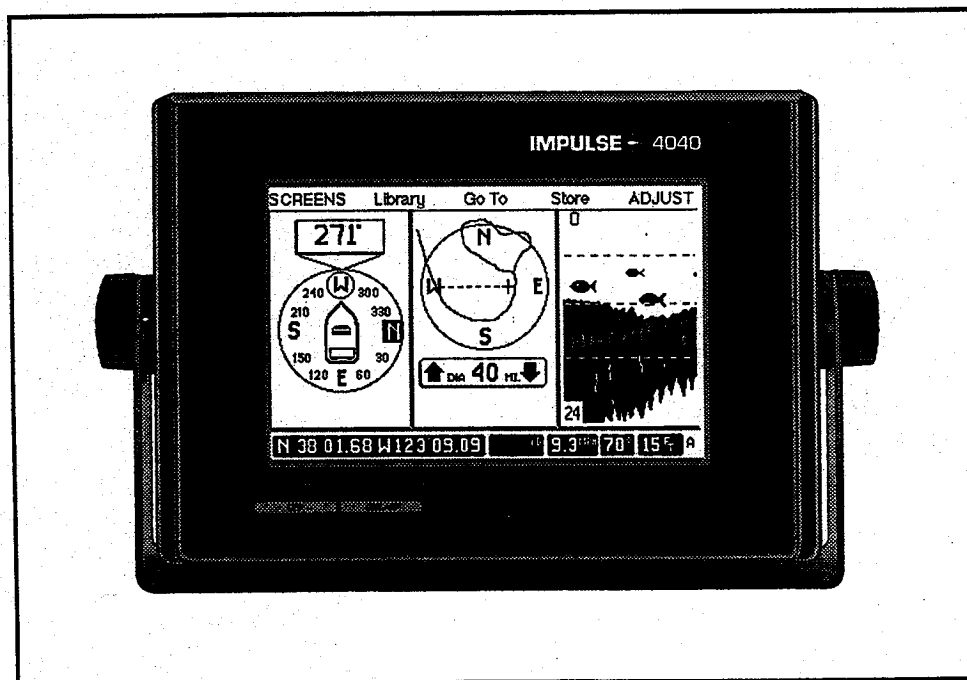


IMPULSE

System 4040 Fish Finder/Loran C Owner's Manual Installation and Operation Guide



IMPULSE

SYSTEM 4040

TO OUR CUSTOMER:

We would like to extend our thanks to you for purchasing the IMPULSE SYSTEM 4040 LORAN/Fish Finder. This product is a highly sophisticated instrument which was 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.

The TOUCH SCREEN and supporting electronics make this system advanced and simple to operate. It is very important that you review this manual carefully and thoroughly prior to using your 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 SYSTEM 4040 is an aid to navigation and does not reduce the need for caution or 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 a 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 Ave. Pittsburg CA 94565 USA
Phone: 510-439-2072

FEATURES OF THE IMPULSE SYSTEM 4040:

GENERAL FEATURES:

- Completely expandable and upgradable through software updates and add-on functions
- Expand to optional full function Flux Gate Compass available in mid-1991
- TOUCH SCREEN OPERATION with User Friendly Menus.
- Super Twist LCD, High-Resolution, High-Contrast, Wide-Temperature Range
- Full daylight viewing.
- Full night viewing with CCT (Cold Cathode Tube) backlighting with bright and dim modes.
- Automatic Contrast Control with manual override accessed through Touch Screen
- Adjustable Sensitivity Control accessed through Touch Screen
- Low Power consumption because of the LCD and the type of components used.
- Permanent storage of all working data at power-down.
- Friendly message system informs you of unit status and error conditions.
- Depth, boat speed, water temperature and present position shown in all screens and modes.
- Built-In Simulator.
- Flat Rate Fee for repairs with new rate established at beginning of each year.
- Ability to display Standard or Metric units.

FISH FINDER/DEPTH FINDER FEATURES:

- Ten primary depth ranges in feet or meters.
- FISH ID displays fish in six different fish shapes or traditional arch/block format.
- One touch zoom enlarging as small as 5' over entire screen.
- Bottom track window follows bottom at whatever range or zoom selected.
- Auto Range selects range automatically according to depth.
- Two echo levels for discrimination between weak and strong echoes - presented as black and gray on screen.
- Fineline for on-the-bottom fish enhancement (similar to gray or white line)
- Digital screen showing digital depth, alarm setting, boat speed, distance traveled log, surface water temperature, a graph of surface temperature over time, and present position.
- Shallow water depth alarm.
- Fish Alarm
- Depth readout in Feet or Meters (selectable from Menu)
- Distance behind the vessel shows how much history is currently being shown on the screen. (Automatically changes when speed of the boat changes.)

LORAN C FEATURES:

- Plotter referenced to true North displays your track and relative position to waypoints and home.
- Storage of up to 80 waypoints, including 20 Instant Storage waypoints.
- Ability to store text and symbols to describe each waypoint.
- Continuous position displays in Latitude/longitude or Time Differences.
- Range and bearing to any destination from your present position.
- Status screen to check LORAN signals and system performance.
- Standard NMEA 0180 and NMEA 0183 output.
- Anchor Drift Alarm, Waypoint Arrival Alarm, Navigation Alarm (CDI).
- Manual ASF Correction
- Automatic GRI selection
- Steering to any waypoint by plotter or graphic 3-D Course Deviation Indicator
- Calculator Screens for navigation planning.

- **Made in the United States.**

GENERAL OVERVIEW:

THIS MANUAL IS A COMBINATION LORAN C AND FISH FINDER MANUAL.

It will provide you with the background information and correct sequence of events required to successfully install and operate your instrument. It is arranged in the sequence outlined below.

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UNDERSTANDING SONAR:

All depth sounders emit Ultra Sonic Sound signals from the transducer into the water located under your boat. These sound signals travel through the water at a rate of approximately 4,800 feet per second (1500 meters per second). The depth sounder transmits a signal and receives a returning echo. The unit calculates the amount of time in microseconds that elapsed while the signal traveled down to the bottom and returned back to the transducer. This time is then converted to depth and displayed on the screen.

It may help to understand these sound signals traveling between the transducer and the bottom by imagining a ping pong ball bouncing up and down from the floor. The closer the ball is to the floor, the less time it takes for it to return. The higher the ball is bounced, the longer it takes to return. Bouncing the ball off of a hard surface, such as cement, is the same as bouncing a signal off of a sandy or hard bottom. Bouncing this same ball off of carpeting creates a totally different effect because the ball returns with less force. The same applies to an echo bouncing off of a muddy or grassy bottom which causes the echoes to be weaker.

AIR ECHOES:

Air echoes can be caused by excessive turbulence under the face of the transducer. Ultra sonic signals from a transducer will not penetrate air. They react to air in the same manner as they react to a hard bottom described above. Therefore, if your transducer is not mounted properly and you are getting turbulence (air bubbles) under your transducer you may get false readings simply because signals are being returned by the turbulence and never reaching the bottom.

Modifying the Shallow Water (TVG) setting can reduce this problem. Adjusting the transducer location can also help solve these false readings.

TRANSDUCER REPLACEMENT/IDENTIFICATION TAG:

On most transducers manufactured after 1987, the operating frequency and part number is attached to the cable or is printed on a mylar tag near the connector end. Do not remove this tag since it identifies the transducer and will help you identify the operating frequency of the transducer. (Incorrect frequency will cause your instrument to operate improperly.)

TRANSDUCER WETTING:

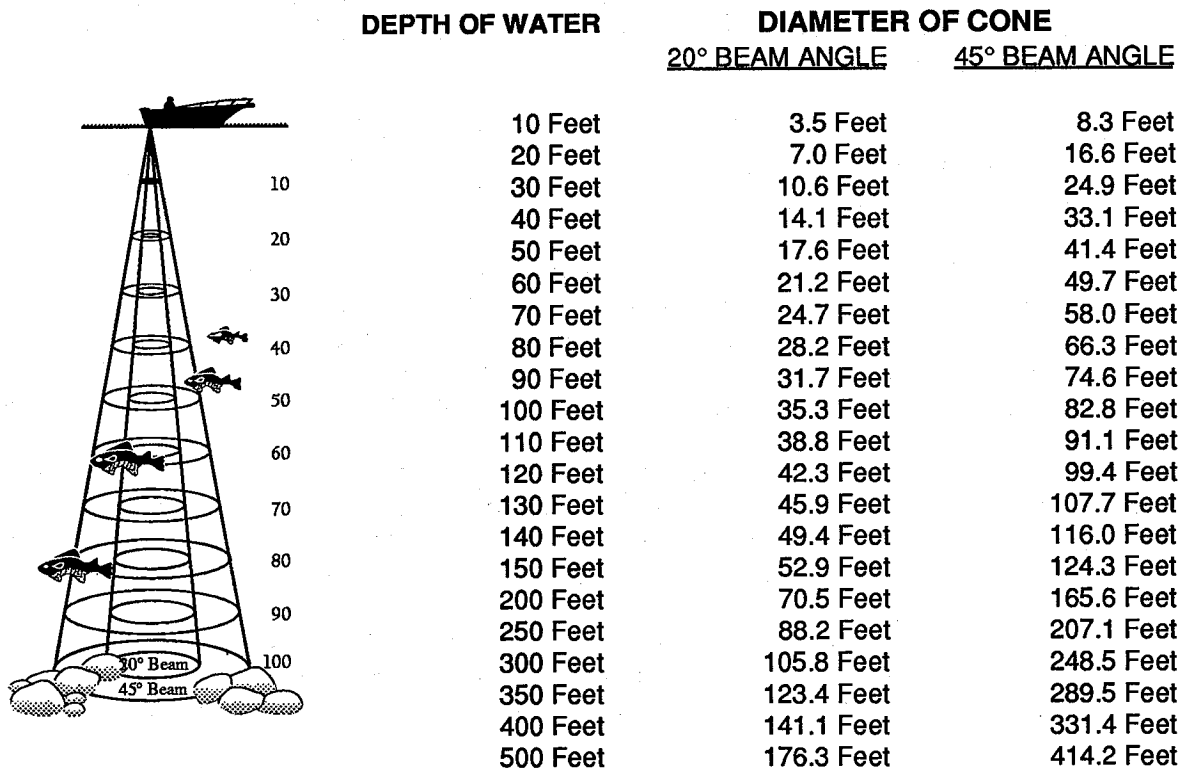
Immediately before launching your vessel, thoroughly wipe the face of the transducer with a detergent type liquid soap. This reduces the amount of time required for the transducer to establish good contact with the water. If this procedure is not followed it may take several days for the complete "wetting" to occur, resulting in reduced performance of the instrument.

