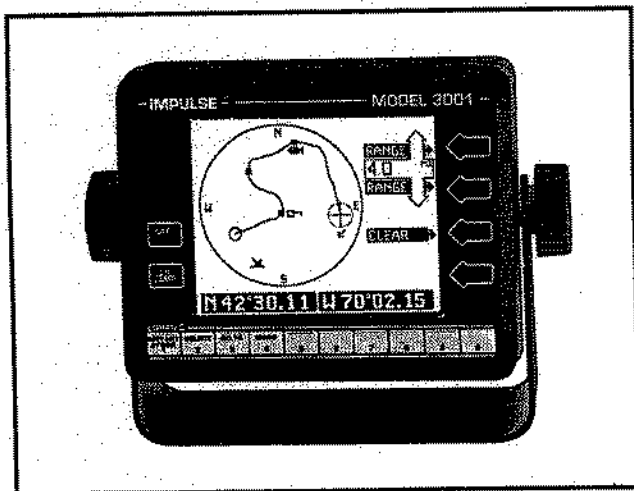


IMPULSE

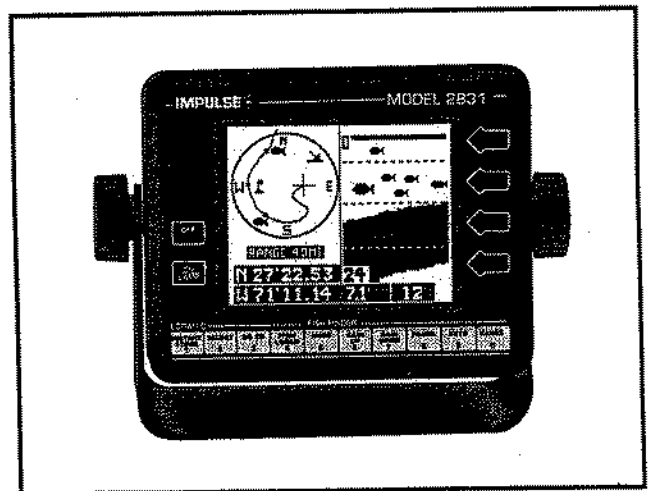
LORAN C FUNCTIONS

Model 3001 Loran C
Model 2831 Fish Finder/Loran C
Owner's Manual
Installation and Operation Guide

Model 3001 Loran C



Model 2831 Fish Finder/Loran C



IMPULSE

LORAN C FUNCTIONS

Model 3001 Loran C Model 2831 Loran C/Fish Finder

TO OUR CUSTOMER:

This manual addresses the Loran C functions of the above mentioned IMPULSE products. The fish finding functions are detailed in a separate Owner's Manual/Installation Guideline.

We would like to extend our thanks to you for purchasing the IMPULSE 2831 Loran C/ Fish Finder or the IMPULSE 3001 Loran C. These products are highly sophisticated instruments which were designed using the criteria of "simplicity of operation". You can expect that we will be making on-going software enhancements to some features of this instrument which will allow you to upgrade your system throughout the manufacturing cycle. **It is very important that you review this manual carefully and thoroughly prior to using your Impulse Instrument.**

Each instrument contains a built-in simulator. We suggest that you use this simulator to thoroughly familiarize your knowledge of this product prior to actual usage. You will find this simulator helpful in teaching you how this LORAN and Fish Finder operate.

CAUTION: Your IMPULSE 2831 and 3001 are aids to navigation and do not reduce the need for caution or good judgment. No electronic navigation system is absolutely reliable; outputs may occasionally be incorrect. The careful navigator should never rely solely on one device, to the extent of endangering life or property. Please remember, any time that a display reading flashes on and off, the outputs may be in error and should not be used for navigation. We recommend that you use this system in combination with marine charts, and knowledge of the area where you are boating.

Again, we want to thank you for purchasing an Impulse product and are confident of your satisfaction.

Sincerely,

IMPULSE TECHNOLOGY

IMPULSE TECHNOLOGY
329 Railroad Avenue, Pittsburg CA 94565 USA
PHONE: 510-439-2072

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This Owner's Manual is a combination manual for both the Impulse 2831 and the Impulse 3001. This manual details the operations of the Loran portions of both units.

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LATITUDE-LONGITUDE EXPLANATION

Latitude-longitude is the standard co-ordinate system in use worldwide. On the left and right edges of your navigation chart, you will find the latitude markings; on the top and bottom are the longitude. Thus, they cross at right angles and make plotting your position very easy. Often these markings are repeated at intervals between the chart edges.

The Prime Meridian is a line running through Greenwich, England which divides East and West Longitudes and is 0°. Going east or west from England, longitude increases until it reaches 180° in mid-Pacific. Longitudes west of Greenwich are called West Longitude, likewise, Longitudes East of Greenwich are called East Longitude.

A Latitude/Longitude reading consists of three elements: degrees, minutes, and 100ths. In the reading **38°02.85**, degrees = **38**, minutes = **02**, 100ths = **85**. A degree is divided into 60 minutes; each minute is further divided into 100ths.

Sometimes minutes are divided into 60 seconds, but usually they are divided into hundredths. Your unit reads out in hundredths. Be sure your chart has minutes divided into tenths (or hundredths), not seconds. Latitude and longitude are plotted in exactly the same manner. In North America latitude (North Latitude) increases towards the top of your chart, and longitude (West Longitude) increases towards the left. In most of Europe and Asia longitude (East Longitude) increases toward the right.

Latitude minutes (one-sixtieth of a degree, e.g. 38°02.85) are exactly one nautical mile (1 nm); a minute of longitude is less than a nautical mile. One one-hundredth (0.01) of a minute of latitude is about 60 feet; one one-hundredth of a minute of longitude is less than 60 feet (about 40 feet at a latitude of 45 degrees). A nautical mile is approximately 6076 feet (1.852 Km).

The unit LORAN receives its numbers in Time Difference (TD) format and then converts them to latitude and longitude. If you choose to operate in the TD mode, the unit actually converts it back again into TD's from LAT/LONG. This is only true for stored Waypoints, not measured position.

For LAT/LONG, one degree of latitude = 60 nautical miles.
TD numbers vary by location, so it is more difficult to determine associated distances for these.

WAYPOINT EXPLANATION

A "Waypoint" is a place on the Earth's surface. It is a location that you want to go to (or return to), or it is a "point" along the "way" where you want to go. In either case, a waypoint is a destination. The unit will remember 80 waypoints, and all can be displayed from the WAYPOINT LIBRARY screen. Waypoints are numbered from #01 to #80.

In order to navigate it is necessary to have both a destination and a starting point so that your unit can "draw" an electronic line (course) between them. A location may be stored as a waypoint through the INSTANT STORE or the MODIFY POSITION functions. See the manual sections entitled "Waypoint Library" and "Waypoint Store" for further explanation.

LORAN C EXPLANATION

BRIEF DESCRIPTION OF LORAN C:

LORAN is an acronym for **LONG R**ange **N**avigation. It is an electronic system of navigation which uses shore-based transmitters, and shipboard receivers. LORAN provides mariners the means to electronically determine their position.

Although the LORAN C system is quite complex, use of the system does not require any special technical expertise. It is not required that you fully understand the system to use it as a navigational aid, however, more extensive knowledge will allow more effective use of the system and provide for

your safety. The following information will provide a good basis for understanding the LORAN C system. It will also provide you with a working knowledge of the terminology involved. Also refer to the Glossary provided in the Appendix of this manual.

LORAN C is a "pulsed" system whose fundamental assumption is that the speed of propagation of a radio wave is constant anywhere in the area of coverage of the system. This assumption is actually subject to some corrections, but we will assume for the sake of this discussion that the speed of a LORAN C signal is actually constant.

Since distance, time and speed are all related, and since we have assumed that the speed of the signal is constant, if we can devise some means to measure the time that it takes for a signal to arrive from a distant transmitter, we can easily calculate the distance the signal has traveled to get to us. Modern electronic LORAN devices provide the means for making very precise time measurements, down to tenths of a millionth of a second.

LORAN SAFETY ADVICE:

LORAN C is not a perfect system nor is it completely trouble free. Most errors result from natural or propagation anomalies, not in the receivers themselves. Errors such as these cannot always be automatically corrected by your receiver and must be taken into account by the operator. A general knowledge of LORAN is necessary for the best possible fix accuracy.

Although LORAN C is a proven, highly accurate aid to navigation, it should always be used in conjunction with other aids available to the navigator. The compass provides reliable directional information, and should always be used for navigation.

Physical sightings of buoys, lights, range markers, and landmarks, as well as information from depth sounders, radio direction finders, radar, and celestial observations, as available, are to be used in conjunction with your LORAN in order to verify your position and confirm navigational system accuracy. LORAN C and computerized navigational systems can save time, increase safety, and reduce costs by providing accurate navigational data. However, various factors may influence the accuracy of the total system. Each component of the total system may contribute an element of error due to individual accuracy limitations. The way you use your navigational equipment, charts, and plotting tools is also of major importance in minimizing inaccuracies. The prudent navigator will know as much as possible about his equipment, and never rely on any one navigational aid.

GRI/TD EXPLANATION

A LORAN C **GRI chain** consists of three to five land-based transmitting stations, each separated by several hundred miles. These stations are maintained by the United States Coast Guard. Within the chain, one station is designated as the **Master Station (M)**, and the others are designated as **Secondary Stations** (often called "slaves") Victor (V), Whiskey (W), X-ray (X), Yankee (Y), and Zulu (Z). Signals transmitted from the secondaries are synchronized with the master signal. **IMPULSE** refers to these stations as the **Master Station and the Secondary Stations 1, 2, 3, 4 and 5.**

In this example, the Master Station (M) and the Secondary Station (1) transmit synchronized pulses at precise time intervals. The on-board LORAN C receiver measures the slight difference in time that it takes for these pulsed signals to reach the boat from these transmitters.

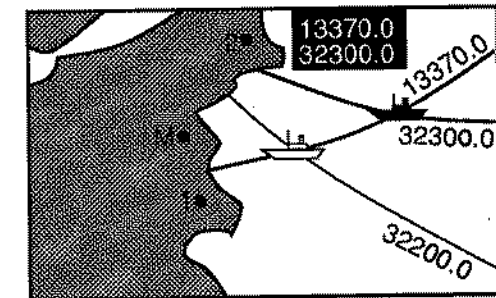
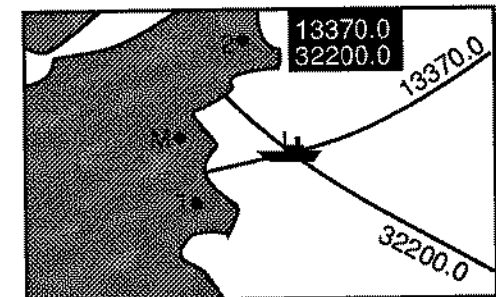
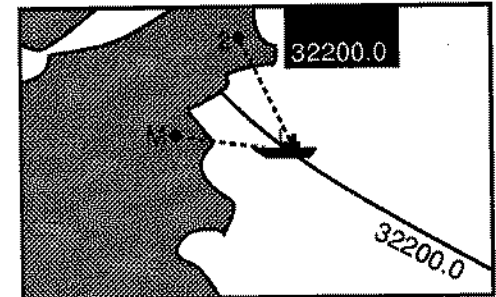
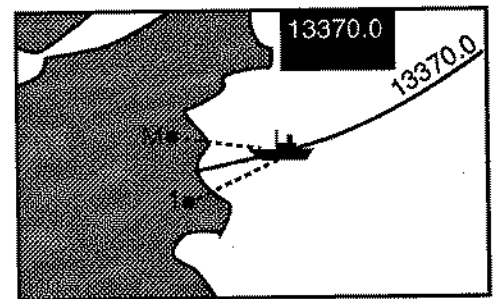
This **time difference** (TD) is measured in microseconds, or millionths of a second, and is then displayed as one readout on the LCD screen. In the example the difference displayed is 13370.0 microseconds. The time difference can be plotted on a LORAN C chart as a **line-of-position** (LOP).

The vessel's position is located somewhere along the 13370 line-of-position as it appears on a LORAN chart. Next, a Time Difference measurement is taken from the Master Station (M) and another of the Secondary Stations (in this case #2). The LORAN C receiver then displays the time difference between M and #2. In this example, the time difference displayed is 32200.0 microseconds. Again, this time difference is plotted on a LORAN C chart as a line-of-position (LOP) and the vessel's position is located somewhere along the 32200.0 line-of-position.

The second LOP intersects the first LOP, so the boat's exact position is where the two LOP's intersect -- 13370.0 and 32200.0.

Continuing this example, if the boat travels for some distance and another reading is taken, the receiver might display 13370.0 and 32300.0 microseconds. This would mean that the boat was following the 13370 LOP, and was now at the intersection of 13370.0 and 32300.0.

The example presented here uses the Secondary stations 1 and 2 to demonstrate the use of the LORAN C system.



NAVIGATING WITH LORAN C

Successful use of the LORAN C system begins with the receiver and the user. The user must be familiar with the various factors which may influence system accuracy when establishing position. Overall accuracy is governed by factors such as the selection of the best secondary stations and plotting a LORAN C Fix (intersection of two LOP's) indicated by the receiver.

Some LORAN C chains were designed to provide two or more LOP fixes in order to provide a larger coverage area. The LORAN may need to use two secondary stations in one area of coverage - two others in another area of coverage. The operator may wish to verify accuracy by checking and cross-checking fixes provided by each of the secondary stations in an area. The most important factors when choosing and/or checking secondaries are: the crossing angle of LOP's and the gradient between the secondary LOP's.

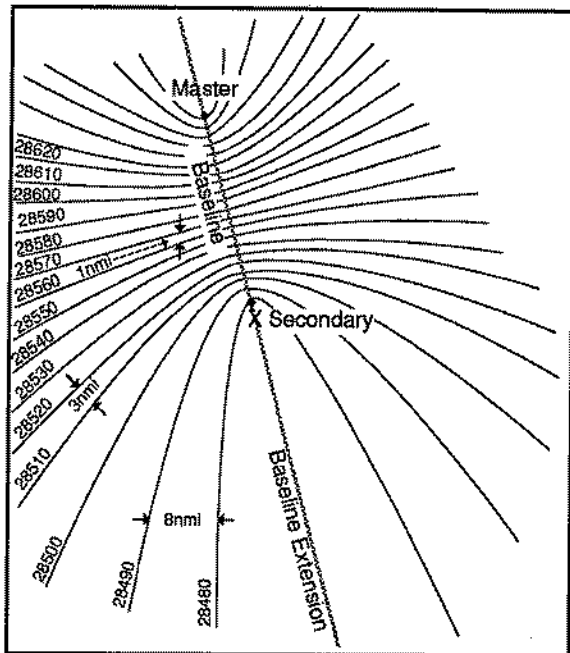
CROSSING ANGLE:

Your position is determined by the crossing point of two intersecting lines-of-position from different Master-Secondary station pairs. Ideally, these two LOP's should intersect at a 90 degree angle. However, conditions are always less than ideal, and so the crossing angle will be somewhat less than 90 degrees. The smaller the crossing angle, the less precise will be the computed position. You

should select stations that produce crossing angles that are most nearly perpendicular. Whenever possible, do not use LOP's which provide crossing angles of less than 30°.

LOP GRADIENT:

The accuracy of a positional fix is greatly dependent on the gradients, or the distance between two parallel LOP's (lines-of-position) for the same Master-Secondary station pair. A large gradient means that the positional error introduced by a small change in the TD is relatively large. You should choose secondary LOP's so that the gradient represents the smallest distance per microsecond. In some areas, a gradient of 10 microseconds between LOP's on the chart may represent one mile of distance. In other areas, a gradient of 10 microseconds between LOP's may represent five miles of distance, or more, depending upon the location and the distance from the Master-Secondary pair.



BASELINE EXTENSION:

The baseline is the line drawn from the Master transmitter directly to a secondary transmitter. The portion of the baseline that continues beyond either transmitter is the "baseline extension". **Under no circumstances should you rely on the data produced by a LORAN-C receiver in the vicinity of a baseline extension, as gross inaccuracies may occur.** (The unit may not be able to determine which side of the baseline extension you are actually on.) If you are near a baseline extension, do not select the corresponding secondary for navigation.

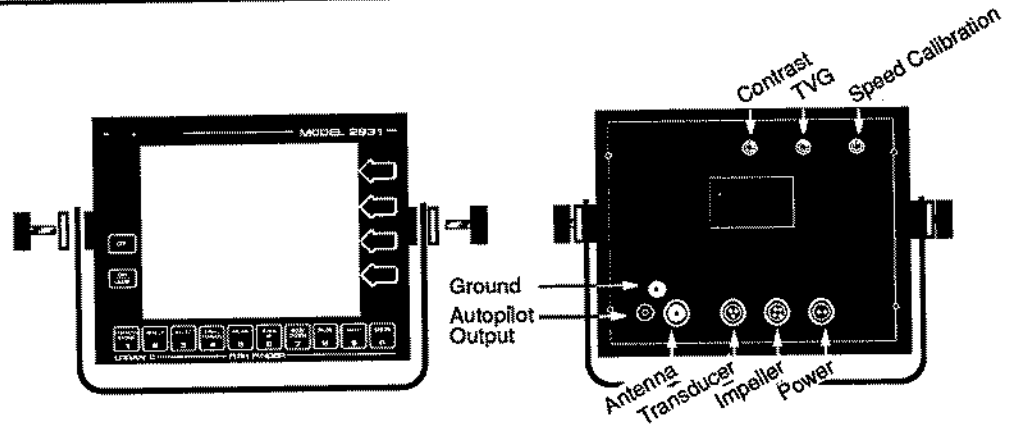
ABSOLUTE ACCURACY is the accuracy with which you can determine your true position. LORAN C is more accurate than other navigational systems, but it is not perfect. LORAN errors can occur, but the knowledgeable operator can work with them, even correct for them and use the system confidently.

Due to signal anomalies the absolute accuracy can be between 0.1 to several nautical miles using LORAN C charts. This accuracy assumes that the TD's used are on a standard chart which has been corrected for signal propagation anomalies. Virtually all new LORAN charts are corrected and will provide this accuracy. **Make sure your charts are current.** Lat/Long converters assume a perfect undistorted saltwater path. The Lat/Long errors are almost totally due to these land vs. saltwater/freshwater propagation effects. Without correction, the Lat/Long fix errors can be as much as a mile or more, depending on location and station geometry.

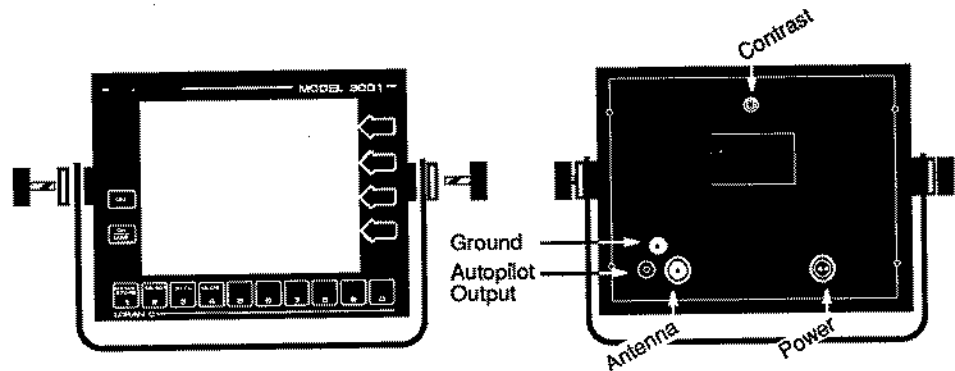
REPEATABLE ACCURACY is the capability of your LORAN to navigate you back to a particular point, time after time. This may be your harbor's entrance or a "hot" fishing spot. Your LORAN C is capable of returning you to within 50 to 200 feet (15 to 60 meters) of a previously stored location.

INSTALLATION

Model 2831



Model 3001



CORRECT PLACEMENT AND VIEWING ANGLE

Mount your IMPULSE 2831/3001 in a location where you can easily monitor and operate the unit. It should be sheltered from the elements as much as possible to ensure ease of operation under adverse conditions and to add to the longevity of the system.

Here are some points to consider before you mount the main instrument housing:

1. Install it where it will capture as much light as possible.
2. Keep at LEAST 3" at the rear of the unit for the connectors.
3. Keep the unit as far as possible from any compass or radio(s) to reduce possible interference.
4. Always disconnect the cables from the unit before you remove it from its mount.
5. Always check for correct voltage and polarity before external grounding.
6. Use only with Negative ground systems; set will not operate if polarity is reversed.
7. Route all associated cables away from other electrical cables and equipment which may radiate electronic interference.

The Impulse 2831/3001 should be mounted so that it can be tilted towards the sun so that it reflects as much available light as possible on the display. Direct sunlight causes the Liquid Crystal Display to appear brighter and the picture to become clearer. The 2831 and 3001 are backlit with an EL (Electro luminescent) lighting panel which is helpful to use in low ambient light conditions and at night.

Adjustments can be made by moving the unit within the gimbal mounting bracket in combination with the contrast adjustment. When the sun is at the back of the instrument and it cannot reflect the sunlight, tilt the instrument down slightly so it can use the light reflecting off the dash (if it is white fiberglass as you might find on a flying bridge). Turn on the back light by using the ON/LAMP key.

COMPASS SAFE DISTANCE

The presence of ferrous metal, electrical equipment or wiring in the vicinity of a magnetic compass tends to distort the magnetic field influencing the compass. As a rule of thumb, mount the LORAN receiver no closer than necessary from any compass and check for compass accuracy. Before finalizing the installation of the receiver and the antenna coupler, operate the LORAN for several hours. Observe any interference or interaction which may occur when the vessel is running and when other equipment is operated. If necessary, change the location or re-route cables to minimize interference.

GIMBAL MOUNTING BRACKET

To mount the main unit, remove the bracket that is attached to the main unit by loosening the two large knobs. Then mount the bracket at the desired location using the appropriate hardware. You may want to place a small piece of neoprene (gasket material) between the bracket and the dash panel to reduce any possible vibrations. Reinstall the main unit in its mounting bracket and connect the transducer, antenna, and power cables to the unit's rear plug.

SWIVEL MOUNTING BRACKET

The OPTIONAL 360° swivel mount makes removal of the instrument easy without having to remove the side thumbscrew knobs and washers each time the instrument is removed from the boat. (Complete swivel assembly = P/N: 950-012; extra base - P/N: 950-022).

CONTRAST CONTROL

There is a contrast control knob on the back of the 2831/3001 housing. You will need to provide access to this control so that the contrast of the display can be adjusted as various light conditions change. When flush mounting either instrument, special care should be made to accessing this knob.

SELECTION OF POWER SOURCE

Do not use a power source shared by a high current load or radio, since power disturbances and transmissions may feed back into the power circuit and create interference. Ensure that regulation of the power source remains within +11.5 volts to +16 volts under load conditions. **You should never have any electronic device turned on when starting an engine as the voltage drop and surge can damage the sensitive electronic components in the set.**

BATTERY CONNECTION/POWER REQUIREMENT

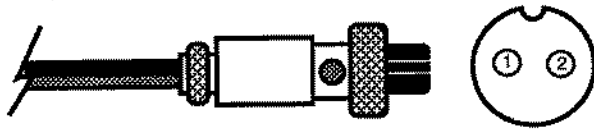
1. Route the power cable away from other possible sources of electrical interference such as engine wiring, VHF radios, bilge pumps, refrigerators, etc.
2. Connect the main unit to a 12 volt battery using the power cable supplied with your unit. You may extend this cable, but you must observe proper polarity (i.e., red - positive, black - negative).
3. Connect the BLACK wire to the negative (-) battery terminal.
4. Connect the RED wire to the positive (+) battery terminal.
5. Make sure the connections are clean and tight so they do not vibrate loose during the boat's operation. Occasionally clean any accumulated corrosion from the battery terminals.
6. If for some reason the fuse is blown, replace with a **1 amp fuse, normal blow.**

DO NOT OVER FUSE! Because the 2831/3001 consumes .2 amps to .3 amps of current when it is on, you will want to keep your battery fully charged.

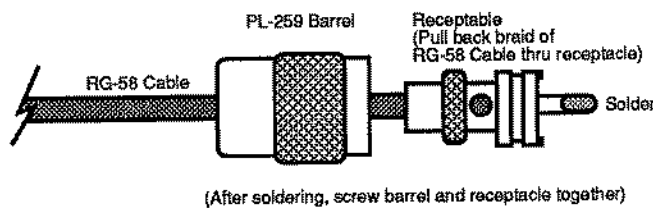
CONNECTOR WIRING

If for some reason you have occasion to check the Internal wiring and/or soldering, all connectors' wiring diagrams, part descriptions, and part numbers are outlined below. Pin numbers refer to the Solder View and are in Counter Clockwise Direction with Pin 1 equal to the Upper left.

<u>CONNECTOR</u>	<u>DESCRIPTION</u>	<u>PART #</u>	<u>COLOR</u>	<u>SOLDER VIEW</u>
POWER:	(2 PIN FEMALE)	703-021	BLACK RED	= PIN 1 = PIN 2



COUPLER:	(PL-259)	703-027	CENTER CONDUCTOR	= 1/2"
			INSULATION	= 1/4"
			BRAID	= 3/4"

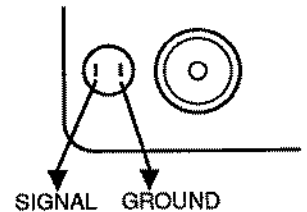


NMEA WIRING

The NMEA Interface is provided on the 2-pin push-on male connectors on the rear panel of the unit. You will need the following parts in order to connect your system:

- 18 to 24 gauge stranded, shielded, twisted-pair cable (Belden 9501 or equivalent)
- 2 fully insulated slip-on (FISO) connectors: (AMP P/N 2-520084-2, Impulse P/N 703-025)

(These parts are not included as standard with your unit, as the percentage of vessels requiring them is very small. You may obtain these from your dealer, or contact Impulse directly.)



To wire the 2-pin female connector:

1. Strip 1/4" of insulation from the 18 to 24 gauge twisted-pair cable.
2. Twist the return (common) line of the listening instrument to the shield at the 2831/3001 end. Insert the end into a FISO connector and securely crimp the wire.
3. Insert the signal wire of the listening instrument into the second FISO connector, and securely crimp the wire.
4. Remove the plug on the back of the Loran instrument housing. Observe the polarity and push these connectors to the tabs in the back of the unit.

The NMEA standard requires listening devices to electrically isolate their Ground from the Talker; therefore you must attach the shield only at the 2831/3001.

