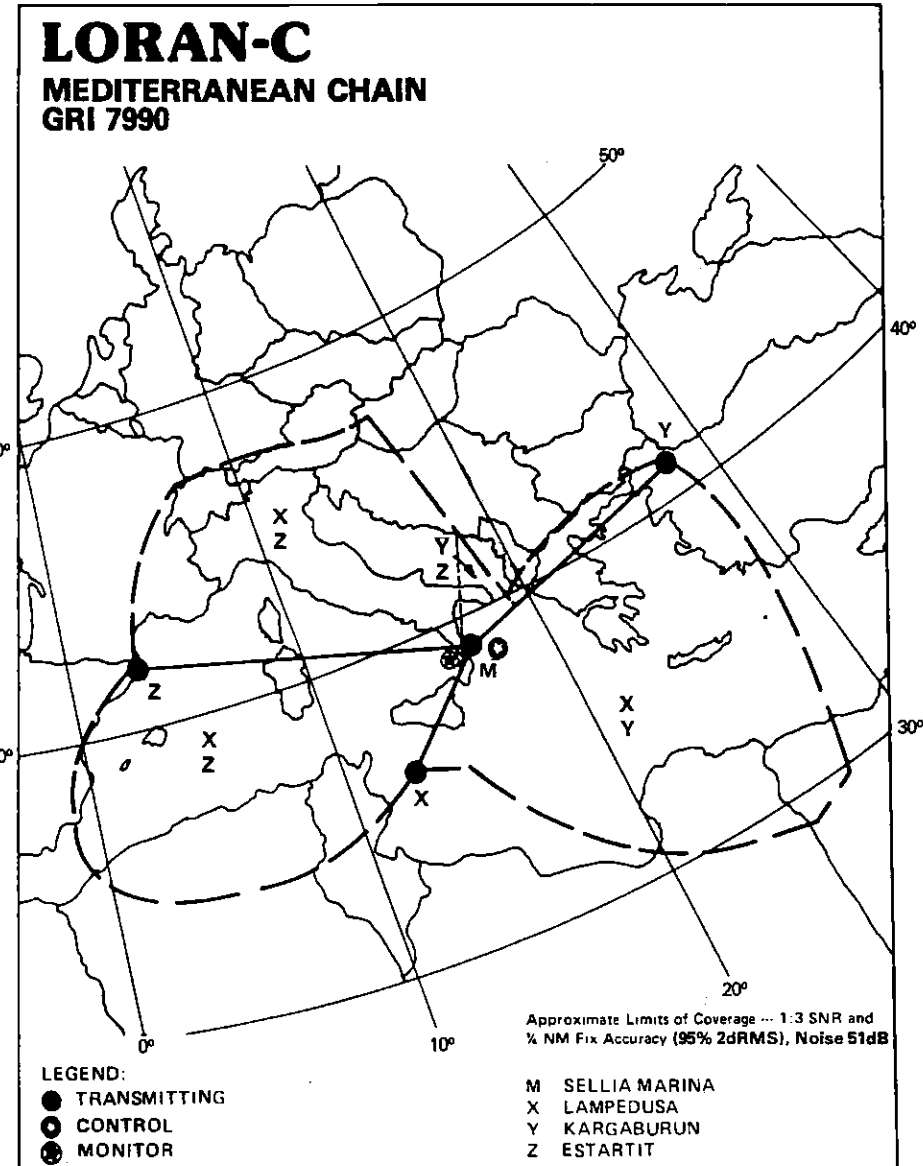


The cycle error display works identically to the SNR display. Simply rotate through the displays using the TD keys to find which stations have a cycle error. Again, do not use stations with a cycle error for navigation.

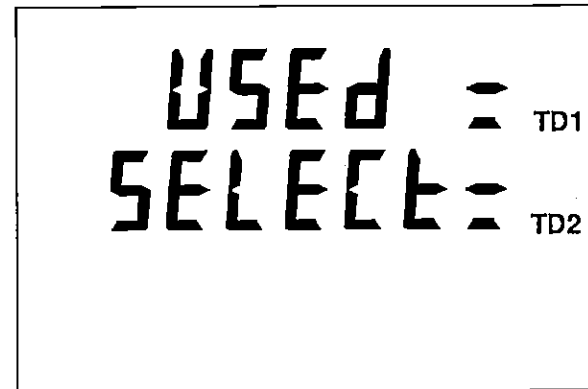
### AUTOMATIC and MANUAL MODES

The LMS-10 chooses the stations with the best crossing angles and signal strengths to use when it's in the automatic mode. It continually monitors the crossing angles and signal strengths to determine the best stations to use.

However, there are times when you don't want the unit to switch stations. For example, if you save a waypoint using one set of stations, you need to use those same stations to navigate back to that waypoint. Navigating with stations other than the ones used to save a waypoint may result in position errors. Placing the unit in the manual mode stops it from changing stations. Choosing the stations yourself also places the unit in the manual mode.



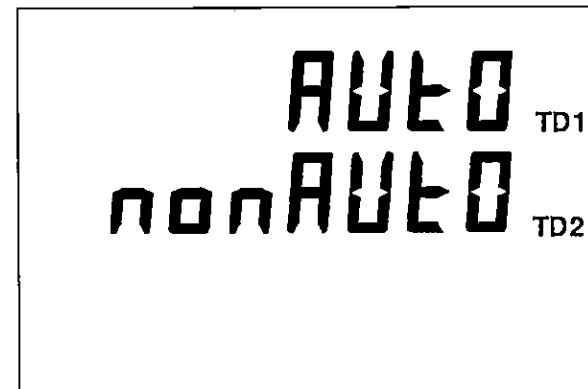
To change from automatic to manual, first press the 2nd key. Next, press the TD/LL key. The screen shown below appears.



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.	CDBLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	SELLIA MARINA, ITALY	38 52 20.6N 16 43 06.2E		AN/FPN-39	165	625 FT MONOPOLE	0.0	
XRAY	LAMPEDUSA ITALY	35 31 20.8N 12 31 30.2E	11000/ 1755.98	ATLS	325	625 FT MONOPOLE	0.0	
YANKEE	KARGABURUN TURKEY	40 58 21.0N 27 52 01.5E	29000/ 3273.29	AN/FPN-39	165	625 FT MONOPOLE	0.0	
ZULU	ESTAPTIT SPAIN	42 03 36.5N 03 12 16.5E	47000/ 3999.74	AN/FPN-39	165	625 FT MONOPOLE	0.0	

Press the TD1 key to see if the unit is in the automatic or manual mode. Press the TD2 key to switch modes. If the TD2 key is pressed, the screen shown below appears.



Now press the TD1 key if you want the automatic mode, or press the TD2 key if you want the non-auto (manual) mode. After the desired key is pressed, the unit returns to the position display.

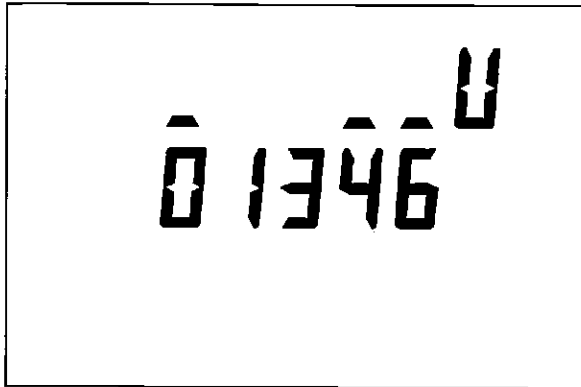
To exit from these menus without changing the mode, simply press the CLR (clear) key.

Another way to see if the LMS-10 is in the manual or automatic mode is to press 5,6,ENT. The display will show "USING AUTO" or "USING NON AUTO", depending on the current mode.

## MANUAL STATION SELECTION

### Viewing Stations In Use

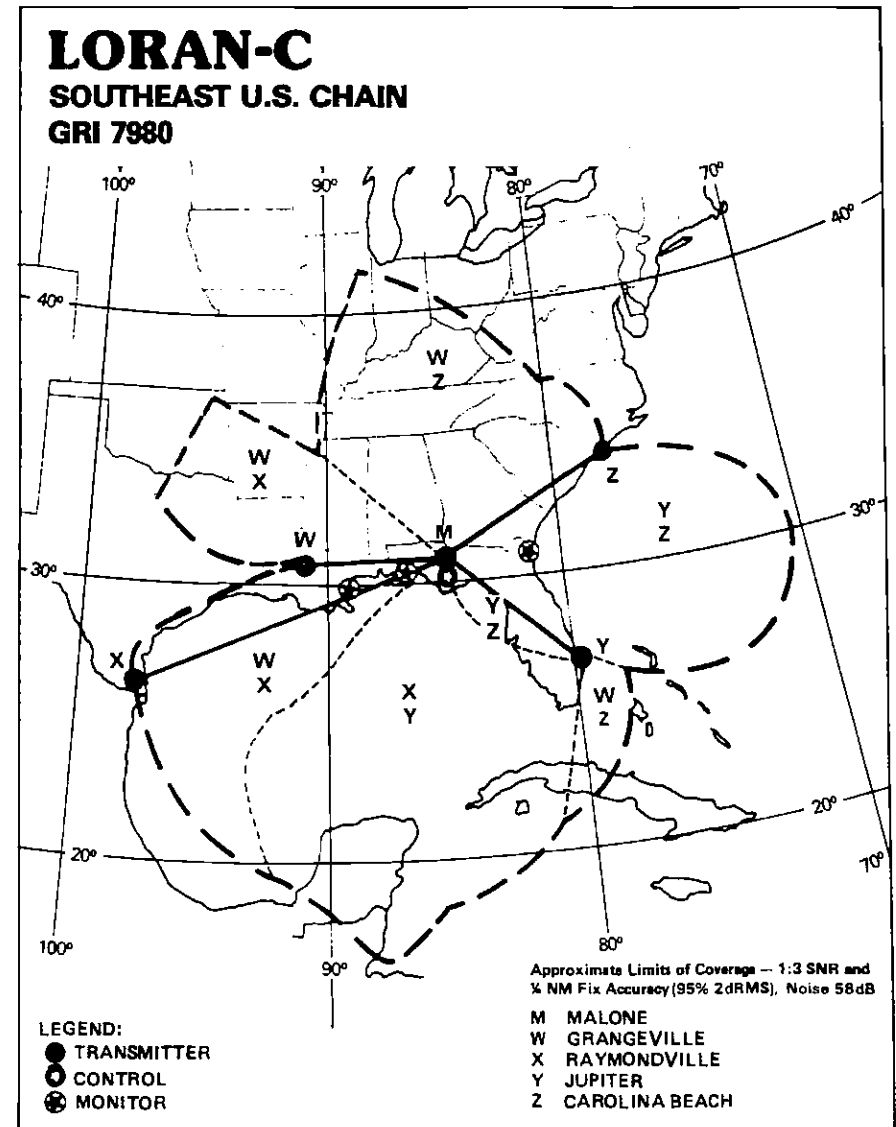
If you wish to use stations other than the ones chosen by the LMS-10, use the Manual Station Selection option. You can view the stations currently in use by pressing 1,4,ENT. A screen similar to the one below appears.

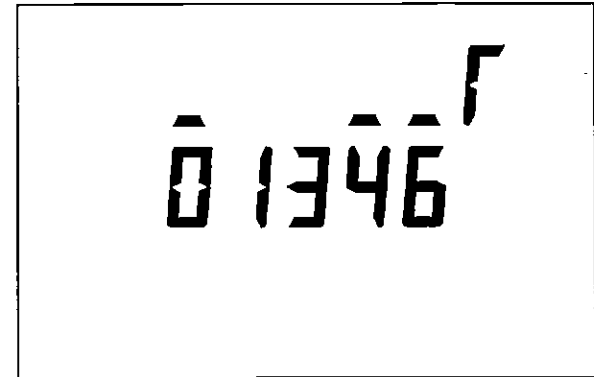


The "U" stands for "stations in use". The TD for each station is represented by the first number in the TD. The master station is always shown with a "0". In this sample screen, the master is 0, the next station's TD is 14598.78, so it is represented by "1". The next station's TD is 31883.30, so it's represented by a 3, and so on. Stations used by the LMS-10 are shown with a dash above them. In this example, the unit is using stations 0, 4, and 6. Press the CLR key to return to the Lat/Long display.