TRANSDUCER PAINTING:

If a vessel is kept in saltwater, especially southern U.S.A., marine growth can accumulate rapidly on the transducer face and seriously reduce performance. If fouling does occur, use a stiff brush or putty knife to remove this growth. Wet sanding of the fouled transducer face is permissible with #220 or finer grade of wet or dry emery paper. (Use plenty of water.) Coating transducers with anti fouling paint is often necessary to achieve consistent performance. All anti fouling paints have a solvent base. However, some solvent bases will damage encapsulation materials and plastics to varying degrees. If you need anti fouling protection **use only paints with a mineral spirits base; do not use acetone vinyl based paints.** Glochester (RULE) Durapoxy is a hard, mineral spirits based paint that has been found to be virtually transparent to acoustic energy. Never apply paint to the transducer by spraying; use a brush or roller. A sprayed surface "wets" very slowly and there are often microscopic air pockets under the surface which attenuate the sound energy.

BEAM ANGLES:

There are two different 120 KHz beam angles available: 20° and 45°. You can generally expect that the 45° beam angle transducer will go to a maximum depth of 480 feet (150 Meters) when the bottom is hard and reflects echoes strongly. The 20° beam angle should be used for deeper water applications. With a strong reflective bottom, it should be able to read to a maximum depth of 960 feet (300 Meters). A graphic description of the conical shape of the beam angle is given below. Note that the diameter of the cone becomes larger as the depth becomes greater. As the depth of water increases, the GAIN (Sensitivity) of the instrument should also be increased.



BACKGROUND:**LATITUDE-LONGITUDE EXPLANATION**

Latitude-longitude is the standard co-ordinate system in use worldwide. Latitude lines on a chart run East-West; longitude lines, North-South. Thus, they cross at right angles and make plotting your position very easy. On the left and right edges of your navigation chart, you will find the latitude markings; on the top and bottom are the longitude. 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 System 4040 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.

BACKGROUND:**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 System 4040 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.

BRIEF DESCRIPTION OF LORAN C:

LORAN is an acronym for **L**ong **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:

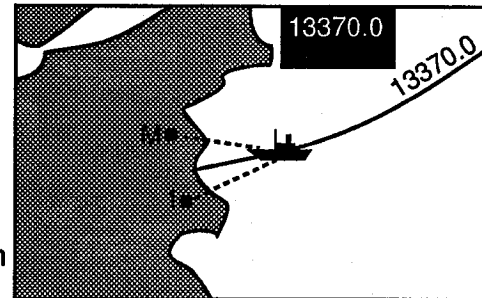
LORAN C is not a perfect system nor is it completely trouble free. Most errors result from natural or propagation anomalies, not in the receivers themselves. Errors such as these cannot always be automatically corrected by your receiver and must be taken into account by the operator. A general knowledge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

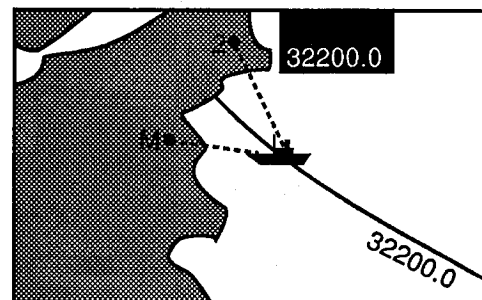
Physical sightings of buoys, lights, range markers, and landmarks, as well as information from depth sounders, radio direction finders, radar, and celestial observations, as available, are to be used in conjunction with your LORAN in order to verify your position and confirm navigational system accuracy. 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.

A LORAN C **GRI chain** consists of three to six 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 other stations 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, and 4 and 5**.

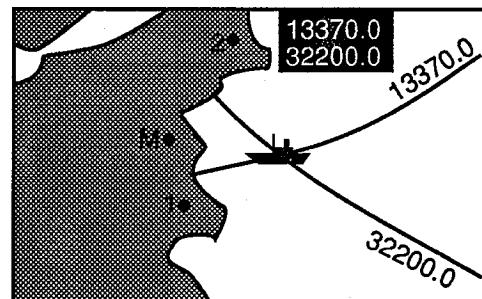
In this example, the Master Station (M) and the Secondary Station (1) transmit synchronized pulses at precise time intervals. The on-board LORAN C receiver measures the slight difference in time that it takes for these pulsed signals to reach the boat from these transmitters.



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)**.

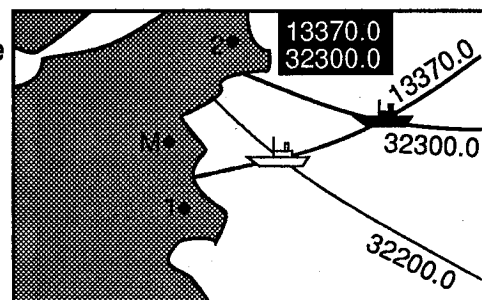


The vessel's position is located somewhere along the 13370 line-of-position as it appears on a LORAN chart. Next, a Time Difference measurement is taken from the Master Station (M) and another of the Secondary Stations (in this case #2). The LORAN C receiver then displays the time difference between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



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.

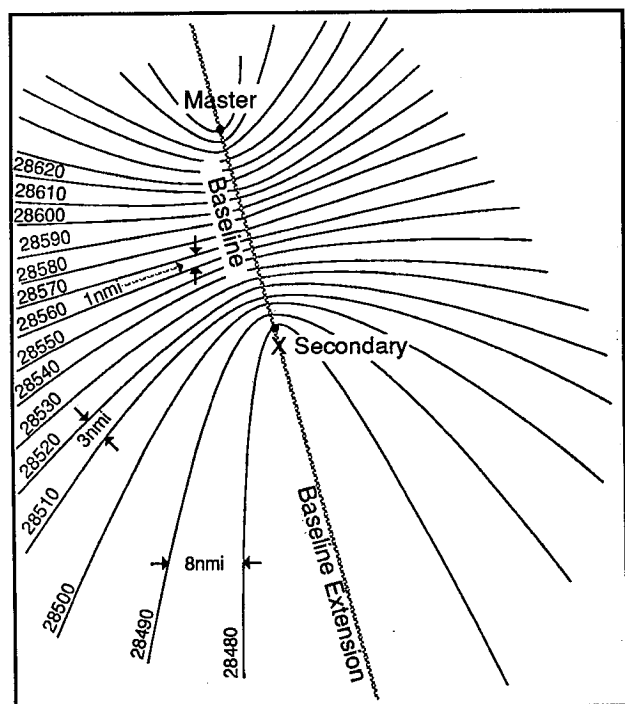
Some LORAN C chains were designed to provide two or more LOP fixes in order to provide a larger coverage area. The LORAN may need to use two secondary stations in one area of coverage - two others in another area of coverage. The operator may wish to verify accuracy by checking and cross-checking fixes 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.

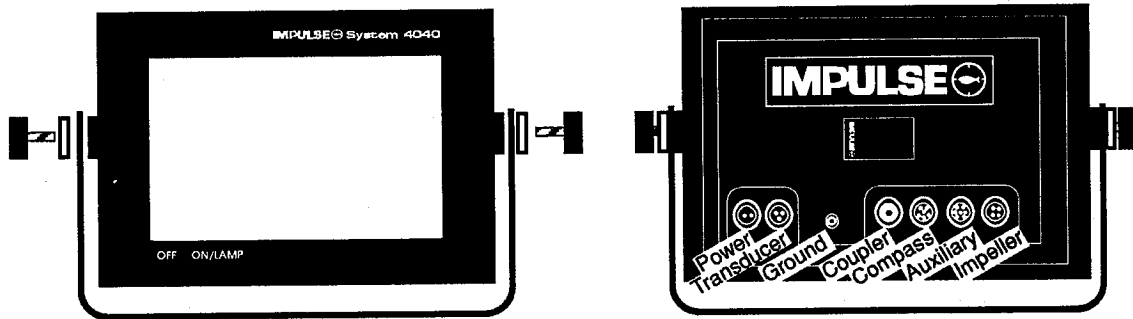


BASELINE EXTENSION: The baseline is the line drawn from the Master transmitter directly to a secondary transmitter. The portion of the baseline that continues beyond either transmitter is the "baseline extension". **Under no circumstances should you rely on the data produced by a LORAN-C receiver in 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.



Mount your SYSTEM 4040 in a location where you can easily monitor and operate the unit. It should also 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" clearance for the connectors.
3. Keep the unit as far as possible from compasses or radio(s) to reduce 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.

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.

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.

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.

INSTALLATION:**CORRECT PLACEMENT AND VIEWING ANGLE**

The SYSTEM 4040 should be mounted as close to a vertical position as possible. Tilting the unit up towards the sun should be avoided. Intense, direct sunlight causes a darkening effect of the Liquid Crystal Display. The System 4040 is backlit with a CCT (Cold Cathode Tube) lighting panel which helps in low ambient light conditions to provide a clear, crisp picture.

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.

INSTALLATION:**POWER SOURCE****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 loaded 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 is positive, black is 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 **2 amp fuse, normal blow**.

DO NOT OVER FUSE! Because the System 4040 consumes .75 amps of current when it is on, you will want to keep your battery fully charged.

INSTALLATION:

DEPTH TRANSDUCERS

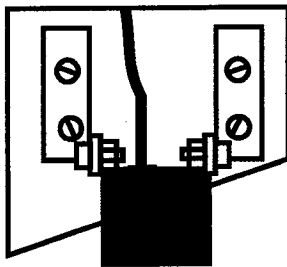
There are a variety of transducers available for use on the many styles of boats available and the preference of the boat owner. The three most popular styles are:

- **TRANSOM MOUNT:** Ideal on boats with outboard engine or on I/O driven boats installed on the stern of the boat)
- **THROUGH-THE-HULL:** Installation (ideal for boats with Inboard engine(s))
- **INSIDE-THE-HULL:** Often called Shoot Through Transducer; can be used effectively if procedures for installation are followed carefully. (Only available in narrow beam angle.)

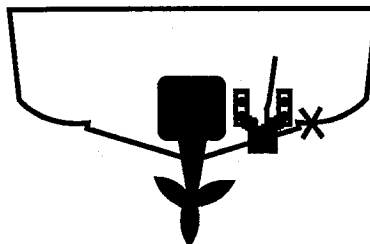
TRANSOM MOUNT TRANSDUCERS

WARNING: DO NOT INSTALL YOUR TRANSDUCER UNDERNEATH A GASOLINE OVERFLOW AS THIS WILL DESTROY THE PLASTIC MATERIAL OF THE TRANSDUCER AND THE BRACKET. THIS DAMAGE IS NOT COVERED UNDER WARRANTY. ALSO, DO NOT USE LOCKTITE OR ANY OTHER ADHESIVES ON THE MOUNTING HARDWARE AS THESE MATERIALS ALSO DESTROY THE TRANSDUCER.