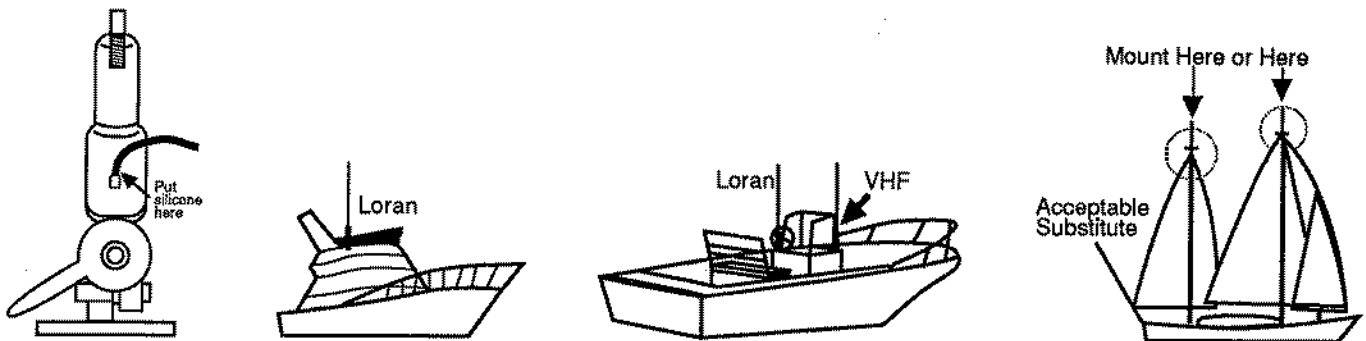
LORAN COUPLER

IMPULSE RECOMMENDS YOU USE A STANDARD 3/8", 24 THREAD, 8' FIBERGLASS LORAN ANTENNA. WE DO NOT RECOMMEND THE USE OF STAINLESS STEEL "WHIP" ANTENNAS DUE TO THE EXCESSIVE MOVEMENT OF THE WHIP WHICH CAN BREAK THE COUPLER AND CAN BE DANGEROUS TO THE USER. IMPULSE DOES NOT RECOMMEND THE USE OF "COMBINATION VHF/LORAN C" ANTENNAS DUE TO THE EXCESSIVE MASS OF MATERIAL IN THIS KIND OF ANTENNA WHICH COULD CAUSE THE COUPLER HOUSING TO BREAK.

THE COUPLER SHOULD BE A MINIMUM OF 3 FEET FROM THE INSTRUMENT HOUSING. Mount the coupler and antenna as high and as far away from other antennas as possible. If there is more than one possible location, evaluate each by operating the receiver with the antenna temporarily installed, tape the coupler in place to test and observe the signal quality.

On sailboats, the preferred location is at the top of the mast. However, transom mounting with either rail mount or antenna extension to raise the coupler above lifelines or rigging may be an acceptable substitute.

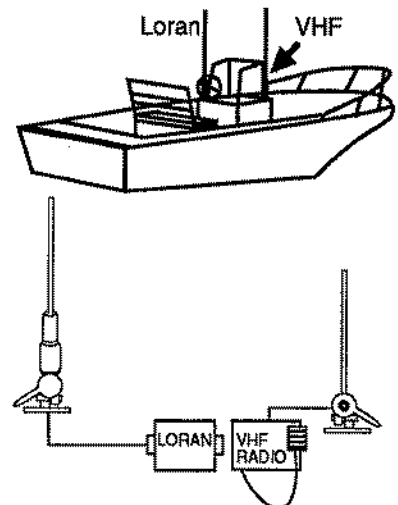
DO NOT USE LOCKTITE OR ANY OTHER PETROLEUM BASED PRODUCT TO SECURE THE ANTENNA TO THE THREADED PORTION OF THE COUPLER AS THIS WILL DESTROY THE COUPLER AND CAUSE DAMAGE TO THE PRINTED CIRCUIT BOARD INSIDE.



PERMANENTLY MOUNTING THE COUPLER AND ANTENNA

Mount the antenna vertically. The most common and most serious interference is that caused by direct inductive coupling between a radiating antenna, for example a VHF antenna or a Side Band antenna and the LORAN receiving antenna. This coupling is directly related to the space between the two antennas. If you have only one possible location for the LORAN antenna and are experiencing adjacent antenna interference, a limited degree of tilting of the LORAN antenna (never exceed 45°) may improve the performance.

1. Install the Ratchet Mount in the appropriate location as determined above.
2. Hand tighten the Coupler onto the ratchet mount.
3. Screw the antenna onto the coupler tightly.
 - Do not use Locktite® or petroleum based products to tighten.
 - Do not use lock washers.
4. Allow enough slack in the cable so that it does not put stress on the cable going to the Printed Circuit Board inside of the coupler when the coupler is laid down and then raised upright.
5. Use either a clear or a white silicone sealer to seal the area where the cable exits the coupler housing to insure that moisture and/or water does not enter the housing.



After the coupler and the ratchet mount are in place, route the cable in as direct a path as possible to the instrument housing.

ROUTING OF ANTENNA CABLE

DO NOT cross cables as this may cause a noise interference to enter into your system and will require re-routing of the cables in order to correct the problem.

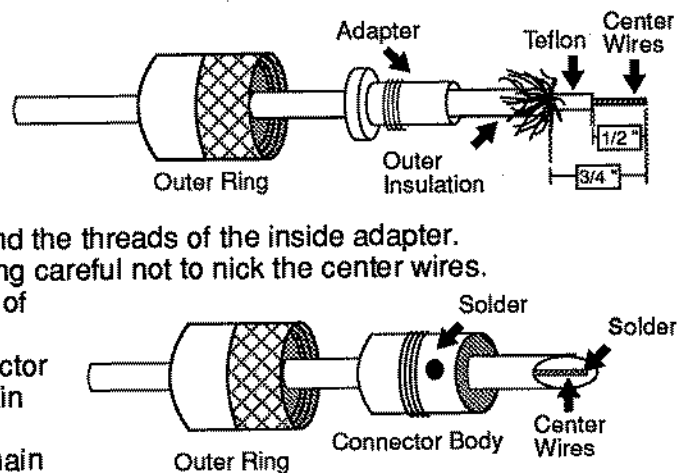
COUPLER

No grounding of the coupler is required because it is powered and grounded through the cable connecting it to the receiver. The coupler cable and connector have been tested at the factory as a complete system. It is recommended that it be left intact for preliminary testing of the installation location. Once you have determined the optimum location, there are two ways you can handle the connector:

1. Route the cable with the connector intact OR
2. Remove the connector, route the cable without the connector, cut off all unwanted cable, and then re-solder the connector. (Use Rosin Core solder only; do not use Acid Core solder). If you have a PL-259 *three-piece* connector, be sure it is re-soldered properly according to the following guidelines:

RE-SOLDERING THE PL-259 CONNECTOR

1. Slide outer ring of PL-259 over the cable.
2. Slide inside adapter over cable.
3. Cut off 3/4" of insulation, taking care not to nick any internal wires.
4. Fan out the shield (braid) wires and fold them over the inside adapter. Trim off any excess shield wires that extend beyond the threads of the inside adapter.
5. Cut off 1/2" of center insulation teflon, being careful not to nick the center wires.
6. Carefully thread the main connector body of the PL-259 connector on to the prepared cable end, ensuring that the center conductor wire exits the center pin (barrel) of the main body.
7. Grasp the inside adapter and screw the main body securely to the adapter.
8. Using a 100-140 watt **Soldering Gun**, solder the shield through the side hole and the center conductor wire through the barrel of the main body. Use Rosin Core solder only; do not use Acid Core solder. Do not overheat the connector or you will melt the insulator inside the plug around the center pin and/or the pin itself. This will more than likely result in a message of "Coupler Short" if the connector is overheated.
9. Trim off excess center conductor wire.
10. Thread outer ring (shell) back over the connector to complete the assembly.



ANTENNA

The antenna is to be screwed into the top of the coupler and tightened securely. Route the cable to the location you have selected for the installation of the receiver. After you have checked the TD Status screen and are sure the signals can "lock" in, you may shorten or lengthen the cable as needed, and then permanently re-solder the Antenna Connector. DO NOT USE THE COMMONLY SUPPLIED LOCK WASHER, as this may cause physical damage to the housing.

RECEIVER GROUNDING

To determine if grounding is advantageous, refer to the TD STATUS screen by watching the bar graph on signal quality increase or decrease. Check for correct voltage and polarity before external grounding this system. Proper grounding of the receiver may improve the performance of your system. You can test the system without a ground to see if acceptable operation is achieved by temporarily attaching a wire to the ground stud on the back of the LORAN and connecting the other end to the vessel ground, i.e. engine block, to determine if grounding is advantageous.

Use a ground strap or heavy gauge wire with the shortest run possible. Route the wire/strap in the most direct run from the back of the receiver to the boat's ground and connect it securely.

Metal hulled vessels - ground strap must be as short as possible.

Wood or Fiberglass hulls, ground strap must be on the engine block or on a common Through-the-Hull tie point (i.e. Dyna Plate) should be used.

KEYPAD

To thoroughly understand the operation of your new instrument, this section simply details the function of each of the keys. The keys are discussed in order starting with the OFF key. Functions associated with each key are detailed in subsequent sections of the manual.



"OFF" KEY:

PRESS AND HOLD this key for 5 full seconds to turn this system OFF.

"ON/LAMP" KEY:

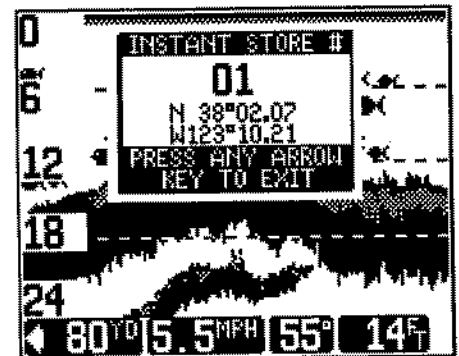
Press ON key to turn your unit on. It will quickly sound "BEEP" to acknowledge that it is receiving power.

Press it again to turn the EL back light ON or OFF as needed.

"INSTANT STORE" KEY:

The 2831/3001 offers two methods of storing a waypoint, by using the Instant Store key or through the Waypoint Planning Screen.

When the Instant Store key is pressed, it will immediately store the waypoint in the next available waypoint position in the Library. The unit maintains an internal pointer to one of the twenty Permanent Memory locations numbered 01 through 20. Each time you store a waypoint into the suggested waypoint position, the pointer is automatically moved to the next higher numbered location. When the pointer reaches location #20, it returns to 01. Thus, the first twenty locations act as a "rolling memory" with the Instant Store key. If you choose to use the Instant Store locations selected by the unit, be aware that previously stored waypoints will be erased, so use caution. In any case, you may always override the selected waypoint location by entering your own two-digit location between 01 and 80 when it appears in the Instant Store window.



1. By pressing this key from any screen or mode (with some exceptions described below), your present position is "frozen" into a temporary holding memory. A pop-up message will appear in

the center of the display. In the figure above, the 2831/3001 is suggesting that you store your present position in Permanent Memory location 01. The coordinates in latitude/longitude or TD's (depending on your selection in the Loran Setup menu) will also be displayed. This will allow you to enter the waypoint in your written log book for future reference and safe keeping.

2. If the unit's selection of location 01 is a satisfactory choice, press any arrow key. The data will then be written into Permanent Memory, erasing any previous waypoint stored in that location. If you decide you want to store your position into a different Permanent Memory location than the one selected by the unit, you may enter the two-digit location (from 01 to 80) before pressing the arrow key.
3. You may easily Instant Store your harbor or launching location as the "HOME" waypoint by pressing Instant Store, "8", "0", and an arrow key.
4. All waypoints in Permanent Memory within the selected plotter range, including those saved using Instant Store, will be displayed on the Plotter Screen (see section on Plotter Screen).
5. You may view, change, assign graphic symbols to, and erase waypoints in Permanent Memory by selecting "Waypoint Planning" from the main menu (see section on Waypoint Planning).

There are some important things to remember about the Instant Store function:

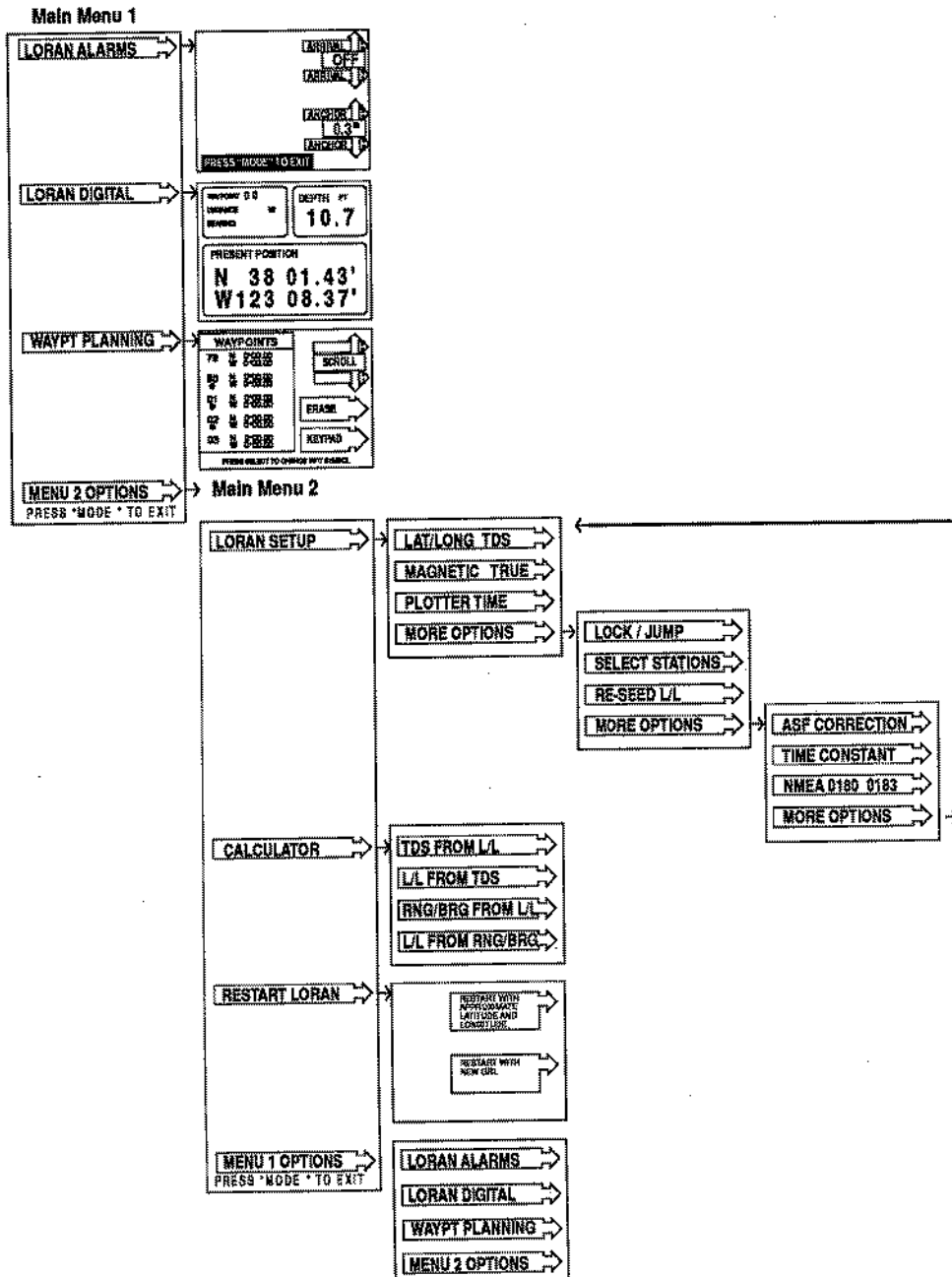
- 1) If you accidentally press the Instant Store key, and wish to exit without saving your position in Permanent Memory, enter "00" and press an arrow key.
- 2) The Instant Store function is disabled in the following situations:
 - If one or more of the stations selected for use are not in "locked" status, or if for any other reason the unit cannot determine your latitude/longitude, the Instant Store key will not work (see section on Signal/Status Screen).
 - Some screens and modes require the use of numeric keypad functions; in this case, the Instant Store key acts as the "1" key, and the Instant Store function is temporarily disabled.
 - If another pop-up message such as an alarm indication or "Please Wait" is already being displayed, you must either acknowledge the message or wait for it to disappear (whichever the case may be) before using the Instant Store key.
- 3) Be certain you remember to press an arrow key after selecting Instant Store. While the Instant Store pop-up message appears on the display, any alarms that have been set are temporarily disabled, so you should promptly exit the Instant Store screen to re-enable all Loran activity.
- 4) If you tell the unit to Instant Store your present position to the waypoint location occupied by your current GO TO destination, the unit will disable the GO TO function before storing the waypoint, and a pop-up message will appear to alert you that this occurred: "GO TO WPT CHANGED - GO TO DISABLED"
- 5) In the Model 2831, the Instant Store function operates fully in the fish finder world, as well as in the Loran world.

"SELECT" KEY:

The SELECT KEY is frequently used to access menus. Generally you are able to leave a menu screen by depressing the MODE KEY. In addition to the primary operating modes described in the previous sections, the 2831/3001 has a number of powerful secondary functions which may be accessed through a simple menu system.

All of the menus in the 2831/3001 offer between two and four selections. The bottom selection is usually "MORE OPTIONS". Pressing the arrow key next to MORE OPTIONS will cause the next menu in the sequence to appear.

PRESS "SELECT" FROM A PRIMARY LORAN SCREEN TO ENTER MENU.



PRESS "MODE" TO EXIT.

You will then return to the primary operating screen you were using before pressing the SELECT key.

"GO TO" KEY:

The 2831/3001 has many powerful functions that assist you in travelling to your destination. All the features of the Plotter Screen, the CDI Screen, and the Navigation Screen are designed to help you quickly and easily navigate to your destination. The GO TO key is the means by which you select a destination waypoint to GO TO.

To use the GO TO key, you must have previously stored your destination in one of the eighty waypoint locations (01 through 80) in Permanent Memory. You may have done this in one of two ways:

- 1) If you pressed the Instant Store key while at this location earlier in the day or on a previous day, thereby automatically saving the waypoint in Permanent Memory.
- 2) If you entered the coordinates of the waypoint manually in latitude/longitude or TD's from the Waypoint Planning screen. These coordinates are available from local charts, or you may have entered the coordinates measured by your friend's Loran. Before selecting the GO TO function, all stations selected for navigation must have already achieved a Search Status of "LOCK". Until the stations are in the Lock Status, pressing the GO TO key will have no effect. The instrument must already be in either the Plotter Screen or the CDI Screen. Then, press the GO TO key.

ENTERING A GO TO WAYPOINT

In the lower left corner of the display is the location in Permanent Memory that the unit "suggests" as a destination waypoint. If this location is in fact your desired destination, press the arrow key marked ENTER. This will establish the suggested waypoint as your destination.

When you have entered a GO TO waypoint, your present position is not shown. If you wish to navigate to a different waypoint than the one suggested, use the numeric keypad to enter the two digit location from 01 to 80 before pressing the ENTER key. If you make a mistake in entering the two-digit destination, you may correct it before pressing ENTER either by simply re-entering the digits (only the most recently pressed two digits are remembered), or if you prefer, press the CLEAR key before re-entering the digits.

GO TO "HOME"

If you wish to navigate to your HOME waypoint (location 80), one way to enter this is by pressing GO TO, "8", "0", ENTER. However, there is an easier way to select HOME as a destination, simply press GO TO, and then press the arrow key marked HOME.

The GO TO function may be disabled by selecting "00" as the destination waypoint. Or, you may press GO TO, CLEAR, and then ENTER. This will inhibit the computation and display of all information related to a destination.

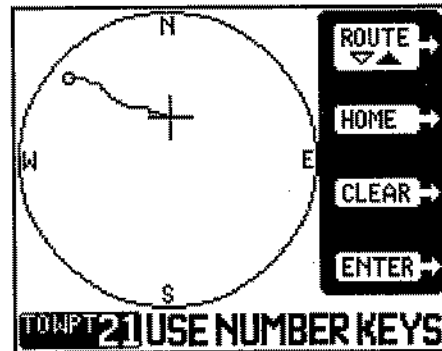
When using the GO TO function, it is important to keep in mind that the ability of the 2831/3001 to help navigate your boat to a destination is dependent on the accuracy of the data it uses to compute your intended course. This means that the following is assumed:

- 1) The unit is locked on the correct cycle for each of the three stations selected for navigation, when initially storing your destination waypoint, as well as when navigating to it. You should verify your TD's with a local chart overprinted with Loran-C lines-of-position (LOP's).
- 2) You are using the same stations when navigating to your destination as you used when you stored its coordinates.
- 3) The unit is computing the correct latitude/longitude (i.e. the internal coordinate converter does not need to be re-seeded).
- 4) If you use ASF corrections, the ASF values you used when originally storing the destination are the same as the values you are using when navigating to it. If you obtain the position of your destination from a friend's Loran, be sure to get his ASF corrections, if he is using them, and enter them into your 2831/3001 before attempting to navigate there.

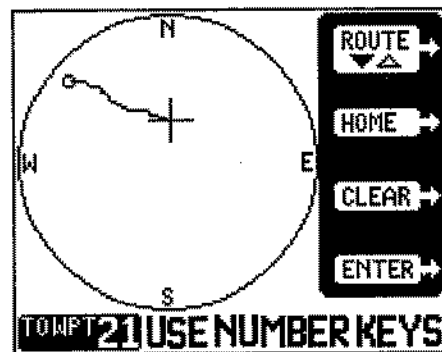
GO TO "ROUTE" FUNCTIONS

The 2831/3001 will allow you to easily navigate along a route, or numerical sequence of waypoints. One application of this would be to follow the channels that direct you in and out of your harbor.

1. To use your 2831/3001 for route sequencing, first establish the route in Permanent Memory by storing the key waypoints along the route in sequentially numbered locations. You may do this using the Instant Store function, or from the Waypoint Planning screen. For example, navigating along waypoints 21, 22, 23, 24, and 25 in sequence from your harbor may direct you to the main channel.
2. When you press the GO TO key to select the first waypoint in the route that you wish to navigate to, enter "21" (in this example) and then press ENTER. When you have navigated to location 21, press GO TO a second time. If the symbol next to the ROUTE arrow key looks like the figure on the right the unit will automatically increment the suggested destination waypoint to 22. Simply press ENTER, and the unit will establish waypoint 22 as the next destination waypoint. Continue in this manner, pressing GO TO, ENTER each time you reach a new leg in your route.



3. When you want to travel back along your route in reverse, for example to return from the main channel back to your harbor, do the following: Press GO TO, and then after entering the first waypoint to navigate to (in this case waypoint 25), press the arrow key marked ROUTE. The adjacent symbol will change and look like the figure of the right. This will cause the 2831/3001 to decrement the waypoints along the sequence, allowing you to navigate through your route in reverse order. In this example, pressing GO TO, ENTER for each leg of your route travelled in reverse will cause the unit to select the destination waypoints in the order 25, 24, 23, 22, and 21.



GO TO FUNCTION USED FOR AUTOPILOT SEQUENCING

If you have an autopilot interfaced to the NMEA 0180 port on the rear of the 2831/3001, you can allow it to assist in steering your boat to your destination. The 2831/3001 outputs encoded CDI data to the autopilot interface when you have established a destination waypoint using the GO TO function.

(Refer to the section on Autopilot Wiring, and the description of the CDI Screen for further information on these functions.) By using the GO TO and ROUTE functions described above in conjunction with your autopilot, the 2831/3001 will periodically send steering data for your destination to your autopilot.

We cannot emphasize too strongly the importance of not relying solely on one navigation system to the extent of endangering life or property. If you do use your 2831/3001 for autopilot control, careful monitoring by an experienced navigator is essential.

"FISH/LORAN" KEY:

The 2831 is really two distinct instruments in one housing. It is a full featured Fish Finder and a plotting Loran C navigational Instrument. Both instruments operate simultaneously. At any one time, though, the display is showing either the Fish Finder World or the Loran World. When you first turn the instrument on, it comes up in the fish finder world.

You may switch between the two instruments at any time by pressing the FISH/LORAN key. When in the fish finder world, Loran signals are still being tracked and plotted. When in the Loran world, depth, log, and temperature graph readings are still fully functional. The fish finder, however, does not update the graphic fishing screen when in the Loran world. Loran alarms (anchor or arrival) are still active in the fish finder world, as is the shallow water alarm in the Loran world.

The FISH/LORAN key has three primary operating screens and many more secondary screen modes. These three primary modes are:

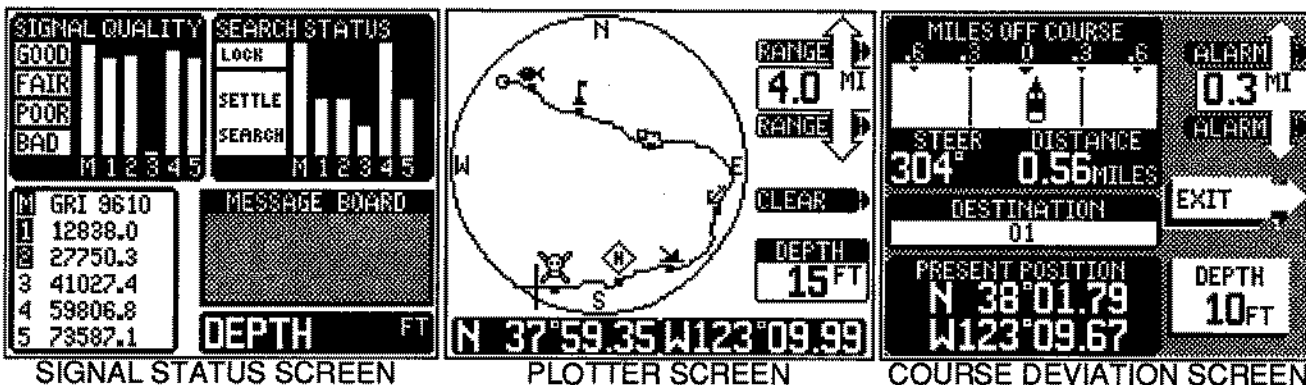
1. FULL FISH FINDER SCREEN
2. FULL LORAN SCREENS (the last one you used will appear)
3. SPLIT SCREEN with Fish Finder and Loran Plotter.

Pressing the FISH/LORAN key repeatedly rotates the screens from the Full Fish Finder screen, to the last one of the three Loran screens you chose, Split Screen displaying one half of the fish finder and one half of the Plotter screen, and then back to the full fish finder screen, etc.

If you have a favorite screen in the fish finder world such as the Digital Screen, the unit will remember this screen when you press FISH/LORAN to switch to the Loran world. A second press of FISH/LORAN will return you to the screen you were using in the fish finding world. Likewise, the last screen you were using in the Loran world is remembered in the fish finder world. This, however, is true only for the Primary Operating modes. Menus and secondary functions will not be remembered.

"MODE" KEY:

Used to enter the Simulator and to exit or leave a screen. The 2831/3001 has three primary Loran screens which are accessed by pressing the MODE key. These three primary modes are:



Pressing the MODE key repeatedly rotates the screens from the Signal Status to the Plotter, to the Course Deviation Screen and then back to the Signal Status, etc. On certain screens, the numeric keypads labeled 1, 2, 3, 4, 5, 6, 7, 8, 9, 0 are enabled to allow you to enter various numeric waypoint coordinates. Since the MODE key is shared by the 5 key on the 2831 and the 4 key on the 3001, an alternate exit key is provided with the instruction: Press an arrow key to "QUIT" or "EXIT".

In the 2831 when the user is in the Fish Finding mode, the MODE KEY serves to exit from Menus and functions. To access menus in the Fish Finder, use the SELECT key instead of the MODE KEY.

KEYPAD NUMBER KEYS:

The bottom row of keys is used to enter waypoint numbers these are shared with the function keys.



SIMULATOR

The simulator is designed to help dealers demonstrate the IMPULSE 2831/3001 and for the user to become familiar with the functions of the product before putting it into actual usage. It is important to know that any of the entries, changes, or set up operations made while you are in the Simulator Mode are not held in permanent memory and will be erased when you turn the unit OFF. Although the simulator allows you to operate the majority of features on the 2831/3001, it does not cover every function in its entirety.

TO ENTER THE SIMULATOR, IMMEDIATELY AFTER TURNING THE UNIT ON WITH THE ON/LAMP KEY, PRESS THE MODE KEY WHILE THE INTRODUCTORY SCREEN IS DISPLAYED.