### Viewing Recommended Stations

You can view the stations the LMS-10 recommends by pressing 1,5,ENT. A screen similar to the one at the top of the next page appears. The symbol that looks like an upside down "L" stands for "Recommend". The TD for each station is represented by the first number in the TD. The master station is always shown with a "0". In this sample screen, the master is 0, the next station's TD is represented by "1". The next station's TD is represented by a 3, and so on. The stations the LMS-10 recommends for use are shown with a dash above them. In this example, the LMS-10 recommends using stations 0, 4, and 6. Press the CLR key to return to the Lat/Long display.



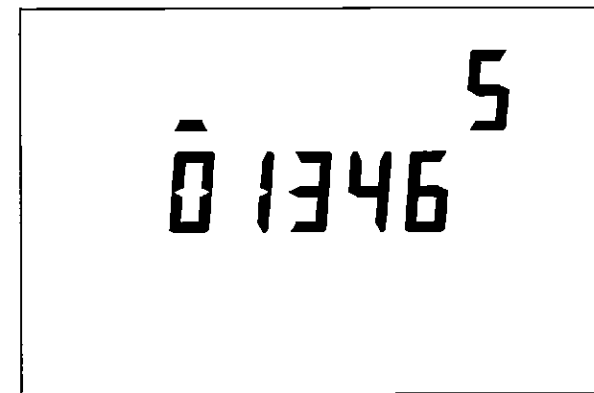


### Selecting Stations

NOTE: Selecting stations places the LMS-10 in the manual mode.

To select the stations, press the 1, 7, and ENT keys. The letter "S" at the right of the screen indicates this is the station select screen. Again, the TDs for each station are represented by the first number in the TD. For example, a 3 is displayed for a station whose TD is 31883.25.

To select the stations, press the number on the keypad that corresponds to the first number in the desired TD. For example, press the 0 key to select the Master station. A dash appears over the 0 on the display, signifying it's selected. Press the 3 key to select the station with a TD beginning with 3, and so on.



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.	CDSLL (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/ 1609.54	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/ 4443.28	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	CAROLINA BEACH, NC	34 03 46.1N 77 54 46.7W	59000/ 2542.73	AN/FPN-42	550	TIP	0.0	DUAL RATE W/GRI 9960

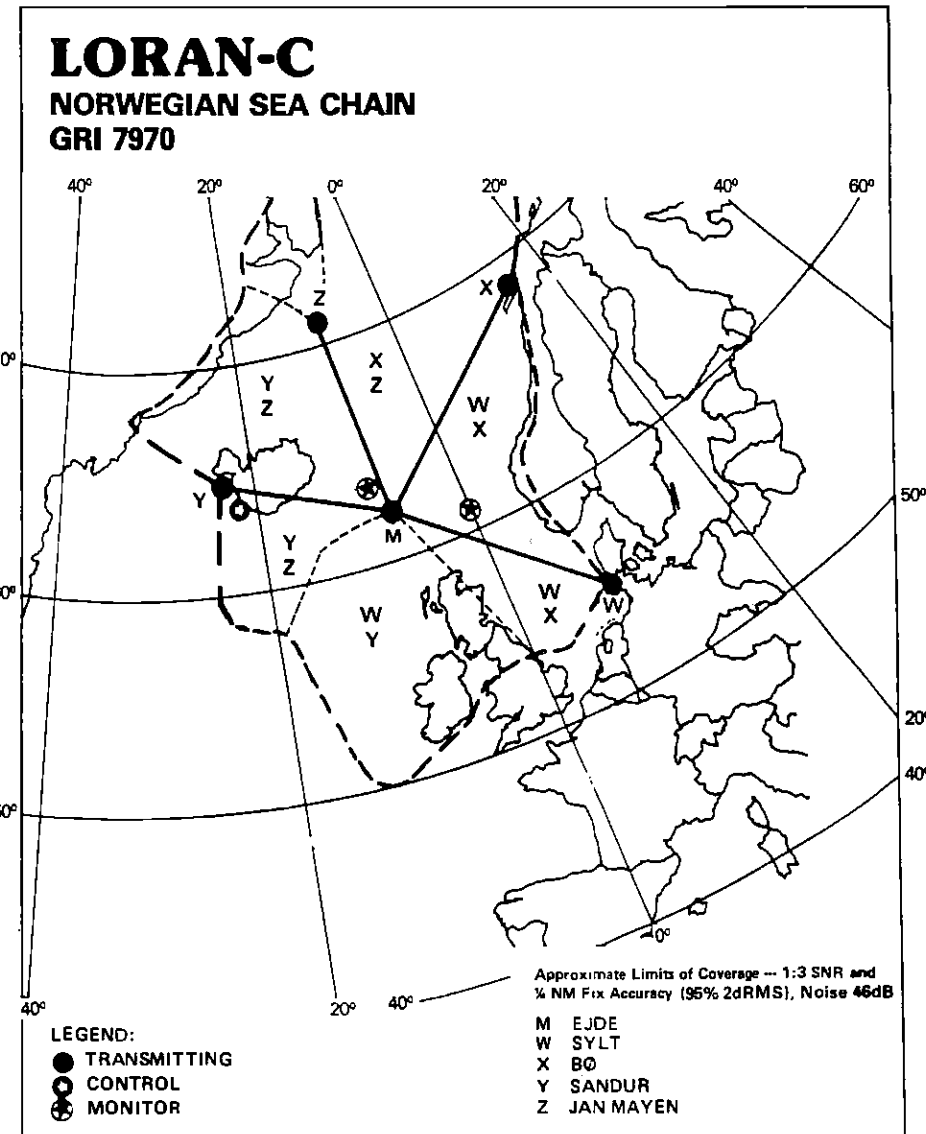
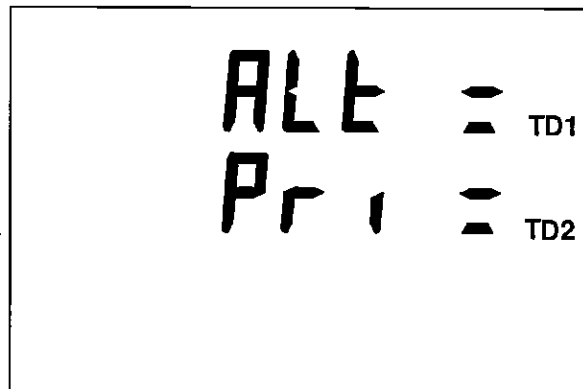
After you've selected the desired stations, press the ENT key. If the stations you've chosen are locked with good signal strengths, the unit should display a latitude/longitude after a short wait.

## PRIMARY AND ALTERNATE SOLUTIONS

The Loran normally determines its position by measuring the time difference between the master and two other stations. Each time difference results in a line of position. Where these two lines of position cross is your present 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 latitude/longitude can be on either side of the baseline. (The baseline is an imaginary line connecting two stations in a straight line.) 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 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. For this reason alone, it's important to know your position when initializing or using the Loran.

If you need to switch from the primary to the alternate solution, press the 2nd, 6 keys. The screen shown below appears. Next, press the TD1 key if you want the alternate solution or press the TD2 key for the primary solution. The latitude/longitude will flash for a few seconds, then show a new position. This process takes a few seconds. The label "ALT" appears in the upper left corner of the screen if the alternate solution is in effect. If the "ALT" label is not on, the primary solution is in effect.



To switch back to the primary solution, simply repeat the above steps.

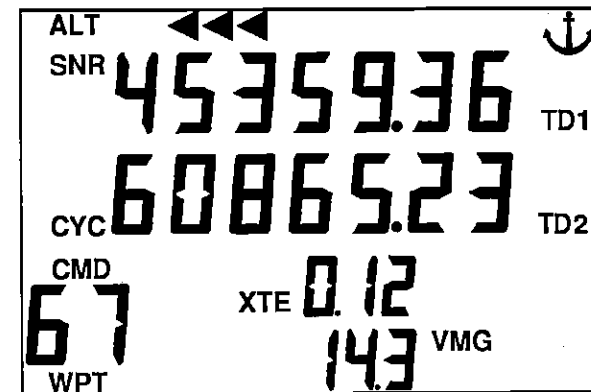
Check your known position against the Loran after it displays a new latitude/longitude. They should be the same. If so, use the Loran and navigate normally.

### DISPLAY - Overview

The LMS-10 display has four lines of information. The upper two lines show your present position in latitude/longitude or TDs. The lower two lines can show Heading, Cross Track Error, Time To Go, Distance To Go, Speed Over Ground, True or Magnetic Bearing, Velocity Made Good, and more.

NORWEGIAN SEA LORAN-C CHAIN GRI7970  
 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 DEFJAVIK, ICELAND

DESIG.	STATION	COORD.	CD/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	EJIDE, FAEROE IS., DENMARK	62 17 59.8N 07 04 26.5W		AN/FPN-44	325	625 FT MONOPOLE	0.0	DUAL RATE W/GRI7930
XRAY	BO NORWAY	68 38 06.2N 14 27 47.0E	11000/ 4048.10	AN/FPN-39	165	625 FT MONOPOLE	0.0	
WHISKEY	SYLT GERMANY	54 48 29.9N 08 17 36.3E	26000/ 4065.62	AN/FPN-42	325	625 FT MONOPOLE	0.0	
YANKEE	SANDUR ICELAND	64 54 26.8N 23 55 21.8W	46000/ 2944.54	AN/FPN-45	1500	1350 FT MONOPOLE	0.0	DUAL RATE W/GRI7930
ZULU	JAN MAYEN NORWAY	70 54 52.7N 08 43 58.7W	80000/ 3216.31	AN/FPN-39	165	625 FT MONOPOLE	0.0	



The arrows at the top of the display are steering indicators. They're used when a waypoint is recalled. The anchor symbol displays when the anchor alarm is triggered.

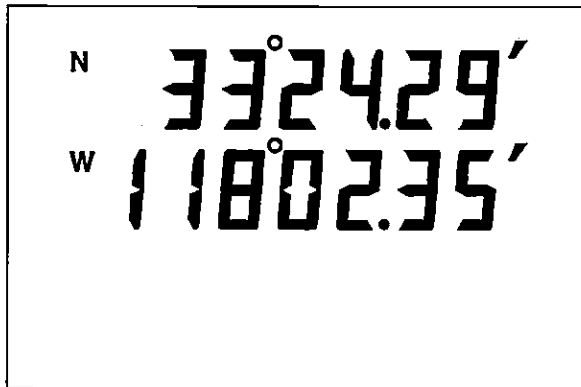
The SNR and CYC symbols are used when a signal to noise ratio or cycle error problem is found on a station currently in use.

The digits at the bottom left corner of the screen are used whenever a number is entered from the keypad, or when a waypoint number is displayed.

## TD/LL

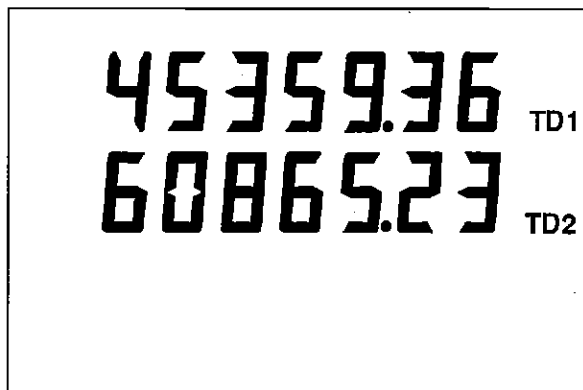
Your present position can be displayed either in Latitude/Longitude or time differences (TD's). After the LMS-10 is initialized, the top two lines display the position in latitude/longitude coordinates.

To switch to the TD display, simply press the TD/LL key. The top two lines switches to the TD's of the secondaries currently in use.