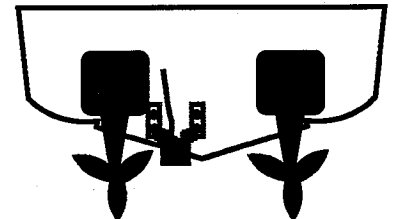
1. Attach the transducer to the bracket as shown.
2. **WEDGE FORWARD:** The styling of the transducer with the wedge installed pointing toward the bow is ideal for aluminum hulls, deep-vee hulls, and flat bottom boats. The wedge allows turbulence and water to flow around the face of the transducer and will give high speed performance.
3. Keep the face of the transducer clean and do not paint unless you use paint designed for transducers as described in the section on Transducer Painting. Before launching the boat, wash the face of the transducer with liquid soap.
4. Keep the transducer cable as far away as possible from engines, motors, and other wires.
5. If you leave your boat in the water, follow the instructions for transducer maintenance and/or painting the face of the transducer with transducer paint designed for this purpose.
6. Just before launching your trailerable boat, thoroughly wipe the face of the transducer with a detergent type liquid soap to clean the thick layer of film coating the face of the transducer. This reduces the amount of time required for the transducer to establish good contact with the water.



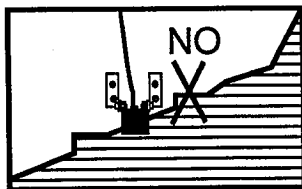
Do not mount on or behind lifting strake



18" to 24" outboard from the centerline before the first lifting strake



Best location for transducer within 6" of centerline



Transducers can be installed on either side, although on single engine boats, the Starboard (right) side is preferred due to the potential of engine cavitation caused by the rotational pitch of the prop. (i.e. The turbulence caused by the transducer could cause your boat's engine to cavitate if the transducer is on the Port side and the rotation of the prop is clockwise.)

WARNING: DO NOT PUT UNDER FUEL OVERFLOW!!!

THROUGH-THE-HULL TRANSDUCERS

The two most popular styles of Through-the-Hull transducers produced are **Low Profile** types, which typically are 1-3/4" or 2" in diameter, or **Stem type** transducers, which typically have a 3/4" pipe thread and require a fairing block to level. The two most popular materials used are nylon and bronze.

- **WOODEN BOATS** require the use of a bronze transducer or bronze fittings due to the fact that when the boat is out of the water, the wood will dry out. When the fitting is installed and the boat returned to the water, the wood will swell and possibly crack a nylon type of transducer. Therefore, bronze is recommended for all wooden boat applications.
- **LARGER FIBERGLASS BOATS** often require bronze transducers and fittings due to the size of the boat and the total number of fittings used in the installation.

INSTALLATION GUIDELINES: THROUGH-THE-HULL:

In mounting a transducer Through-the-Hull (through-hull), it is important that it is done correctly because the location of the transducer on the hull will determine how well the entire unit will perform.

There are several factors involved in choosing a good location for a Through-the-Hull transducer. In general, powerboats should have the transducer mounted in the last 1/2 - 2/3 of the hull below the waterline, but always forward of the props and shafts. Sailboats should have the transducer mounted in the first third of the hull below the waterline, if possible, about two feet in front of the keel. Consider the following when mounting your Through-the-Hull transducer:

1. The transducer face must always have a smooth flow of water over the face of transmitting surface. Bubbles will cause the instrument to read improperly and cause erroneous readings.
2. Never mount a transducer in direct line or within 4 feet behind another through hull fitting, the keel or rudder, zinc anodes, or other projections that would cause turbulence around the transducer when the boat is under way.
3. Never mount a transducer in a recess or cutaway on the hull so that the face of the transducer is shielded from direct contact with the flow of water.

LOW PROFILE TRANSDUCERS

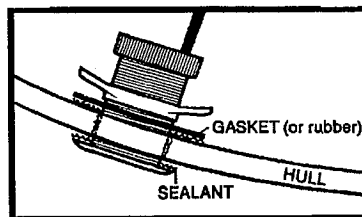
The Low Profile style of transducer is ideal for high speed sport boats and sailboats, this style of transducer is designed to be mounted flush against the hull without a fairing or leveling block. The hull deadrise angle must not exceed 20° in order to use this transducer fitting.

- **SAILBOATS:** Normally at maximum beam amidship or in front of the keel
- **POWERBOATS:** Off centerline, 6"-12" and before the first lifting strake (flat area). Do not install it on a lifting strake since this is the area where air bubbles travel from the bow to the stern in order to provide a smooth ride.

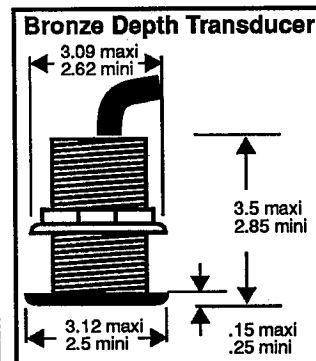
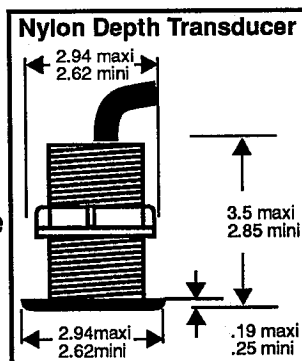
INSTALLATION: LOW PROFILE TRANSDUCER

Mount the transducer using the following steps:

1. Drill an 1/8" pilot hole in the preferred transducer location.
2. Drill a 1 3/4" or 2" hole through the hull using the pilot hole as a guide.
3. Have some type of soft backing plate or thin piece of plywood (3-1/2" x 3-1/2" x 1/2" thick) available to strengthen the inside of the hull around where the hole was drilled. This serves the dual purpose of allowing the transducer to conform to the inside of the hull along while preventing the transducer locknut from unwinding.
4. Route the transducer cable through the hole in the hull. Do not pull on the cable as this may cause internal damage to the transducer by causing an internal wiring short and require a new transducer be installed.



5. Apply a good grade of underwater marine sealant (polysulphide compound) to the flange of the transducer. Use enough sealant so that it beads out around the transducer as you tighten from inside of the hull.
6. Put the nut on the transducer from the inside of the hull. If nylon, hand tighten only. If bronze, tighten with a wrench. (NOTE: On speed/temperature impellers, use the stainless steel wire supplied with the unit to lock the nut and the wing nut together. This will help prevent pressure from building up and causing the Through-the-Hull assembly from leaking or breaking loose.)
7. Clean off any excess sealant from around the transducer.



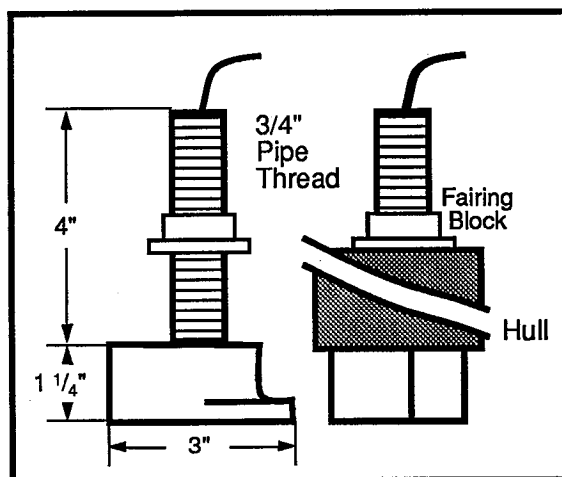
STEM TYPE OR POWERBOAT BRONZE TRANSDUCERS

The Stem type transducer is popular as a replacement transducer since it was the primary style used on older boats and the stem will fit the same size hole as the previous defective or obsolete transducer. In order to provide good, steady readings, it requires the use of a fairing block. Without a fairing block, a large portion of the transducer is unprotected and runs the risk of being hit off by objects in the water. Fairing blocks are best made out of hard wood such as oak. The shape of the block will be determined by the shape of your hull and the style of transducer you choose.

- **WOODEN BOATS** require the use of a bronze transducer or bronze fittings due to the fact that when the boat is out of the water, the wood dries. When the fitting is installed and the boat returned to the water, the wood will swell and possibly crack a nylon type of transducer. Therefore, **bronze is required for all wooden** boat installations.

INSTALLATION: STEM TYPE (POWERBOAT BRONZE) TRANSDUCERS

1. Drill a 1/8" pilot hole in the preferred transducer location. Reference previous section on determining the best location for your type of boat.
2. Drill a hole "slightly" larger than the stem of the transducer. Be carefully not to make it too large as you will run the risk of water leaking into the hull.
3. Cut the fairing block to the shape of your hull and insert the cable and stem of the transducer through 1/2 of the fairing block.
4. Apply a good grade of underwater marine sealant (polysulphide compound) to the flange on the transducer and to the surface of the leveling block where the block touches the outside of the hull. Apply enough sealant so that it beads out around the transducer as you tighten the transducer nut.
5. Put the remaining 1/2 of the fairing block on the inside of the transducer along with sealant next to the hull. Tighten lightly with a wrench.
6. Clean off the excess sealant from around the transducer.



IMPORTANT: AFTER LAUNCHING THE BOAT, BE CERTAIN TO CHECK THE TRANSDUCER LOCATION FOR LEAKS.

INSIDE-THE-HULL TRANSDUCERS

This type of transducer is very popular since it does not require the drilling of a hole such as the Through-the-Hull transducer. However, you should consider the disadvantage due to the possible loss of sensitivity which could cause a measurable depth loss in terms of maximum depth capability. The success of Inside-the-Hull installation is also greatly dependent upon the purity of the hull directly below the transducer and the type of hull.

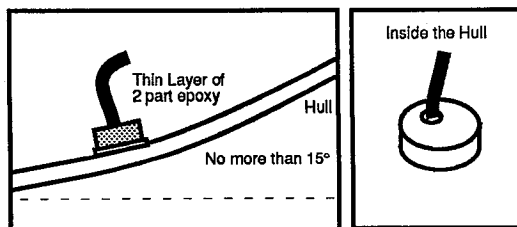
When performing an Inside-the-Hull installation, you must use the special INSIDE-THE-HULL TRANSDUCER since internal to the housing is a transducer crystal which is wider in inside diameter than other styles of transducers and is designed to transmit the pulse Through-the-Hull. Do not attempt to use a transom mount transducer as the crystal is too small to insure optimum instrument results.

Make sure that the transducer mounting location is at a point where a minimum of air bubbles occur beneath the installation location. For example, do not choose an area above a lifting strake because this is an area where air travels underneath the hull and could cause erroneous readings or not allow the pulse to transmit and/or be received back to the unit.

DO NOT USE INSIDE-THE-HULL MOUNTING ON ALUMINUM HULLS, BALSA CORE HULLS, WOODEN HULLS, OR HULLS WHERE THE DEADRISE ANGLE IS MORE THAN 15°.

INSTALLATION: INSIDE-THE-HULL TRANSDUCERS

1. Select a relatively "thin" area of the hull. Avoid any built up areas that have been added to strengthen the hull.
2. The transducer must be below the waterline and in an area where it will always have water underneath its surface.
3. Mount in an area as flat and horizontal as possible. The greater the angle (deadrise) of the hull, the greater the loss in sensitivity and maximum depth.
4. We recommend that you perform a test to determine the accuracy of readings before permanently installing the transducer. Do this by either placing the transducer in a plastic bag of water or putting axle grease on the face of the transducer. Then try the unit in this location to ascertain the readings in shallow water and deep water.
5. After finding the optimum location, sand and clean the installation surface until it is smooth.
6. **MIX THE TWO PART EPOXY SUPPLIED WITH THE TRANSDUCER FOR AT LEAST 3 MINUTES.** If this is not done, proper bonding of the transducer to the hull will not occur and false readings can be caused.
7. Apply the mixture to the clean location on the hull and to the face of the transducer in a small amount.
8. Press the face of the transducer into the spot of epoxy and slowly rotate it in one direction only to remove any air bubbles and until the transducer is physically against the hull or within 1/4" of the hull.