WARNING: MAKE SURE YOU DO NOT USE THE SIMULATOR IN "REAL WORLD CONDITIONS" AND RELY UPON ITS INFORMATION. IT IS FOR DEMONSTRATION AND EDUCATIONAL PURPOSES ONLY.

In the simulator mode, a simulated course is traversed so you can view the operation of the Plotter display, the Signal Status display, and the Course Deviation display. (The fish finder functions are also simulated for the 2831 owners.)

The following functions are not supported in the simulator Mode.

- Numeric displays such as TDs, distance, bearing, speed, depth, etc. will appear in their respective display locations, but the numbers will have no useful meaning.
- You may enter waypoints using INSTANT STORE or from the WAYPOINT PLANNING Screen, but they will be forgotten when the unit is turned off. Any waypoints that may be stored in Permanent Memory will not be displayed in the Simulator Mode, nor can they be changed.
- Most LORAN SETUP functions will not produce the intended results. For example, you may not JUMP or LOCK a station in the Simulator mode. ASF corrections may not be entered. Selected Stations may not be changed. Loran alarms do not activate. You may try these various functions on these screens, but the desired results will probably not occur.
- A GRI of 9940 is used in the Simulator Mode. Restarting the unit with a new position or GRI will not change the GRI of the simulator.
- The Calculator functions will produce nonsense results in the Simulator Mode.
- We recommend the use of the Simulator to dealers for demonstration purposes. New users when first becoming familiar with the unit can operate many of the functions without actually installing the coupler and an antenna.

TO EXIT THE SIMULATOR, TURN THE INSTRUMENT OFF BY USING THE "OFF" KEY.

FIRST START

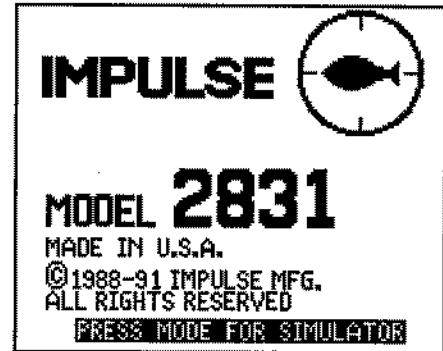
If your LORAN has never been started, you will need to follow these steps. The preferred way to FIRST START your LORAN is by entering your latitude and longitude.

NOTE: It is assumed that the coupler with the antenna has been attached to the instrument.

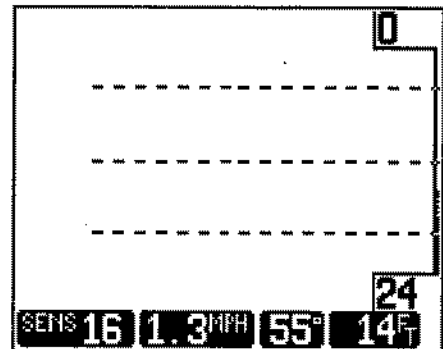
1. PRESS "ON/LAMP" key and you will immediately hear "BEEP". If the unit beeps, but no display appears, adjust the Contrast Control on the rear panel to darken the image.

WAIT 5 SECONDS for the unit to "BEEP, BEEP".

FOR FIRST START PURPOSES, YOU DO NOT WANT TO PRESS THE MODE KEY.

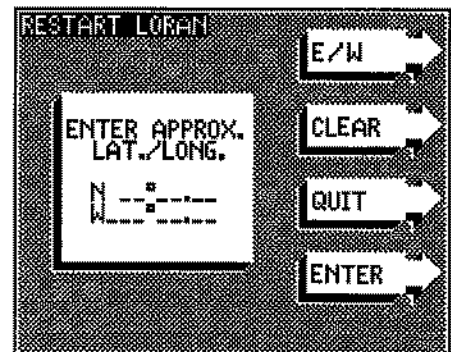


If you have a 2831, the Fishing Screen will appear. You will need to switch to the Loran world by pressing the FISH/LORAN key.



If you have a 3001, the first time you use your LORAN, the RESTART LORAN SCREEN appears after the "BEEP, BEEP", asking you to enter your approximate latitude/longitude.

2. Using the numbers located on the keys at the bottom of the keypad, enter your approximate lat/long to within +/- 1 degree.
 - Enter leading ZEROES if the longitude is less than three digits. For example, if the longitude is 85 41 12, you must enter 085 41 12.
 - Press the Arrow next to The E/W arrow if you need to change to East longitude.
3. When you have entered the correct latitude/longitude, press the fourth arrow key which is labelled "ENTER".



If this screen does not appear, but the TD STATUS screen appears instead, the unit is attempting to perform an AUTOMATIC RESTART using a restart location previously stored in Permanent Memory. If it is searching within your LORAN chain (GRI), it may acquire signals correctly. If not, the Message Board may say "LOOKING FOR SIGNAL" or "PLEASE RESTART LORAN". In this case, you may wish to restart your LORAN manually or to erase PERMANENT MEMORY to restore it to its factory condition before proceeding.

After properly starting or restarting your LORAN with your approximate Present Position, the TD STATUS screen should appear, showing the LORAN automatically searching, selecting, and locking on the available signals. This process will generally take between 4 and 7 minutes, depending on signal strength and relative interference. When the unit has achieved LOCK status on the 3 stations selected for use, it will begin computing all navigation functions including your latitude/longitude (TD's).

The 2831/3001 will use this information to determine the most appropriate GRI to use and the most appropriate stations to use, before attempting to search for signals. After this initialization procedure is performed, the unit will remember the entered information in Permanent Memory, and will automatically perform the initialization each time the unit is turned on.

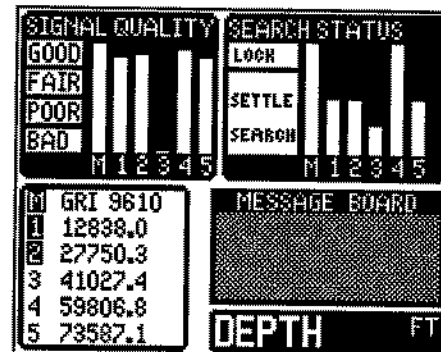
There are some circumstances where you may wish to re-initialize the receiver with a new starting position, or with a new GRI. These circumstances include:

- You have moved the 2831/3001 more than 50 miles with the power off.
- The Message Board on the Signal/Status Screen says "PLEASE RESTART LORAN."
- The Message Board recommends you use a different GRI than the one you are presently using.

To re-initialize your 2831/3001, select RESTART LORAN from Main Menu 2 and refer to the OPERATIONS section of this manual entitled RESTART LORAN.

SIGNAL/STATUS SCREEN

The Signal/Status screen displays the status of all LORAN signals being received, error conditions and warnings on the Message Board, and (on the 2831) the depth of the water. The various functions are as follows:



SEARCH STATUS

The Search Status block shows the progress of searching, settling, and tracking of each signal being received from the Master and available Secondary transmitters in the present chain (GRI). For each station, a bar graph indicates whether the receiver is in "SEARCH", "SETTLE", or "LOCK". The meanings of these terms are as follows:

SEARCH: When the LORAN is in SEARCH for a particular station, it does not yet see the signal for that station, and is systematically sweeping the band to acquire it. This process is also referred to as "Acquisition." If the LORAN is in SEARCH mode for ALL available stations, the Message Board will read "Looking for Signal".

SETTLE: Once a signal has been acquired in the SEARCH mode, the LORAN will proceed to identify the correct cycle of the received signal for tracking. This process will include distinguishing a groundwave signal from a skywave signal, aligning phase codes of signals, and selecting the appropriate cycle. If you observe the TD's block while a secondary station is "settling", you will notice the TD for that station occasionally changes by multiples of 10 microseconds. Each 10 microsecond change is equivalent to a jump of one cycle. Therefore, this process is also referred to as "Cycle Selection". The Settling process typically takes about 4 to 7 minutes. A weak station may cause the unit to take longer in selecting the correct cycle.

LOCK: When the internal microprocessor is satisfied that the correct cycle has been established for a given station, the Search Status for that station will jump from "SETTLE" to "LOCK". When the three stations selected for navigation (see Station Selection) have all "locked", the unit is ready to compute your position and all other navigation information.

A very weak or distant signal may cause the Search Status for that station to switch from "LOCK" to "SETTLE" or even down to "SEARCH". If the unit is indecisive about using a given cycle, you should use a different station, if possible (see Station Selection), or sometimes manually locking the cycle will help (see LOCK/JUMP).

You should ALWAYS check the TD's against a local chart after the stations become "Locked" to verify that the correct cycle has in fact been established, and periodically thereafter. An incorrectly selected cycle will cause large errors in the unit's ability to establish your position.

SIGNAL QUALITY

The Signal Quality block shows in bar graph format the relative strength of signals received from the Master and available Secondary transmitters. This bar graph is similar to a SNR (Signal-to-Noise Ratio) meter, and so the presence or absence of local in-band interference (either on-board or off-board) will cause these levels to decrease and increase dynamically. Generally, distant stations will have a lower Signal Quality, and nearby stations (or stations with more powerful transmitters) will have a higher Signal Quality. As long as the unit is able to track a station (i.e. its Search Status is in LOCK) it is relatively unimportant if its Signal Quality is POOR. However, as interference levels increase, the stations with POOR or BAD Signal Qualities will be the first to slip a cycle or become lost entirely. (Refer to "Troubleshooting Guidelines" for help on improving Signal Qualities.)

While the unit has a Search Status of "Settle" for a given station, the Signal Quality for that station will alternately rise and fall each time a new cycle is selected. This is normal behavior. Once the correct cycle has been selected and the Search Status goes to "Lock", the Signal Quality will stabilize. If a

station has a "locked" Search Status, but exhibits a Signal Quality that is "really bad", i.e. the bar graph is only one or two pixels high, the unit is in danger of losing its "lock" for that station.

TD's

This block displays the selected GRI (Group Repetition Interval) for the Master, and the measured Time Differences (TDs) for the received Secondaries, as well as other pertinent information. (See the section entitled "Defining the System" for an explanation of how Time Differences work.). The three stations selected for navigation will be highlighted with inverse characters within this block (see Station Selection). In addition, a station which has been manually cycle locked in the LOCK/JUMP screen will display an "L" to the right of its TD in this block.

"BLINK" condition:

When a transmitter station detects an abnormality in the chain (i.e. a station is out of tolerance, so accuracy of the system is in question), it will begin transmitting a special signal which is received by your LORAN receiver. This special signal is referred to as a "blink condition". If the 2831/3001 LORAN receives a blink condition from any of the stations, the TD block on the Signal/Status screen will alternate the message "BLINK" with the TD for that station. If a station is in blink condition, you should not use that station for navigation.

THE MESSAGE BOARD

The Message Board will give a variety of warnings and error conditions.

"PLEASE RESTART LORAN". This message will occur if the unit has no information with which to automatically restart the LORAN. In this case, you must manually restart it. See the instructions entitled "Restart Loran".

"COUPLER SHORT". The coaxial cable or the connector from the Antenna Coupler Unit is shorted. Find and repair the short.

"LOOKING FOR SIGNAL". This message will appear if the unit is in SEARCH mode for all stations. Possible reasons include:

- 1) The Antenna Coupler Unit is improperly installed or connected (perhaps a loose connector or cable has become detached from the coupler due to excessive strain).
- 2) The unit was restarted with the wrong position or GRI.
- 3) The antenna is picking up extreme interference, which is masking out all signals.
- 4) The unit is out of calibration.

"RECOMMEND STATIONS _____". This message indicates that the stations selected for navigation may not be optimum for your area. Possible reasons include:

- 1) You have navigated too far away from one of the selected stations, thus making a closer station more appropriate for an accurate fix.
- 2) You are in the vicinity of a baseline extension, which means that there is a risk of extremely large errors in position.

When a "RECOMMEND STATIONS" message appears, you should ascertain from your charts and the other information on the Signal/Status display whether it is appropriate to switch to the stations recommended. If you wish to switch to the recommended stations, see the section entitled "Select Stations".

"RECOMMEND GRI _____". In most areas, there is only one chain (GRI) of LORAN stations available for reception. However, some of the chains overlap territories, so in some areas, you have a choice of chains. The "RECOMMEND GRI" message will appear when you have navigated from the area serviced by your present chain to a new area serviced by the recommended chain. If you wish to switch to the recommended GRI, you must restart the LORAN. See the section entitled "GRI Restart".

"CAN'T COMPUTE LAT/LONG". This message may appear for one of the following reasons:

- 1) You are in an area where the gradients and/or crossing angles of the signals are extreme, so it is impossible for the coordinate conversion programming of the unit to compute a latitude/longitude with the presently selected stations. For example, if you are within about 20 miles of one of the stations selected for navigation, or if you are in a baseline extension area.
- 2) There are at least two latitude/longitude pairs which can correspond to a given TD pair. You may be in a conversion area which has caused the unit to select the wrong lat/long pair to compute.
- 3) If you performed a GRI restart, the coordinate converter may need to be re-seeded.
You may correct the problem in one of the following ways:
 - 1) Changing the selected stations, if possible, will sometimes correct this problem. See "Select Stations".
 - 2) Re-seeding the latitude/longitude coordinate converter may also correct this problem. See "Re-seed Lat/Long".

"CAUTION: OSC = ____". This message means the internal precision TCXO (Temperature Compensated Crystal Oscillator) oscillator may be out of calibration. The indicated numeric value is the measured degree of error in parts per hundred million. Generally, oscillator errors less than 380 are useable; however, exercise caution when this message is displayed. The message "caution osc" is generally not a problem. It is more a technical information message than a cause for concern. The only time we really need to watch out, is if the numbers stay above +400. Then there may be a possibility of a cycle jump or a 10 micro seconds error in position.

"LORAN INOP". If this message appears and remains on the Message Board, turn your 2831/3001 off and back on again. If the message is still showing try erasing the memory & re-initialize. If the message persists, the unit probably has an internal electronic problem. Return the unit to IMPULSE for repair.

PLOTTER SCREEN

The PLOTTER SCREEN is one of the most useful LORAN screens offered in your instrument. It graphically displays your position relative to your track, your present position, your intended course, your HOME and any stored Waypoints. The plot is always referenced to TRUE NORTH.

DIAMETER OF THE CIRCLE

The diameter of the circle shown on the screen can easily be increased or decreased by using the arrow keys located adjacent to the words labelled UP or DOWN. The smallest diameter range is .5 miles. Pressing the arrow pointing UP, adjusts the circle in the following increments:

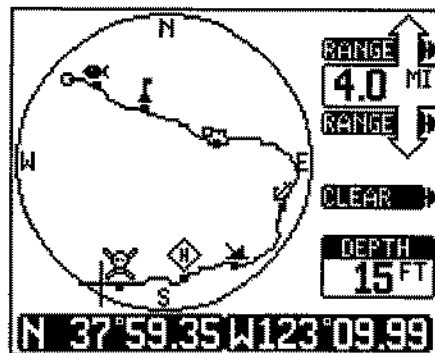
.5, 1 mile, 2 miles, 4 miles, 8 miles, 16 miles, 32 miles, 64 miles, 128 miles, 256 miles, 512 miles.

Pressing the second arrow key pointing DOWN, adjusts the plotter diameter circle smaller.

GRAPHIC SYMBOLS: There are many graphic symbols used on the PLOTTER screen to help you identify key positions. Symbols only show when circle is four miles or less.

"+" CURSOR: This is your present position. As you move, this cursor will follow your track. If the cursor reaches the edge of the plot display area, the plot will automatically shift to place the cursor in the center of the display region.

SMALL CIRCLE: This is the position you occupied when the unit first achieved "LOCK" status on the three stations selected for navigation. If you waited the few minutes in your harbor for this circle to appear at the beginning of the day, you will have a reference for the starting position of the day. This location is not remembered in permanent memory, and so it may be different from day to day.



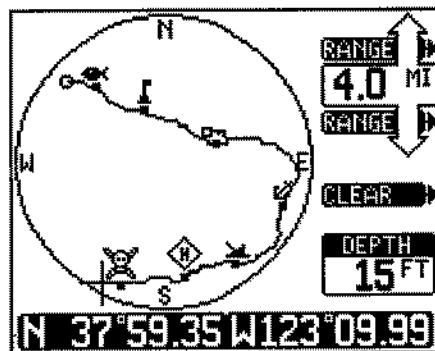
TRIANGLE: This is the position of the waypoint stored in location 80, which is also referred to as "Home." You may wish to store the position of your harbor or launching location in waypoint 80, which will then be uniquely represented on the plotter screen by this triangle. This position is remembered after power down in permanent memory until you change it, either through the Instant Store key, or through the Waypoint Planning screen. If you have selected waypoint 80 as your destination using the GO TO key, this triangle will be flashing.

SMALL SQUARE: The small square represents any waypoint stored in locations 01 through 79. These positions are remembered after power down in permanent memory until you change them, either through the "Store" function, or through the Waypoint Library screen. If you select one of waypoints 01 through 79 as your destination using the GO TO key, the small square corresponding to this waypoint will be flashing.

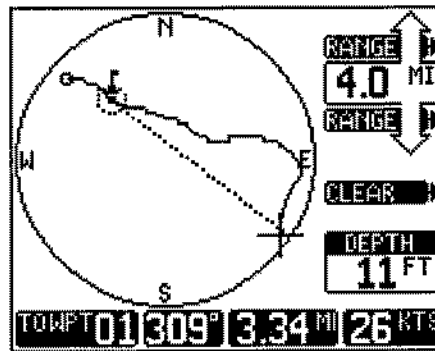
HEAVY LINE: The heavy black line represents your track, or where you have been. This track is stored in a temporary memory within the LORAN, and is erased when turning the unit off. The amount of temporary memory allocated to the track is finite (about 1000 locations), and so after a period of time the oldest track data are erased from memory. The line will not be erased from the display, however, until an event occurs which causes the plotter screen to be redrawn (e.g. changing modes, pressing a RANGE key, or movement of your boat which causes an automatic display shift). In order to conserve the track memory, when your boat is not moving (i.e. at anchor) the plot rate is automatically slowed down.

DOTTED LINE: The dotted line is the intended course of travel to your destination waypoint, which was selected when you pressed the GO TO key. See the section on GO TO key for a further description of this function.

DATA AT THE BOTTOM OF THE PLOTTER SCREEN



Present Position Information



GO TO waypoint selected

The line of data located at the bottom of the Plotter Screen displays pertinent navigational information. This line of data displays your present position on all screens except on the Digital Screen. When you do have a GO TO selected, however, this line will display the selected waypoint, bearing to this waypoint, distance, and boat speed. When any of the information is blinking on and off, it cannot be relied upon as correct data.

PRESENT POSITION: "LATITUDE/LONGITUDE" OR "TIME DELAYS" (TD'S)

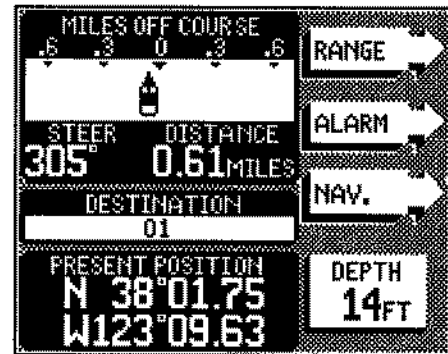
The information displayed in this location indicates your PRESENT POSITION. If you have selected a Waypoint "Go To" destination, the present position is replaced with the Go To waypoint number and the distance and bearing to that waypoint is shown.

DIGITAL DEPTH: "FEET" (2831 only)

The information displayed in this area of the screen provides a digital reference to the depth of the water.

COURSE DEVIATION SCREEN

The CDI screen is used when navigating to a destination selected with the GO TO key (see the section on GO TO key for further information). In addition to displaying your present position and range and bearing to your destination, this screen displays a graphic Course Deviation Indicator (CDI) in the form of a horizontally moving boat. (Course Deviation, or CDI, is sometimes also referred to as "Cross Track Error," or XTE.)



When you enable the GO TO function, an intended course is plotted to your destination. (This intended course is drawn on the Plotter Screen as a straight dotted line.) On the CDI screen, the moving boat indicates your position relative to this intended course. If you are on course, the boat will be centered on "0". If you have drifted to the right of your intended course, the boat will be shown to the right of center. In this case, you must steer to the left to get back on course.

The CDI scale is graduated in nautical miles, and may be changed as follows:

- 1) Press the arrow key marked "RANGE". This will cause the arrow key functions to change.
- 2) Press the UP and DOWN arrow keys to increase or decrease the CDI range as desired.
- 3) Press the arrow key marked "EXIT". This will cause the arrow keys to return to their original functions.

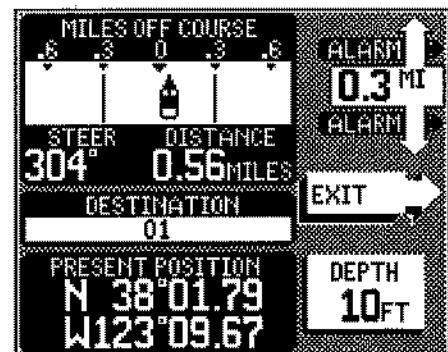
If your vessel moves farther off course than the selected range will allow, the displayed boat will remain on the edge of the CDI display. In this case, you must increase the range to view your actual Course Deviation. Note that the CDI indicator is only active when the GO TO function is enabled. If you have not selected a GO TO waypoint, the boat will not appear (see section on GO TO key).

Also note that the CDI indicator only makes sense when you are travelling FROM your start position TO your destination position. If you are traveling AWAY from your destination, or if you pass your destination, the CDI indicator will no longer provide useful information. (You may wish to set an Arrival Alarm to alert you when your destination has been reached - see section on Arrival Alarm.)

CDI ALARM

You may set a CDI boundary alarm to warn you when you travel too far off your intended course. To do this, perform the following steps:

- 1) Press the arrow key marked "ALARM". This will cause the arrow key functions to change.
- 2) Press the UP or DOWN arrow keys to increase or decrease the alarm range as desired. Notice the vertical bars that are drawn in the CDI display. These are the alarm boundary markers. If the displayed boat crosses one of these markers, an alarm will sound.
- 3) Press the arrow key marked "EXIT". This will cause the arrow keys to return to their original functions.



There are some important things to remember about the CDI alarm:

- The CDI alarm is active only in the Plotter Screen, the CDI Screen and the Navigation Screen. Changing to a different mode, will prevent the CDI alarm from sounding. The alarm setting will be retained, so when you return to the Plotter Screen the CDI Screen or the Navigation Screen the CDI alarm will still be activated.

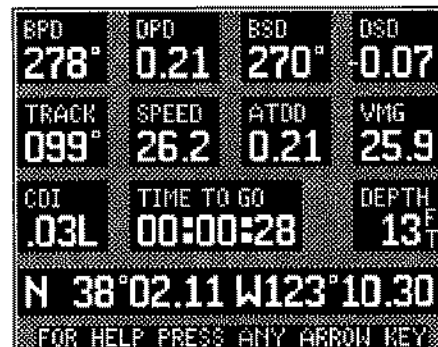
- On the 2831, the CDI alarm has a different sound than the depth alarm. The depth alarm (which is enabled from the Digital Screen in the fish finder world) has a rapid beep-beep-beep sound, while the CDI alarm has a noticeably slower beep rate. If both alarm conditions exist, the depth alarm will have precedence, so the beep rate will be faster.
- If any of the information on the CDI screen is flashing on and off, the numbers are in question and should not be relied upon. You should press MODE to select the SIGNAL/STATUS display to determine what the problem is.

NAVIGATION SCREEN

The Navigation Screen is accessed through the COURSE DEVIATION INDICATOR (CDI) Screen. It allows access to a wealth of advanced navigational data

1. To access the Navigation Screen from the CDI Screen, press the arrow key marked "NAV".
2. To exit the Navigation Screen, press the MODE key.

As with the CDI Screen, most of the functions on the Navigation Screen are active only when you have selected a GO TO waypoint. If you have not selected a destination with the GO TO function, most of the Information blocks on the Navigation Screen will remain empty.



The abbreviations and their meanings are as follows.

BPD - Bearing from Present Position to Destination.

The bearing from your present position to your destination is measured in degrees, relative to either True North or Magnetic North, depending on your selection in the Loran Setup menu. This is the same bearing as shown on the Plotter Screen, the CDI Screen, and the Loran Digital Screen. This value is updated continuously as you navigate.

DPD - Distance from Present Position to Destination

The distance from your present position to your destination is measured in nautical miles. This value is the same distance as shown on the Plotter Screen, the CDI Screen, and the Loran Digital Screen. This value is updated continuously as you navigate.

BSD - Bearing from Start to Destination

This is the bearing from your starting location (where you were when you pressed the GO TO key) to your destination waypoint. This value was computed when you pressed the GO TO key, and does not change as you navigate. This bearing is displayed in degrees, relative to either True North or Magnetic North, depending on your selection in the Loran Setup menu.

DSD - Distance from Start to Destination

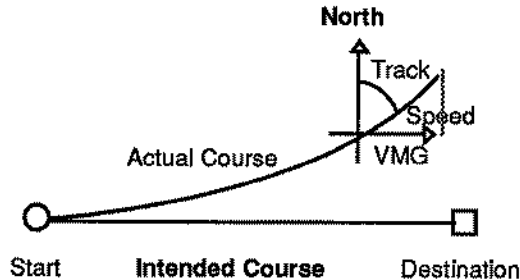
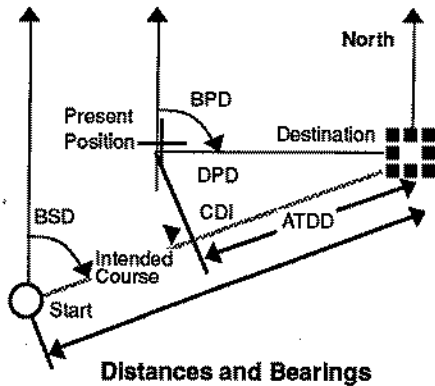
This is the distance from your starting location (where you were when you pressed the GO TO key) to your destination waypoint. This value was computed when you pressed the GO TO key, and does not change as you navigate. This distance is displayed in nautical miles.

CDI - Course Deviation Indicator

This is the distance from your present position along a perpendicular to your intended course of travel (see figure). The CDI is measured in nautical miles. Also indicated is whether you are to the right (R) or left (L) of your intended course. This is the same value that is used to derive the graphic CDI indicator on the CDI Screen. CDI is also sometimes referred to as Cross Track Error (XTE).

ATDD - Along Track Distance to Destination

This is the distance to your destination from the perpendicular drawn from your present position to your intended course of travel (see figure). Another way of looking at this value is that it is the distance that your vessel would be from your destination if your CDI was 0, i.e. if you were on course. The ATDD is measured in nautical miles.



TRACK-Your Track is measured in degrees with respect to either True North or Magnetic North, depending on your selection in the Loran Setup menu.

This value is the average direction your boat has been traveling. This value has a relatively long averaging time, and so is most accurate when you have been traveling in a straight line for several minutes. (You can increase or decrease the averaging time by changing the Time Constant option in the Loran Setup menus.) If you have been at anchor for a period of time, this value will have no useful meaning and will change erratically.

SPEED -This is the average speed of your boat and is measured in knots.

As with the Track, this value has a relatively long averaging time, and so is most accurate when you have been traveling in a straight line at a constant speed for several minutes. (You can increase or decrease the averaging time by changing the Time Constant option in the Loran Setup menus.)

TIME TO GO - This is the estimated time to go until you reach your destination, assuming the present speed of your vessel remains constant, and assuming you will follow a straight line course to your destination. The reading is in Hours : Minutes : Seconds.

VMG -Velocity Made Good. This is the component of your Speed vector that is parallel to your intended course of travel. The measurement is in knots.