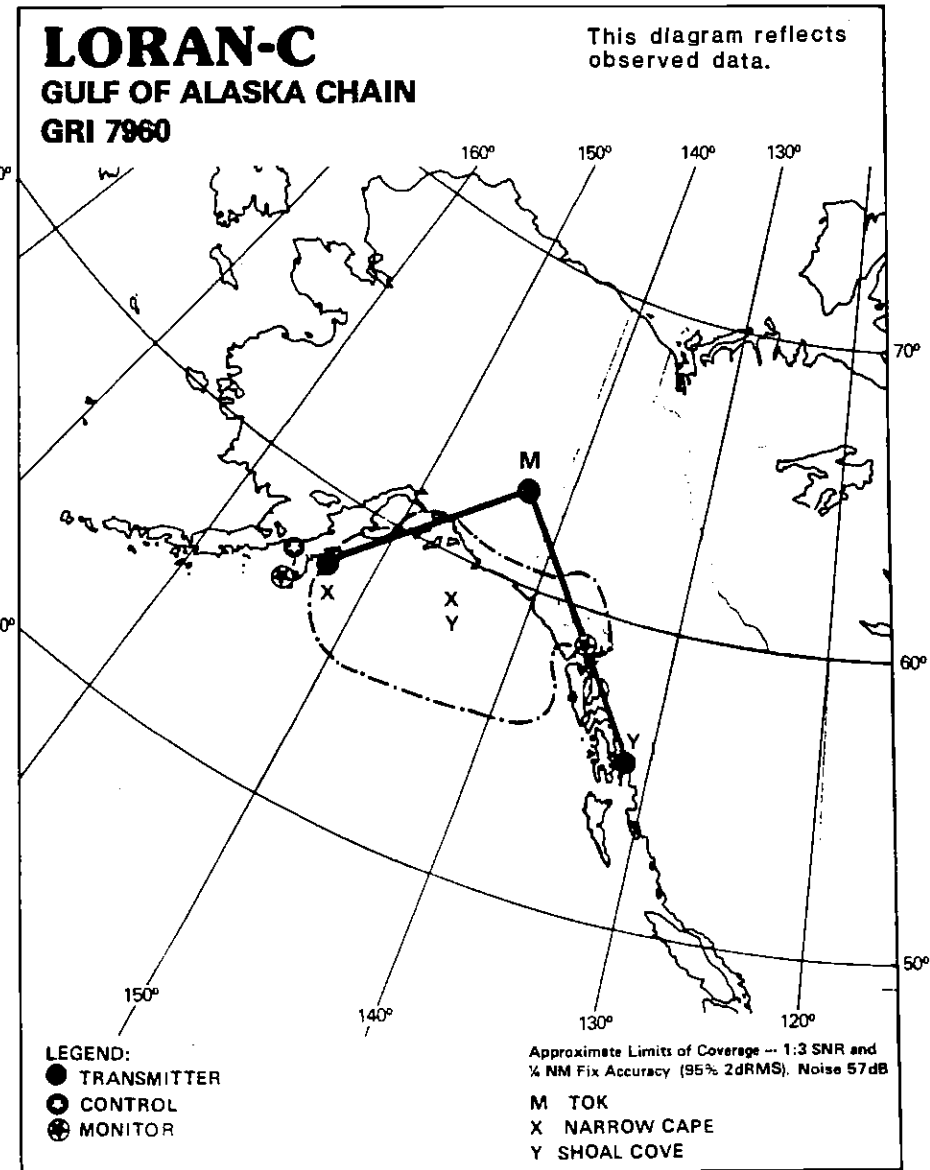


LATITUDE/LONGITUDE DISPLAY

To switch back to the latitude/longitude display, simply press the TD/LL key again. Press the TD1 and TD2 keys to rotate through the stations when TDs are displayed.



T.D. DISPLAY

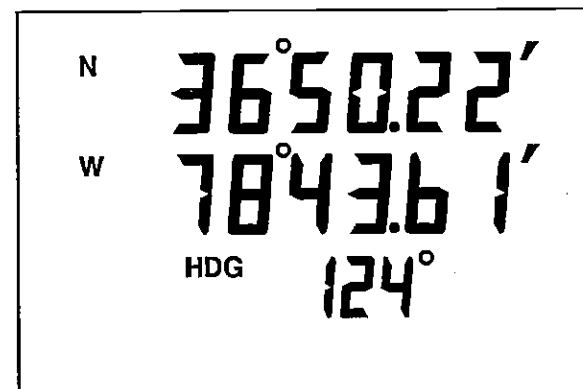


GULF OF ALASKA LORAN-C CHAIN GR1 7960  
 REGIONAL MANGER COMMANDER, PACIFIC AREA, ALAMEDA, CA  
 CHAIN MANAGER: COMMANDER 17TH COAST GUARD DISTRICT, JUNEAU, AK  
 COORDINATOR OF CHAIN OPERATIONS LOCATION: LORMONSTA KODIAK, AK  
 CONTROL SITE: LORMONSTA KODIAK, AK

DESIG.	STATION	COORD.	CDVLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	TOK AK	63 19 42.8N 142 46 31.9W		AN/FPN-44A	540	SLT	+1.0	
XRAY	NARROW CAPE, AK	57 26 20.2N 152 22 11.3W	11000/ 2804.45	AN/FPN-44A	400	625 FT MONOPOLE	0.0	DUAL RATE W/GRI8990
YANKEE	SHOAL COVE AK	55 26 20.9N 131 15 19.6W	26000/ 3651.14	AN/FPN-44A	540	SLT	0.0	DUAL RATE W/GRI8990

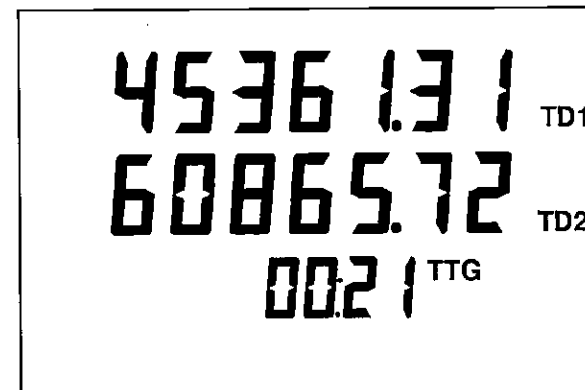
## HEADING (HDG)

To show your current heading, press the 2nd key, then the TD1 key. The heading displays on the third line. Heading is the direction the boat is travelling. The LMS-10 displays the heading in degrees magnetic. You don't have to recall a waypoint to use this feature.



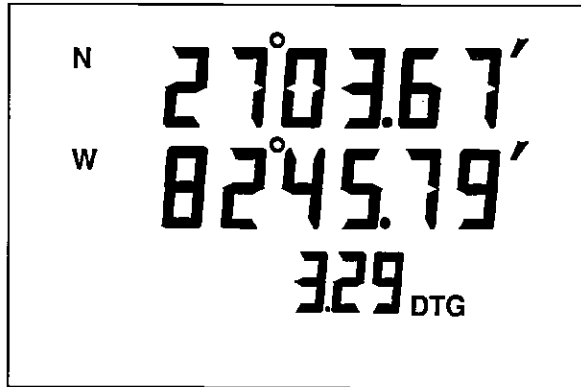
## TIME TO GO (TTG)

When a waypoint is recalled, the amount of time remaining until you reach the waypoint can be displayed on the third line. Press the 2nd key, then the TD2 key. Time To Go is displayed in hours and minutes. You will need to recall a waypoint to use this feature.



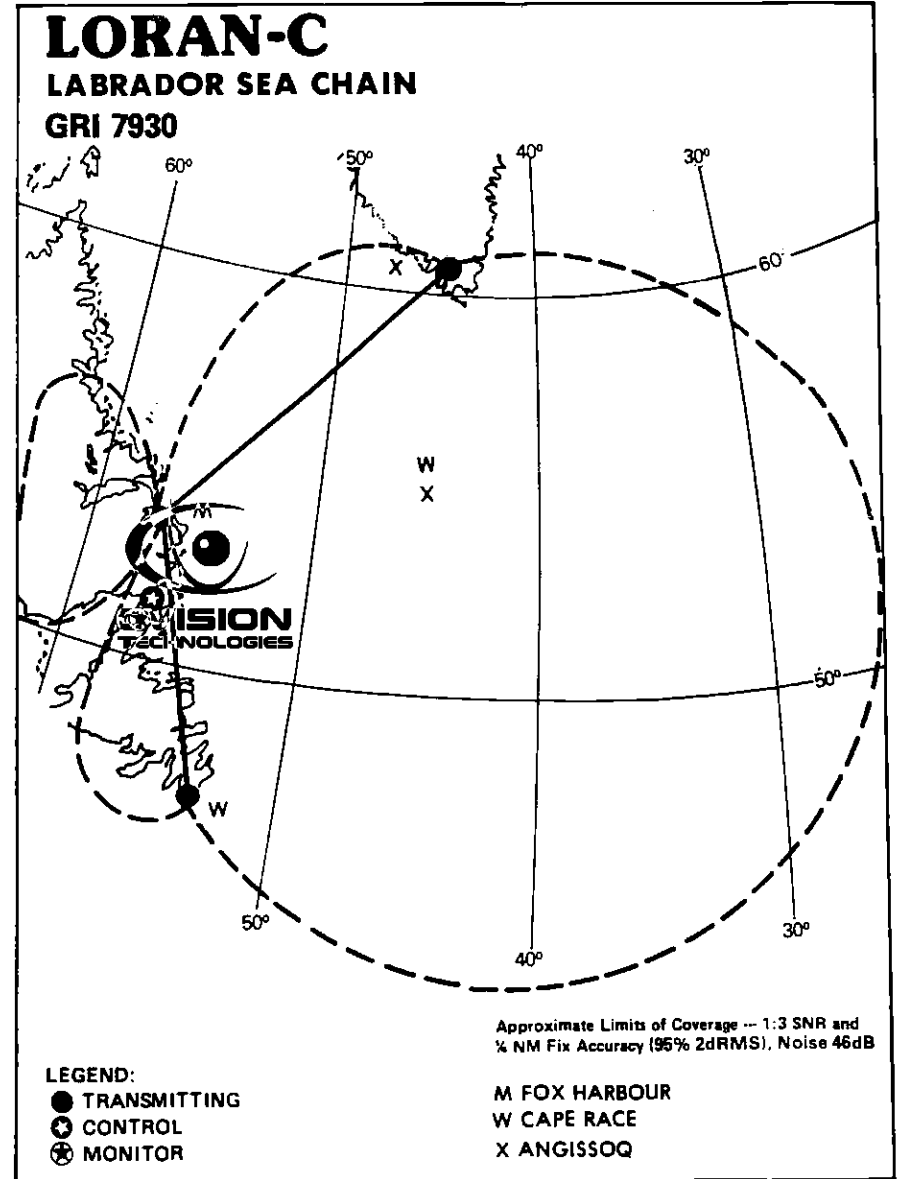
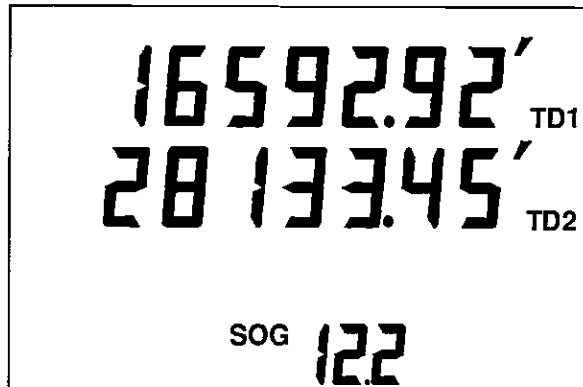
## DISTANCE TO GO (DTG)

The distance between your present position and a waypoint is called the Distance To Go or DTG. To view it, press the 2nd key, then the 0 key. The Distance To Go displays on the third line in nautical miles.



## Speed Over Ground (SOG)

The averaged speed over ground you are making is called Speed Over Ground or SOG. For example, if you are travelling at ten knots directly against a two knot current, then your ground speed is eight knots. Press the 2nd key, then the 3 key to get your Speed Over Ground. It displays on the fourth line in knots. You don't need to recall a waypoint to use this feature.