When the epoxy has cured, it should be permanently bonded to the hull and hard to the touch. Test the epoxy which extends out of the underside of transducer with a screwdriver to insure that it can't be dented and is completely hard. Epoxy which is not hardened will eventually come up and cause improper readings.

IMPULSE provides only two kinds of speed/temperature impellers - Transom Mount or Through-the-Hull. The materials are generally either nylon or bronze and the type you install is dependent upon the style of boat, and personal preferences.

- **TRANSOM MOUNT** Speed/Temperature Impellers are ideal for boats with I/O or outboard engine(s) and are installed on the stern of the boat. They can be installed as follows:
 - Clipped on to a wedge shaped Transom Mount transducer
 - Use a separate mounting bracket installed "in line" with the deadrise angle of the hull so that only the impeller blades extend below the hull
- **THROUGH-THE-HULL** Speed/Temperature Impellers are ideal for boats with Inboard engine(s). They can be removed and a "dummy plug" inserted for ease of cleaning.

TRANSOM MOUNT IMPELLERS

The following guidelines should be considered when installing a transom mount impeller:

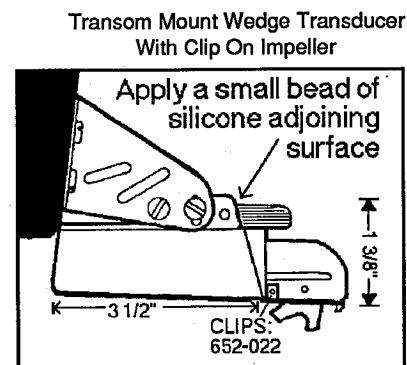
- The impeller should be mounted in a location on the hull where it will always remain under water and where the flow of water is not turbulent.
- Do NOT locate this fitting immediately behind any protrusions or other fittings which could cause turbulence.
- Do NOT install your impeller near a close-by through hull fitting that discharges water, as this will cause inaccurate readings of the surface water temperature.

There are two types of transom mount speed/temperature impellers available:

CLIP-ON STYLE IMPELLERS

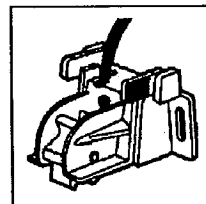
The Clip-On style impeller is used with the wedge shaped transom mount transducer. There are two methods for installing this style impeller:

- Clip the impeller to the rear of the transducer. Follow these steps:
 1. Simply slide the bottom of the impeller into the slides of the rear of the transducer and snap securely in place.
 2. Apply a small bead of silicone to the adjoining surfaces.
 3. Make sure that the Clip On impeller is at least 3° to 5° lower than the front of the wedge of the transducer. Adjust this level by using the slides in the mounting brackets.



Clip On Bracket:
652-015

- Use a separate mounting bracket. For some applications, including flat bottom hulls, it is successful to turn the Transom Mount wedge-shaped transducer so that it is pointing backwards, installing it as a smooth extension of the hull. This "backwards mount" makes a direct clipping on of the impeller impossible, and requires the use of a separate Impeller Clip-On Bracket (P/N 652-015). Using this bracket, the impeller should be installed on the opposite side of the hull "in line" with the deadrise angle of the hull so that just the blades are below the hull.

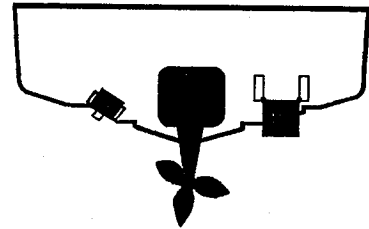


BRONZE HIGH SPEED IMPELLERS

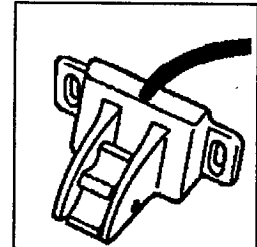
This bronze style impeller is generally used for boats which have speed applications in excess of 45 MPH. (The Clip-On impeller is not recommended for these conditions due to the excessive stress placed on the transducer at high speeds, which could damage both the transducer and the Clip-On impeller). It is suggested that the optional Bronze Impeller housing (P/N: 653-0904) be installed on the opposite side of the hull from the depth sounder transducer.

Follow these steps to install your Bronze High Speed Impeller:

1. Install the impeller in a location of the transom with the deadrise angle of the hull. Be sure that it is not on a lifting strake. Only the impeller blades should be extended below the underbody of the hull.
2. Secure the impeller to the hull using high quality screws and then seal with silicone to insure that water does not enter in these locations.



Bronze Impeller:
653-0904

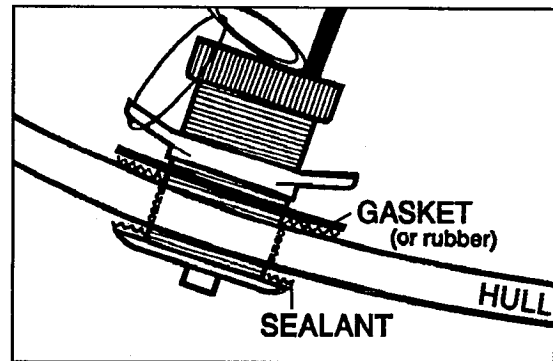


THROUGH-THE-HULL IMPELLERS

This type of fitting is low in profile and only has a small flange extending out of the hull. The paddle wheel assembly is designed so that it can easily be removed from the fitting housing for easy cleaning. It is important, therefore, to choose an area which permits convenient access from inside the boat.

HOW TO INSTALL THROUGH-THE-HULL SPEED/TEMPERATURE IMPELLER:

1. Mark the desired location on the boat's hull and check inside and outside of the hull for clearance.
2. Drill a pilot hole and then a 2" hole for the through hull fitting. Locate the arrow imprinted into the flange of the unit and point it towards the bow. This will notch aligns with an arrow on the top of the impeller assembly and will help you locate the correct alignment when you are cleaning the blades.
3. Apply a marine sealant (polysulphide compound) around the hole and to the flange of the fitting. Mount the fitting in the hole and hand tighten the nut to the inside of the hull.
4. Gently insert the impeller assembly and carefully pull up on the cable so as not to cause internal damage to the wiring internal to the assembly.
5. Line up the notch and the arrow of the impeller assembly and then tighten the nut securely so that water cannot enter the bilge.
6. Secure the Stainless Steel Ring to the Wing Nut by using either the stainless steel wire to link the two together or passing the locking pin (new style) through the assembly.



THROUGH-HULL ASSEMBLY CLEANING PROCEDURE:

1. First locate the DUMMY PLUG which should have been provided with your unit. Without this, do not perform the cleaning procedure.
2. With the dummy plug in hand, locate the notch of the through hull fitting to make sure that it lines up with the notch of the dummy plug. This will insure that the plug can be tighten correctly so as to stop the flow of water into the hull.
3. Loosen the nut of the through hull fitting. Quickly pull up on the ring at the top of the impeller assembly. Immediately pull it out of the fitting and PUSH THE DUMMY PLUG IN PLACE aligning it with the notch. Tighten the nut in place. Typically you can expect between 1 to 2 pints of water to flow into the bilge before the dummy plug is tightly in place.

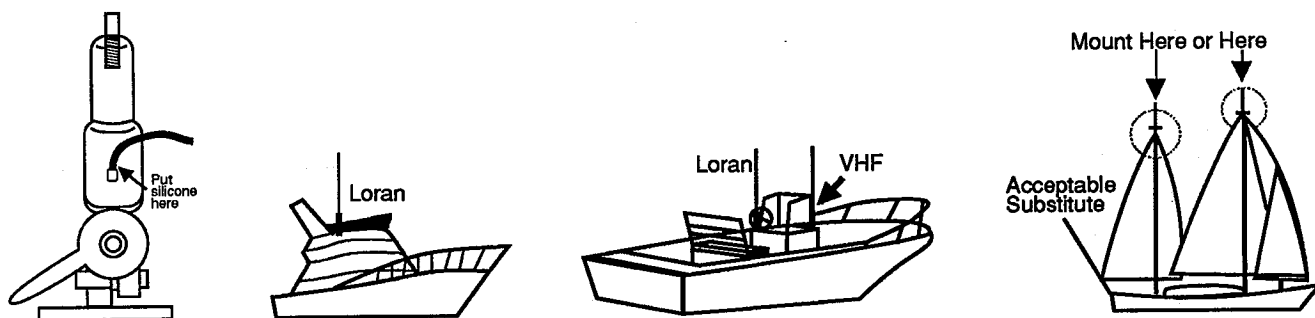
IMPULSE RECOMMENDS YOU USE A STANDARD 3/8", 24 THREAD, 8' FIBERGLASS LORAN ANTENNA. WE DO NOT RECOMMEND THE USE OF STAINLESS STEEL "WHIP" ANTENNAS DUE TO THE EXCESSIVE MOVEMENT OF THE WHIP WHICH CAN BREAK THE COUPLER AND CAN BE DANGEROUS TO THE USER.

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 MUST 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 PLASTIC OF THE COUPLER AND POSSIBLY CAUSE INTERNAL 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 any other 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 the System 4040 instrument housing.

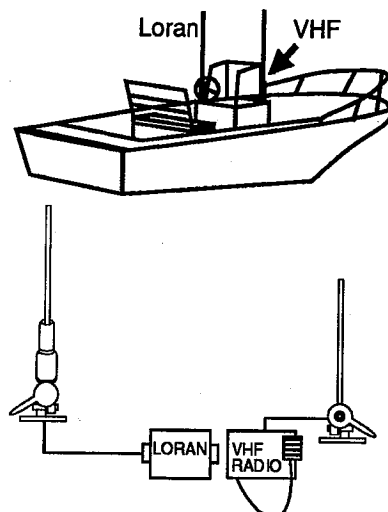
ROUTING OF ANTENNA CABLE:

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. Be sure that this connector (PL-259) is re-soldered properly according to the instructions described.



RE-SOLDERING THE PL-259 CONNECTOR:

DO NOT SOLDER WITH TOO MUCH HEAT. Use a 100-140 watt Soldering Gun. 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.

1. Put outer shell of PL-259 over the cable, i.e. slide shell on to cable.
2. Cut off 3/4" of insulation, taking care not to nick any internal wires.
3. Fan out the shield (braid) wires and then fold over the insulation.
4. Cut off 1/2" of center insulation, be careful not to nick the center wire.
5. Carefully thread the main body of the PL-259 connector on to the prepared cable end. Solder the center conductor and the shield through the side and center holes.
6. Lastly, thread outer 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.