HELP - From the Navigation Screen, you may press any arrow key to select a handy reference screen showing definitions of the above functions. Again press any arrow key to return to the Navigation Screen.

Press MODE to return to the CDI Screen.

If any of the information on the Navigation Screen is flashing on and off, the numbers are in question and should not be relied upon. You should press MODE twice to select the SIGNAL/STATUS display to ascertain what the problem is.

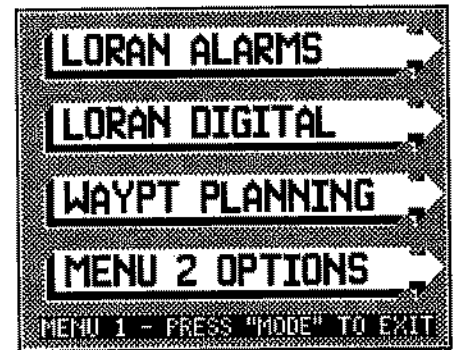
LORAN ALARMS

The 3001 and 2831 Lorans have three independently adjustable Loran alarms to alert you of various conditions - the Anchor Alarm, the Arrival Alarm and the CDI alarm. The CDI Alarm is enabled only on the CDI, Navigation and Plotter Screens. See the section on CDI Alarm for a description of this function. The other two alarms-Anchor Alarm and Arrival Alarm-are enabled by selecting the LORAN ALARMS option from Main Menu 1 shown above.

The 2831 has an adjustable Depth Alarm to alert you when the water becomes too shallow. (Refer to the Fish Finder section of the Owner's Manual to set the Depth Alarm.) Each of the Loran alarms are described below:

The first available option from Main Menu 1 is the LORAN ALARM.

1. To access this mode, press Select from one of the Primary Loran screens.
2. Press the first arrow key labelled LORAN ALARMS.
3. To leave the Loran Alarm Screen, press the MODE key.



ANCHOR ALARM

The Anchor Alarm is useful to alert you when your anchor has slipped, causing your boat to drift. An imaginary circle is established around your boat, with your original anchor position at its center. If the Loran detects that your boat has travelled outside this circle, the Anchor Alarm will sound. This circle is drawn on the Plotter Screen, except when its diameter is less than 8 pixels or greater than 1000 pixels. Even though the circle may not be drawn, the Anchor Alarm function will still be active.

1. To set an anchor alarm, first make sure your boat is not moving. (If you set an anchor alarm while underway, the alarm will sound almost immediately after enabling it.) Also make sure your unit has achieved Lock status on all stations used and is computing your correct position.
2. Selecting the LORAN ALARMS option from Main Menu 1.
3. Press the top arrow key to enable the Anchor Alarm. (If you had previously selected a waypoint this will be automatically disabled, and the message "GO TO DISABLED" will appear momentarily.) You may use the UP or DOWN arrow keys to set the anchor alarm in increments of a tenth of a nautical mile, with a range from 0.1 nm to 9.9 nm. This range refers to the radius (NOT the diameter) of the imaginary circle. If you wish to disable the Anchor Alarm, press both the UP and DOWN arrow keys simultaneously or the Down arrow key until it turns off.
4. After selecting the Anchor Alarm radius, press the MODE key to exit the Loran Alarms screen.



If you wish to reestablish the Anchor Alarm at this point, you must again invoke the LORAN ALARMS screen from Main Menu 1. If your boat travels outside the established circle, the alarm will start beeping, and a pop-up Loran Memo reading "ANCHOR DRIFT" will appear in the center of the display. To clear this message, press any of the four arrow keys. In addition to acknowledging the message and turning off the beeping, this will have the effect of automatically turning off the Anchor Alarm function. To remind you of this fact, another message, "ANCHOR ALARM DISABLED", will momentarily appear. This second message will disappear after a few seconds.

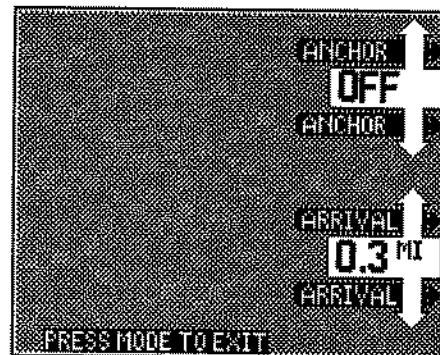
After setting an Anchor Alarm, it is active in all modes and at all times, with the following exceptions:

- 1) If the unit loses its lock on any of the selected stations, or cannot compute your present position, the Anchor Alarm will not sound.
- 2) If another pop-up message block is on the display when the Anchor Alarm condition occurs (for example, when entering an Instant Store waypoint), the Anchor Alarm will wait for the previous message to disappear before sounding.

ARRIVAL ALARM

The Arrival Alarm is used in conjunction with the GO TO function to alert you when you are in the vicinity of your destination waypoint. An imaginary circle is established, with your destination waypoint at its center. If the Loran detects that your boat has travelled into this circle, the Arrival Alarm will sound.

This circle is drawn on the Plotter Screen, except when its diameter is less than 8 pixels or greater than 1000 pixels. Even though in these circumstances the circle may not be drawn, the Arrival Alarm function will still be active. To use the Arrival Alarm, first make sure your unit has achieved Lock status on all stations used and is computing your correct position. In addition, you will need to establish a destination waypoint, using the GO TO function.



To enable the Arrival Alarm,

1. Press the SELECT key from one of the primary operating screens.
2. Select the LORAN ALARMS option from Main Menu 1.
3. Press the arrow key adjacent to the Arrival Alarm "up" indicator (the third arrow key down from the top). You may use the Arrival Alarm UP or DOWN arrow keys to set the Arrival Alarm in increments of a tenth of a nautical mile, with a range from 0.1 nm to 9.9 nm. (As with the Anchor Alarm, this range refers to the radius, not the diameter, of the imaginary circle.)

To disable the Arrival Alarm:

1. Press both the UP and DOWN arrow keys simultaneously or the Down arrow key until it turns off.
2. After selecting the desired Arrival Alarm radius, press the MODE key to exit the Loran Alarms screen.

If your boat travels within the established circle, the alarm will beep three times, and a pop-up Loran Memo reading "ARRIVED AT WPT" will appear in the center of the display. To clear this message, press any of the four arrow keys. This will disable the Arrival Alarm FOR THIS WAYPOINT ONLY. If you leave this destination and subsequently return, the Arrival Alarm will NOT sound again. However, if you press the GO TO key to establish a new waypoint as a destination, the Arrival Alarm will be automatically activated for the new destination waypoint.

After setting an Arrival Alarm, it will be active in all modes and at all times except:

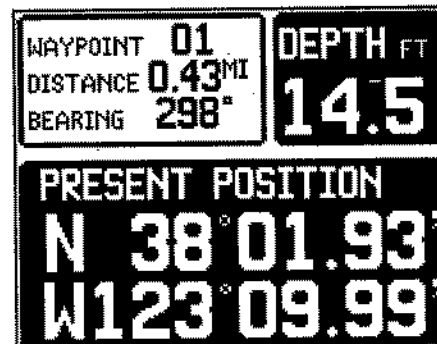
- 1) As stated above, after the Arrival Alarm has sounded once for a waypoint it will not sound again until you select a new destination waypoint using the GO TO function.
- 2) If the unit loses its lock on any of the selected stations, or otherwise cannot compute your present position, the Arrival Alarm will not sound.
- 3) If another pop-up message block is on the display when the Arrival Alarm condition occurs (for example, when entering an Instant Store waypoint), the Arrival Alarm will wait for the previous message to disappear before sounding.

LORAN DIGITAL SCREEN

The second available option from Main Menu 1 is the LORAN DIGITAL Screen.

1. To access this mode, press Select from one of the Primary Loran screens.
2. Press the arrow key labelled LORAN DIGITAL.
3. To leave the Loran Digital Screen, press the MODE key

The bottom of this screen shows, in large easy-to-read characters, your present position in latitude/longitude or TDs. If you select a destination waypoint using the GO TO key, the box in the upper left corner will display the destination waypoint number, the bearing from your present position to your destination (referenced to true north or magnetic north, see MAGNETIC-TRUE), and the range (distance) in nautical miles to your destination.



In the Model 2831, the box in the upper right corner shows the digital depth of the water. In the Model 3001, this box instead shows your average speed-over-ground in knots, and your track (the average direction you have been going) referenced to true north or magnetic north. Refer to the description of these functions in the section on the Navigation Screen.

If any information on this screen is flashing on and off, the numbers are in question and should not be relied upon. You should press the MODE key to select the SIGNAL/STATUS display to ascertain what the problem is.

The LORAN DIGITAL mode is treated similarly to the primary operating modes in that you may press the SELECT key from this mode to access the menu system. After leaving the menu system (by pressing the Mode key or another indicated exit key), operation will return to the Loran Digital Screen.

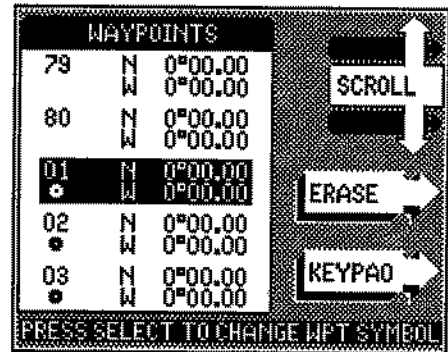
Pressing the MODE key from the Loran Digital Screen will cause the unit to exit to the Signal Status Screen.

WAYPOINT PLANNING SCREEN

The third available option from Main Menu 1 is the WAYPOINT PLANNING Screen.

1. To access this mode, press Select from one of the Primary Loran screens.
2. Press the arrow key labelled WAYPT PLANNING.
3. To leave the Waypoint Planning Screen, press the MODE key.

The 2831/3001 will store as many as eighty distinct waypoints in its Permanent Memory, numbered from 01 to 80. You can view, change, and erase waypoints in Permanent Memory by selecting "WAYPOINT PLANNING" from Main Menu 1. In addition, the Waypoint Planning Screen will allow you to assign symbols to be associated with each waypoint for plotting on the Plotter Screen, if you desire.



On the left side of the Waypoint Planning Screen is a "window" revealing five consecutive waypoints in Permanent Memory. The waypoints are displayed in either latitude/longitude or TD's, depending on your selection in the Loran Setup. The waypoint currently selected for editing is the one highlighted in white characters on black background. You may scroll this window up or down by operating the two "SCROLL" arrow keys on the upper right corner of the unit. This will allow you to select and view any waypoint.

An alternative method for selecting a waypoint (particularly if you need to scroll through a large number of waypoints to reach your selection) is to press both UP and DOWN SCROLL arrow keys simultaneously. A pop-up window will appear, prompting you to enter the waypoint number of your selection. Enter the two-digit waypoint number, and then press any arrow key. The selected waypoint will immediately appear in the scrolling window.

Notice that waypoints 01 through 20 have a bullet "•" adjacent to each waypoint. This is to serve as a reminder that these are the waypoints used for the Instant Store rolling memory. Refer to the section on Instant Store for a description of these special waypoints.

Remember also that waypoint 80 is the special "Home" waypoint which is displayed as a triangle on the Plotter Screen (refer to the description of the Plotter Screen for further discussion of the Home waypoint).

ASSIGNING WAYPOINT SYMBOLS:

In addition, the Waypoint Planning Screen allows you to assign a graphic symbol to each waypoint. Each assigned symbol will be displayed on the Plotter Screen above its associated waypoint. The symbols and their meanings are as follows:

The following symbols will appear on the plotter screen when you are in the 4 mile or less range:



FISH - This symbol associated with a waypoint indicates a proven good fishing spot.



BUOY - Assign this symbol to the locations of buoys, or markers along a route.



KEY WAYPOINT - This symbol may be used to denote a "key" location, for example a critical junction on your route, or perhaps an important destination such as a friend's dock or a seaside restaurant.



ANCHOR - Assign this symbol to a known good anchorage location.



SHIPWRECK - This symbol marks the location of a sunken ship, for divers or fishermen.



HAZARD - You may assign this symbol to a waypoint indicating hazardous navigating conditions, such as shallow water, reefs, or perhaps to mark the position of an island that you don't want to run into in the fog.



DANGER - Assign this symbol to exceptionally hazardous zones, that you want to avoid at all costs.

1. To select a symbol to assign to a waypoint, scroll to the desired waypoint. Then, press the **SELECT** key until the symbol you desire appears between the waypoint number and its coordinates. The symbol will be stored in Permanent Memory when you either scroll to a different waypoint, or exit the Waypoint Planning Screen.
2. To remove a symbol, scroll to the desired waypoint, and press the **SELECT** key until no symbol appears.

ERASING WAYPOINTS:

To easily erase a waypoint from Permanent Memory, scroll to the waypoint you desire to delete, and press the arrow key marked ERASE. The waypoint will be instantly removed from Permanent Memory. If this waypoint was previously plotted on the Plotter Screen, it will no longer appear. You may easily erase a sequence of waypoints by pressing SCROLL, ERASE, SCROLL, ERASE, etc. for the entire sequence.

Obviously, you will want to exercise caution when using the ERASE key.

ENTERING AND CHANGING WAYPOINTS:

Waypoints may be manually entered and changed from the Waypoint Planning Screen by scrolling to the waypoint you desire to change and then pressing the arrow key marked "KEYPAD." The arrow keys will then change functions as follows:

Using the numeric keypad, enter the latitude/longitude (or TD's if in TD mode) of the waypoint you desire to enter. You will need to enter leading zeroes, if necessary (for example, if the west longitude is 085 41.12 you will need to enter 085 41 12).

Press the E/W arrow key if you need to change to East longitude. If you make a mistake, press the CLEAR arrow key to restart. Press the ENTER arrow key when through. This will enter the waypoint into Permanent Memory and will exit the keypad entry mode.

If you decide you really didn't want to change the waypoint after all, press the QUIT arrow key instead of the ENTER key. The unit will then exit the keypad entry mode without changing the contents of Permanent Memory.

We recommend you maintain a waypoint log in a separate notebook, recording each waypoint memory location as it is stored, along with its coordinates in latitude/longitude or TD's, and any reference information to help you remember why you stored it.

For example:

<u>WAYPOINT#</u>	<u>COORDINATES</u>	<u>DESCRIPTION</u>
80	N 38 12.15 W 122 53.15	Home (Entrance to Harbor)
01	N 38 00.11 W 123 04.12	Great Fishing Hole!

There are some important things to remember when entering or changing waypoints from the Waypoint Planning Screen.

- 1) If you decide to erase or change the waypoint location occupied by your current GO TO destination, the unit will disable the GO TO function before storing the waypoint, and a pop-up message will appear to alert you that this occurred: "GO TO WPT CHANGED - GO TO DISABLED".
- 2) Although waypoints may be displayed in either latitude/longitude or TD's (depending on your selection), they are actually stored in the 2831/3001 as latitude/longitude. If you operate your unit in TD mode, the built-in microprocessor will translate the TD's to latitude/longitude before storing the waypoint in Permanent Memory, and then will translate the stored latitude/longitude back to the TD's corresponding to the stations you have selected for navigation, prior to printing them on the Waypoint Planning Screen. Be aware that there may be a slight amount of "round-off error" in performing this calculation. As a result, the TD's that are displayed may occasionally be slightly different than those you entered. This will, however, have no effect on the ability of the unit to navigate to your destination.

- 3) If you are in TD mode, the unit will display TD's corresponding to the stations you have presently selected for navigation. If, however, you enter TD's that correspond to a different station pair than the unit is presently using, the 2831/3001 will automatically convert the entered TD's to the equivalent TD position that uses the selected stations. If this occurs, a pop-up message "CONVERTING TD'S TO STATIONS IN USE" will appear momentarily to inform you of this. In this case, the TD numbers that appear will be quite different than the ones you actually entered. If you wish to view the TD's corresponding to the ones you entered, go to the Station Selection Screen and select the stations you had intended when entering the waypoint. Upon returning to the Waypoint Planning Screen, the correct TD's will appear.
- 4) If you enter waypoints in TD mode, and the TD numbers you enter for some reason cannot be translated to a latitude/longitude for storage, a pop-up message will appear: "SORRY - CAN'T CONVERT TD'S TO LAT/LONG", and the waypoint will not be stored. This may occur for either of the following reasons:
 - The entered TD's are invalid; i.e. the TD numbers do not correspond to any pair of intersecting LOP's (lines-of-position).
 - The entered TD's are valid in the Primary lat/long conversion area, but your unit is operating in the Alternate lat/long conversion area, or vice versa (see Re-seed Lat/Long).
- 5) Be aware of the effect of ASF corrections on waypoints entered on the Waypoint Planning Screen.

Most Loran-C charts assume an all-seawater path for the signal propagation and are therefore uncorrected for ASF's. If you derive your waypoints (in TD's) from such a chart, you may need to enter an ASF correction into your 2831 to achieve the desired accuracy when navigating to a destination waypoint (refer to the section on ASF Corrections for instructions on entering ASF corrections into your 2831/3001).

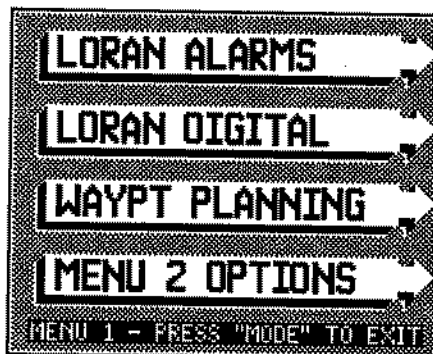
If you enter waypoints derived from a friend's Loran, find out if his coordinates are affected by ASF corrections, and if so, enter the appropriate ASF values into your 2831/3001 before entering the waypoints.

If you use ASF corrections, the ASF values you are using will be added to any waypoint entered in TD's before converting the waypoint to latitude/longitude for storage in Permanent Memory. However, when converting the stored latitude/longitude back to TD's, ASF corrections are not subtracted from the result. This will cause the displayed TD's of waypoints to be different than the entered TD's by the amount of the ASF corrections.

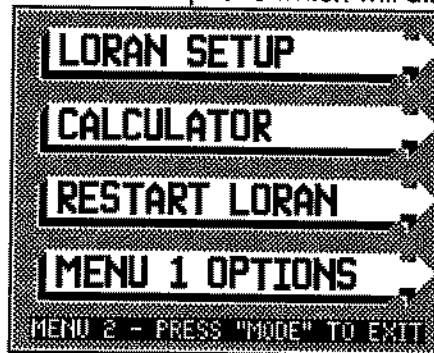
If you do use ASF corrections, be sure when navigating to a waypoint that the ASF corrections you are presently using are the same as those you were using when you stored the waypoint. This is true whether you stored the waypoint using the Instant Store key, or if you used the Waypoint Planning Screen.

LORAN SET UP

1. To access the Loran Set Up options on Main Menu 2, press the SELECT key once from one of the primary mode screens which will invoke Menu 1 which will display as follows:



2. Then press the arrow key marked Menu 2 Options which will display as follows:



You can return to Main Menu 1 if you wish, by pressing the arrow key marked MENU 1 OPTIONS at the bottom of the Main Menu 2 screen.

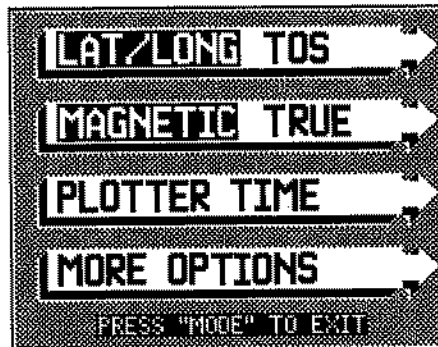
3. Pressing the MODE key from any menu will return the unit to the primary operating mode you were using before pressing the SELECT key.

The 2831/3001 contains a number of functions which allow you to customize the operation of the unit for your specific needs, or alter some of the parameters of operation to assist in locking onto the received signal or in computing your position. These functions are accessed through the Loran Setup Screens, and are described below.

The Loran Setup Screens are accessed by pressing the first arrow key on the Main Menu 2 which is labelled LORAN SETUP. There are three Setup screens. You may switch between these three screens by pressing the MORE OPTIONS arrow key at the bottom of each display.

LORAN SETUP SCREEN 1

Loran Setup Screen 1 offers the following selections which are described below:



LATITUDE/LONGITUDE - TD'S

Pressing the arrow key marked LAT/LONG - TD'S will allow you to change the format with which position information is displayed in the 2831/3001. This will affect all screens that display position, including both present position and waypoint information. When operating in TD mode, only the TD's corresponding to the stations selected for navigation will be displayed (see SELECT STATIONS).

On the Signal/Status Screen, all received TD's are displayed, regardless of the setting of the LAT/LONG - TDs option. Your selection will be stored in Permanent Memory until you change it.

MAGNETIC-TRUE

The 2831/3001 performs all directional computations with respect to True North. If you wish to have the unit instead display bearings referenced to Magnetic North, select the MAGNETIC option. The coordinate converter will then automatically compute the magnetic variation for your area and apply it to all bearings before printing them on the display.

Your selection will be remembered in Permanent Memory until you change it.

PLOTTER TIME

Your track as plotted on the Plotter Screen is stored in a temporary memory as a sequence of positions. When the 2831/3001 draws this track on the display, it plots each position and "connects the dots", so to speak.

Approximately 1000 temporary memory locations are allocated to the track, and so after a period of time the oldest track data are erased from memory to make room for new data.

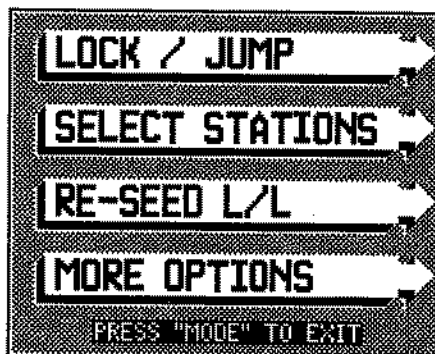
You may adjust the amount of time the unit waits between plots of your present position by selecting the PLOTTER TIME option from Setup Menu 1. Then, press the UP or DOWN arrow keys to select your desired plotter time. The amount of time the unit waits between plots, as well as the corresponding approximate amount of history your unit will remember, is shown below:

<u>PLOTTER TIME</u>	<u>APPROXIMATE HISTORY</u>
2 seconds	30 minutes
10 seconds	2 hours 45 minutes
30 seconds	8 hours 30 minutes
1 minute	16 hours 40 minutes
2 minutes	33 hours 30 minutes
5 minutes	3.5 days

In order to conserve the track memory, when your boat is not moving (i.e. at anchor) the plot rate is automatically slowed down. This will have the effect of preserving your history for a longer period of time.

LORAN SETUP SCREEN 2

Loren Setup Menu 2 Options offers the following selections which are described below:



LOCK/JUMP

The Lock/Jump Screen allows you to manually select the cycle of the received signal that is tracked by the Loran receiver. This feature is intended to be used by experienced Loran-C users who are acquainted with the nature of Loran signal reception.

The 2831/3001 is a totally automatic Loran-C receiver. Once the unit is initialized with a starting position (either automatically or manually from the Restart Screen), it acquires the signal, selects and locks onto the correct cycle, and then tracks the selected cycle. This is individually done for each of the received stations.

Except in rare cases, the 2831/3001 properly selects the correct cycle with no required intervention by the user. However, if you are in a fringe area, or are operating in an area with extreme noise, the unit may be indecisive about a given cycle, or may decide to lock onto the wrong cycle. (If the unit is locked on the wrong cycle for a given station, the TD for that station will be wrong by a multiple of 10 microseconds.) This may be due to ECD effects (envelope-to-cycle difference), which are distortions in the shape of the received signal due to propagation in the atmosphere. Or, a received groundwave signal may be very weak, causing the unit to lock onto a skywave signal, which will cause the corresponding TD to be several tens of microseconds too high. In any case, if the unit has trouble selecting the correct cycle, you may wish to employ the Lock/Jump Screen to manually lock the unit onto the correct cycle.

1. Select **LOCK/JUMP** from Setup Screen 2.
2. Press the **SCROLL** arrow key to select the station you are concerned with.
3. Press the **UN/LOCK** arrow key if you want to lock the selected station onto its present cycle without changing the cycle being tracked. The word "LOCKED" will appear next to the TD for that station.
4. Press the **JUMP UP** arrow key if you want to track a later cycle for a selected station. The corresponding TD will increase by 10 microseconds, and the word "LOCKED" will appear next to the TD for that station.
5. Press the **JUMP DOWN** arrow key if you want to track an earlier cycle for a selected station. The corresponding TD will decrease by 10 microseconds, and the word "LOCKED" will appear next to the TD for that station.
6. Scroll to the desired station and press the **UN/LOCK** arrow key if you wish to "unlock" a manually locked station. The word "LOCKED" will disappear, and the unit will return to automatic cycle selection mode for that station. If you had previously jumped or locked to a cycle, this will cause the unit to eventually select the cycle it otherwise would have selected before manually locking it.

When using the Lock/Jump Screen, be aware of the following: There will be a several second delay after pressing **JUMP UP**, **JUMP DOWN**, or **UN/LOCK** before the desired effect takes place.

If the unit has a search status of **SEARCH** for a given station (on the Signal/Status Screen), that station may not be manually locked or jumped; you must wait until the station achieves a search

status of either SETTLE or LOCK. If a signal corresponding to a manually locked station becomes very weak and the unit goes from SETTLE to SEARCH for that station, the station is automatically unlocked. When the signal is re-acquired, you may manually lock it again.

When a station is manually locked, the Search Status for that station may remain in "SETTLE", never achieving "LOCK" status. However, since the station has been manually locked, the unit will disregard the Search Status for that station and will perform all computations (including latitude/longitude and plotter points) based on the currently selected cycle. Therefore, incorrect numerical data will NOT start flashing even though the unit may be tracking the wrong cycle. The user is therefore cautioned to BE CAREFUL when manually locking stations.

If you instruct the unit to JUMP UP on the Master station, this will have the effect of decreasing the values for all TD's by 10 microseconds. Likewise, jumping the Master down a cycle will cause all TD's to increase by 10 microseconds.

Reception may sometimes be improved by jumping ALL received stations (including the Master) up one cycle. This will tend to improve the signal-to-noise ratio of the received signals, thereby giving improved levels on the Signal Quality bar graph. However, this technique increases the likelihood of skywave contamination, and so will not be appropriate in all cases.

Please note that on the Signal/Status Screen, an "L" appears next to the TD for each station that is manually locked.

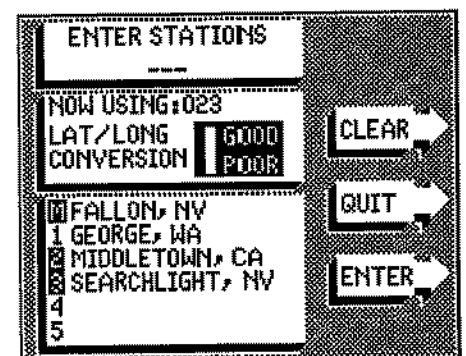
SELECT STATIONS

The SELECT STATIONS option on Setup Screen 2 invokes the Station Selection Screen, which allows you to select the three stations used for computation of latitude/longitude and all other navigational information.

Some station chains (GRI's) have only a Master and two secondary transmitters, so there is no choice as to which stations to select. Other chains offer as many as five secondary transmitters in addition to the Master. The 2831/3001 will track the TD's for all stations being received, and will display all TD's on the Signal/Status Screen. However, only three stations (usually the Master and two secondaries) are actually used to "triangulate" your position in latitude/longitude.