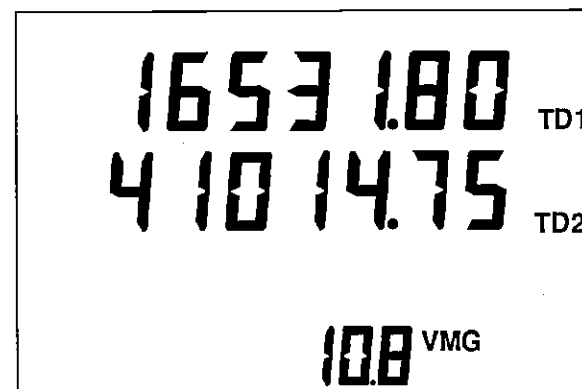


LABRADOR SEA LORAN-C CHAIN GRI 7930  
 REGIONAL MANAGER COMMANDER ATLANTIC AREA NEW YORK, NY  
 CHAIN MANAGER COMMANDER, ATLANTIC AREA, NEW YORK, NY  
 COORDINATOR OF CHAIN OPERATIONS LOCATION: LORMONSTA ST. ANTHONY, NEWFOUNDLAND, CANADA  
 CONTROL SITE: LORMONSTA ST. ANTHONY, NEWFOUNDLAND

DESIG.	STATION	COORD.	CD/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	FOX HARBOUR NRLD, CANANDA	52 22 35.2N 55 42 28.4W		AN/FPN-64 (56 HCG'S)	800	700 FT MONOPOLE	0.0	DUAL RATE W/GRI5930
WHISKEY	CAPE RACE NRLD, CANADA	46 46 32.2N 53 10 28.2W	11000/ 2167.31	AN/FPN-45	1500	1350 FT MONOPOLE	0.0	DUAL RATE W/GRI5930
XRAY	ANGISSOO GREENLAND	59 59 17.3N 45 10 27.5W	26000/ 3585.39	AN/FPN-45	760	625 FT MONOPOLE	0.0	DUAL RATE W/GRI9980

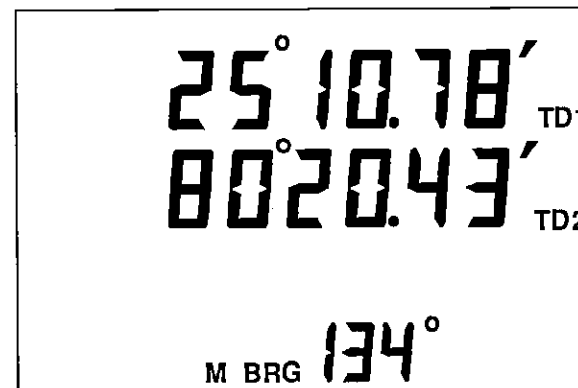
## Velocity Made Good (VMG)

Velocity Made Good is the speed you are making towards a waypoint. For example, if you are travelling at ten knots directly towards a waypoint and there isn't any wind or current, then your VMG is ten knots. Moving directly away from the waypoint under the same conditions results in a VMG of -10 knots. VMG displays on the fourth line in knots. To show the Velocity Made Good, press the 2nd key, then the 1 key.



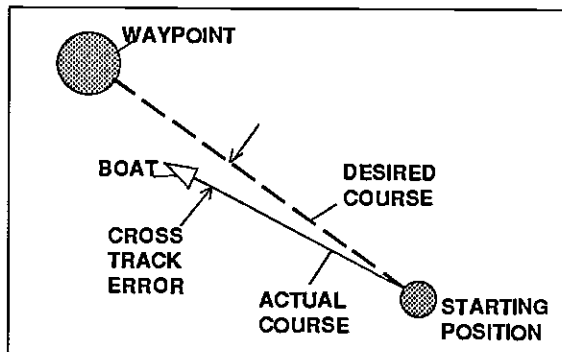
## TRUE/MAGNETIC BEARING

Bearing is the direction from the boat to the waypoint. The LMS-10 can display the bearing in degrees true or magnetic. To show the bearing in degrees true, press the 2nd key, then the 4 key. Press the 2nd key, then the 5 key to show bearing in degrees magnetic.

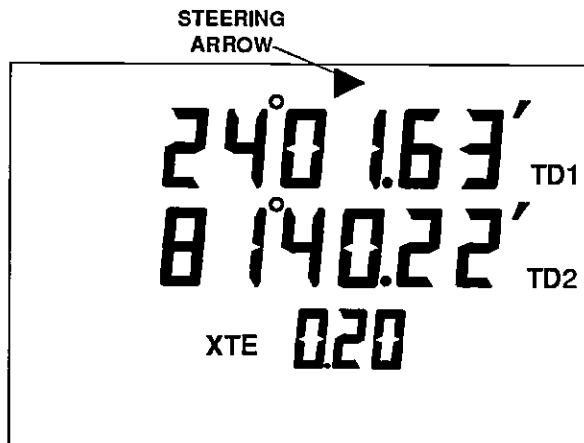


## CROSS TRACK ERROR (XTE)

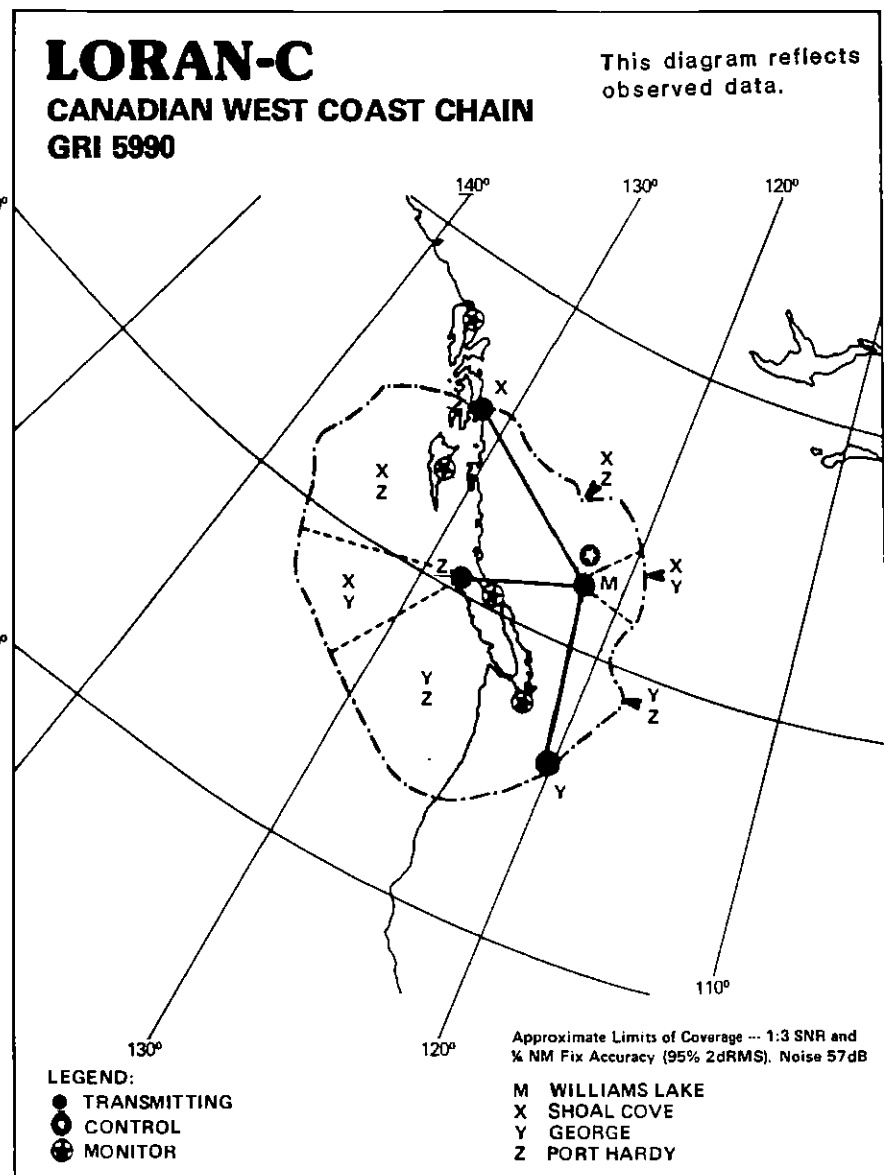
Your position to the left or right of the desired course to a waypoint is called the cross track error. This is shown on the display's third line in nautical miles. A waypoint must be recalled to use the cross track error feature.



To show the cross track error (XTE), press the 2nd key, then the CLR key. The cross track error will immediately be displayed on the third line.



The arrows at the top of the screen also show the cross track error. They point in the direction you must steer to get back on course. These are called steering indicators. For example, if the arrow points to the right, you must steer to the right to get back on course. These are activated automatically when a waypoint or route is recalled.



## CROSS TRACK ERROR PER ARROW

Each arrow stands for .10 nautical mile when the LMS-10 is turned on for the very first time. In other words, if two arrows are pointing to the right, then you are .20 mile off course. The amount of cross track error per arrow is adjustable from .01 nautical mile to 9.99 nautical miles. To change this, press 2,2,ENT.

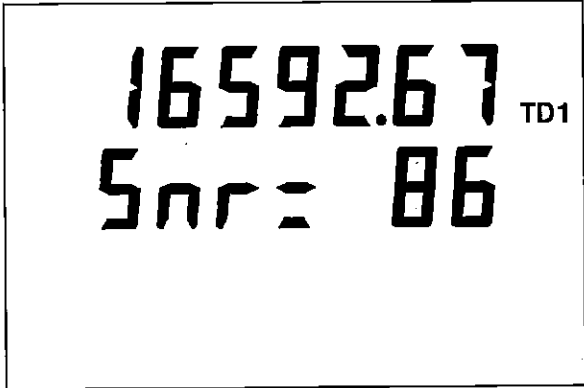
The current cross track error per arrow is displayed at the top of the screen. To change it, simply enter the new number using the numeric keypad. For example, to change to 0.05 nautical mile per arrow, simply press 0,0,5. As soon as the last key is pressed, the LMS-10 accepts the entry and returns to the position screen. The unit will now use the new numbers.

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.	CDVBL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	WILLIAMS LAKE, BC, CANADA	51 57 58.8N 122 22 02.2W		AN/FPN-44A	400	825 FT MONOPOLE	+1.0	
XRAY	SHOAL COVE AK	55 26 29.9N 131 15 19.7W	11000/ 2343.60	AN/FPN-44A	540	SLT	0.0	DUAL RATE W/GRI 7950
YANKEE	GEORGE, WA	47 03 48.0N 119 44 39.5W	27000/ 1927.36	AN/FPN-45	1600	SLT	+0.5	DUAL RATE W/GRI 9940
ZULU	PORT HARDY BC, CANADA	50 36 29.7N 127 21 29.0W	41000/ 1266.61	AN/FPN-64 (32 HCG'S)	400	825 FT MONOPOLE	0.0	ALERT BAY

## SIGNAL TO NOISE RATIO (SNR)

The signal to noise ratio (SNR) can be viewed for each station in the chain by pressing 2nd, 2. The TD for the first station appears at the top of the screen. It's SNR is displayed directly underneath it. In this example, the SNR for this TD is 95, which is good. The range of SNRs is from 00 (Poor) to 99 (Good). To view another TD's SNR simply press the TD1 key. This rotates through all stations used in the chain.



16592.67 TD1  
Snr = 86

To exit from the SNR status menu, press the CLR key.

## FIX QUALITY

Fix quality is a measure of the lines of position crossing angles. The fix quality range is from 0 to 9. 0 means the loran is not usable for navigation and the display will flash, 1 - 3 is a poor fix quality, 4 - 6 is fair, and 7 - 9 is good. If the fix quality is in the poor range, use the position information with caution. The displayed position can and will vary with poor crossing angles. None of the navigation displays will operate until the fix quality is one or higher.