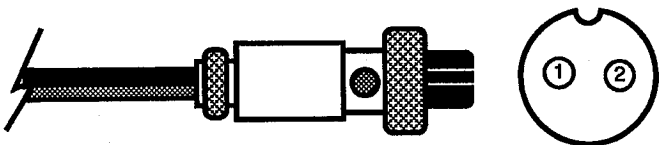
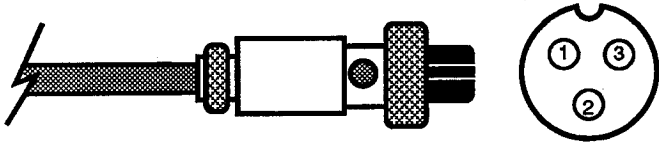
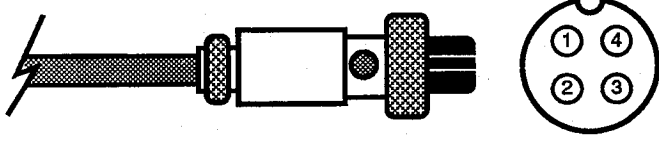
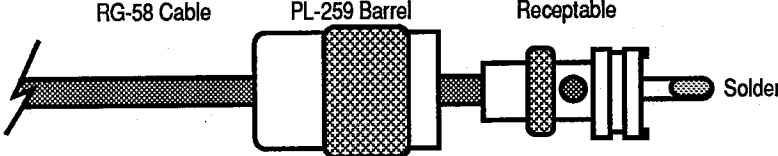
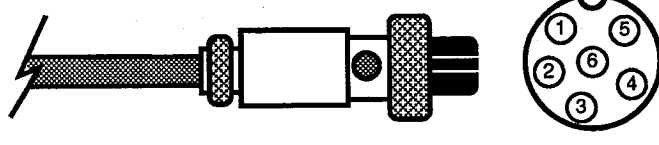
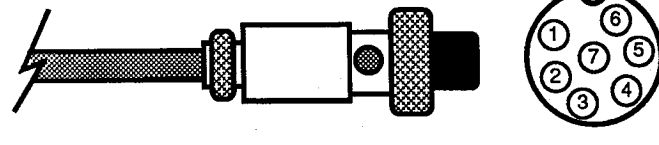
Metal hulled vessels - ground strap must be as short as possible.

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.

INSTALLATION:**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 SOLDER VIEW AND ARE IN COUNTER CLOCKWISE DIRECTION WITH PIN 1 = 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	= Pin 1
			Red	= Pin 2
TRANSDUCER	(3 PIN FEMALE) 703-002		Black/Green	= Pin 1
			Shield	= Pin 2
			Red	= Pin 3
SPEED/TEMP	(4 PIN FEMALE) 703-007		Black/Shield	= Pin 1
			Green	= Pin 2
			Red	= Pin 3
			White	= Pin 4
COUPLER	(PL-259) 703-027		Center Conductor	== 1/2"
			Insulation	= 1/4"
			Braid	= 3/4"
	(Pull back braid of RG-58 Cable thru receptacle) (After soldering, screw barrel and receptacle together)			
COMPASS	(6 PIN FEMALE) 703-034		Brown/Braid	= Pin 1
			N.C.	= Pin 2
			Yellow	= Pin 3
			Green	= Pin 4
			Black	= Pin 5
			Gray	= Pin 6
AUXILIARY PORT	(7 PIN FEMALE) 703-033		Ground	= Pin 1
			Switched 12 V	= Pin 2
			AUX 1 out	= Pin 3
			AUX 1 in	= Pin 4
			AUX 2 out	= Pin 5
			AUX 2 in	= Pin 6
			NMEA Data Out	= Pin 7

OPERATION:**TURNING ON THE SYSTEM 4040**

There are only two front panel keys on the bottom left corner of the System 4040. These keys are labeled: OFF and ON/LAMP.

- **ON/LAMP**
Press ON key to turn your unit on. It will quickly sound "BEEP, BEEP" to acknowledge that it is receiving power and is ON and the CCT back light will turn on.
- **ON/LAMP:**
Press ON/LAMP again to select the dim setting for the CCT backlighting.
Press it once again to turn the CCT backlight OFF. You may change the brightness of the CCT backlight at any time during the operation of the unit by pressing this key.
- **OFF**
PRESS AND HOLD this key for 5 full seconds to turn this system OFF.

OPERATION:**TOUCH SCREEN**

The System 4040 TOUCH SCREEN was designed for ease of operation. By simply touching the screen in the location of the function you desire, you instruct the unit to perform this function. This creates a unique link between the unit and your decision making process. When you touch the screen, several things will occur:

- A short BEEP will alert you that your instruction has been received
- The function you touched will appear on the screen
- On MENU screens, the function you choose will turn from a positive image into a negative image.

DO NOT "push" the screen, but gently touch it so that your finger breaks the beams of light that are emitted from the inside lip around the edge of the Liquid Crystal Display. If you do not hear a "BEEP" acknowledging that your finger has broken the electronic eye beam, rotate your finger in a small circular movement in the approximate location so that the beam of light is broken.

NOTE: The System 4040 will not accept your touch command if you have more than one finger on the screen.

OVER EXPOSURE TO BRIGHT SUNLIGHT:

WARNING: The System 4040 Touch Screen uses a grid pattern of Light Emitting Diodes (LED's) to detect your touch instructions. If your system is over exposed to sunlight coming in from the left side and hitting the right edge of the display, it may prevent these Touch Screen sensors from receiving your touch instructions. To correct this condition, either shade the instrument, or swivel it if installed on the optional swivel mounting bracket.

OPERATION:**SIMULATOR**

The simulator is designed to help dealers demonstrate the System 4040 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 System 4040, it does not simulate each function in its entirety.

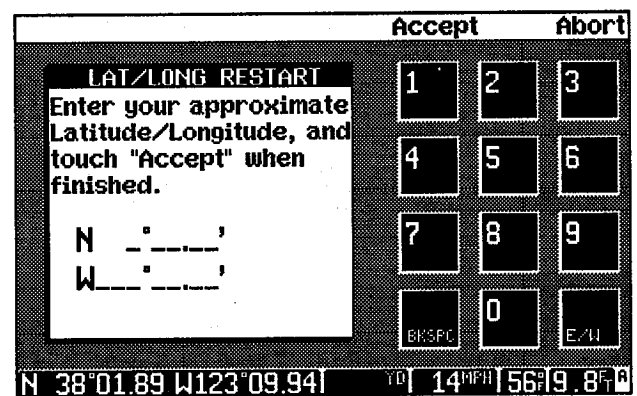
To enter the simulator, turn the unit on and touch the word "**SIMULATOR**", which appears in the bottom right hand corner of the title screen. To bypass the simulator and enter the "Real World", do not Touch the word "**SIMULATOR**" on the opening screen.

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.

LORAN FIRST START

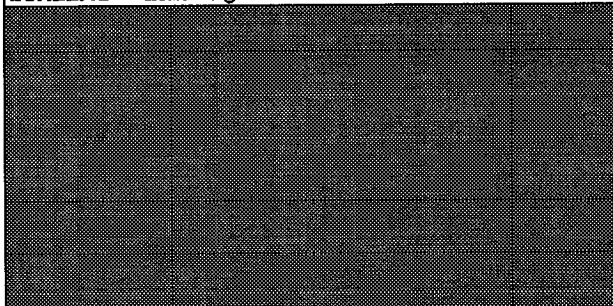
NOTE: It is assumed that the coupler with the antenna has been attached to the instrument.

- Enter your approximate latitude/longitude and touch the word **"Accept"**. You will need to enter a leading zero, if necessary. For example, if the west longitude is 85° 41.12', you will need to enter 085 41 12.
-
- The TD/STATUS screen should then 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 information, including your TD's and latitude/longitude.
 - If, after the TITLE screen is cleared, the LAT/LONG RESTART 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. (Review the manual sections entitled "RESTART LORAN" and "PERMANENT MEMORY" for further explanation.)



SELECTION BAR AT TOP OF LCD SCREEN

SCREENS brings up the MAIN MENU SELECTION screen, where you may choose a combination of up to three functions to be displayed on the System 4040 split screen.

SCREENS	Library	Go To	Store	ADJUST
				
N 32°59'63"	W 123°07'92"	4277'Y0	14MPH	78° 115°

Store brings up the Waypoint Instant Store function.

ADJUST allows the user to perform adjustments to any screens which are currently selected.

DATA AT THE BOTTOM OF THE SCREEN

The line of data located at the bottom of the screen displays pertinent NAVIGATION INFORMATION. It is displayed on all screens at all times except on the DIGITAL screen. When any of the information is blinking on and off, it cannot be relied upon as correct information and the source of the problem needs to be determined.



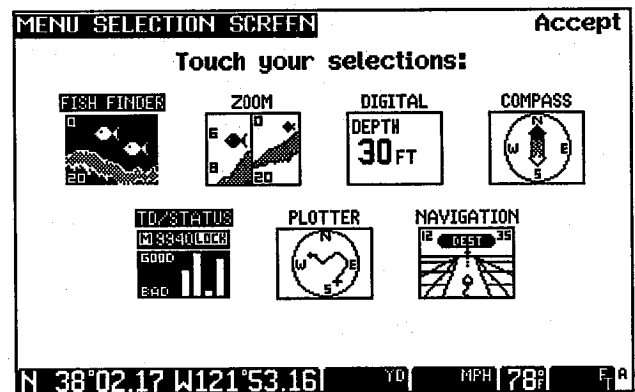
1. **PRESENT POSITION: "LATITUDE/LONGITUDE OR TIME DIFFERENCES (TD'S)"**
The leftmost entry in the bottom data line gives your PRESENT POSITION in Latitude/Longitude or Loran Time Differences (TD'S) depending on your selection in the DIGITAL ADJUST screen. If you have selected a Waypoint "Go To" destination, the present position is replaced with the Go To waypoint number and the distance and bearing to that waypoint is shown (unless the NAVIGATION screen is selected, in which case the line reverts to your Present Position).
2. **DISTANCE BEHIND THE BOAT: "YARDS/METERS"**
The information displayed in this box is the distance measured from the right edge of the LCD screen to the left edge of the Fish Finder image. It is helpful in determining how far behind the boat various targets are located. The distance displayed will be proportional to the speed of your boat. The slower your boat is traveling, the less the distance you will be covering and, therefore, the smaller the value displayed. The faster your boat, the higher the value. The value is in yards/statute miles or meters/nautical miles depending on your selection of FEET/METERS in the DIGITAL ADJUST screen. The Distance Behind the Boat value is cleared when going from one screen to another, or when entering/exiting Pause mode. The Distance Behind the Boat number increases in value as information is scrolled to the left of the screen until the entire screen is filled. An Arrow is printed to the left of the number to indicate that the Distance reading reflects the distance between the right and left edges of the Fish Finder display.
3. **SPEED OF THE BOAT: "MPH/KTS"**
The information displayed in this area refers to your current speed, and is derived from the installed speed impeller.
4. **TEMPERATURE: "FAHRENHEIT/CELSIUS"**
The information displayed in this area refers to the temperature of the water "at the surface". It will display in Fahrenheit or Celsius, depending on your selection of Feet/Meters in the DIGITAL ADJUST screen.
5. **DIGITAL DEPTH: "FEET/METERS"**
The information displayed in this area provides a digital reading of the depth of the water. The depth will be in feet or meters, depending on your selection in the DIGITAL ADJUST screen.
6. **AUTO ENUNCIATOR:**
If the fish finder is in Auto Range mode, this will be indicated by an "A" in the lower right corner of the display.