If you desire to change the stations selected for navigation, press the SELECT STATIONS key from Setup Screen 2. The following screen will appear:

1. The **bottom block** on the screen displays the city names where each transmitter site is located, for the presently selected GRI. (The figure shows the stations for GRI 9940, U.S. West Coast.) The presently selected station numbers are highlighted on the left edge of this block as white numerals on a black background.
2. The **center block** on the screen displays the three presently selected station numbers (Master is 0) along with a bar graph showing the quality of the latitude/longitude conversion. This bar graph is derived from the computed gradients, and is only displayed if the coordinate converter is able to converge on a valid latitude/longitude. If no latitude/longitude can be computed, the message "NO FIX" will appear instead of the bar graph. If the gradients for the selected stations are relatively small, the bar graph will indicate "GOOD" if the gradients are large, the bar graph will indicate "POOR". This simple graph may be useful in helping you select which are the most appropriate stations to use.
3. The **topmost block** on the screen prompts you to enter a new set of stations. Using the numeric keypad, enter the station numbers for the three stations you wish to use. When entering the



Master station number, use the "0" key. If you make a mistake, press the CLEAR arrow key to restart. After entering the three station numbers, press the ENTER arrow key.

For example, assume you are using the U.S. West Coast GRI of 9940, and you wish to select the Master et Fallon, Nevada and the two secondary transmitters at George, Washington and Searchlight, Nevada. To do this, enter 0, 1, 3, and then press the ENTER arrow key. To exit the station selection screen, press the QUIT arrow key. On the Signal/Status Screen, the three stations selected for navigation will be highlighted with inverse characters on the left side of the TD's block. The 2831/3001 will remember the selected stations by storing them in Permanent Memory.

Remember that all position calculations will use the stations that you select. In particular, the TD's that are used when waypoints are entered and displayed are those selected on the Station Selection Screen.

Unlike most other Loran-C receivers, the 2831/3001 will allow you to enter a set of three secondary transmitters, in lieu of a Master and two secondaries. Ordinarily, this is discouraged, as TD's are always referenced to a Master. In addition, many of the 2831/3001 functions will not produce predictable results when the Master station is not selected (for example, TD's as displayed by the 2831/3001 may not generate numbers that correspond with local charts, and waypoints displayed on the Waypoint Planning Screen in TD mode will produce nonsensical numbers). Nevertheless, if a Master station is inoperative, the 2831/3001 can compute your present position in latitude/longitude from three selected secondaries. However, we do not recommend you operate your 2831/3001 in this manner unless absolutely necessary.

RESEED LATITUDE/LONGITUDE

Much of the technology within the 2831/3001 Loran-C receiver is related to the sophisticated software programs that are executed by the internal microprocessors. One of these programs is the "coordinate converter", which mathematically translates the received TD's into latitude/longitude. Since Loran-C is a hyperbolic navigation system, there are at least two solutions to the equation which performs this conversion. In order to ensure that the coordinate converter is generating the correct solution, the RE-SEED L/L option is included in your 2831/3001.

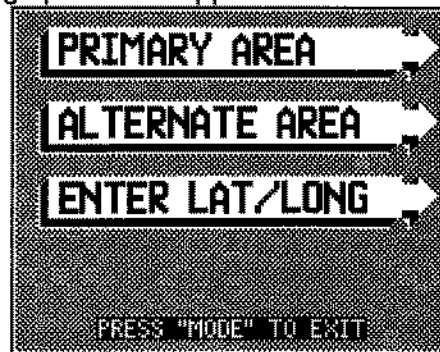
You may need to re-seed the coordinate converter in any of the following conditions:

- Your unit is producing the correct TD's, but an obviously incorrect latitude/longitude is displayed.
- The Message Board on the Signal/Status Screen displays "CAN'T COMPUTE LAT/LONG".
- After a GRI Restart.
- If you have traveled more than 60 miles from where you turned off your unit.

To re-seed, select RE-SEED L/L from Setup Screen 2. The following options will appear:

There are two methods by which you can re-seed the unit. The preferred method is by selecting "ENTER LAT/LONG".

1. Enter your approximate location in latitude/longitude Using the numeric keypad. You will need to enter leading zeroes, if necessary (for example, if the west longitude is 85 41.12 you will need to enter 085 41 12).
2. Press the E/W arrow key if you need to change between east and west longitude. If you make a mistake, press the CLEAR arrow key to restart.
3. Press the ENTER arrow key when through. This will enter your position as a new seed for the coordinate converter, and will exit the Re-Seed Lat/Long screen.



An alternate method for re-seeding your unit is to use the PRIMARY AREA / ALTERNATE AREA selection keys. This will cause your unit to use one of two roughly approximate built-in seeds. This method will sometimes reduce the number of keystrokes you will have to enter to re-seed the unit.

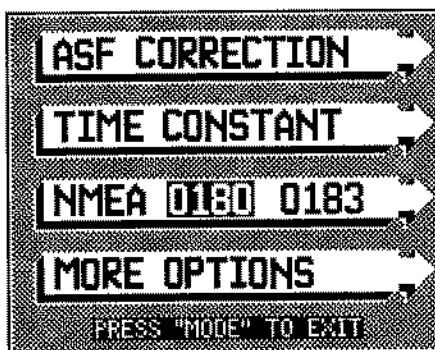
To re-seed using this method, after selecting RE-SEED L/L from Setup Screen 2:

1. Press the key marked PRIMARY AREA, and then press MODE to exit.
2. View your latitude/longitude from one of the primary display modes to see if the correct latitude/longitude is being computed. If not, return to the RE-SEED L/L menu and press the key marked ALTERNATE AREA.
3. Press MODE to exit, and verify that the correct latitude/longitude is being computed.

The use of the PRIMARY/ALTERNATE seeds will not adversely affect the outcome; it will either work or it won't. If this approach does not produce a correct position, you may need to use the ENTER LAT/LONG screen (described above) to enter the correct seed. When re-seeding the coordinate converter, the 2831/3001 continues to track all received signals. The TD's will not be changed. Only the latitude/longitude and other computed navigational information derived from the latitude/longitude will change. The effect of re-seeding will occur within a few seconds.

LORAN SETUP SCREEN 3

LORAN SETUP SCREEN 3 offers the following selections which are described below:



* Selecting MORE OPTIONS, returns you to the Loran Set Up Screen 1.

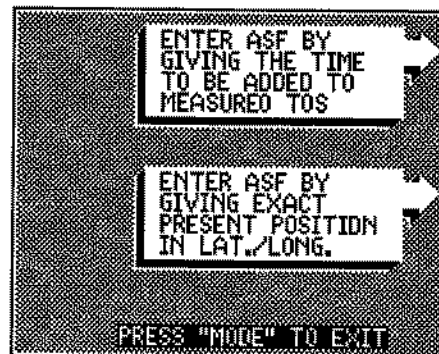
ASF CORRECTION

Loran-C signals, like all radio signals, are affected by the water and terrain the signal must propagate over. If the signal travels over land for part of its route to your receiver, the time differences your Loran-C receiver measures will be slightly different than those the unit would measure if the signal had travelled over an all-seawater path. Most Loran-C stations are located inland, and so most signals are somewhat affected by these land anomalies. Since the measured TD's are affected, the computed latitude/longitude will be slightly in error. These land effects are referred to as Additional Secondary Factors, or ASF's. The U.S. Coast Guard publishes tables and charts indicating ASF corrections for certain coastal areas. These ASF corrections are usually in the form of small offsets to be added or subtracted from the measured TD's.

By using ASF Corrections, the absolute accuracy of the latitude/longitude displayed on a Loran-C receiver will be improved. However, its repeatable accuracy will not be affected at all. ("Absolute accuracy" refers to the ability of the Loran-C system to determine the correct latitude/longitude. "Repeatable accuracy" refers to the ability of a receiver to return to a place it has been before.) It is not necessary to use ASF corrections unless you are concerned with the "absolute accuracy" of the displayed latitude/longitude.

The 2831/3001 makes provision to enter ASF corrections through use of the ASF Correction Screens. From Setup Screen 3, select ASF CORRECTION. The following selections will appear:

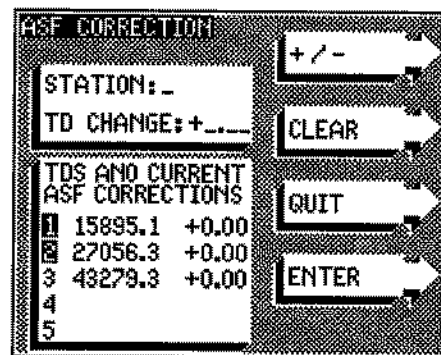
Press "MODE" to exit.



If you know the TD offsets (in microseconds) to be added or subtracted from the measured TD's, select the first option. The following screen will appear:

The first method of entering an ASF CORRECTION is by entering a station number and an ASF correction. The method of doing this is best illustrated through the example below. Assume we are using the Master and secondaries 1 and 3 for navigation. If we want to enter an ASF correction of +0.45 microseconds for secondary 1 and -1.60 microseconds for secondary 3, we would enter these keystrokes:

1 (secondary station number 1)
0 (ASF magnitude of 0.45)
4
5
ENTER (enter the ASF for station 1)
3 (secondary station number 3)
+/- (switch to minus sign)
1 (ASF magnitude of 1.60)
6
0
ENTER (enter the ASF for station 3)



You can only enter an ASF correction factor up to +/- 9.99.

If the correction factor needed is larger, you must use the latitude/longitude entry method. If you make a mistake, press the CLEAR arrow key to start over. To exit this screen, press the QUIT arrow key.

Please note that ASF corrections cannot be entered for the Master transmitter. ASF effects on the received Master signal should be included in the value used for each secondary. In the 2831/3001, measured TD's are always shown exactly as they are received, without ASF corrections applied. ASF corrections are applied to the measured TD's before the coordinate converter computes the latitude/longitude. Therefore, entered ASF corrections only affect the displayed latitude/longitude and other derived navigational information, and not the displayed present position in TD's.

When storing, viewing, and navigating to waypoints in your 2831/3001, keep in mind that waypoints are stored in latitude/longitude format. Therefore, any ASF corrections entered will be applied to the TD's before storing a waypoint. If you operate your unit in TD mode, waypoints will be displayed with the ASF corrections applied that were in use when the waypoint was initially stored.

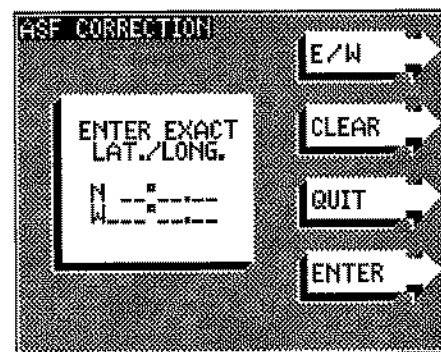
When using ASF corrections, be sure when navigating to a waypoint that the ASF corrections you are presently using are the same as those you were using when you stored the waypoint. This is true whether you stored the waypoint using the Instant Store key, or if you used the Waypoint Planning Screen. For further discussion of how the 2831/3001 stores and navigates to waypoints, refer to the sections on Instant Store Key, GO TO Key, and Waypoint Planning.

Entered ASF corrections are remembered in Permanent Memory until you change them. When you turn your unit on, any stored ASF corrections will be automatically enabled. To disable ASF corrections, simply enter +0.00 for each station on the above-described ASF Corrections Screen.

The bottom block on this screen (labeled "TD's AND CURRENT ASF CORRECTIONS") shows the presently measured TD's along with the presently used ASF corrections. The TD's shown are those actually measured; i.e. ASF corrections are not applied to the displayed TD's. If no ASF corrections are being used, the corrections for all secondary transmitters should read "+0.00". The secondaries selected for navigation are shown on the left edge of this block with inverse characters on a black background.

The **second method** for entering ASF corrections is through the second option on the ASF Corrections Menu. The following screen will appear:

To use this method, navigate your boat to a location where the latitude/longitude is known exactly. Ensure that all stations selected for navigation have locked, and that the unit is computing your approximate latitude/longitude. Then, from the ASF Corrections Menu, select "ENTER ASF BY GIVING EXACT PRESENT POSITION IN LAT./LONG.". At the prompt, enter your exact latitude/longitude. The 2831/3001 will automatically compute the corresponding TD offsets. Any previously stored ASF corrections will be discarded. If you were to subsequently select the screen "ENTER ASF BY GIVING THE TIME TO BE ADDED TO MEASURED TD's", you would see the computed offsets displayed.



Note that ASF corrections entered with this second method will depend on the choice of stations used. If you change stations used after computing ASF corrections this way, the new ASF corrections will not be correct, and you will need to re-enter them.

Entered ASF corrections are usually good for approximately a 25 mile radius, depending on the paths the signals take. In areas near cliffs, tall mountains, and where the signals must travel over a mountain range, conditions change rapidly, so ASF corrections in these situations are good only for local areas.

TIME CONSTANT

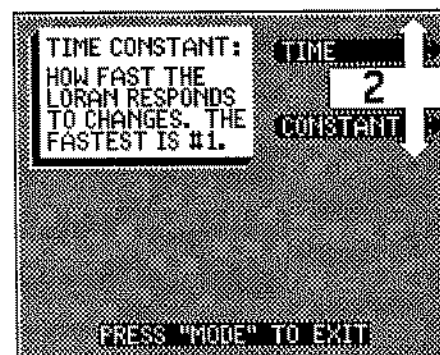
The 2831/3001 computes your Speed and Track by measuring the rate of change of your position over time. In order to compensate for random fluctuations in the received Loran signal, the calculation is averaged over time to smooth out the reading. You may adjust the averaging time in your 2831/3001 by selecting TIME CONSTANT from Setup Screen 3.

Use the UP and DOWN arrow keys to select a Time Constant of 1, 2, or 3, as follows:

TIME CONSTANT = 1: This is the fastest averaging time. Speed and Track will respond quickly when performing maneuvers. However, the reading will tend to be more jittery, especially at slow speeds. This setting is recommended if you change speed or direction often.

TIME CONSTANT = 2: This is a medium averaging time. The 2831/3001 is shipped from the factory with this as normal. For most applications, a Time Constant of 2 will work perfectly.

TIME CONSTANT = 3: This is the slowest averaging time.



Speed and Track will respond more slowly, though the reading will be smoother and less jittery. This setting is recommended if you usually travel at a constant speed in the same direction for long periods of time.

The Time Constant setting is remembered In Permanent Memory. **NOTE: THE TIME CONSTANT ADJUSTMENT WILL AFFECT THE AVERAGING TIME IN THE COMPUTATION OF LATITUDE/LONGITUDE AS WELL AS OF SPEED AND TRACK. HOWEVER, THE DISPLAY OF TD'S WILL NOT BE AFFECTED.**

NMEA 0180 AND NMEA 0183 SELECTION

Your Model 3001/2831 is equipped with the NMEA Industry Standard interface to allow It to communicate with other instruments which you may have installed on your boat. The Model 3001/2831 is classified as an NMEA "talker". It will provide the following interface functions:

- NMEA 0180 data for an autopilot
- NMEA 0183 data for an autopilot, radar, and/or chart plotter

You may select either one of two data formats from the LORAN SETUP screen:

- NMEA 0180 (autopilot only)
- NMEA 0183 (autopilot, radar, and/or chart plotter)

Select the button corresponding to the NMEA arrow to toggle between NMEA 0180 autopilot format and NMEA 0183. The setting you choose is stored in Permanent Memory, so your selection is retained when power is removed.

NMEA 0183 SENTENCES:

The sentences provided by the NMEA 0183 output are as follows:

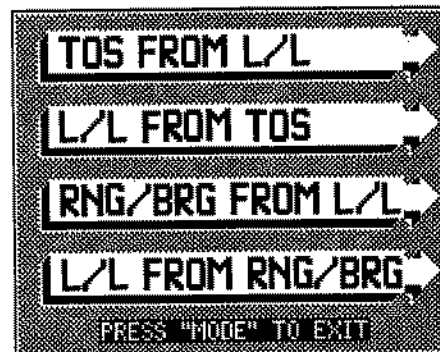
LCGLL	Latitude/longitude
LCGTD	Time differences
LCVTG	VOG and COG vector
LCBOD	Bearing from origin to destination
LCWPL	Destination waypoint, latitude/longitude
LCWDC	Distance to waypoint, great circle
LCXTE	Cross Track Error (CDI)
LCBWC	Bearing and Distance from present position to waypoint
LCAPA	Autopilot Output
LCAAM	Arrival Alarm
LCRMA	Required minimum sentence A
LCRMB	Required minimum sentence B

All data is output approximately once every 2 seconds. The sentences output by the System 3001/2831 have a Baud Rate of 4800, 8 data bits, 2 stop bits, and no parity bits.

CALCULATOR

Among the powerful features of the 2831/3001 is a set of screens which allow you to utilize the abilities of the unit's internal microcomputer to perform various Loran calculations. These screens are referred to as the Calculator Screens, and are extremely useful as an aid in navigating and planning. To gain access to the Calculator functions, select CALCULATOR from Main Menu 2. The following selections will appear:

- TD's FROM L/L** This screen will allow you to translate any latitude/longitude to a set of TD's for your present GRI.
- L/L FROM TD's** This screen will allow you to translate any valid TD pair in your present GRI to a latitude/longitude.
- RNG/BRG FROM L/L** This screen will allow you to compute the range and bearing between any two points given in latitude/longitude.
- L/L FROM RNG/BRG** This screen will allow you to compute the latitude/longitude of a destination point, given a starting location and a range and bearing.



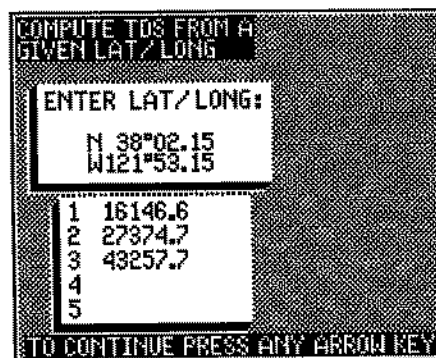
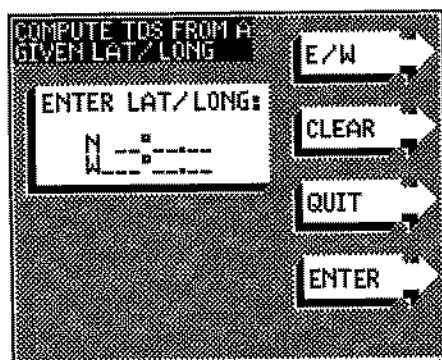
Press the arrow key corresponding to the calculation you wish to make. The functions of these screens are described below.

NOTE: CALCULATOR FUNCTIONS WILL NOT WORK PROPERLY IN THE FOLLOWING CIRCUMSTANCES:

- 1) When the 2831/3001 is in Simulator Mode.
- 2) On the Signal Status Screen when any of the following messages appear on the Message Board:
"LOOKING FOR SIGNAL"
"PLEASE RESTART LORAN"
"COUPLER SHORT"
"LORAN INOP"

Generally speaking, these conditions mean that in order to use the Calculator functions, your Loran must be connected to a coupler and must be receiving signals (although it is not necessary to be locked on all stations). If the Loran cannot perform a calculation due to one of these conditions, a pop-up message will appear on the corresponding Calculator Screen: "SORRY - CAN'T DO CALCULATION". (In Simulator Mode, the Calculator Screens will appear to work, but the results are simulated, and therefore the actual numbers are not valid.)

COMPUTING TD's FROM LATITUDE/LONGITUDE



The first option on the Calculator Menu will allow you to translate a given latitude/longitude into TD's. In order to use this function, you must be using the same GRI for reception as you intend to use for the computed TD's.

Using the numeric keypad, enter the latitude/longitude of the location you wish to translate. You will need to enter leading zeroes, if necessary (for example, if the west longitude is 85 41.12 you will need to enter 085 41 12). Press the E/W arrow key if you need to change to east longitude. If you make a mistake, press the CLEAR arrow key to restart. Press the ENTER arrow key when finished.

The message "PLEASE WAIT" will appear for a short time while the unit performs the calculation. The unit will then display at the bottom of the screen the computed TD's for all secondaries in the present GRI. The latitude/longitude you entered will remain at the top of the screen for reference. The computed TD's will be a direct translation, unaffected by ASF corrections. After copying the numbers from the screen into a notebook, press any arrow key to continue. You may then enter another latitude/longitude to translate, or exit the screen by pressing the QUIT arrow key.

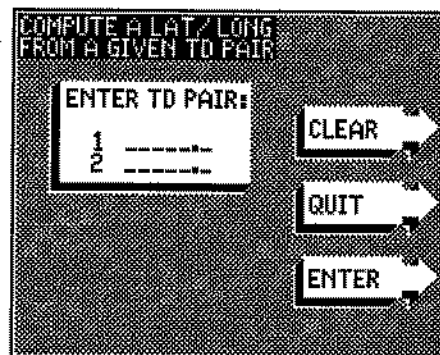
Please note that it is possible to enter a position for conversion that in reality would be too far away from the Loran transmitters in your GRI for a receiver to be able to detect any signal. The 2831/3001 ignores this fact, and translates any latitude/longitude to a set of intersecting TD's for your present GRI, even though the intersection may occur several thousand miles away.

COMPUTING LATITUDE/LONGITUDE FROM TD'S

The second option on the Calculator Menu will allow you to translate a pair of TD's to a latitude/longitude. In order to use this function, you must be using the same GRI and stations selected for reception as you intend to use for the entered TD's.

Using the numeric keypad, enter the two TD's you wish to translate. If you make a mistake, press the CLEAR arrow key to restart. Press the ENTER arrow key when through.

The message "PLEASE WAIT" will appear for several seconds while the unit performs the calculation. The unit will then display at the bottom of the screen the computed lat/long corresponding to the TD's you entered. Your entered TD's will remain at the top of the screen for reference. After copying the numbers from the screen into a notebook, press any arrow key to continue. You may then enter another pair of TD's to translate, or exit the screen by pressing the QUIT arrow key.



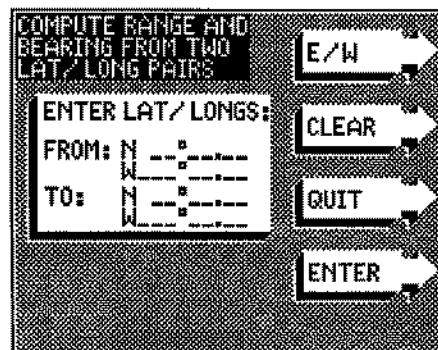
Please note that any ASF corrections stored in the Permanent Memory will be applied to the entered TD's before converting to latitude/longitude. If the unit for some reason cannot perform the translation from TD's to latitude/longitude, a pop-up message will appear: "SORRY - CAN'T CONVERT TD'S TO LAT/LONG". This may occur for either of the following reasons:

- The entered TD's are not valid TD's for the selected stations. For example, the entered TD's may correspond to a different station pair than the selected pair.
- The entered TD's are valid in the Primary lat/long conversion area, but your unit is operating in the Alternate lat/long conversion area, or vice versa (see Re-seed Lat/Long).

COMPUTING RANGE/BEARING FROM LATITUDE/LONGITUDE

The third option on the Calculator Menu will allow you to compute the range and bearing between an origin and a destination entered in latitude/longitude.

Using the numeric keypad, enter the latitude/longitude of the starting and ending locations. You will need to enter leading zeroes, if necessary (for example, if the west longitude is 85 41.12 you will need to enter 085 41 12). Press the E/W arrow key if you need to change to east longitude. Press the CLEAR arrow key to restart. Press the ENTER arrow key when finished.



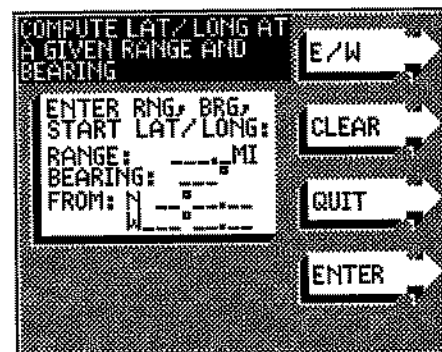
The message "PLEASE WAIT" will appear for a couple of seconds while the unit performs the calculation. The unit will then display at the bottom of the screen the computed range (distance) and bearing between the two points. The range will be in nautical miles, and the bearing will be in degrees with respect to True North or Magnetic North, whichever option you have selected in the Loran Setup menus. The positions you entered will remain at the top of the screen for reference.

After copying the Range and Bearing into a notebook, press any arrow key to continue. Then, enter another pair of latitude/longitudes to translate, or exit the screen by pressing the QUIT arrow key.

COMPUTING LATITUDE/LONGITUDE FROM RANGE/BEARING

The fourth option on the Calculator Menu will allow you to compute the position in latitude/longitude of a point at a given range and bearing from a given origin point. Using the numeric keypad, enter the following:

- The RANGE (distance) to your intended destination, in nautical miles. You will need to enter leading zeroes, if necessary (for example, if the range is 7.5 miles, enter 0075).
- The BEARING to your intended destination, in degrees with respect to True North or Magnetic North (whichever option you have selected from the Loran Setup menus). Again, you will need to enter leading zeroes, if necessary (for example, if the bearing is 32 degrees, enter 032).
- The location of the known origin, in latitude/longitude. Again, you will need to enter leading zeroes, if necessary (for example, if the west longitude is 85 41.12 you will need to enter 085 41 12). Press the E/W arrow key if you need to change to east longitude.



If you make a mistake, press the CLEAR arrow key to restart. Press the ENTER arrow key when finished entering all of the above information.

The message "PLEASE WAIT" will appear for a short time while the unit performs the calculation. The unit will then display at the bottom of the screen the computed latitude/longitude of the destination point. All of the information you entered will remain at the top of the screen for reference.

After copying the numbers from the screen into a notebook, press any arrow key to continue. You may then enter another range/bearing/lat/long group to translate if you wish, or you may exit the screen by pressing the QUIT arrow key.

RESTART LORAN

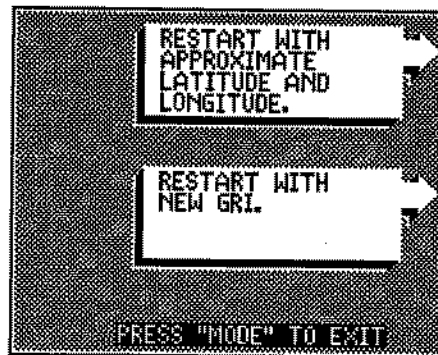
There are some circumstances where you may wish to re-initialize the receiver with a new starting position, or with a new GRI. These circumstances include:

- You have moved the instrument more than 50 miles with the power off.
- The Message Board on the Signal/Status Screen says PLEASE RESTART LORAN.
- The Message Board recommend you use a different GRI than the one you are presently using.

To re-initialize your unit, select RESTART LORAN from Main Menu 2. The following selections will appear:

The following screens allows you to restart your Loran when circumstances require you to enter an new Latitude/Longitude or a new GRI other than the one used when you performed the FIRST START procedure.

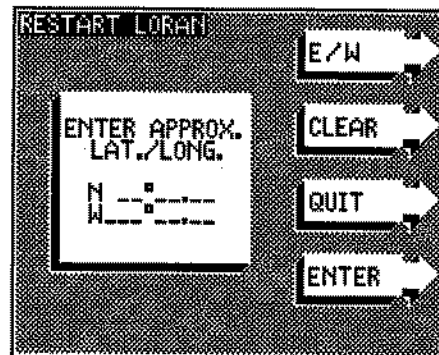
In most cases, it is preferred to restart your 2831/3001 by entering your approximate latitude/longitude. This will allow the 2831/3001 to automatically select the most appropriate GRI and stations used. It will also ensure that the coordinate converter will compute your correct latitude/longitude, and there will therefore be no need to re-seed the unit. However, if you wish to specify a different GRI than the one the unit would ordinarily select, you may instead restart using the GRI Restart option. NOTE: Restarting your Loran will cause the unit to go into acquisition mode for all stations. It will take the unit a few minutes to settle and lock onto the signals.