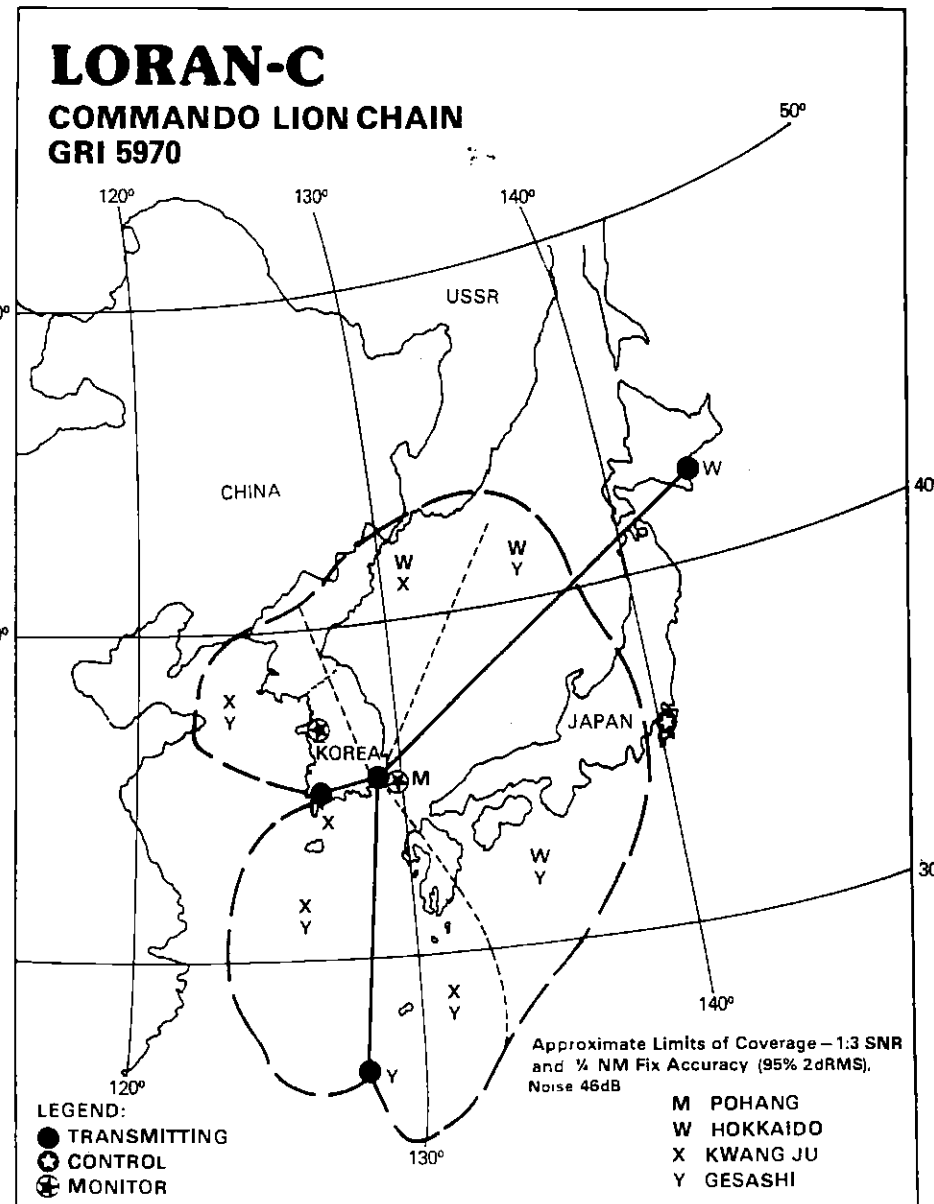
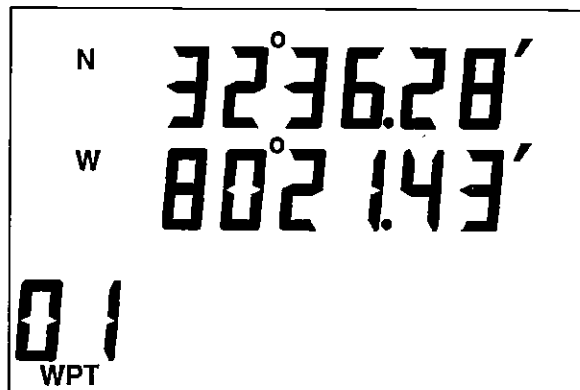
To view the fix quality, press 5,2,ENT. The display will show the following "F = 9" if the fix quality is nine. Press the CLR key to exit from this menu.

## HOW TO SAVE A WAYPOINT

Waypoints are positions that you store in the LMS-10's memory. You can then navigate to these positions. Waypoints are useful for marking shipwrecks, buoys, and other fishing or navigational locations. The LMS-10 can store up to 100 waypoints (0 - 99). You can store your present position in a waypoint, or enter TD's or latitude/longitude positions as waypoints.

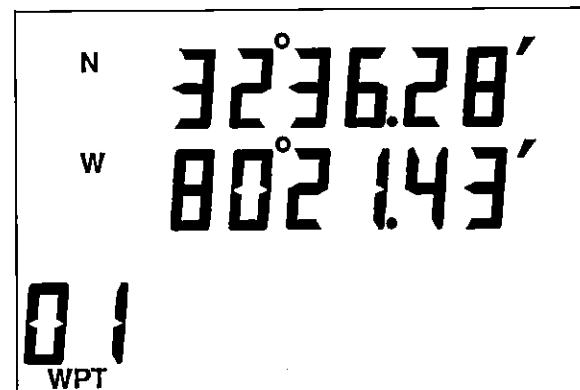
### Saving Current Position (Quick Save Feature)

The LMS-10 lets you save your current position with only two key presses. This "Quick Save" feature lets you save the position of a wreck or other objects easily and quickly. To save your present position as a waypoint, simply press the STO key. A display similar to the one shown below appears.



COMMANIDO LION 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	COOR.	CDBLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NOM ECD	NOTES
MASTER	POHANG KOREA	35 11 05.2N 129 20 27.3E		ANTRN-38	35	400 FT MONOPOLE	+1.5	USAF MANNED
WHISKEY	HOKKAIDO JAPAN	42 44 37.1N 143 43 09.2E	11000/ 4783.68	ANFPH-45	1000	625 FT MONOPOLE	+0.5	DUAL RATE W/GRI 9970
XRAY	KWANGJU KOREA	35 02 23.9N 126 32 26.7E	31000/ 947.02	ANTRN-38	35	400 FT MONOPOLE	-1.75	USAF MANNED
YANKEE	GESASHI JAPAN	26 36 25.0N 126 08 56.4E	42000/ 3585.56	ANFPN-45	1000	625 FT MONOPOLE	0.0	DUAL RATE W/GRI 9970



Your current position displays at the top of the screen. The first available waypoint number shows in the bottom left corner of the screen. To store this position under the displayed waypoint number, simply press the ENT key. If you wish to store this waypoint under another number, press the CLR key, then enter the desired waypoint number using the number keypad. Your waypoint number appears in the lower left corner of the screen as you enter it. You can use any number from 00 to 99. Make certain to add a "0" to the beginning of numbers less than ten. For example, if you wish to store your current position as waypoint number one, press the "0" key, then the "1" key. If you make a mistake, press the CLR key. To exit from this screen without saving a waypoint, press the CLR key twice.

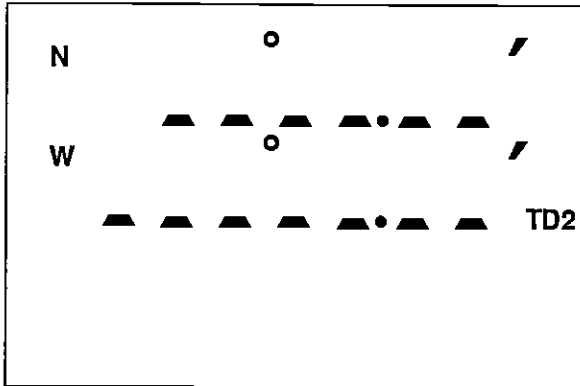
The waypoint number increments each time you save a waypoint, so you don't have to keep track of the waypoint numbers. Once you've stored the waypoint, the LMS-10 returns you to the Loran display.

#### TIP

Save your home port as waypoint number 01. It's easy to remember home is number one each time you want to return to it.

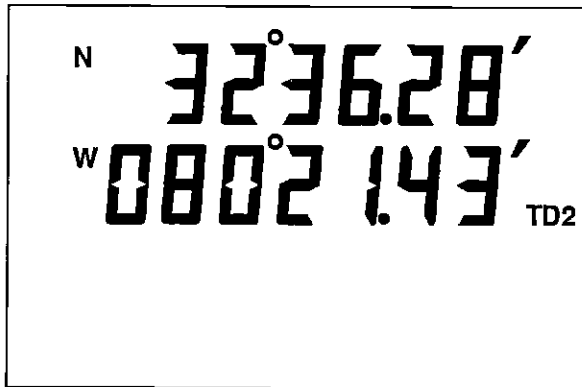
#### ENTER NEW WAYPOINT - LATITUDE/LONGITUDE

To save a waypoint other than your present position in latitude/longitude, first press the 1,9,ENT keys. The "Save Waypoint" menu appears. (See the screen at the top of the next page.)



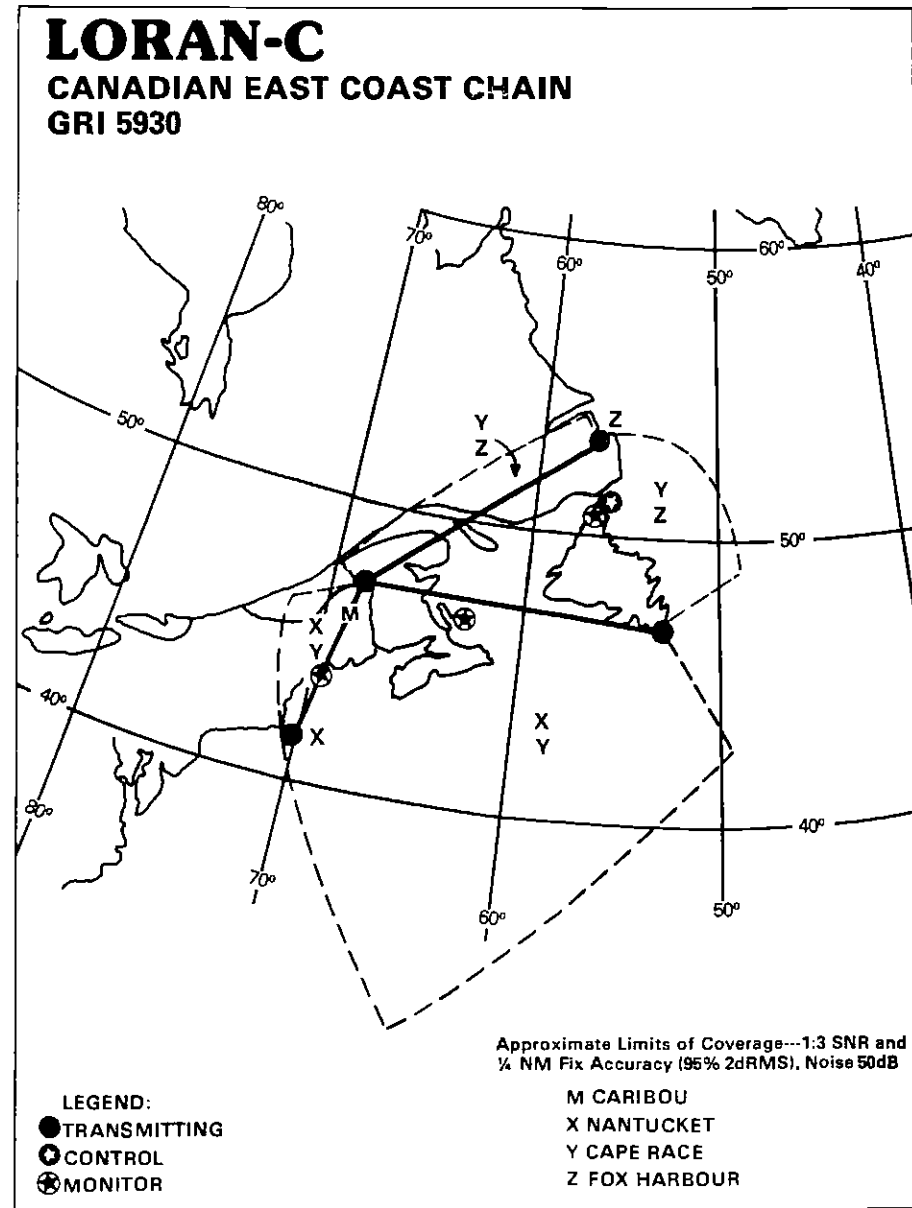
Now enter your waypoint position using the numeric keypad beneath the display. Remember to enter a "0" at the beginning of the longitude if it is less than 100 degrees. Our example latitude/longitude of the waypoint is 32 degrees, 36.28 minutes latitude and 82 degrees, 21.43 minutes longitude. So we entered 323628, then 0802143.

The screen looks like this after you enter the longitude.



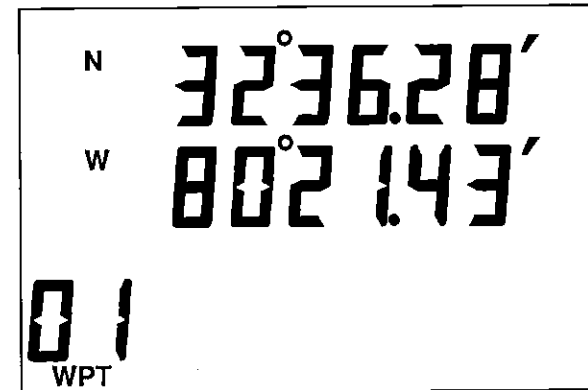
If you're east of Greenwich, England, press the TD2 key. This changes the longitude to east. If your longitude is west, don't change it.