MAIN MENU SELECTION SCREEN:

Touch the word **"SCREENS"** in the SELECTION BAR at the top of the LCD on the MENU SELECTION screen. When you touch it, a short BEEP sounds to advise you that your command has been received. In live operation, (when you are not in simulator), the options currently installed in your unit are displayed in the boxes on the MENU SELECTION screen.

Each function shown on the MENU SELECTION screen has a heading. Directly below the heading is a box showing a symbol (icon) graphically describing the individual function. To select one of these functions, touch the center of the box desired. To let you know that your selection has been accepted, the box you have touched will be inverted, and you will hear a short "BEEP" sound.

With the exception of the DIGITAL function, up to three screen combinations can be simultaneously displayed in the LCD window. If you attempt to select a fourth function, you will be advised to "Please deselect one or more screens". Because the DIGITAL function requires the full LCD, the System 4040 automatically deselects all functions currently enabled when you touch the DIGITAL icon. When you deselect the DIGITAL screen, the System 4040 returns to your previous screen selections.



Touching **"ADJUST"** in the SELECTION BAR at the top of the LCD allows you to perform adjustments to any screens you have currently selected. When you Touch the ADJUST function, you can adjust either of the following:

- Adjust the Contrast to make it lighter or darker
- Adjust the screen(s) you currently have selected

CONTRAST ADJUSTMENT:

The display screen of your System 4040 is a Liquid Crystal Display (LCD). A property of LCD's, in general, is that temperature changes will affect the contrast of the display. At high temperatures, LCD's are darker; likewise at lower temperatures, they are lighter. The System 4040 automatically detects and compensates for these temperature variations by adjusting the voltage applied to the LCD to provide a fairly constant contrast level.

Even with this automatic compensation, you may prefer to adjust the contrast yourself. To do this, Touch the **UP** and **DOWN** Contrast arrows in the upper left corner of the ADJUST screen. Touching the **UP** arrows causes the contrast to become darker. Likewise, touching the **DOWN** arrow will decrease the contrast and make the screen dimmer. When exiting the ADJUST screen by touching **"Exit"**, your Contrast changes will be stored in Permanent Memory, and will be applied the next time you turn the unit on.

It is possible to adjust the contrast of the display to be too light to see anything on the screen. If this happens, follow these steps to return the unit to its original factory setting:

1. Turn the unit OFF by pressing and holding the OFF key for at least 5 seconds.
2. Press and hold the ON/LAMP key, and without releasing it, hold the key until you hear a short beep-beep (after approximately 3 seconds).
3. Release the ON/LAMP key. The System 4040 opening screen with the IMPULSE logo should appear.

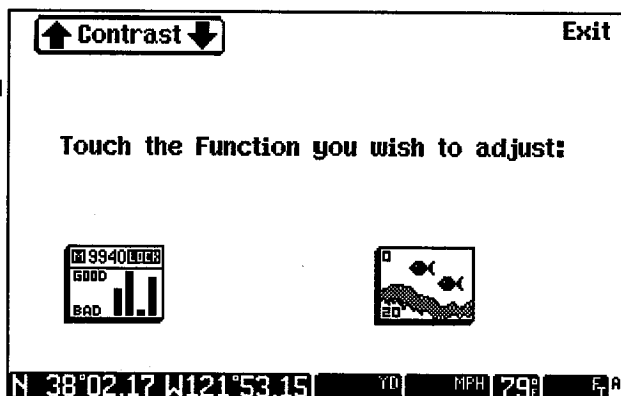
CURRENT SELECTION ADJUSTMENTS:

Each screen shown on the MENU SELECTION screen has an Adjustment function which will allow you to fine tune the operation of the feature. The symbols (icons) of your selected functions are shown in the lower center of the Adjustment screen. Touch the box corresponding to the screen you wish to adjust to access the appropriate Adjustment screen.

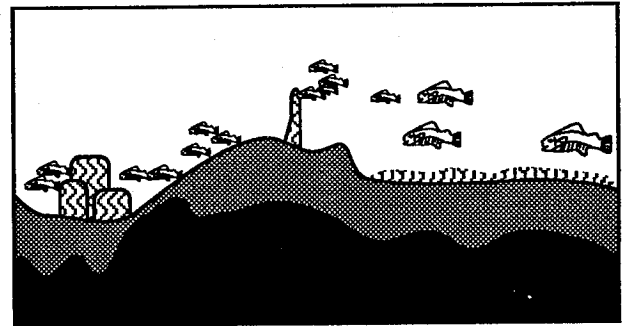
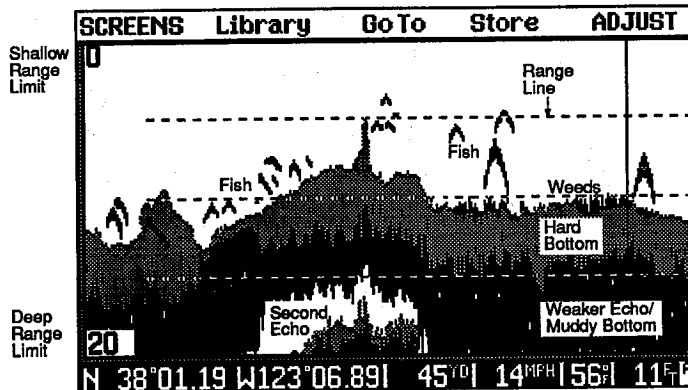
NOTE: You cannot adjust a function unless you have enabled it from the MENU SELECTION screen.

EXIT

Touch **"Exit"** to return to the last screen you had selected prior to performing adjustments.



To access the FISH FINDER function, touch the symbol box entitled "FISH FINDER" on the MENU SELECTION screen and touch "Accept".



READING A FISH FINDER SCREEN

The System 4040 LCD graphically displays transducer information such as bottom conditions, fish (targets), and matter growing off the bottom. Pixel shading and patterns are employed to assist the user in quickly interpreting the screen:

- **Muddy bottoms** are displayed in dark shades.
- **Hard bottoms** are seen as a checkerboard pattern of light and dark pixels.
- **Fish** are identified as suspended matter off of the bottom contour and often appear in the shape of arches. This is greatly dependent upon the speed of the boat when traveling over the fish, the beam angle of the transducer, and the location of the fish in the beam angle. Wider angle transducers are more likely to display fish in the arch shaped format. Narrow angle transducer display fish in more vertical or blocked format. Refer to the sections of this manual entitled "Understanding Sonar and Beam Angles" for background.
- **Second Echoes** generally occur when the bottom is very hard and reflective in nature. Under this condition, the original echo (traveling upward) can bounce off the water surface, travel back down to the bottom, and be reflected to the transceiver a second time. Second Echoes will appear as a "second bottom", located under the actual bottom on the FISH FINDER screen. Note that the Digital Depth accuracy is not affected by Second Echoes.
- **Bait Fish/Schools of Fish** are displayed in tightly packed groups on the screen and appear as "clouds going across the screen".
- **Grass/kelp** growing on the bottom is displayed as dark images
- **Rip Tide** is shown as a very faint bottom.

The System 4040 FISH FINDER screen displays the most current sonar image on the right edge of the LCD. Therefore, targets on the right edge of the display are directly below the transducer. As new information is displayed, it "bumps" the older information to the left until fish and bottom contour information is displayed across the entire screen.

The oldest information, displayed at the left edge of the image, will be a certain distance behind your boat. This distance is given in the "Distance Behind the Boat" entry in the DATA LINE at the bottom of the LCD. The faster your boat is traveling, the greater the distance you will be covering, and the higher the value in the "Distance Behind the Boat" entry. When you are trolling, you will be covering less distance, and the value will be smaller. This distance proves useful when judging how far back a given target is behind you.

RANGE LINES

The FISH FINDER screen is divided into four equal sections, each separated by a horizontal dashed line. These Range Lines are helpful in determining the location of fish and depth of the bottom in relation to the Fish Finder range selected.

To access the ADJUST FISH FINDER screen, touch the word "**Adjust**" on the SELECTION BAR on the top line of the LCD, then touch the FISH FINDER symbol on the lower right half of the screen.

GAIN UP/DOWN

In general terms, GAIN refers to the amount of sensitivity which is required in order to display fish finder data clearly on the display. Typically, less Gain is required when the water is shallow and clear and more Gain when the water is deeper and the pulse must be projected further.

Touching the **DOWN** arrow reduces the gain, as it relates to the Fish Finder screen. Likewise, the **UP** arrow increases the Gain of the instrument. There are 14 gain settings available in the System 4040.

For good fish finding, adjust the gain at the higher settings so that you are picking up the fish, but not so high as to detect interference or clutter. If, after a heavy rain, you find tiny dots throughout the display (air bubbles caused by the rain), reduce the Gain setting of the instrument to make the screen clearer and easier to interpret. The Gain control does not affect the Digital Depth reading of the instrument.

CLUTTER FILTER

The Clutter Filter adjustment is a sensitivity control for the Fish Finder in shallow water. The first ten feet or so of water under your boat typically contain numerous air bubbles caused by propeller action, choppy waves, the wake of other boats, rain, etc. A fish finder will detect this "surface clutter" and display it as black pixels scattered near the top of the screen.

To reduce the amount of surface clutter on the screen, use the **UP** arrow to increase the amount of filtering. This will attenuate (decrease) the receiver's sensitivity to echoes in shallow water.

The Clutter Filter setting ranges from OFF to 7. If the setting is OFF, no echoes are being filtered, so this setting is appropriate only in minimum surface clutter conditions. The Clutter Filter should be adjusted to the lowest setting which produces a relatively clear Fish Finder image. This setting may need to change to accommodate different water conditions.