LATITUDE/LONGITUDE RESTART

Press the top arrow key, marked "RESTART WITH APPROXIMATE LATITUDE AND LONGITUDE" to select this option.

The unit will then prompt you to enter your approximate position in latitude/longitude. Using the numeric keypad, enter the latitude/longitude of your present position, within about +/- 1 degree. (Although you may enter this to within 1 degree, the unit may lock onto the signals faster if you enter a more precise position.) You will need to enter leading zeroes, if necessary (for example, if the west longitude is 85 41.12 you will need to enter 085 41 12). Press the E/W arrow key if you need to change to east longitude. If you make a mistake, press the CLEAR arrow key to restart.



If you decide you really didn't want to restart the Loran after all, press the QUIT key.

Otherwise, press the ENTER arrow key when finished entering your position. The unit will then automatically select the most appropriate GRI and stations to use, restart the Loran, and will automatically switch modes to the Signal/Status Screen, where you can observe the 2831/3001 acquiring, settling, and locking onto the signals. You may determine your approximate location from a local chart, or alternatively, refer to the Appendix for approximate turn-on locations.

GRI RESTART

If you wish to specify a different GRI than the one the unit would ordinarily select, you may instead restart using the GRI RESTART Option screen. Restarting your LORAN will cause the unit to go into acquisition mode for all stations. It will take the unit a few minutes to settle and lock onto the signals.

On the left side of the GRI Restart Screen is a list of the GRI's that the 2831/3001 recognizes. The currently selected GRI and its location in the world is highlighted in white characters on black background. If you do not know your GRI, use Appendix at the back of this book and/or use your local LORAN C charts. Select the LORAN C chain (GRI) that gives the best coverage for the area that you generally use. Locate the MASTER and the SECONDARIES and anticipate which will be the best. As a general rule, consider the maximum range for the transmitting stations to be 1,000 miles. Usually, there is only one GRI to choose. In some areas you may have a choice of GRI's. For consistent accuracy, you will not want to change either GRI or TDs on a given trip unless absolutely necessary.



You may scroll this list up or down by operating the two "SCROLL" arrow keys on the upper right corner of the unit. This will allow you to view all recognized GRI's, and will also allow you to select any GRI.

If you decide you really didn't want to perform a GRI restart after all, don't press ENTER, but do press the QUIT arrow key. This will allow you to exit the screen without restarting the Loran.

However, if you wish to restart the 2831/3001 with the selected GRI, press the ENTER arrow key. The unit will then restart the Loran using the selected GRI, and will automatically switch modes to the Signal/Status Screen, where you can observe the 2831/3001 acquiring, settling, and locking onto the signals. If the GRI you selected was different than the GRI you had previously been using, the 2831/3001 will by default select the Master and secondary transmitters 1 and 2 for navigation. You may need to access the Station Selection Screen to select a more appropriate triad. In addition, you may need to access the Re-Seed Lat/Long menu to ensure that the coordinate converter is properly initialized to produce a correct latitude/longitude readout.

ERASING PERMANENT MEMORY

The 2831/3001 contains an internal memory which retains its data even when the unit has been turned off and disconnected from its power cable. We refer to this memory as "Permanent Memory." This memory is of the latest technology and does not even require an internal battery within the instrument. The data within the Permanent Memory will be retained virtually forever, or until you give the unit a command to change it.

The following information is stored in this memory:

- All 80 waypoints, in latitude/longitude format
- A pointer to the next Instant Store waypoint to be stored
- Your last known position to the nearest degree, and/or your GRI, which are used for automatic Restart
- Loran Setup Options:
 - Display TDs or Latitude/Longitude
 - Display True or Magnetic Bearing
 - The Time Constant
 - The Plotter Time
 - Manual ASF Corrections
 - Selected Stations
 - NMEA 0180/0183 Selection
- Fish Finder Setup Options (Model 2831 only)
 - Display Feet or Meters
 - Fish ID On or Off

When your 2831/3001 is shipped from the factory, the Permanent Memory is erased, which sets the above parameters to their default settings, and all waypoints to 0,0.

If you desire, at any time you may reset the Permanent Memory to its "factory" condition by performing the following steps:

WARNING! PERFORMING THE FOLLOWING STEPS WILL ERASE ALL PERMANENT MEMORY, INCLUDING ALL WAYPOINTS, FROM THE 2831/3001, AND RESET TO THE NOMINAL FACTORY SETTINGS.

1. Turn the unit off by pressing the "OFF" key.
2. Simultaneously press and hold keys "8" and "0".
3. While holding down keys "8" and "0", turn the unit ON by pressing the "ON/LAMP" key.
4. After about 1 second, the following message should appear on the display: "ALL PERMANENT MEMORY ERASED."
5. Turn the unit OFF by pressing the "OFF" key.

A partial list of terms used with LORAN C is presented herein. Additional information can be obtained from the sources referenced in this manual.

ABSOLUTE ACCURACY	The ability of the Loran System to determine one's exact position, in order to agree with a local chart. In general, ASF corrections are employed to assist in improving a unit's absolute accuracy
ACQUISITION:	(Search) is the process of establishing the approximate location in time of the Master and each of the selected secondaries with sufficient accuracy to permit subsequent settling and tracking.
ASF	ADDITIONAL SECONDARY FACTORS- Factors accounting for variations in LORAN signal velocity caused by changes in the conductivity of the earth's surface.
ANCHOR ALARM	This function is designed to warn you if your boat is drifting or if the anchor could be slipping so that your boat drifts out of your selected distance range.
ANTENNA	An 8 foot fiberglass whip that mounts to the coupler.
ANTENNA COUPLER	A device that converts and pre-processes the electrical output of the antenna to the signal level and impedance necessary to drive the receiver.
ARRIVAL ALARM	An audible warning is sounded when you reach your destination (preset waypoint).
BASELINE	The segment of the great circle line joining the Master and Secondary stations.
BASELINE EXTENSION	An extension of the Baseline formed by projecting the Baseline through the Master and Secondary stations in either direction.
BLINK	A LORAN system alarm warning the operator of technical problems or faulty timing at any of the LORAN transmitters.
CDI	Course Deviation Indicator. When traveling to a destination, this is a measure of the OFF course perpendicular distance to the intended course of travel.
CHAIN	A group of LORAN C transmitting stations identified by a specific GRI. Generally there is a Master and 2 to 5 secondaries in a chain.
CODING DELAY	The difference in time of transmission between the Master and Secondary stations.
CONDUCTIVITY	The electrical properties of the earth's surface which affects the speed at which LORAN signals travel over ground paths. (See ASF - Additional Secondary Factors.)
CROSSING ANGLE	The angle - from 0 to 90 degrees, at which the two Lines of Position (LOP's) intersect.
CROSS-RATE/CROSS-CHAIN INTERFERENCE	LORAN signal interference caused by signals from another chain.
CROSS TRACK ERROR	The computed off-course deviation (to left or right) from the course between the Point of Origin and the desired destination or waypoint, often abbreviated XTE. (see CDI)
CYCLE SLIP	Failure of the receiver to maintain synchronization and alignment of the phase code of the LORAN C pulses which can cause time difference measurement errors in multiples of 10 microseconds.
DESTINATION	A Waypoint - a position or location to which the user wishes to travel consisting of the intersection of two Lines of Position (LOP's).
DUAL RATE STATION	A LORAN station which operates in two LORAN chains.
ELECTRO LUMINESCENT (EL) FULLY AUTOMATIC LORAN RECEIVER	The panel of light that backlights the 2831/2801/3001. Equipment that, after the initial selection of the chain, automatically acquires the master and secondaries, settles, cycle selects, tracks the signals, and periodically updates the lines of position without manipulation of panel controls.
GRADIENT	The Time Difference separation between Lines of Position, (specified in microseconds). Gradients vary accordingly with selection of Master-Secondary pairs.
GRI-GROUP REPETITION INTERVAL	The time coded delay, a 4 digit number used to identify the group of transmitter stations in a specified LORAN C chain.
GROUND WAVE	The path along the curvature of the earth which the LORAN C signals follow. (see SKY WAVE)
IN-BAND NOISE	Any electrical interference which occurs within the LORAN C band of 90 KHz to 110 KHz.
IONOSPHERE	An atmospheric layer above the earth's surface, varying in altitude between 25 to 250 miles, which reflect radio waves.

LATITUDE-LONGITUDE	Grid system used in Mercator projection charts in which the parallel lines which run East (right side of chart) and West (left side of chart) denote Latitude--from 0 degrees at the Equator to 90 degrees North or South at the Poles. Lines of Longitude run North (top) and South (bottom)--from 0 degrees to 180 degrees East or West of Greenwich.
LINE OF POSITION-LOP	A graphical plot of all observation points having the same constant measured time difference (TD) between the Master station and Secondary stations. The graphical plot forms the Line of Position printed on the LORAN C chart.
LORAN C SYSTEM	A long range navigation system that operates at an assigned frequency of 100 KHz. It utilizes pulsed signals from widely spaced transmitting stations and measures the difference in arrival times of the pulses to determine position relative to the transmitting stations.
LORAN FIX	The position or location established by the intersection of two LOP's.
MAXIMUM OPERATING RANGE	The maximum distance within the prime coverage area where LORAN reception is possible within a specified accuracy and a specified signal to noise ratio.
M-MASTER STATION	The controlling station of the LORAN C chain which transmits the reference timing signals.
MINIMUM OPERATING RANGE	The range, 5 to 20 miles, wherein the receiver may not track the desired cycle, thus causing displayed errors in increments of 10 microseconds.
NOTCH FILTERS	A narrow band noise filter used to tune out interference near the LORAN C band.
PIXELS	The individual dots on the LCD screen.
RECEIVER	A device that processes LORAN signals from the antenna coupler and measures the difference in arrival time of the selected signals representing the measured parameter.
REPEATABILITY	The ability to return to a particular position or location using LORAN C navigation aids. (see ACCURACY)
REPEATABLE ACCURACY	The ability of the Loran System to return you to the same location time and time again. Many factors affect repeatable accuracy, perhaps the largest being local gradients and crossing angles.
SECONDARY STATION	Any transmitting station in the chain that is not the Master station. Secondaries are usually designated V, W, X, Y, Z and referenced to the Master (M) station GRI. The IMPULSE 2831 refers to these secondaries as 1, 2, 3, 4 and 5.
SENSITIVITY	Sensitivity is another name for GAIN. In general, the deeper the water, the more gain is required.
SETTLE	Is the process of automatically aligning the phase codes, identifying the correct cycle zero-crossing, establishing ground wave tracking, and indicating that time differences are valid.
SIGNAL-TO-NOISE RATIO	The ratio of LORAN signal strength, at the TIMING point, to the in-band noise.
SKYWAVE	A LORAN C signal transmission which is reflected by the ionosphere. These signals are less accurate than the ground wave signals. (see GROUND WAVE)
SPEED OVER GROUND	The rate of advance of a vessel over the ground, as opposed to speed through the water.
SUPERTWIST LCO	Liquid Crystal Display. An liquid organic compound between two layers of glass with polarizing abilities. The display screen of the 2831/3001 is a LCD with Supertwist crystals. The molecules internal to the display are twisted so that they provide you with a high contrast levels and better viewing angles.
TIME DIFFERENCE-TO	Time Difference is the time of arrival of the secondary signal minus the time of arrival of the master signal, as observed on a single receiver.
TRACKING	Is the process of maintaining the synchronization of the receiver with the selected signals.
WAYPOINT	A destination, position or location, to which the LORAN C user wishes to travel, consisting of the intersection of two Lines of Position (LOP's).

GENERAL OPERATION

1. **SYMPTOM:** Unit does not turn on at all. No beep, no display.
CHECK: Make sure the unit is actually receiving power. Check the inline fuse, and the circuit breaker panel on the boat. Make certain the unit is receiving 11.5 to 16 volts of CLEAN DC. Make sure the DC polarity has not been reversed. Check for corrosion on the power connector, and clean if necessary. Sometimes gently spreading the two pins on the male power connector with a small knife will help make a better contact.
2. **SYMPTOM:** Unit Beeps, but no display
CHECK: Disconnect the 4 Pin speed/temperature connector from the back of the instrument. If the display returns, replace the speed/temperature impeller.
3. **SYMPTOM:** Unit always operates in Simulator Mode, fishing Image repeats over and over again regardless of the boat's movement.
CHECK: After turning the unit on, do not press the SIMULATOR key.

LORAN C**1. MESSAGE BOARD READINGS ON TD STATUS SCREEN:****"COUPLER SHORT"**

CHECK: Unplug the Antenna Coupler Unit from the back of the 4020. If the message remains, the 4020 may be defective and should be returned to IMPULSE for repair. If the message goes away, the coaxial cable or the connector from the Antenna Coupler Unit is probably shorted. Find and repair the short.

"PLEASE RESTART LORAN"

No TD's appear; no latitude/longitude (TD's) prints; the PLOTTER screen doesn't plot; most LORAN functions do not work.

CHECK: The unit has no information with which to automatically restart the LORAN. In this case, you must manually re-start it. See RESTART LORAN.

"LOOKING FOR SIGNAL"

No TD's appear; no latitude/longitude (TD's) prints; the Plotter screen doesn't plot; most LORAN functions do not work. Sometimes, the message may go away and return. Signal qualities do not rise.

CHECK:

- a) The Antenna Coupler Unit may be Improperly installed or connected (perhaps a loose connector or a bad connection). See INSTALLING THE ANTENNA/COUPLER.
- b) The unit may have been restarted with the wrong position or GRI. See RESTART LORAN.
- c) The antenna may be picking up extreme interference, which is masking out all signals. See IMPROVING LORAN RECEPTION, below.
- d) The internal precision oscillator in the unit may be out of calibration. If this is the case, the unit must be calibrated at the factory.

"CAN'T COMPUTE LAT/LONG"

The TD's for the selected stations have locked but the latitude/longitude (TD's) is flashing, OR the Message Board on the TD STATUS screen reads "CAN'T COMPUTE LAT/LONG":

CHECK:

- a) You may need to re-seed the coordinate converter with your approximate present position. See RE-SEED LAT/LONG.
- b) You may be in a baseline extension area for one of the stations used. You will need to ascertain this from a local chart or from the GRI charts in the back of this manual. If this is the case, you will need to select a different station triad. See SELECT STATIONS.

"LORAN IN OP"

CHECK: Turn your 4020 off and back on again. If the message is still showing try erasing the permanent memory & restart the Loran per instructions. If the message persists, the unit probably has an internal electronic problem and will need to be returned to IMPULSE for repair.

"CAUTION: OSC = ####"

The internal precision TCXO oscillator may be out of calibration. The Indicated numeric value is the measured degree of error in parts per hundred million. Generally, oscillators with errors less than 380 are useable, however, exercise caution when this message is displayed. If the displayed numeric value stays above 400, factory calibration may be necessary.

2. **SYMPTOM:** Signal Qualities for all stations are POOR or BAD. One or two stations may be in SEARCH mode, although it is clear the unit is receiving some signals.

CHECK:

- a) The antenna may be picking up extreme interference, which is masking out all signals. See IMPROVING LORAN RECEPTION, below.
- b) The Antenna Coupler Unit may be improperly installed or connected (perhaps a loose connector, or a bad connection). See INSTALLING THE ANTENNA/COUPLER.

3. **SYMPTOM:** Search Status for a given station remains in SEARCH. Other signals can settle and lock.

CHECK:

- a) The station is probably too distant and/or not powerful enough to receive. Sometimes better antenna placement will improve reception (see INSTALLING THE ANTENNA/COUPLER). Grounding the receiver to a good water ground may also improve reception of weak signals (see RECEIVER GROUNDING). Reducing any local interference to LORAN reception may also be necessary. See IMPROVING LORAN RECEPTION, below.
- b) The transmitter in question may be off the air temporarily. If possible, use a different set of stations with which to navigate.

4. **SYMPTOM:** One or more TD's is wrong by 10 microseconds or a multiple of 10 microseconds. The Search Status for the corresponding station may be indecisive, switching from SETTLE to LOCK and then back to SETTLE again.

CHECK: This may be due to ECD effects (envelope-to-cycle difference), which are distortions in the shape of the received signal due to propagation in the atmosphere. These distortions sometimes make it extremely difficult for the unit to locate the correct cycle to track. Another possible cause of these symptoms is that a received groundwave signal may be very weak, causing the unit to lock onto a skywave signal, which will cause the corresponding TD to be several tens of microseconds too high. In any case, if the unit has trouble selecting the correct cycle, you may wish to employ the LOCK/JUMP screen to manually lock the unit onto the correct cycle (see LOCK / JUMP). If all are wrong by the same amount, the unit may have selected the wrong cycle for the Master station. In this case, you will need to manually lock the Master station.

5. **SYMPTOM:** The unit produces the correct TD's but the latitude/longitude is wrong.

CHECK: If the latitude/longitude is close to the correct reading (within a few minutes):

- a) Make sure you are using the most appropriate stations for your area. Gradients and crossing angles change with each set of stations selected; therefore changing stations used will change the latitude/longitude calculation by a small amount. See SELECT STATIONS.
- b) If you are concerned about the absolute accuracy of LORAN, you may wish to employ ASF corrections to correct small anomalies in the received signal. See ASF CORRECTIONS.

CHECK: If the latitude/longitude is not close to the correct reading:

- a) You may need to re-seed the coordinate converter with your approximate present position. See RE-SEED LAT/LONG.
- b) Determine from local charts whether you are in the baseline extension area for one of the stations presently in use. If you are in the baseline extension area, select a different station triad. See SELECT STATIONS.

IMPROVING LORAN RECEPTION

In most cases, the installation and operation of your IMPULSE 2831/3001 will be straight forward and trouble-free. However, if you encounter difficulty in reception of the LORAN signals, the following techniques should be employed to help isolate and correct poor reception. When we refer to "poor reception," we are referring to one or more of the following behaviors when viewing the Signal/Status Screen:

- The Message Board reads "LOOKING FOR SIGNAL" most of the time.
- One or two stations may have a Search Status of SEARCH.
- Signal qualities for one or more stations are POOR or BAD.

Before attributing the problem to a source of radio frequency interference (RFI), be certain to rule out other potential causes for the symptom. For example, if the Message Board reads "LOOKING FOR SIGNAL", it may be because the LORAN was restarted with a wrong GRI, or the Antenna/Coupler unit is improperly connected. These are not "interference problems". Refer to the described symptoms under TROUBLE SHOOTING GUIDELINES to aid in isolating these other problems. Local interference may be divided into two general categories: off-board and on-board.

OFF-BOARD INTERFERENCE

Off-board Interference may be caused by local (non-LORAN-C) transmitters which broadcast at frequencies at or near the LORAN band of 100 KHz. The 2831/3001 contains six preset notch filters to reduce RFI caused by the most common and troublesome transmitters. You may help reduce the effects of off-board interference by selecting a better antenna location (see INSTALLING THE ANTENNA/COUPLER). In addition, grounding the receiver to a good water ground may also improve reception of weaker signals in the presence of RFI (see RECEIVER GROUNDING).

ISOLATING ON-BOARD INTERFERENCE

On-board Interference is caused by other electrical devices located on your boat. To reduce the effects of these other sources of RFI, you will first need to isolate the source.

- First, turn off all possible sources of Interference (see list of INTERFERENCE SOURCES), including your boat's engine.
- Then, turn on the IMPULSE 2831/3001. Allow the unit a few minutes to settle and lock on all stations. Observe the behavior of the unit, in particular noting the Signal Quality levels that the unit eventually achieves.
- Turn the unit off again, and then start your boat's engine. Turn the IMPULSE back on, again wait a few minutes for the unit to settle and lock, and again observe the Signal Quality levels that the unit achieves. If the Signal Quality levels remain high when "revving" the engine, there is apparently no substantial engine related Interference. If the Signal Quality drops significantly, you will probably need to filter the sources of noise, e.g. alternator, ignition, tach, etc.
- Next, turn on each suspect piece of equipment, one at a time, and watch for any loss of Signal Quality. If you have a noticeable loss, repeat a few times on each one to make sure it's actually caused by the equipment you just turned on. Again, if the Signal Quality drops significantly, you will probably need to take corrective steps of action with the equipment in question. Sometimes this will involve shielding or properly grounding an instrument, or by consulting the manufacturer of the offending equipment.

INTERFERENCE SOURCES

RFI: RADIO FREQUENCY INTERFERENCE:

Sources of RFI affecting LORAN receivers are usually from the boat's environment itself. Any transmitter such as a VHF radio or CB radio, is a potential source of interference. Also with the steady increase in the amount of electrical and electronic equipment, associated cable wiring, and reduced wiring standards, the level of RFI has risen accordingly. This section defines the main sources of RFI, and identifies the paths through which it can be reduced.

The worst and most common noise sources are alternators, fluorescent lights, and TV-type devices. Each usually produce enough RFI to seriously degrade or prevent the normal operation of a LORAN instrument.

ALTERNATORS

The most likely source of interference and perhaps the most common on-board source of RFI is the alternator used for charging the battery. This interference is readily controlled by installing an appropriate filter at the output of each alternator. A proper filter in the POSITIVE LEAD between the BATTERY and the ALTERNATOR will usually solve this interference. **NOTE: NEVER FILTER THE FIELD LEAD AS THIS WILL PROBABLY DAMAGE THE ALTERNATOR.**

We recommend using the MAR LINE alternator filters. You can reach them by calling: 213-595-6521.

FLUORESCENT LIGHTS

Small 12 volt DC fluorescent lights produce both conducted and radiated RFI. If you need these lights while operating your LORAN, install a filter in the power line to each unit. If interference is radiated, you may need to RF shield each lamp.

TV SETS

All TV-type devices, i.e., TV's, computer and video displays, produce a great amount of RFI. This is conducted out of the set's power wiring and is radiated by the magnetic components of the set's beam deflection and high voltage circuits. A practical means of controlling this radiation - without a totally shielded enclosure - is not available. Separate the two instruments as far as possible from each other. We suggest that the offending device be turned OFF.

LESS COMMON SOURCES OF RFI

This group of possible interfering sources may or may not cause a problem. Every boat is different. Use your LORAN's Signal Quality Screen to monitor the severity of these sources. If the quality drops by 10% or more, it may be best to suppress the device. A DC power filter installed at the source will usually take care of the problem. Select a power line filter with a current rating capable of handling each device for each offending accessory.

DC MOTORS

Motors such as those used in pumps, windshield wipers, and refrigerators may also cause interference.

DIGITAL INSTRUMENTS

Instruments with microprocessors, such as depth sounders, speedometers, tachometers, etc., use switching circuits that may cause interference.

CONVENTIONAL GASOLINE ENGINES

Conventional gas engines can generate interference from the ignition wiring system, coils, plugs, electronic ignition (CD type). By following the manufacturer's suppression recommendations, these sources can usually be reduced and/or eliminated.

POWER INVERTERS

Power inverters used in radars, strobe lights, and various types of electronic equipment can cause RFI interference.

LORAN RECEIVER ISOLATION

Noise filters act to reduce noise from various sources, however, it sometimes cannot be totally eliminated. Reduce this residual noise by providing RF isolation in both sides of the LORAN's DC power line, install a power line conditioner.

LORAN C START UP LOCATIONS

ALABAMA		
Bayou La Batre	30°20.00	88°15.00
Gulf shores	30°15.00	87°40.00
Mobile	30°40.00	88°00.00

ARIZONA		
Phoenix	33°27.00	112°04.00

CALIFORNIA		
Big Sur	36°10.00	121°45.00
Bodega Bay	38°20.00	123°00.00
Crescent City	41°45.00	124°10.00
Eureka	40°50.00	124°10.00
Fort Bragg	39°30.00	123°50.00
Half Moon Bay	37°30.00	122°25.00
Imperial beach	32°40.00	117°10.00
Long Beach	33°45.00	118°15.00
Monterey	36°35.00	121°50.00
Morro Bay	35°20.00	120°50.00
Newport Beach	33°40.00	118°00.00
Oceanside	33°15.00	117°25.00
Point Arena	38°50.00	123°40.00
Pt. Conception	34°25.00	120°25.00
Pt. Hueneume	34°10.00	119°10.00
Redondo Beach	33°50.00	118°20.00
Rockport	39°45.00	123°45.00
San Diego	32°45.00	117°15.00
San Francisco	37°50.00	122°25.00
San Simeon	35°35.00	121°10.00
Santa Barbara	34°25.00	119°40.00
Santa Cruz	36°55.00	122°00.00
Santa Monica	34°00.00	118°25.00
Ventura	34°15.00	119°20.00

COLORADO		
Denver	39.45.00	105°00.00

CONNECTICUT		
Bridgeport	41°10.00	73°10.00
New Haven	41°15.00	72°55.00
New London	41°20.00	72°05.00
Stamford	41°05.00	73°30.00

DELAWARE		
Delaware Bay	39°00.00	75°20.00
Rehoboth Beach	38°40.00	75°10.00

FLORIDA		
Apalachicola	29°45.00	85°00.00
Boca Raton	26°20.00	80°00.00
Bradenton	27°30.00	82°35.00
Cape Coral	26°35.00	82°00.00
Cedar Key	29°10.00	83°00.00
Clearwater	28°00.00	82°50.00
Cocoa Beach	28°20.00	80°35.00
Crystal River	28°55.00	82°40.00
Daytona Beach	29°15.00	81°00.00
Destin	30°25.00	86°30.00
Ft. Lauderdale	26°10.00	80°10.00
Ft. Pierce	27°30.00	80°20.00
Hollywood	26°00.00	80°10.00
Jacksonville Beach	30°15.00	81°20.00
Jensen Beach	27°15.00	80°10.00
Key Biscayne	25°40.00	80°10.00
Key Largo	25°10.00	80°25.00
Key West	25°30.00	81°50.00
Marathon	24°40.00	81°10.00
Marco	25°55.00	81°45.00
Melbourne	28°05.00	80°30.00

Miami	25°45.00	80°10.00
Naples	26°10.00	81°50.00
New Smyrna	29°00.00	80°55.00
Panama City	30°10.00	85°40.00
Pensacola	30°25.00	87°15.00
Pompano Beach	26°15.00	80°05.00
Port Richey	28°20.00	82°45.00
Port St. Joe	29°50.00	85°20.00
Punta Gorda	26°55.00	82°00.00
Sarasota	27°20.00	82°30.00
St. Augustine	29°50.00	81°10.00
St. Petersburg	27°45.00	82°40.00
Tampa	27°55.00	82°30.00
Tarpon Springs	28°10.00	82°50.00
Titusville	28°40.00	80°40.00
Venice	27°05.00	82°30.00
Vero Beach	27°40.00	80°26.00
West Palm Beach	26°50.00	80°00.00

• 43 TD may be unusable near W. Palm Beach

GEORGIA		
Brunswick	31°10.00	81°25.00
Savannah	32°00.00	81°10.00

IDAHO		
Boise	43°37.00	116°13.00
Idaho Falls	43°29.00	112°02.00

ILLINOIS		
Chicago	41°50.00	87°35.00
Evanston	42°00.00	87°45.00
Waukegan	42°20.00	87°50.00