Now press the ENT key. The message "Please Hold" appears while the unit converts the data you entered.



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

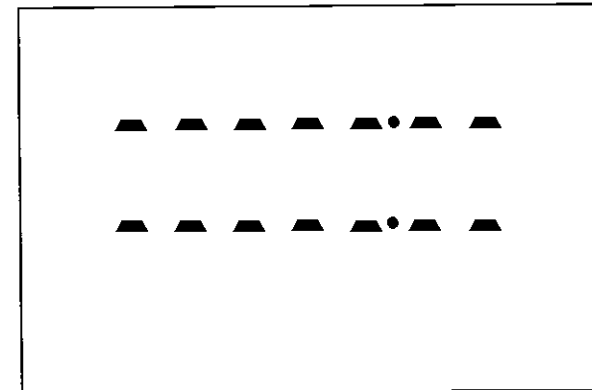
DESIG.	STATION	COORD.	CD/BLL (us)	XMITTER	PWR (KW)	TRANSMIT ANTENNA	NCM ECD	NOTES
MASTER	CARIBOU ME	46 46 27.2N 67 55 37.7W		AN/FPN-42	350	SLT	0.0	DUAL RATE W/GRI9960
XRAY	NANTUCKET MA	41 15 11.8N 69 58 39.1W	11000/ 2131.88	AN/FPN-42	325	625 FT MONOPOLE	0.0	DUAL RATE W/GRI9960
YANKEE	CAPE RACE NFLD CANADA	46 46 32.2N 53 10 28.2W	25000/ 3765.52	AN/FPN-45	1500	1350 FT MONOPOLE	0.0	DUAL RATE W/GRI7930
ZULU	FOX HARBOUR NFLD CANADA	52 22 35.2N 55 42 28.4W	3800/ 3594.69	AN/FPN-64 (56 HC G'S)	800	700 FT MONOPOLE	0.0	DUAL RATE W/GRI7930



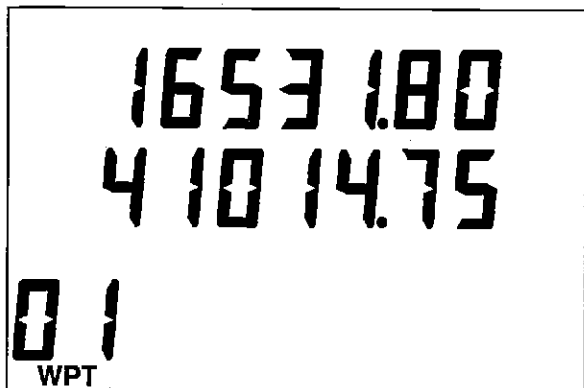
The LMS-10 returns to the Save Waypoint screen after it converts the position. The position you entered shows at the top of the screen in latitude/longitude coordinates. The first available waypoint number appears in the lower left corner of the screen. To save the position under this waypoint number, simply press the ENT key. If you wish to save the position under a different waypoint number, first press the CLR key, then enter the desired waypoint number. The LMS-10 will automatically take the number as it is entered and return to the position display.

#### ENTER NEW WAYPOINT - TD's

To enter a waypoint other than your present position in TD's, first press the 1,3,ENT keys. The "Save Waypoint" menu shown below appears.



Now enter your waypoint position using the numeric keypad beneath the display. Our example waypoint TD is 16531.80 and 41014.75.



Note: You must enter T.D.'s for the stations the LMS-10 is currently using. For example, if the LMS-10 is using the master, W and X, then you must enter a waypoint while the unit is using those stations.

Now press the ENT key. The message "Please Hold" appears while the unit converts the data you entered.

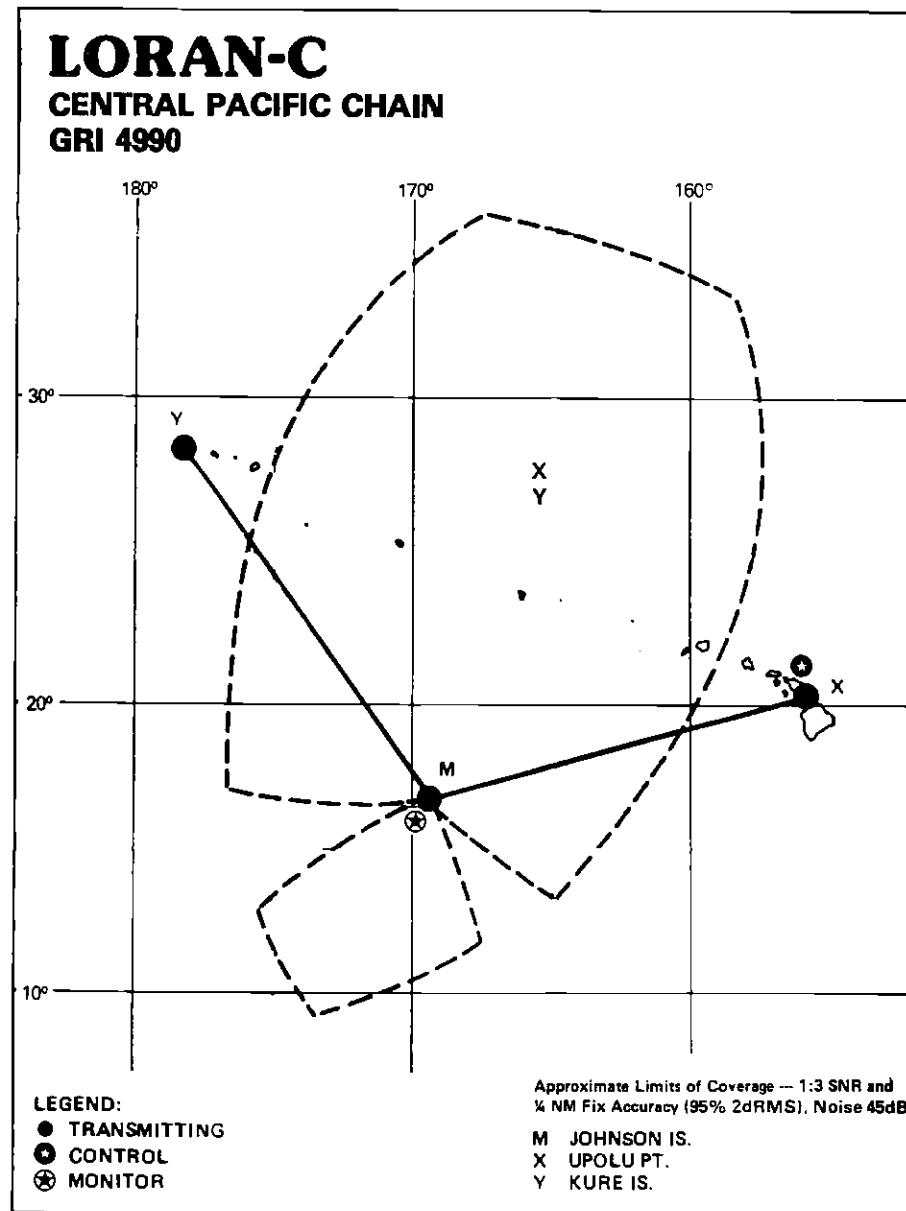
The LMS-10 returns to the Save Waypoint screen after it converts the position. The position you entered shows at the top of the screen in TDs. The first available waypoint number appears in the lower left corner of the screen. To save the position under this waypoint number, simply press the ENT key. If you wish to save the position under a different waypoint number, first press the CLR key, then enter the desired waypoint number. The LMS-10 will automatically take the number as it is entered and return to the position display.

To exit from this screen without saving the waypoint, press the CLR key twice.

### ERASING A WAYPOINT

Actually, a waypoint can't be erased. However, the waypoint number can be re-used simply by saving a new waypoint using a waypoint number currently in use. For example, if you wish to change the position stored in waypoint number 5, simply store a new waypoint in position number 5. The LMS-10 writes over the old waypoint position.

NOTE: Make certain a waypoint isn't used in a route before changing the position stored under a waypoint number!

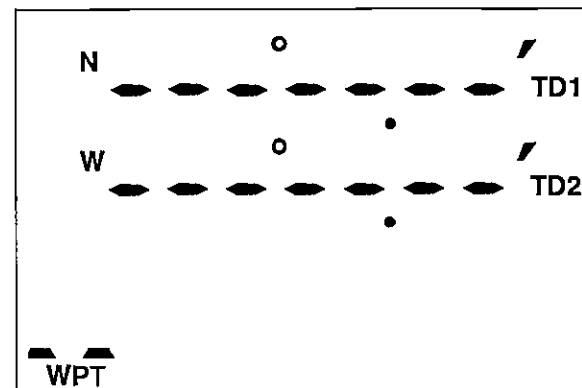


CENTRAL PACIFIC LORAN-C CHAIN GRI 4990  
 REGIONAL MANAGER: COMMANDER, PACIFIC AREA, ALAMEDA, CA  
 CHAIN MANAGER 14TH COAST GUARD DISTRICT, HONOLULU, HI  
 COORDINATOR OF CHAIN OPERATIONS LOCATION: OMSTA KANEHOE, HI  
 CONTROL SITE: OMSTA KANEHOE, HI

DESIG.	STATION	COORD.	CD/BLL (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 155 53 09.7W	11000/ 4972.23	AN/FPN-42	325	625 FT MONOPOLE	0.0	
YANKEE	KURE ISLAND HI	26 29 41.8N 176 17 30.2W	29000/ 5253.18	AN/FPN-42	325	625 FT MONOPOLE	0.0	

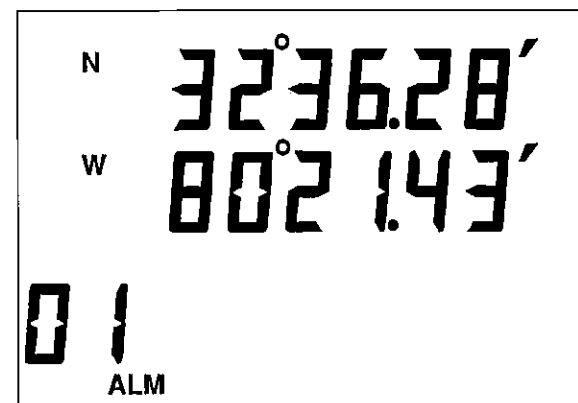
## WAYPOINT RECALL

You must either recall a waypoint or use the Go To Waypoint feature to use the navigation functions. To recall a waypoint, simply press the 2nd key, then press the STO key. A screen similar to the one below appears.



Enter the waypoint's number using the keys on the numeric keypad. If you make a mistake, press the CLR key and try again. In this example, waypoint number 01 is recalled.

If this isn't the desired waypoint, you can either enter another waypoint number using the numeric keypad or press the TD1 and TD2 keys to scroll through the waypoints. For example, if you enter waypoint number 05, then press the TD1 key, waypoint number 04 will appear. Pressing the TD1 key decreases the waypoint numbers, the TD2 key increases them. Press the ENT key when the desired waypoint is shown.

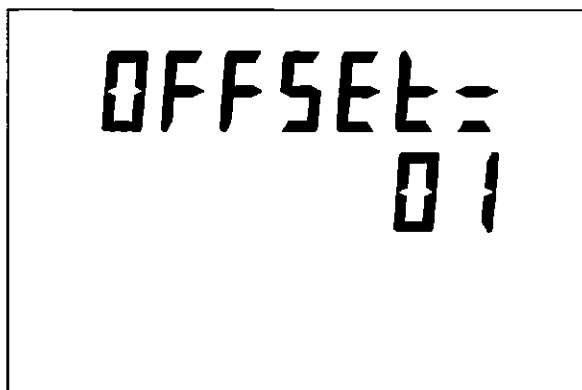


The unit returns to the position display, with the waypoint number in the lower left corner. (See the screen at the bottom of page 27.) The letters "ALM" should appear shortly. This means the arrival alarm is activated.

### WAYPOINT COUNTER OFFSET

The counter for the list of waypoints can be moved, if desired. For example, if you usually use waypoints numbers 50 through 55, you can set the waypoint counter to 50. This way, every time you store a waypoint, the starting waypoint will be number 50 instead of number 1.

To set the waypoint counter offset, press 4, 6, ENT. The screen below appears. Now enter the offset number. The screen will automatically clear. From now on, each time you store a waypoint, the starting waypoint number will be the one you entered.