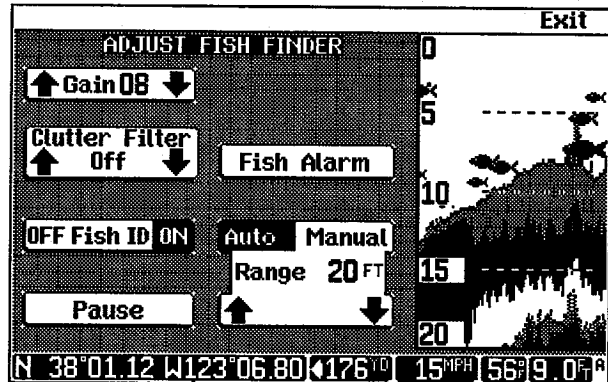
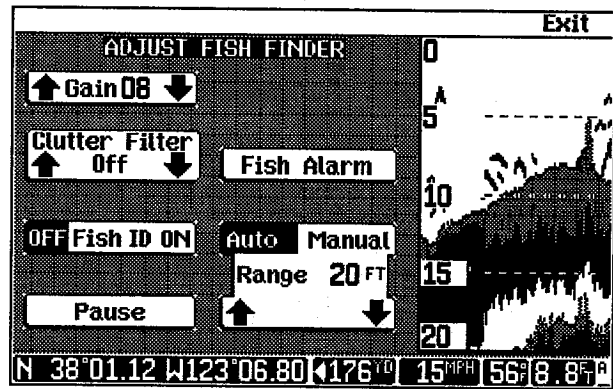
Note: Do not try to adjust out the straight band located at the top of the display. This band is the transmitter pulse, and will represent an area equal to approximately 1.5 feet of depth.

FISH ID ON/FISH ID OFF

By touching Fish ID **ON**, you program the instrument to display fish in the actual shape of fish. Six different fish sizes are used to display various target sizes. Touching Fish ID **OFF** instructs the unit to display fish in the traditional shape(s) such as arches, blocks, or marks on the screen.

PAUSE

The Pause function allows you to stop the FISH FINDER screen from scrolling. When in Pause mode, the FISH FINDER is not displaying updated transducer information on the screen. After you disable Pause mode by touching Pause a second time, a vertical line is drawn on the screen to remind you that the image at the left of the screen is outdated and should not be relied upon. The current, updated image is displayed to the right of the vertical line.



FISH ALARM

Touching the Fish Alarm box will access the ADJUST FISH ALARM screen, which is described on the next page.

AUTO/MANUAL RANGE ADJUSTMENT

The System 4040 provides two methods for setting the FISH FINDER range:

When in the AUTO range mode, your FISH FINDER screen will change depth ranges automatically as the bottom contour changes. If AUTO is selected, the letter "A" is printed in the rightmost entry of the data line at the bottom of the LCD.

When you touch the MANUAL range selection, your fish finder will change ranges according to the following pre-programmed range scales:

DEPTH RANGES IN FEET:

0-20', 0-40', 0-60', 0-80', 0-120', 0-200', 0-320', 0-400', 0-640', 0-960'.

DEPTH RANGES IN METERS:

0-8 m, 0-12 m, 0-20 m, 0-32 m, 0-40 m, 0-60 m, 0-80 m, 0-120 m, 0-200 m, 0-300 m

For MANUAL range selection, touch the **DOWN** or **UP** arrow in the Range box to increase or decrease the range, respectively. To change from FEET to METERS, refer to the manual section entitled "ADJUST DIGITAL SCREEN"

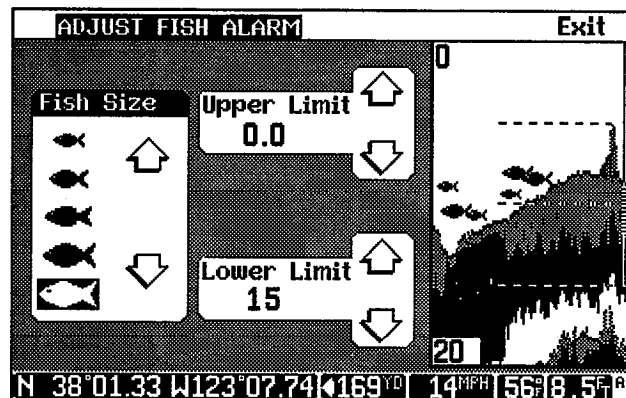
EXIT

Touch "**Exit**" to return to the last screen you had selected prior to performing adjustments.

<p>NOTE: ALL ADJUSTMENTS PERFORMED IN THE ADJUST FISH FINDER SCREEN ALSO AFFECT THE ZOOM SCREEN.</p>

FISH ALARM

The Fish Alarm feature enables the System 4040 to alert you when fish enter a region (or zone) you select. You can select the minimum fish size you wish to trigger the alarm, thereby preventing the alarm from sounding on bait fish or other small species. The Fish Alarm in the System 4040 distinguishes between five different fish sizes, and is triggered when Fish ID detects a fish of the size selected. The Fish Alarm will function even if the Fish ID feature is disabled. The FISH ALARM screen is accessed by selecting the ADJUST FISH FINDER screen, and then touching "Fish Alarm."



When the System 4040 is first turned on, the Fish Alarm will be disabled. To enable the Fish Alarm, either touch the Upper or Lower Limit arrow, or a Fish Size arrow. This will enable the full depth range as the selected Fish Alarm zone. The alarm zone is represented by a vertical open bar displayed on the right edge of the FISH FINDER screen. This bar will also appear on the right edge of the ZOOM screen. The alarm zone may be changed as follows:

To set the Fish Alarm UPPER LIMIT:

Touch the **DOWN** arrow in the Upper Limit box. The depth will increase each time the arrow is touched. The top of the vertical bar on the right side of the FISH FINDER screen will also move downwards, graphically indicating change in the zone.

To adjust the Upper Limit to a shallower depth, touch the **UP** arrow in the Upper Limit box. The indicated depth and the vertical bar will change accordingly.

To set the Fish Alarm LOWER LIMIT:

Touch the **UP** arrow in the Lower Limit box. The depth will decrease each time the arrow is touched. The bottom of the vertical bar on the right side of the FISH FINDER screen will also move upwards.

To adjust the Lower Limit to a deeper depth, touch the **DOWN** arrow in the Lower Limit box. The indicated depth and the vertical bar will change accordingly.

At deeper depth ranges, the adjustment increments of the Fish Alarm Upper and Lower Limits are proportionally greater.

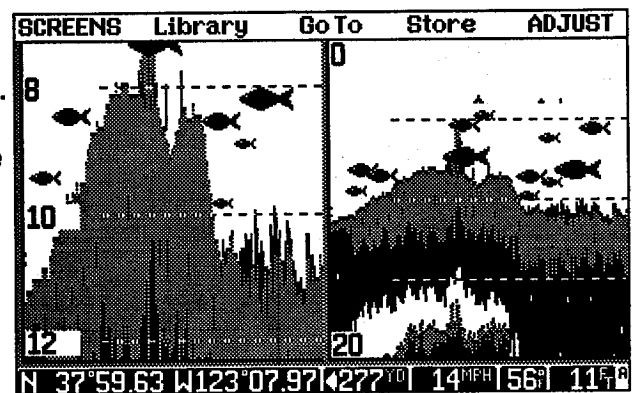
To set the FISH SIZE for the Fish Alarm:

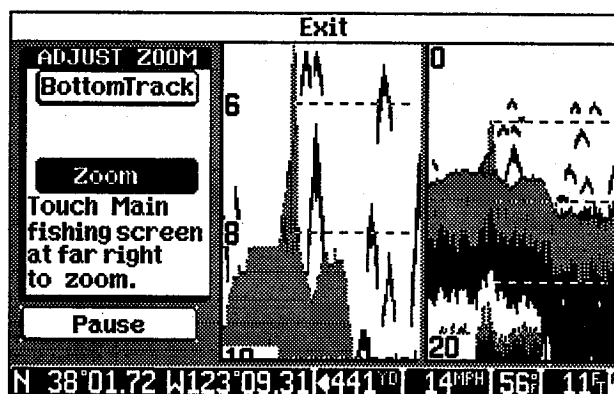
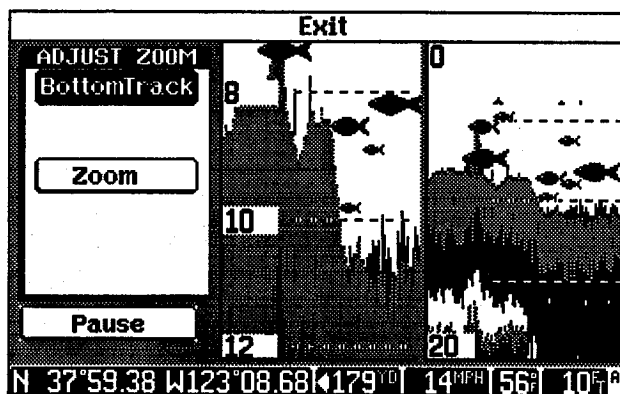
Touch either the **UP** or **DOWN** arrow in the FISH SIZE box to highlight the size of fish you wish to trigger the alarm. If no fish are selected, the Fish Alarm is disabled.

Any fish of the sizes you have selected entering the zone you have established will sound the alarm with a short "beep-beep."

Choose the ZOOM function from the MENU SELECTION screen by first touching the symbol box entitled ZOOM and then touching the word "Accept". The ZOOM section of the screen immediately starts displaying a magnified section of the range you have selected. This magnified portion is equal to one fourth (1/4) of the full range scale, or can be thought of as 4X magnification.

Two Zoom modes can be selected through the ADJUST ZOOM screen. **Bottom Tracking** mode is helpful when you are looking for objects or fish off of the bottom or when you are navigating and want to keep the bottom contour on the screen at all times. **Zoom** mode is used to magnify a specific section of the full display. This mode is preferable when looking for a species of fish that inhabit a particular depth of water, and when watching the bottom is not necessary.





To access the ZOOM ADJUSTMENT screen, touch the word **"ADJUST"** on the SELECTION BAR on the top line of the LCD, then touch the ZOOM symbol, so that the ZOOM ADJUSTMENT screen appears. In addition, the FISH FINDER screen appears to assist you in performing adjustments.

There are two types of adjustments you can perform in the Zoom function: Bottom Tracking expansion or Zoom to a certain section of water.

BOTTOM TRACK

Touching this selection will instruct your instrument to follow the bottom contour. This function is advantageous if you are bottom fishing and need more precise information displayed on the screen with reference to activities occurring off the bottom or if you are navigating and want to keep the bottom on the screen at all times.

ZOOM

Touching this selection allows you to change the Zoom expansion area. When you select Zoom mode, a message appears advising you to "Touch Main fishing screen at far right to zoom". Touch the spot on the FISH FINDER screen which you want to enlarge and it will be magnified in the adjacent ZOOM screen. For example, if you want to zoom a particular fish or object, simply touch it on the FISH FINDER screen and the instrument will enlarge it on the screen. There are eight zoom incremental sections on the screen.