INDIANA		
Gary	41°30.00	87°15.00

IOWA		
Des Moines	41°35.00	93°37.00

KANSAS		
Kansas City	39°07.00	94°37.00
Wichita	37°41.00	97°20.00

LOUISIANA		
Abbeville	29°55.00	92°05.00
Cameron	29°45.00	93°20.00
Houma	29°30.00	90°40.00
Lake Charles	30°10.00	93°10.00
Morgan City	29°35.00	91°10.00
New Iberia	30°00.00	91°50.00
New Orleans	30°00.00	90°00.00
Slidel	30°10.00	89°45.00

• The 11 TD is unusable close to Coast

MAINE		
Bar Harbor	44°20.00	68°15.00
Belfast	44°25.00	69°00.00
Brunswick	44°00.00	70°00.00
Millbridge	44°30.00	67°50.00
Perry	45°00.00	67°00.00
Rockland	44°00.00	69°00.00
Portland	43°40.00	70°20.00

MARYLAND		
Annapolis	39°00.00	76°30.00
Cambridge	38°35.00	76°05.00
Crisfield	30°00.00	75°50.00
Lexington Park	30°15.00	76°25.00
Ocean City	38°20.00	75°05.00

MASSACHUSETTS		
Boston	42°20.00	71°00.00
Eastham	41°50.00	70°00.00
Falmouth	41°30.00	70°35.00
Gloucester	42°35.00	70°40.00
Lynn	42°30.00	70°55.00
New Bedford	41°40.00	70°55.00
Newburyport	42°45.00	70°50.00
Plymouth	42°00.00	70°40.00
Pocasset	41°40.00	70°40.00
Provincetown	42°05.00	70°10.00
Quincy	42°15.00	71°00.00
Sagamore	41°45.00	70°30.00
Salem	42°30.00	70°55.00
S. Yarmouth	41°40.00	70°10.00

MICHIGAN		
Alpena	45°00.00	83°30.00
Bay City	43°40.00	83°55.00
Benton Harbor	42°05.00	86°35.00
Cheboygan	45°40.00	84°30.00
Copper Harbor	47°30.00	87°55.00
Detroit	42°20.00	83°00.00
Escanaba	45°40.00	87°05.00
Gould City	46°10.00	85°45.00
Grand Marais	46°40.00	86°00.00
Hessel	46°00.00	84°25.00
Holland	42°50.00	86°15.00
Houghton	47°05.00	88°30.00
Ludington	43°55.00	86°30.00
Manistee	44°15.00	86°20.00
Manistique	45°55.00	86°15.00
Marquette	46°35.00	87°20.00
Menominee	45°10.00	87°35.00
Monroe	41°50.00	83°15.00
Munsing	46°25.00	86°35.00
Muskegon	43°10.00	86°25.00
Northport	45°05.00	85°40.00
Onkama	44°25.00	86°20.00
Ontonagon	46°50.00	89°20.00
Petoskey	45°20.00	85°00.00
Port Austin	44°00.00	83°00.00
Port Hope	44°00.00	82°50.00
Port Huron	43°00.00	82°30.00
South Haven	42°25.00	86°20.00
St. Ignace	45°50.00	84°45.00
Tawas City	44°20.00	83°25.00
Whitefish Point	46°45.00	85°00.00

MINNESOTA		
Duluth	46°47.00	92°07.00
Graid Marais	47°50.00	90°20.00
Grand Potage	48°00.00	89°40.00
St. Paul	44°57.00	93°06.00
Silver Bay	47°15.00	91°15.00
Two Harbors	47°00.00	91°40.00

MISSISSIPPI		
Bay St. Louis	30°20.00	89°20.00
Biloxi	30°25.00	88°55.00
Gulfport	30°20.00	89°05.00
Pascagoula	30°20.00	88°35.00

MISSOURI		
St. Louis	38°37.00	90°12.00

LORAN C START UP LOCATIONS

MONTANA

Helena	46°36.00	112°01.00
Billings	45°47.00	108°30.00

NEBRASKA

Omaha	41°15.00	95°56.00
Lincoln	40°49.00	95°41.00

NEW HAMPSHIRE

Portsmouth	43°00.00	70°45.00
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NEW JERSEY

Asbury Park	40°15.00	74°00.00
Atlantic City	39°20.00	74°25.00
Cape May	38°55.00	74°55.00
Delaware Bay	39°15.00	75°15.00
Perth Amboy	40°30.00	74°15.00
Point Pleasant	40°05.00	74°00.00
Sandy Hook	40°30.00	74°00.00
Stone Harbor	39°00.00	74°45.00

NEW MEXICO

Santa Fe	35°41.00	105°57.00
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NEW YORK

Bayshore	40°45.00	73°15.00
Buffalo	42°50.00	78°55.00
Dunkirk	42°30.00	79°20.00
Greenport	41°05.00	72°20.00
Kings Point	40°50.00	73°45.00
Lakeside Beach	43°20.00	78°15.00
Long Beach	40°35.00	73°35.00
Mastic	40°50.00	72°50.00
Montauk	41°00.00	72°00.00
New Rochelle	40°55.00	73°45.00
Northport	40°55.00	73°21.00
Oswego	43°25.00	76°30.00
Riverhead	40°55.00	72°40.00
Rochester	43°15.00	77°35.00
Roosevelt Beach	43°20.00	78°50.00
Sag Harbor	41°00.00	72°15.00
South Hampton	40°50.00	72°20.00
Stony Brook	41°00.00	73°10.00
Watertown	44°00.00	76°00.00

N. CAROLINA

Elizabeth City	36°20.00	76°10.00
Englemard	35°30.00	76°00.00
Hatteras	35°15.00	75°45.00
Hobacken	35°15.00	76°30.00
Kitty Hawk	36°05.00	75°45.00
Morehead City	34°45.00	76°40.00
New Bern	35°10.00	77°00.00
Washington	35°30.00	77°00.00
Wilmington	34°15.00	78°00.00

N. DAKOTA

Bismarck	46°48.00	100°47.00
Fargo	46°52.00	96°48.00

OHIO

Ashtabula	41°50.00	80°50.00
Cleveland	41°30.00	81°45.00
Sandusky	41°25.00	82°45.00
Toledo	41°40.00	83°30.00

OKLAHOMA

Oklahoma City	35°28.00	97°31.00
Tulsa	36°09.00	95°59.00

OREGON

Astoria	46°10.00	123°50.00
Brookings	42°05.00	124°25.00
Coos Bay	43°20.00	124°20.00
Florence	44°00.00	124°05.00
Gold Beach	42°25.00	124°20.00
Lincoln City	44°55.00	124°00.00
Newport	44°40.00	124°00.00
Port Orford	42°45.00	124°30.00
Portland	45°35.00	122°40.00
Reedsport	43°40.00	124°10.00
Seaside	46°00.00	124°00.00
Tillamook	45°30.00	123°55.00

PENNSYLVANIA

Erie	42°10.00	80°05.00
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RHODE ISLAND

Narragansett	41°25.00	71°25.00
Newport	41°30.00	71°20.00
Warwick	41°40.00	71°20.00

S. CAROLINA

Charleston	32°50.00	80°00.00
Georgetown	33°20.00	79°20.00
Hilton Head	32°10.00	80°45.00
Myrtle Beach	33°40.00	79°00.00

S. DAKOTA

Pierre	44°22.00	100°21.00
Sioux Falls	43°32.00	96°44.00

TEXAS

Aransas Pass	27°50.00	97°10.00
Amarillo	35°12.00	101°50.00
Baytown	29°40.00	95°50.00
Beaumont	30°00.00	94°10.00
Corpus Christi	27°45.00	97°20.00
Dallas	32°47.00	96°48.00
El Paso	31°45.00	106°29.00
Freeport	28°55.00	95°10.00
Galveston	29°20.00	94°40.00
Houston	29°45.00	95°25.00
Port Arthur	29°55.00	94°00.00
Port Isabel	26°00.00	97°15.00
Port Lavaca	28°35.00	96°30.00
Port Mansfield	26°30.00	97°20.00

the 11 TD may be unusable near coast

UTAH

Salt Lake City	40°45.00	111°53.00
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VIRGINIA

Burgess	37°50.00	76°15.00
Cape Charles	37°15.00	76°00.00
Hampton	37°00.00	76°15.00
Virginia Beach	36°50.00	76°00.00

WASHINGTON

Anacortes	48°30.00	122°35.00
Bellingham	48°45.00	122°30.00
Cape Flattery	48°20.00	124°40.00
Everett	48°00.00	122°10.00
Iiwaco	46°15.00	124°00.00
La Push	47°50.00	124°35.00
Neah Bay		
Oak Harbor	48°15.00	122°35.00
Port Angeles	48°05.00	123°35.00
Port Townsend	48°05.00	122°45.00
Queets	47°30.00	124°20.00
Seattle	47°35.00	122°25.00
South Bend	46°40.00	123°55.00
Spokane	47°40.00	117°24.00
Tacoma	47°15.00	122°35.00
Westport	46°50.00	124°05.00

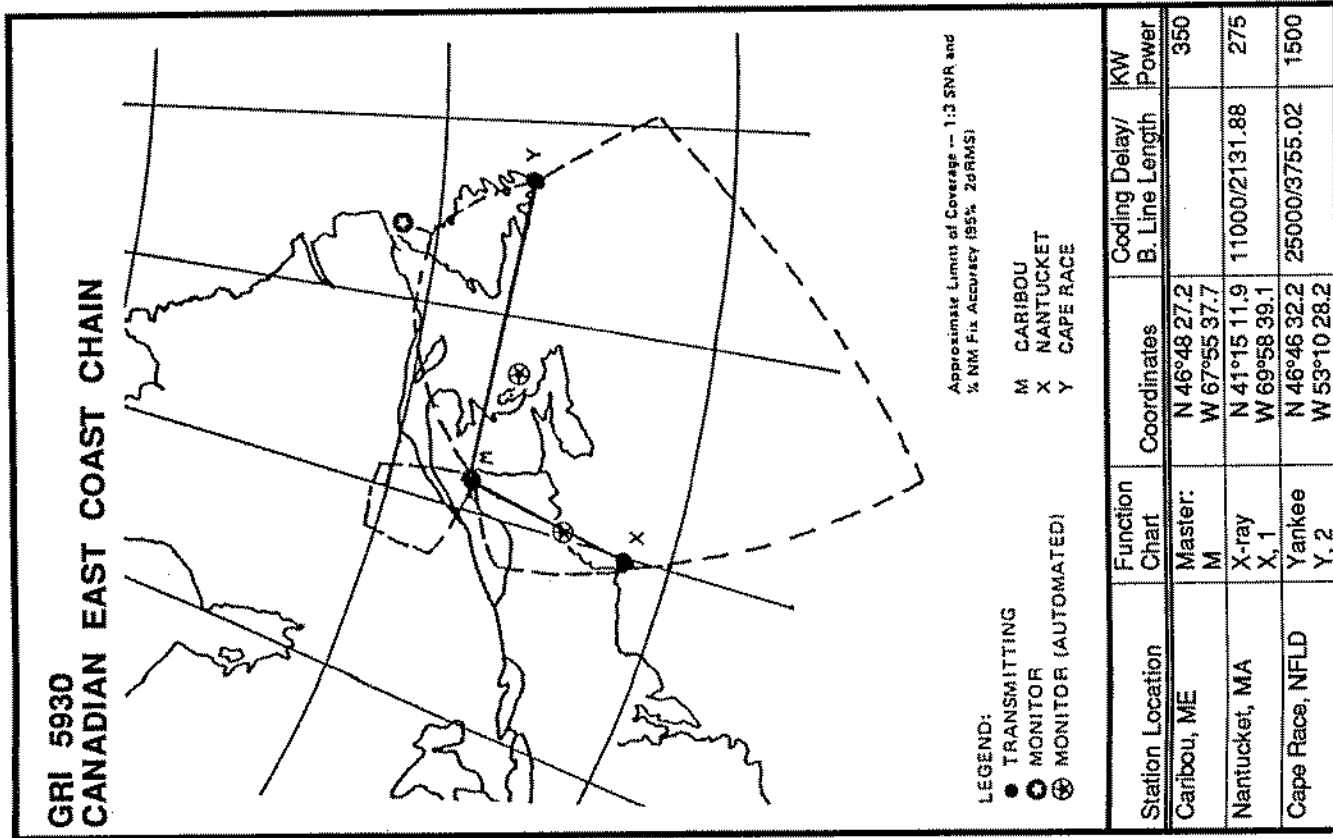
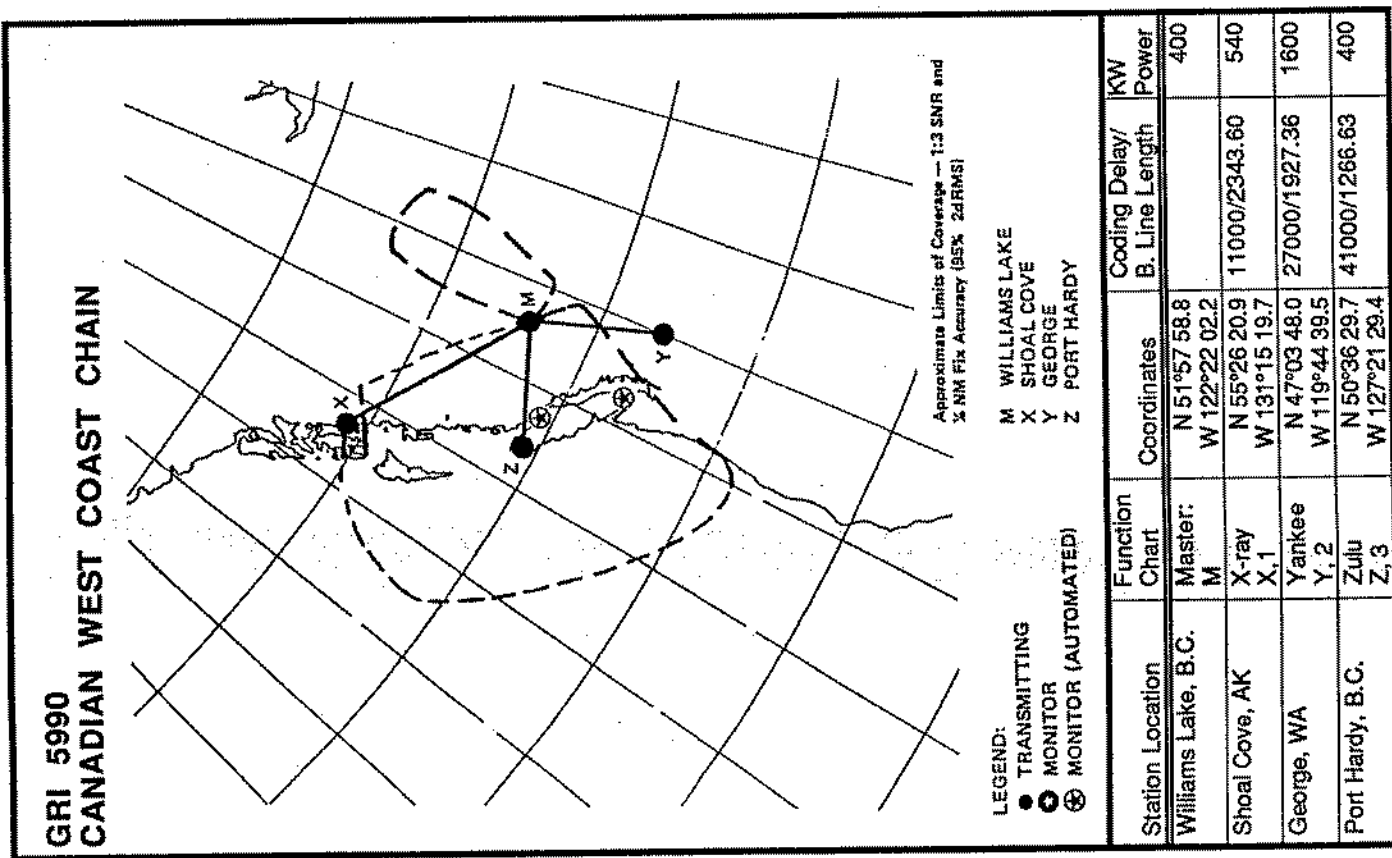
WISCONSIN

Ashland	46°40.00	90°50.00
Greenbay	44°35.00	87°55.00
Kenosha	42°35.00	87°50.00
Manitowoc	44°05.00	87°40.00
Marinette	45°05.00	87°35.00
Milwaukee	43°00.00	87°55.00
Port Wing	46°50.00	91°30.00
Red Cliff	46°50.00	90°45.00
Sheboygan	43°45.00	87°45.00
Sister Bay	45°15.00	87°10.00
Sturgeon Bay	44°50.00	87°20.00
Superior	46°45.00	92°00.00

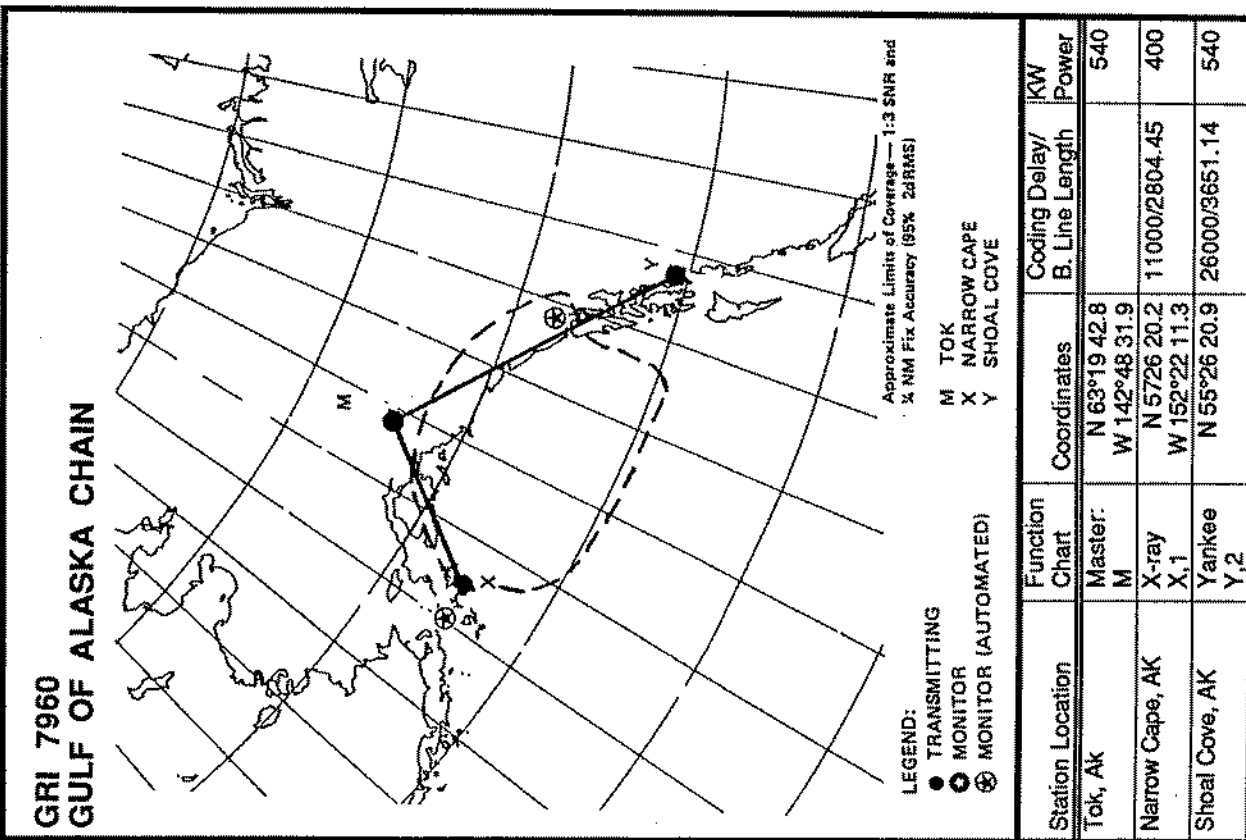
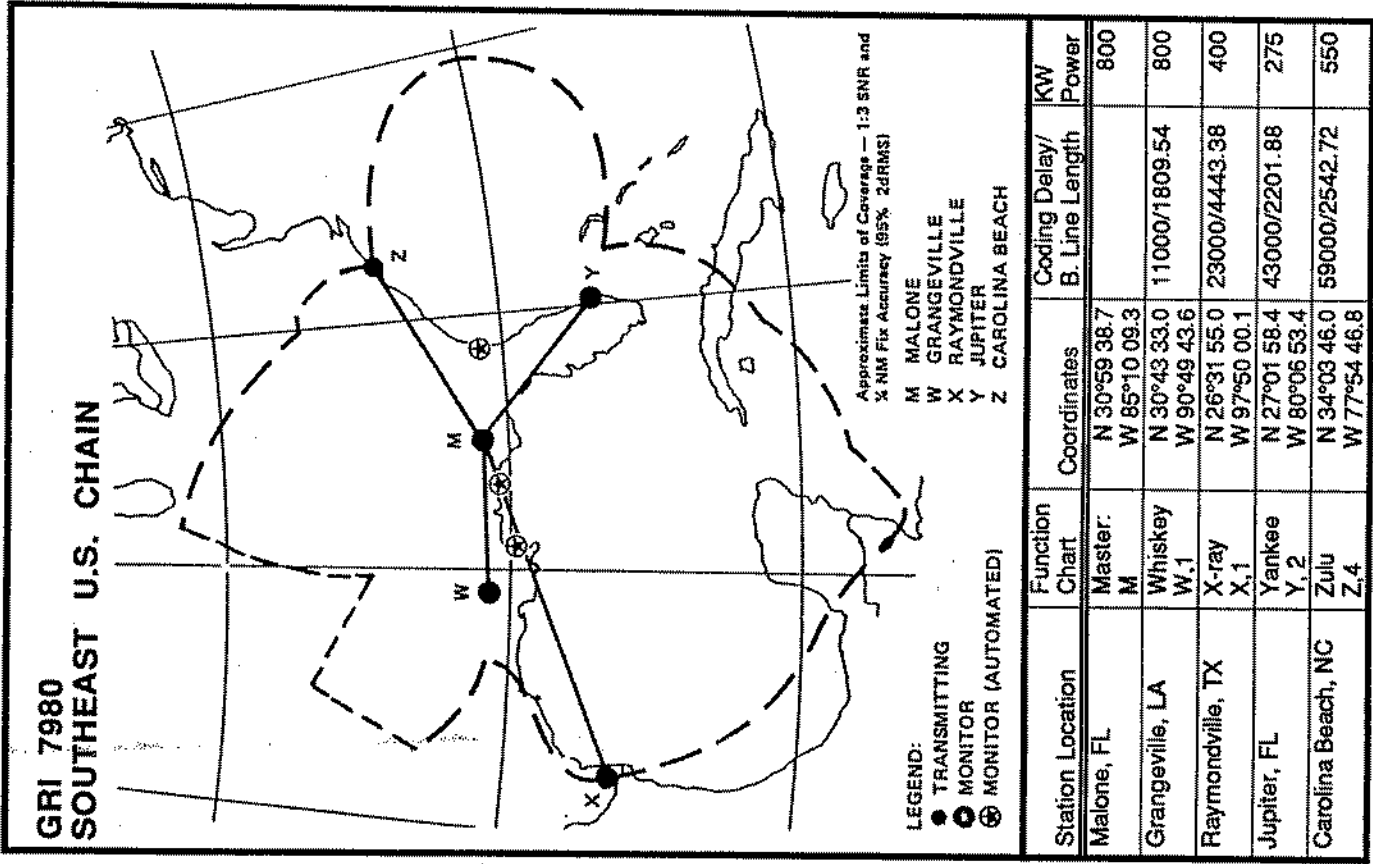
WYOMING

Cheyenne	41°08.00	104°49.00
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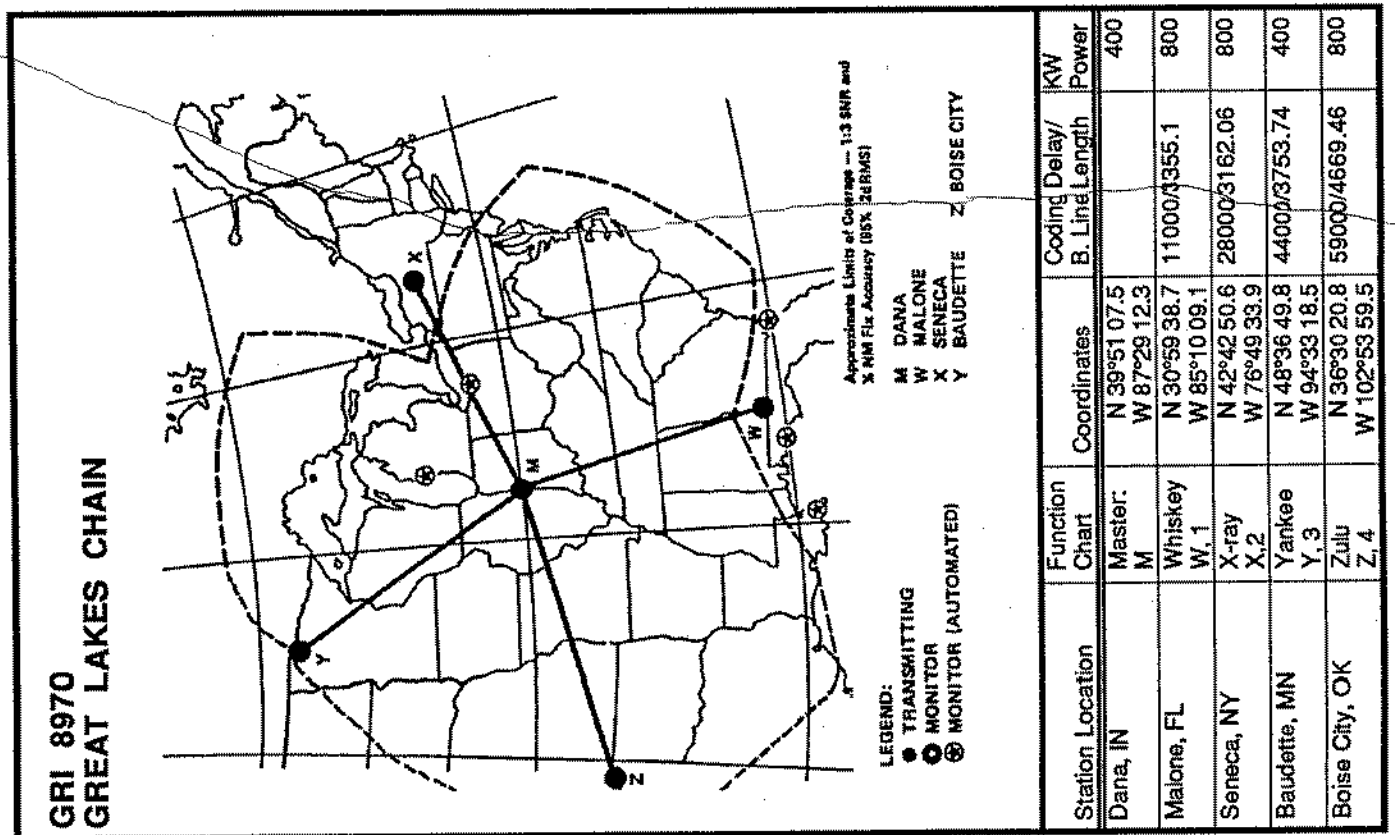
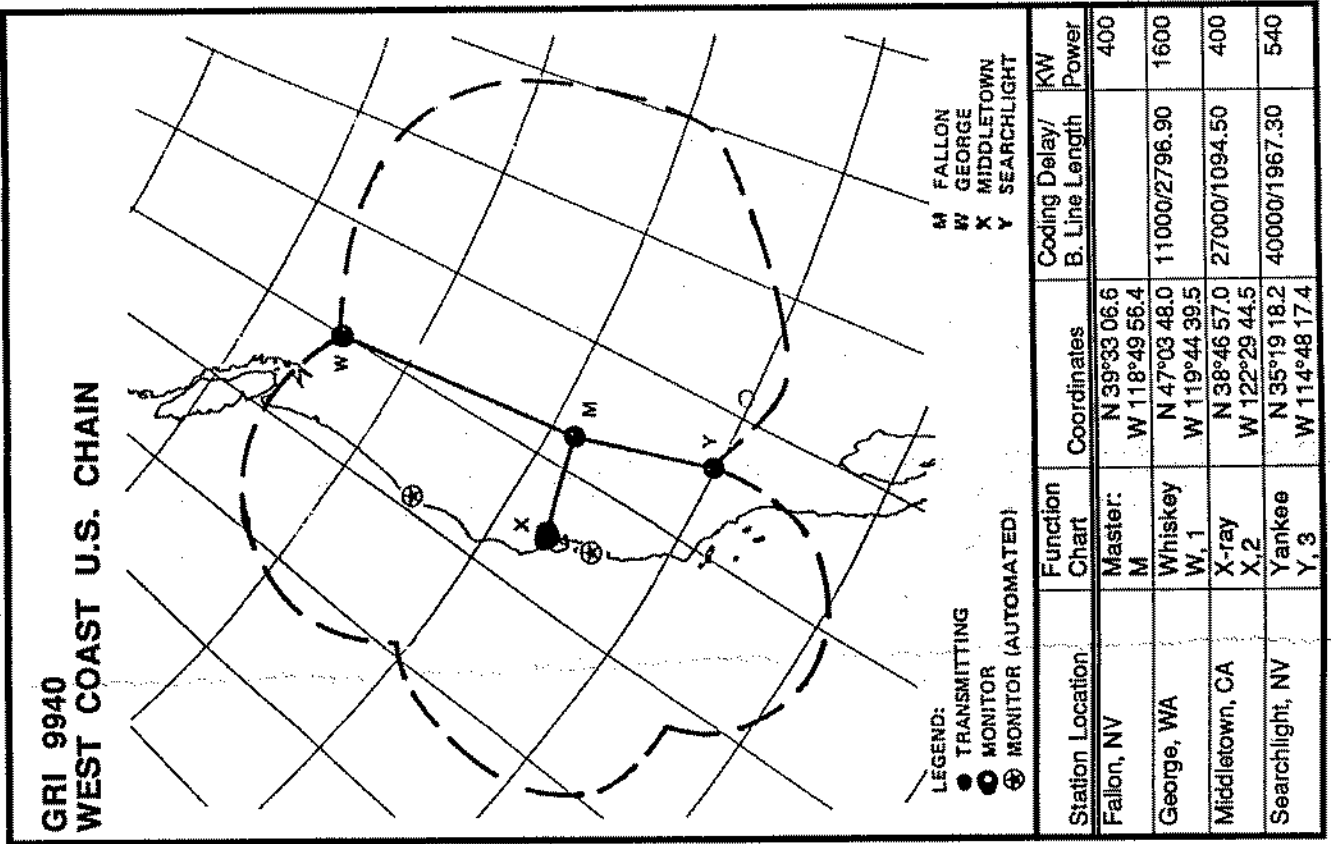
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 CANADIAN WEST COAST CHAIN - GRI 5990