### GO TO WAYPOINT

If you wish to simply go to a waypoint that isn't in the LMS-10's memory, press the 1,6,ENT keys. The Go To Waypoint entry screen appears. This screen looks identical to the one at the top of page 27. Now enter the waypoint's latitude and longitude using the numeric keypad. Then press the ENT key. The LMS-10 will return to the position screen. You can now use the unit to show navigation information to the waypoint.

54 .....	Display Start Position
55 .....	Display Loran Module's Version Number
56 .....	Display Automatic/Manual Mode

### KEYBOARD 2nd FUNCTION COMMANDS

2nd - TD1 .....	Display Heading
2nd - TD2 .....	Display Time To Go (TTG)
2nd - TD/LL .....	Switch Automatic or Manual
2nd - STO .....	Recall a Waypoint
2nd - 0 .....	Display Distance To Go (DTG)
2nd - 1 .....	Display Velocity Made Good (VMG)
2nd - 2 .....	Display Signal To Noise Ratio (SNR)
2nd - 3 .....	Display Speed Over Ground (SOG)
2nd - 4 .....	Display True Bearing
2nd - 5 .....	Display Magnetic Bearing
2nd - 6 .....	Switch Between Alternate or Primary Solution
.....	Change GRI
2nd - 8 .....	F1 Display
2nd - 9 .....	F2 Display
2nd - ENT .....	LMS-10 Status
2nd - CLR .....	Display Cross Track Error (XTE)

### FACTORY DEFAULTS

Arrival Radius .....	.10 nautical mile
Anchor Radius .....	.20 nautical mile
Cross Track Increments .....	.10 nautical mile
NMEA Output .....	Off
ASF offsets .....	Reset to zero
ASF corrections .....	Off
Waypoint Offset .....	Zero
Alt/Primary Solution .....	Primary
Auto/Manual Mode .....	Automatic

## COMMAND LIST

The following list of commands are used by entering the number on the numeric keypad, then pressing the ENT key.

10	.....	Turn 24 Hour Clock On
11	.....	Turn 24 Hour Clock Off
12	.....	Enter Initial Position
13	.....	Enter Waypoint Position - TD's
14	.....	Display Stations in Use
15	.....	Display Recommended Stations
16	.....	Go To Waypoint - L/L
17	.....	Select Stations for Use
19	.....	Enter Waypoint Position - L/L
21	.....	Set Clock's Time
22	.....	Set Cross Track Error Per Arrow
23	.....	Turn Anchor Alarm On
24	.....	Turn Anchor Alarm Off
25	.....	Create Route
26	.....	Start Route Forward
27	.....	Start Route Reverse
28	.....	Turn Lights On or Off
30	.....	Select NMEA 0180 Output
31	.....	Turn NMEA Output Off
33	.....	Select NMEA 0183 Output
34	.....	Select Lowrance X-16 Output
35	.....	Enter ASF Correction - L/L
36	.....	Enter ASF Correction -TD 1st Station
37	.....	Enter ASF Correction -TD 2nd Station
38	.....	Enter ASF Correction -TD 3rd Station
39	.....	Enter ASF Correction -TD 4th Station
40	.....	Turn ASF Correction On
41	.....	Turn ASF Correction Off
42	.....	Clear Lower Displays
44	.....	Enter Anchor Alarm Radius
45	.....	Enter Arrival Alarm Radius
46	.....	Enter Waypoint Counter Offset
47	.....	Reset
48	.....	Cancel Route
50	.....	Display Magnetic Variation
51	.....	Display LMS-10 Version Number
52	.....	Display Fix Quality
53	.....	Display Destination Position

## VIEW DESTINATION WAYPOINT

To view the recalled waypoint (destination waypoint), press 5,3,ENT. The destination waypoint appears at the top of the display. Press the CLR key to return to the navigation screen.

## VIEW STARTING WAYPOINT

To view your position when you recalled a waypoint, or the last waypoint position you arrived at in a route, press 5,4,ENT. The starting position displays at the top of the screen. Press the CLR key to return to the navigation screen.

## ROUTES

The LMS-10 gives you the ability to go to several waypoints without having to re-program the unit. This is called Routes. A route typically consists of two or more waypoints. When you run a route, the LMS-10 gives 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. Navigational information is displayed for this waypoint until the arrival alarm sounds and the process repeats. When you reach the last waypoint in a route, the arrival alarm sounds until you turn it off.

The LMS-10 has the capability for 25 routes with 10 waypoints per route.

### Creating a Route

To create a route, first press 2, 5, ENT. A screen appears with a flashing bar next to the letters "rTE". Now enter the route number. In this example, we'll use 01. After you've entered the route number, you will need to enter the waypoint numbers to be used in the route. The waypoint counter is displayed beneath the route number. You can assign up to ten waypoints to the route.

**NOTE:** Make certain to assign waypoints to the route in the order you intend to travel. For example, if you travel to waypoints numbers 3, 23, and 40, in that order, then enter them into the route in the same order.



## TD's IN USE

To view the TD's the LMS-10 is currently using, press 4,9,ENT. The TD's will be shown on the upper two lines of the display. To exit from this screen, press the CLR key.

## MAGNETIC VARIATION

The difference between the north pole (true north) and the location of magnetic north is called magnetic variation. The variation changes from one part of the country to another. For example, on the east coast of the United States, the magnetic variation might be 4 degrees west, while on the west coast it might be 20 degrees east.

The LMS-10 has a magnetic variation chart in its permanent memory. To view the magnetic variation at your present position, press 5,0,ENT. Press the CLR key to restore the navigation screen.

## VERSION NUMBER

The software, or program inside your LMS-10 and the Ioran module are numbered. This helps our customer service department when troubleshooting your unit. To view the LMS-10's software version number, press 5,1,ENT. To view the Ioran module's version number, press 5,5,ENT. Press the CLR key to clear either screen.

## STAT

If the LMS-10 loses the GRI, or has another problem, a message appears when the STAT function is used. To view the status screen, press 2nd, ENT keys. A screen appears with the message "GRI found" if the communications between the LMS-10 and Ioran module are correct. Other messages show error or warnings if there is a communications or other problem with the Ioran module as shown below.

LOST GRI      The unit lost the GRI.

NOT ADD UP    There is a problem with the LMS-10 (Not the LC-1).

After you've entered all of the waypoints in the route, press the ENT key. The LMS-10 returns to the position screen. Your route is now in memory.

## Following a Route

To follow a route, first decide if you want to travel forward through the route or backwards. Travelling forward through a route means starting at the first waypoint on the list and travelling consecutively through the waypoints to the last one. Travelling backwards through the route means starting at the last route on the list and travelling consecutively through the waypoints to the first one.

Press 2,6,ENT to travel forwards through the route.

Press 2,7,ENT to travel backwards through the route.

## Cancelling a Route

To cancel a route, press 4,8,ENT. This stops the LMS-10 from sequencing to the next waypoint. It clears all navigation information from the screen, with the exception of the latitude/longitude or TD display. This does not erase the route.

## Erasing a Route

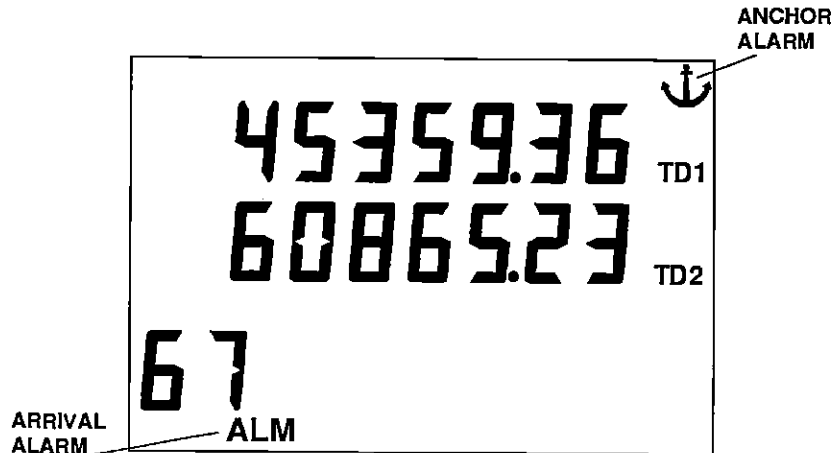
To erase a route, simply recall the route by pressing 2,5,ENT. Next, enter the route's number that you wish to erase. Now press the CLR key to erase the first waypoint from the route. Rotate to the next waypoint by pressing the TD1 key. Again, press the CLR key to erase the waypoint. Continue doing so until all waypoints are erased from the route. Now press the ENT key. This clears the route entry menu and returns you to the navigation screen.

## ALARMS

The LMS-10 has two Loran alarms; an anchor alarm and an arrival alarm. The anchor alarm sounds an audible tone when the boat moves outside a preset limit. This can warn you if your anchor drags. The arrival alarm sounds a tone when you're within a preset distance of a waypoint.

## Anchor Alarm

To adjust the anchor alarm's radius, press 4,4,ENT. The anchor alarm adjustment menu appears. The radius is adjustable from .01 to 9.99 nautical miles. Enter the desired radius. As soon as the last digit is entered, the LMS-10 accepts the radius and returns to the position screen. The anchor symbol appears in the upper right corner, signifying the anchor alarm is on.



To activate the anchor alarm, press the 2,3,ENT keys. Now if the boat moves more than the anchor alarm radius, the alarm will sound. For example, if the anchor alarm is set to .05 nautical mile, the alarm will sound if the position moves more than .05 nautical mile or approximately 300 feet.

To turn the anchor alarm off, press the 2,4,ENT keys.

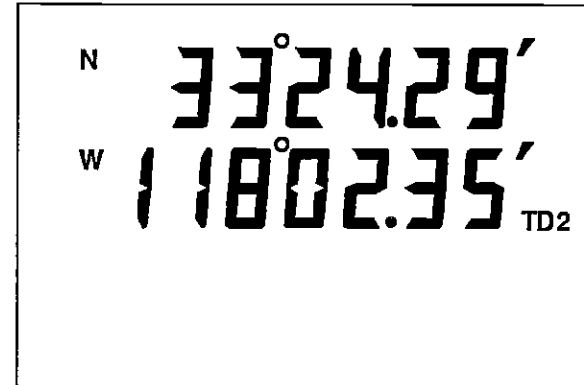
## Arrival Alarm

The arrival alarm sounds a tone when your position is within the alarm's radius of a waypoint. For example, the alarm will sound if you come within .5 nautical miles of a waypoint, if the arrival alarm's setting is .5 nautical mile.

To adjust the arrival alarm's radius, press 4,5,ENT. The alarm adjustment screen appears. The radius is adjustable from .01 to 9.99 nautical miles. Enter the desired radius using the keys on the numeric keypad. As soon as the last digit is entered, the LMS-10 accepts the radius and returns to the position screen.

After you've entered the latitude, do the same with the longitude. Remember to enter a zero as the first number in the longitude if it's less than 100 degrees. For example, if your longitude is 85 degrees, enter 0850000.

Your screen should look like the one below after you've entered the position. If your longitude is west of Greenwich, England, no change is necessary. If it's east longitude, press the "TD2" key. This changes the longitude to east.



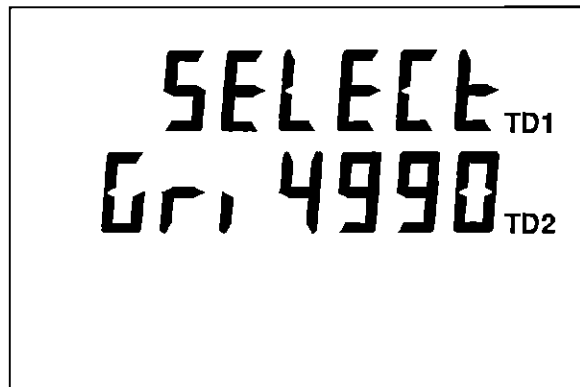
Once you've entered the correct latitude/longitude position, press the ENT key. The LMS-10 then flashes numbers on the Lat/Long display. The unit is searching for the stations in the chain you selected. Once the Loran "locks on" to the stations and computes your position, your LMS-10 is ready for navigation.

## RESET

To reset the LMS-10 to its factory settings, press 4,7,ENT.

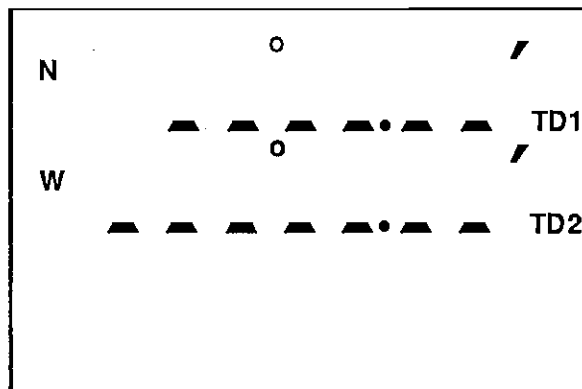
NOTE: This does NOT erase any waypoints or routes from memory, but it does turn the NMEA output off.

If you pressed the TD2 key, the Enter GRI screen appears. Press the TD1 or TD2 keys to scroll through the GRIs until the desired GRI appears. Now press the ENT key. The LMS-10 will begin searching for the stations in the new GRI. Once it finds and locks on to the new stations, it will show position information based upon this chain.



### Enter New Initial Position

If you wish to restart the LMS-10 by entering a new initial position, press the 1,2,ENT keys. The screen shown below appears. Now enter your present latitude, using the numeric keys at the bottom of the display. If you make a mistake, press the CLR key and re-enter the numbers from the beginning. Press the CLR key twice to exit from this menu.



The arrival alarm is automatically set when a waypoint is recalled.

### ASF Correction

Since many Loran transmitters are located inland, their signals are affected by the terrain that they travel over. Plains, lakes, mountains, cities, all effect the signal and they each effect it in a different way.

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 aren't affected the way the program inside the Loran receiver thinks they should. Therefore, the Loran shows a TD or latitude/longitude that is not the actual position.

The LMS-10 has an ASF correction feature that allows you to change the addition secondary factor. 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.

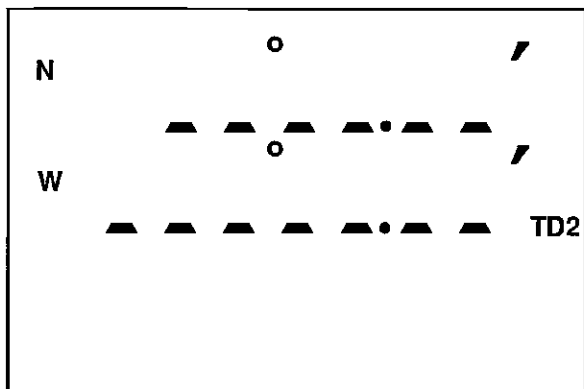
### IMPORTANT:

ASF corrections entered by the user are good only for the stations in use at the time and for the 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 holds especially true if you enter a latitude/longitude position to change ASF. The LMS-10 will only apply the ASF correction to the stations in use, not all of them. Again, if you change stations, and especially if you change GRI's, the ASF will have to be re-entered.

There are two ways to change the ASF. You can enter the offset in micro-seconds for each TD, or you can simply enter a latitude/longitude.

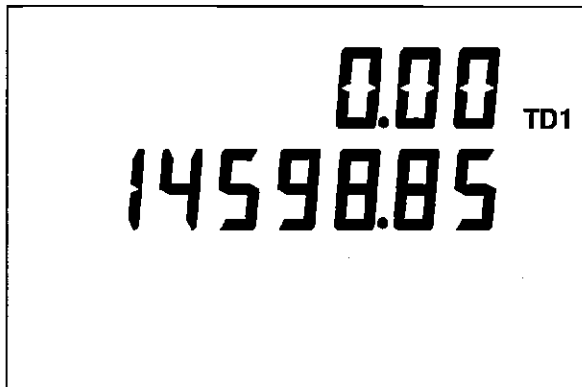
To change the ASF using the latitude/longitude, first make certain you are physically at the location you want corrected. Next, press the

3,5,ENT keys. A screen similar to the one below appears. Now enter the corrected latitude and longitude for your present position. Make certain to add a zero to the longitude if it is less than 100 degrees. Press the TD2 key if you need to switch from west to east longitude. Once you have the correct latitude/longitude entered, press the ENT key. The LMS-10 will automatically add the ASF correction to all subsequent position information.



Changing the ASF using TD offsets requires a different approach than the lat/long method. A different command number is used for each TD. First press the command number according to the desired TD, then enter the offset. Continue until the ASF for all of the TDs in use has been entered. Each time an ASF is entered, the LMS-10 automatically uses it for that station. You can enter an ASF for one or all of the TDs.

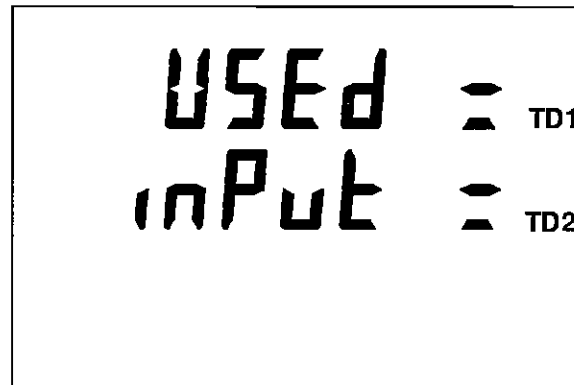
For example, press 3,6,ENT to set the ASF for the first station. A screen similar to the one below appears.



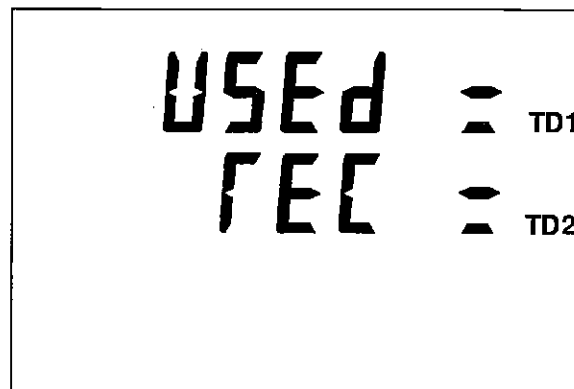
## RESTART LORAN

### Select New GRI

If you wish to change GRI's, press the 2nd key, then the 7 key. The screen shown below appears. Press the TD1 key to view the GRI currently in use or press the TD2 key to enter a new GRI.



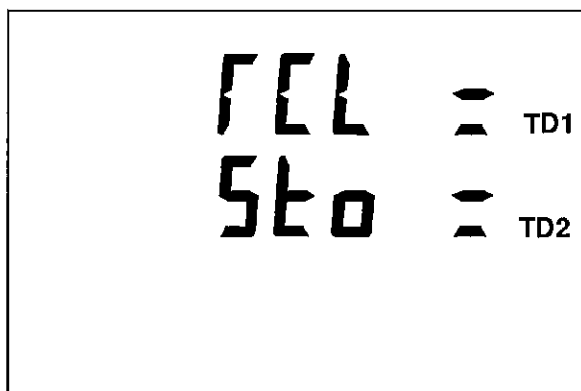
If you pressed the TD1 key, the screen shown below appears. Now press the TD1 key to see the GRI in use or press the TD2 key to see the GRI the LMS-10 recommends. Press the CLR key to exit from any of these screens.



## F1 and F2

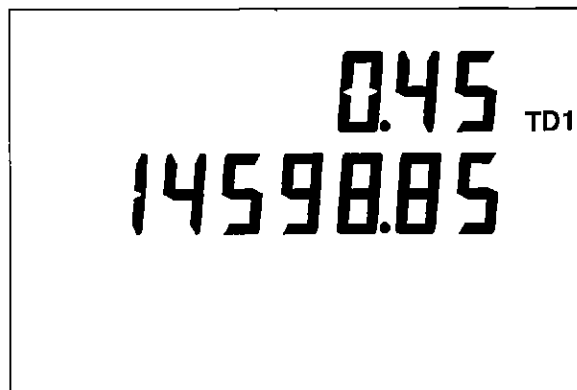
The LMS-10 gives you the ability to customize two different screens. For example, suppose you usually view your current position in TDs, along with heading and speed over ground, but you also like to see your current position in latitude/longitude, cross track error, and velocity made good. You can assign one set of displays to the F1 key and the other set to the F2 key. Then switch between the displays as desired.

To assign a display to the F1 key, first set the screen up as desired. Then press the 2nd,8 keys. The screen shown below appears.



Press the TD2 key to store the screen into memory. The LMS-10 will then return to the navigation screen. Now you can change the displays by first pressing the 2nd, 8 keys, then press the TD1 key. The navigation display appears, using the features you stored. Storing and recalling screens using the F2 key works identically to the F1 key, except you press the 2nd, 9 keys instead of the 2nd, 8 keys.

The TD for the first station displays on the second line. Enter the desired ASF correction using the keys on the numeric keypad. Press the TD1 key to change from a positive offset to a negative one. When you have the desired correction entered, press the ENT key. The LMS-10 will return to the navigation screen, automatically putting your correction into effect.



Use the same method for all of the other stations. The command numbers for all of the stations are:

- 36 - 1st Station
- 37 - 2nd Station
- 38 - 3rd Station
- 39 - 4th Station

Simply press the command number, then the ENT key to enter the ASF correction. NOTE: The TD's for each station are not displayed in order, nor are they displayed according to station's letter designator.

The ASFs can be turned off or on again using two commands. Pressing 4,1,ENT turns the ASF correction off, 4,0,ENT turns the correction on.

## NMEA OUTPUT

The LMS-10 can output data according to NMEA 0180, 0183, or Lowrance X-16 formats. The NMEA output is off when the LMS-10 is turned on for the first time. The unit sends data out the white wire on the LMS-10's power cable. See the Power Connections section for wiring instructions.

To change to a different data output, press 3,3,ENT key for NMEA 0183, 3,4,ENT for the X-16 format, or 3,0,ENT for NMEA 0180 format. The unit will return to the last used Loran screen and send data out the serial data line.

If you wish to turn the output off, press 3,1,ENT.

### 24 HOUR CLOCK - TIMER

The LMS-10 has a twenty four hour clock and timer built in. Once set, the clock will keep accurate time, however please remember that the LMS-10 forgets the time when the unit is turned off. Therefore, the clock has to be reset each time the unit is turned on. When the unit is first turned on, the clock acts as a timer and displays elapsed time since the unit was turned on.

To set the clock, press the 2,1,ENT keys. Now enter the time in hours and minutes using the keys on the numeric keypad. As soon as the last minute is entered, the unit returns to the position screen.

To turn the clock on, press the 1,0,ENT keys. To turn it off, press the 1,1,ENT keys.

To use the clock as a timer, reset the clock's time to 00:00. It will then show elapsed time since it was reset.

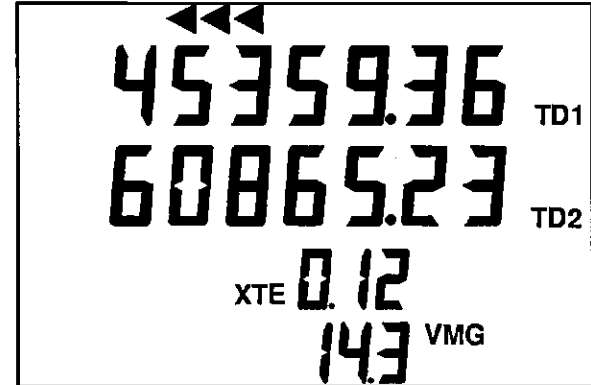
### LIGHTS

The LMS-10 has a backlighted display and keyboard for night use. When it is first turned on, the lights flash for a few seconds so you can find the keys that turn the lights on continuously.

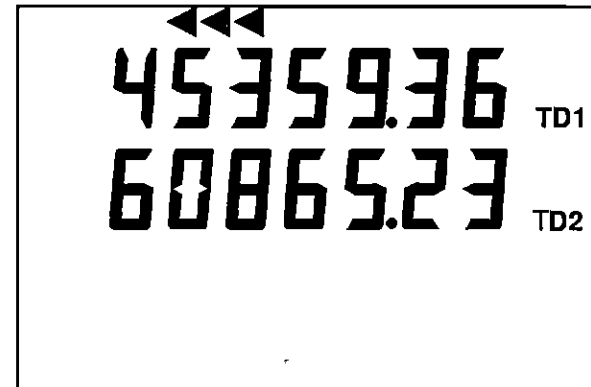
Press the 2,8,ENT keys to turn the lights on or off.

### CLEAR LOWER DISPLAY

If you wish to turn the lower two lines of the display off, press the 4,2,ENT keys. This won't affect alarms or other features, it simply turns these two displays off.



LOWER DISPLAYS ON



LOWER DISPLAYS OFF