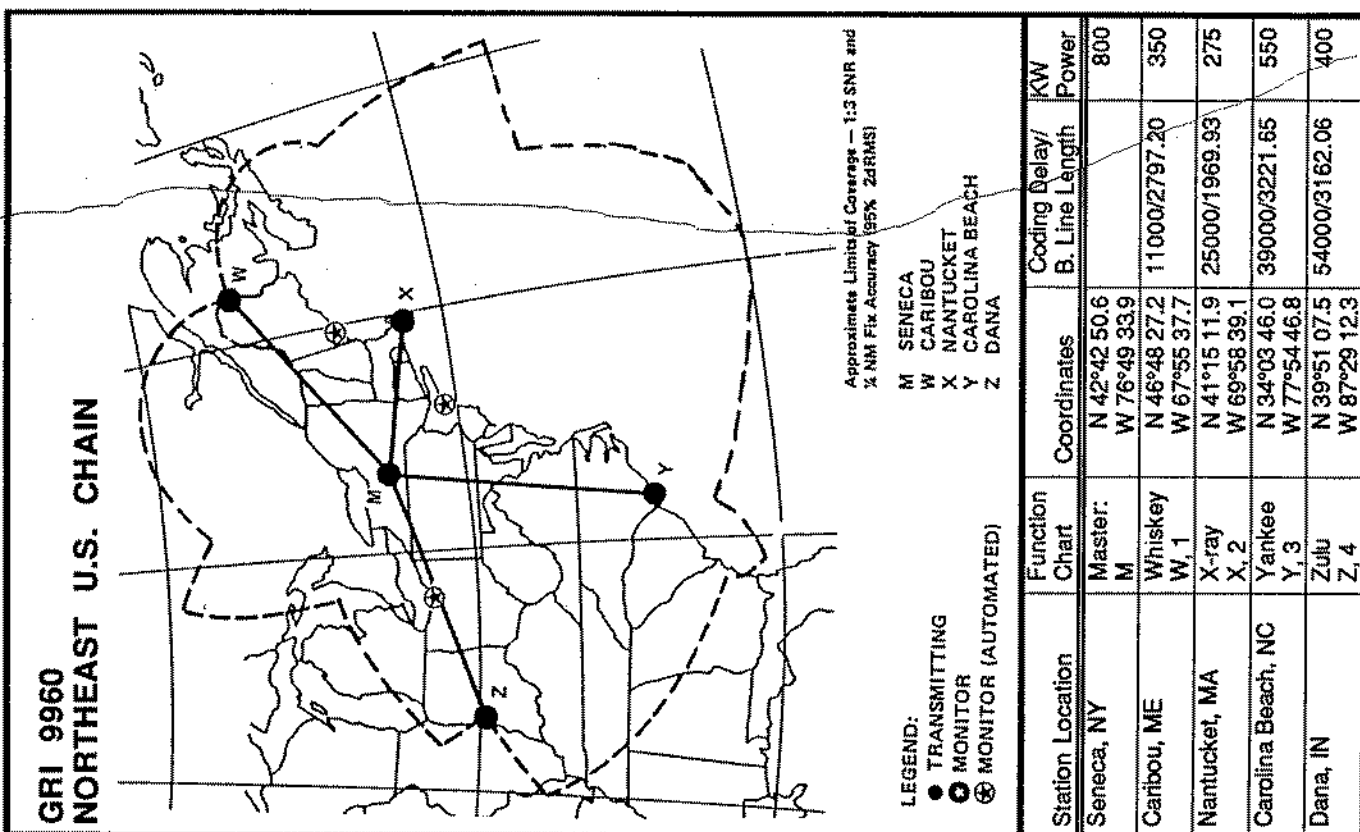
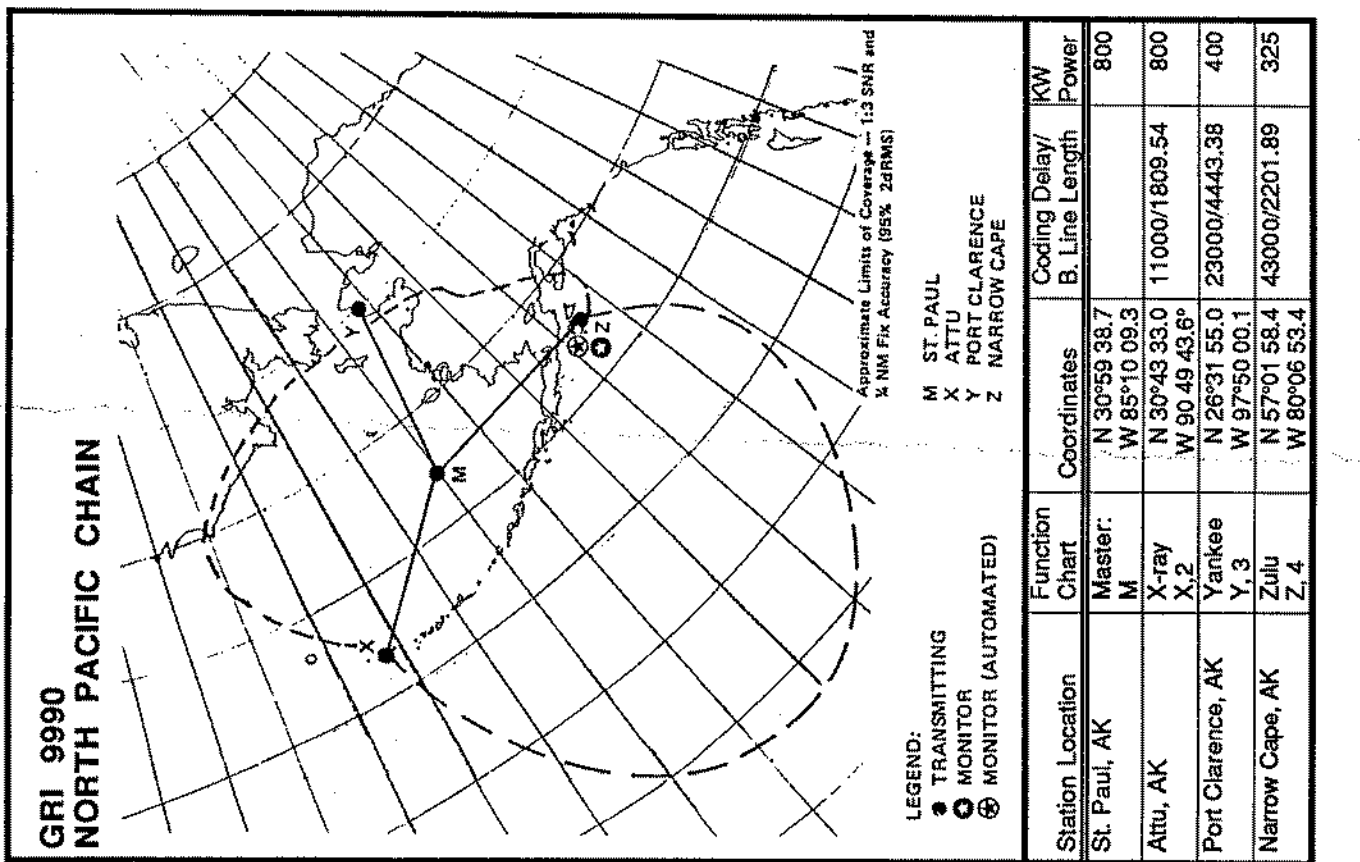
GULF OF ALASKA CHAIN - GRI 7960
 SOUTHEAST U.S. CHAIN - GRI 7980



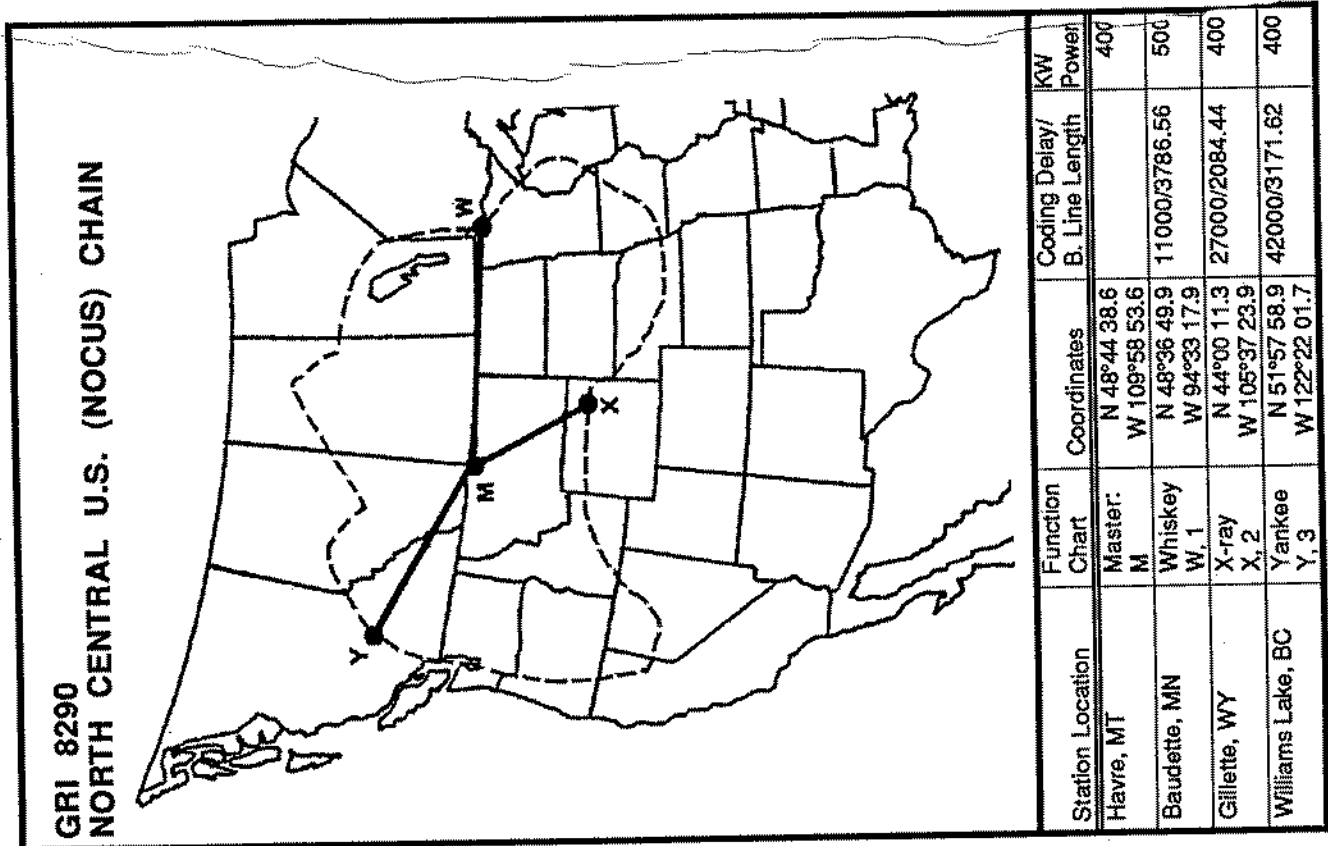
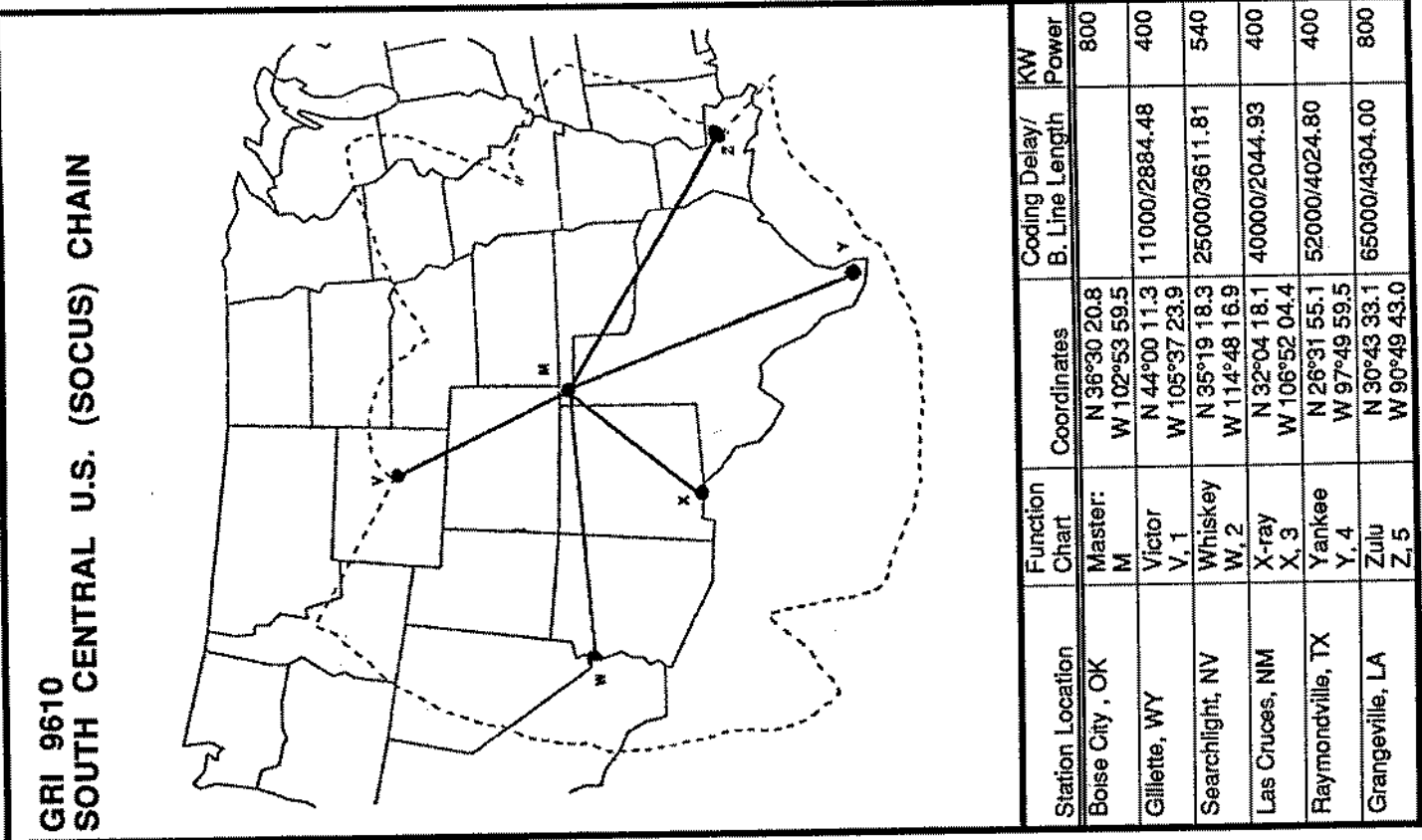
GREAT LAKES CHAIN - GRI 8970
 WEST COAST U.S. CHAIN - GRI 9940



NORTHEAST U.S. CHAIN - GRI 9960
 NORTH PACIFIC CHAIN - GRI 9990



NORTH CENTRAL U.S. (NOCUS) CHAIN - GRI 8280
 SOUTH CENTRAL U.S. (SOCUS) CHAIN - GRI 9610



LORAN C FEATURES

Waypoints:	80 total waypoints 20 Instant Store
Primary Graphic Screens:	LORAN Plotter Screen Signal Status Screen Course Deviation Screen
Pixel Resolution:	160 X 128 square pixels (20,480)
LCD Window Size:	4" Wide x 3-1/4" High
Case Size:	6-1/2" Wide x 5-1/8" High x 3-7/8" Deep without mounting bracket/knobs (add 2" for plugs)
Coupler Dimensions:	2" Diameter x 6 1/2" High with 24 feet of RG-58 cable with PL-259 connector attached
Data Output:	NMEA 0183 Autopilot Interface
Notch Filters:	6 preset internal filters
Input Voltage:	11-16 volts DC, negative ground
Current Drain:	.2 amps with lamp off; .3 amps with lamp on
Frequency:	100 KHz
Memory Back Up	Permanent Memory does not require any battery to retain all navigational information at power off.
Display Element:	High resolution (20,480 pixels), Supertwist LCD with EL (Electro luminescent) panel backlighting.
ASF Correction	Manual for Latitude/Longitude or Time Delays (TD's)
Heading:	Automatic Bearing in either true or magnetic
Unit Weight:	2.4 pounds;
Antenna:	Not included with Instrument. Impulse recommends that you use a standard 3/8", 24 thread, 8' Loran antenna. We do not recommend the usage of stainless steel whip antennas or combination antennas.
Antenna Ratchet Mount:	Not included with Instrument. Use a standard 1", 14 Thread Mount

ALL SPECIFICATIONS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

CARE AND MAINTENANCE

- Never spray directly with a hose or otherwise submerge your unit.
- Never use harsh cleaners or solvents (gasoline, window cleaner etc.) to clean your instrument or the transducer or paddle wheel.
- Do not use Loctite® on any plastic parts like the Antenna Coupler or the transducer since it will disintegrate the material and destroy the plastic.
This kind of damage is not covered under warranty.

• Coupler	Model 3500
• Gimbal Mounting Bracket	950-028
• Knobs - Side Thumbscrew type (2 each)	206-002
• Rubber Washers - Requires 2 each against case	208-006
• Nylon Washers - Requires 2 each against bracket	209-002
• Power Cord with 2 amp fuse	719-031
• 2 Pin Female Connector (Power)	703-021
• 3 Pin Female Connector (Transducer)	703-002
• 4 Pin Female Connector (Speed/Temperature)	703-007
• Stainless Steel Kick Up Bracket	652-013 (option)
• Clip On Bracket /Transom Speed/Temp. Impeller	652-015 (option)
• Replacement Clips for Transom Speed/Temp. Impeller	652-022
• Switch Box - 2 Units to 1 Transducer	652-024 (option)
• Switch Box - 1 Unit to 2 Transducers	652-023 (option)
• 360° Swivel Mounting Bracket	950-012 (option)

REPLACEMENT TRANSDUCERS FOR FISH FINDER - 120 KHz

• Transom Mount 45° Beam Angle	650-3303
• Transom Mount 20° Beam Angle	650-3403
• Low Profile NYLON 45° Beam Angle	650-5003
• Low Profile NYLON 20° Beam Angle	650-5103
• Low Profile BRONZE 45° Beam Angle	650-5203
• Low Profile BRONZE 20° Beam Angle	650-5303
• Inside the Hull 20° Beam Angle	650-3703
• Triducer, Bronze 20° Beam Angle	653-1008
• Power Boat Bronze 45° Beam Angle	650-3903
• Power Boat Bronze 20° Beam Angle	650-4003

REPLACEMENT SPEED/TEMPERATURE IMPELLERS

• Transom Mount, (Clips On to 650-3303, 650-3403)	653-0704
• Transom Mount, HIGH SPEED BRONZE	653-0904
• Low Profile NYLON	653-1104
• Low Profile BRONZE	653-1204

TRANSDUCER EXTENSIONS AND IMPELLER EXTENSIONS

(Transducer and Speed Impeller options are available at *additional charge*)

<u>TRANSDUCER</u>	<u>SPEED/TEMPERATURE</u>
10'.....P/N 720-001	10'.....P/N 720-005
20'.....P/N 720-002	20'.....P/N 720-008
30'.....P/N 720-003	30'.....P/N 720-007

Note: We do not recommend the cable be extended to more than a total of 50 feet. (accessories are supplied with approximately 20' cable purchasing an additional 30' extension equals 50' total cable length.)

WARRANTOR: Impulse Manufacturing, Inc. ("Impulse")

ELEMENTS OF WARRANTY: Impulse warrants, to the original retail purchaser, for a period of one (1) year from the date of purchase or within eighteen (18) months from the end of the month in which the product was shipped from Impulse, Impulse products (hereinafter referred to as the Product) to be free from defects in material and workmanship with only the limitations or exclusions set out below.

WARRANTY DURATION: This warranty shall terminate and be of no further effect one (1) year from the date of purchase or eighteen (18) months from the end of the month in which the product was shipped from Impulse, or at the time the product is (a) damaged or abused, (b) not maintained as reasonable or necessary, (c) modified by unauthorized personnel, (d) improperly programmed, (e) repaired by someone other than warrantor for a defect or malfunction covered by this warranty, or (f) used in a manner or environmental condition for which the product was not intended.

STATEMENT OF REMEDY: In the event that the Product does not conform to this warranty at any time while this warranty is in effect, warrantor will repair or recondition the defect and return it to you without charge for parts, service, or any other cost incurred by the warrantor in connection with the performance of this warranty. Any Costs incurred with transducer or impeller replacement other than the cost of the transducer or impeller, itself, is specifically excluded from this warranty. **THE ONE (1) YEAR LIMITED WARRANTY SET FORTH ABOVE IS SOLE AND EXCLUSIVE WARRANTY PERTAINING TO THE PRODUCT AND IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES OF ANY NATURE WHATSOEVER, WHETHER EXPRESS, IMPLIED OR ARISING BY OPERATION OF LAW, INCLUDING, BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THIS WARRANTY DOES NOT COVER OR PROVIDE FOR THE REIMBURSEMENT OR PAYMENT OF INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Some states do not allow this exclusion or limitation on incidental or consequential damages, so the above limitation or exclusion may not apply to you.

WARRANTY REGISTRATION CARD: In order to facilitate the servicing of this warranty by warrantor, the Warranty Registration Card should be returned by the Warrantor. However, return of the Warranty Registration Card is not a precondition of this Warranty, and this Warranty will be observed by the Warrantor whether or not the Warranty Registration Card is returned, provided that other satisfactory evidence of the date of purchase is provided.

LEGAL REMEDIES: This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. This warranty is void outside of the United States of America.

IMPULSE CUSTOMER SERVICE CENTER: If you are certain that the Product is defective, pack the Product carefully (preferably in its original packaging) and include a note describing the specific defect that has caused you to return it. For your protection, it is advisable to insure the parcel against loss or damage. The Product (with evidence of original purchase) should be shipped or delivered (by UPS or insured parcel post), freight prepaid, to warrantor at:

IMPULSE MANUFACTURING, INC.
695 RAILROAD AVENUE
PITTSBURG CA 94565 U.S.A.
Telephone: (510) 439-2072
(8:00 a.m. to 5:00 p.m. PST - Monday through Friday)

IMPULSE, for a Flat Rate Fee, will repair and/or recondition the instrument to its original operational standards. Upon completion of repair, IMPULSE offers its original Limited Warranty to the instrument for a period of 90 days after the date of repair.

Services performed by IMPULSE for instruments Out of Warranty will be charged at a Fixed Rate established at the beginning of each calendar year.

- The Flat Rate Charge for 1991 for the Impulse 2831/3001/4000/4040 is \$79.00 which will be charged for each repair incident occurring in the year.

The Flat Rate Charges are subject to change without prior written notice.

The following items are specifically excluded from the Flat Rate Charge and the owner shall be responsible for any additional charges for the repair or replacement of the following items:

1. Replacement of the Liquid Crystal Display (LCD).
2. Cases, front panels, knobs, brackets, and hardware associated with the assembly of the instrument.
3. Transducers, impellers, couplers, and power cords.

This program does not cover defects or damages caused by unauthorized service, nor damages through accident, misuse, or abuse. The owner is responsible to provide reasonable and necessary maintenance in accordance with instructions provided in this Owner's Manual and to use common sense regarding storage in extreme weather conditions.

Software Updates for the Product may be available in the future at a nominal rate.

For your protection, it is advisable to insure the parcel against loss or damage. The product is returned "freight prepaid" to the following address:

**IMPULSE TECHNOLOGY
695 Railroad Avenue
Pittsburg CA 94565 USA**

PHONE: 510-439-2072, Main Number

FAX: 510-427-1920, Main Office

**Checking on Status of Returns
Phone: 510-427-2570 or 510-427-2580**

WARRANTY REGISTRATION CARD

To validate warranty, fill out card and return to IMPULSE within 10 days of purchase.

Model _____ Date Purchased _____

Serial No. _____

Name _____

Street _____

City _____ State _____ Zip _____

Phone Number _____

Dealer's Name _____

Address _____

City _____ State _____ Zip _____

Phone Number _____

**PLACE
STAMP
HERE**

**IMPULSE TECHNOLOGY
329 Railroad Avenue
Pittsburg, CA 94565**

Impulse Technology

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