PAUSE

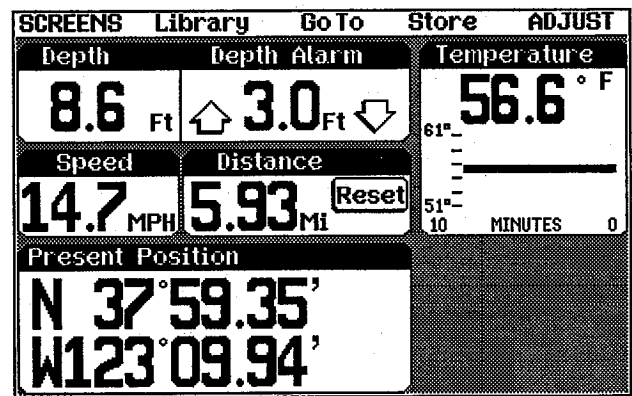
Touching this selection stops the FISH FINDER and ZOOM screens from scrolling. Touching **"Pause"** again, returns the instrument to active updating of the Fish Finder and Zoom functions. Remember that the information shown on the screen to the left of the vertical line is not current and cannot be relied upon for navigational and safety purposes. The image displayed to the right of this PAUSE line is current and accurate for navigational purposes.

EXIT

Touch **"Exit"** to return to the last screen you had selected prior to performing adjustments.

To select the DIGITAL screen, touch the DIGITAL icon on the MENU SELECTION screen, then touch "Accept".

- Normally, the System 4040 allows you to split screens and share the display with one, two, or three menu selections. However, if you select the DIGITAL screen, the other screens will be de-selected and only the symbol box for DIGITAL will remain highlighted. This is because the DIGITAL screen requires the use of the full LCD screen.
- When you deselect the DIGITAL icon, the MENU SELECTION screen returns to your previous screen selections.



DIGITAL DEPTH: In the left hand corner, the Digital Depth is displayed from 2.5 to 10.0 feet (0.8 to 10 meters) in tenths. It then reads in whole numbers down to a maximum depth of 480 feet (150 meters) with the 120 KHz wide angle transducer (dependent upon the reflective nature of the bottom). The narrow beam transducer will read to 960 feet (300 meters) with a good bottom.

DEPTH ALARM: A shallow water alarm can be set from 3.0 to 30 feet (1 to 8 meters). An audible sound will alert the user when the depth of water becomes SHALLOWER than the preset alarm. When this alarm is enabled, it will remain active even if the DIGITAL screen is exited. It can also be set to OFF so that no alarm is programmed.

TEMPERATURE: Surface temperature is derived from readings from a thermistor sensor located in the speed/temperature impeller. A periodic cleaning of this thermistor sensor is advised, as growth occurring on the sensor could inhibit its proper functioning. Below the printed temperature is a range bar which tracks temperature within a ten degree (10°) range over a ten minute period of time. This feature is helpful when looking for changes in the surface temperature of the water.

SPEED OF THE BOAT: Digital speed of the vessel is determined by counting the pulses from the rotation of the impeller blades. Therefore, speeds are greatly dependent upon the installation of the impeller. The impeller is rated at a minimum speed of 1.0 knot (1.15 MPH) and maximum speed of approximately 50 knots (57.5 MPH). However, your System 4040 is able to measure speeds of up to 80 knots (92 MPH), though this is unlikely since the impeller blades will probably cavitate at these higher speeds.

DISTANCE: This entry displays the distance traveled since power was applied to the unit. It will read up to 999 miles (statute or nautical), but is cleared when power is turned off. Touch "Reset" to manually reset the distance log.

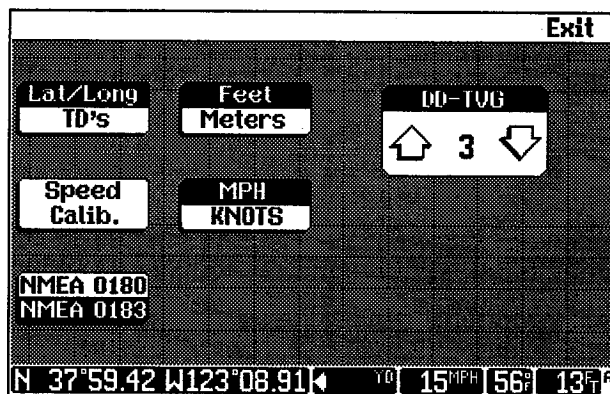
PRESENT POSITION: The LORAN reading in this Present Position represents your vessel's current Latitude/Longitude or TD's.

NOTE: If any of the numbers on the DIGITAL screen begin flashing on and off, do not count on them for accuracy.

To access the ADJUST DIGITAL screen, touch the word "**ADJUST**" in the SELECTION BAR on the top line of the LCD, and touch the DIGITAL symbol.

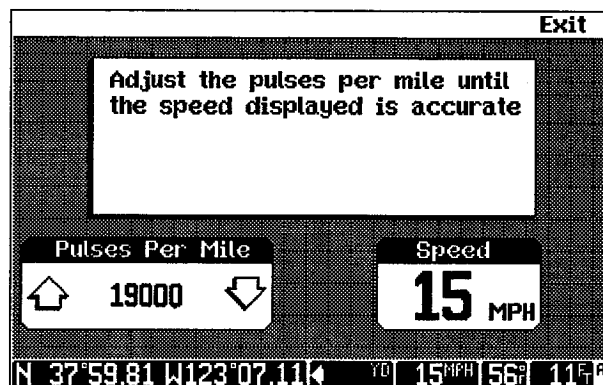
LAT/LONG - TD'S

This selection will toggle the display of present position and waypoints from latitude/longitude to TD's, or vice versa. (The TD/STATUS screen always displays Ioran TD's, and is not affected by this function.) The setting you choose is stored in Permanent Memory, so your selection is retained when power is removed.



SPEED CALIBRATE

The impeller shipped with your System 4040 has a pulse rate of 19,000 pulses per statute mile (22000 pulses per nautical mile). Therefore, your System 4040 is shipped from the factory with the Speed calibrated to 19,000 pulses per mile. However, factors such as impeller mounting, hull characteristics, and water flow can affect the accuracy of the speed reading. The SPEED CALIBRATION function will allow you to adjust the pulses per mile to obtain a correct speed reading. Note that this will calibrate your boat SPEED IN THE WATER, as opposed to your SPEED OVER GROUND.



To properly calibrate the System 4040 Speed reading, do the following:

1. Use the **UP** and **DOWN** arrows to initially set the pulses per mile on the 4040 screen to 19000 PPM.
2. Run a known distance at a constant RPM, using a stopwatch to accurately time the run in seconds. Note the Speed as displayed on the SPEED CALIBRATION screen on the System 4040. (NOTE: If you are measuring the distance traveled in statute miles, set the MPH/KNOTS control to MPH. If you are measuring the distance traveled in nautical miles set the MPH/KNOTS control to KNOTS.)
3. Reverse your direction, and travel back to your starting point at the same RPM. Again, use a stopwatch to accurately time the run in seconds, and note the Speed as displayed on the SPEED CALIBRATION screen. (The Speed on the 4040 screen should be the same as the Speed displayed in Step 2 if running at the same RPM.)
4. Use the following formulas to determine the correct number of pulses per mile (PPM):

$$\text{STEP 2 SPEED} = \frac{(3600) \times (\text{DISTANCE FROM STEP 2})}{\text{TIME FROM STEP 2}} \quad \text{STEP 3 SPEED} = \frac{(3600) \times (\text{DISTANCE FROM STEP 3})}{\text{TIME FROM STEP 3}}$$

$$\text{AVERAGE SPEED} = \frac{(\text{STEP 2 SPEED}) + (\text{STEP 3 SPEED})}{2}$$

$$\text{CORRECT PPM} = (19000) \times \frac{(\text{SPEED DISPLAYED ON 4040})}{\text{AVERAGE SPEED FROM STEP 4}}$$

5. Use the **UP** and **DOWN** arrows to set the pulses per mile on the 4040 screen as close as possible to that calculated in Step 4.

EXAMPLE:

A boat running at a constant RPM, travels 1 mile upstream in 12 minutes (720 seconds). The reverse run takes 4 minutes (240 seconds). Due to impeller mounting and hull characteristics, the System 4040 Speed Calibration screen displays an inaccurate speed of 12 MPH for both runs.

$$\begin{array}{l} \text{SPEED} = \frac{3600 \times \text{DISTANCE}}{\text{TIME}} \end{array}$$

LAP 1	LAP 2
$\frac{3600 \times 1 \text{ MI}}{720 \text{ SEC}} = 5 \text{ MPH}$	$\frac{3600 \times 1 \text{ MI}}{240 \text{ SEC}} = 15 \text{ MPH}$

$$\text{AVERAGE SPEED} = \frac{\text{SPEED LAP 1} + \text{SPEED LAP 2}}{2} = \frac{5 + 15}{2} = 10 \text{ MPH}$$

$$\text{CORRECT PPM} = (19000) \times \frac{(12 \text{ MPH})}{(10 \text{ MPH})} = 22800 \text{ PPM}$$

To properly calibrate the System 4040 Speed reading, adjust the Pulses per Mile on the 4040 screen as close as possible to 22800.

NOTE: IF THE MEASURED DISTANCE IS IN STATUTE MILES (5,280 feet) THE SPEED IS IN MPH.
IF THE MEASURED DISTANCE IS IN NAUTICAL MILES (6,076 feet) THE SPEED IS IN KNOTS.

NMEA 0180 - NMEA 0183

If your System 4040 is interfaced to an autopilot, radar, or chart plotter, you will need to select the format of the data output. Touch this selection 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. Refer to the section entitled, INTERFACE TO OTHER INSTRUMENTS for more information about the NMEA 0180 and NMEA 0183 interface.

FEET - METERS

Your System 4040 can operate in either Standard or Metric mode. The FEET/METERS box is used to select one of these modes. The setting you choose is stored in Permanent Memory, so your selection is retained when power is removed. The following are the display conventions for the two modes:

	FEET	METERS
Depth of water	Feet (FT)	Meters (MT)
Impeller speed	Statute MPH	Knots (KTS)
Distance log	Statute miles (MI) (5280 feet/mile)	Nautical miles (NM) (6076 feet/mile)
Water temperature	Fahrenheit (F)	Celsius (C)
Distance behind boat	Yards (YD)	Meters (MT)
	Statute miles (MI)	Kilometers (KM)
Fish Finder ranges	0-20, 40, 60, 80, 120, 200, 300, 400, 640, 960 feet	0-8, 12, 20, 32, 40, 60, 80, 120, 200, 300 meters
Depth alarms	3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 25, 30 feet	1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0 m

Note: All of the distances related to and derived from the Loran portion of the System 4040, including the diameter of the plotter circle and the distance to your destination, are in Nautical miles, regardless of the setting of the FEET-METERS selection.

MPH/KNOTS

The MPH/KNOTS setting allows you to specify whether your speed will be displayed in Standard Miles per Hour or Nautical Miles per Hour. Other units such as depth, temperature, etc, will NOT be affected by this adjustment.

TVG (TIME VARIED GAIN)

The TVG adjustment is a sensitivity control for the Digital Depth in shallow water. The first ten feet of water contain numerous air bubbles caused by propeller action, choppy waves, rain, etc. This "surface clutter" may cause a false shallow echo which may be interpreted by the Digital Depth as a bottom reading.

The TVG setting ranges from 1 to 7. The TVG circuitry attenuates (decreases) the received echo in shallow water. A TVG setting of 1 is minimum attenuation, while a TVG setting of 7 is maximum.

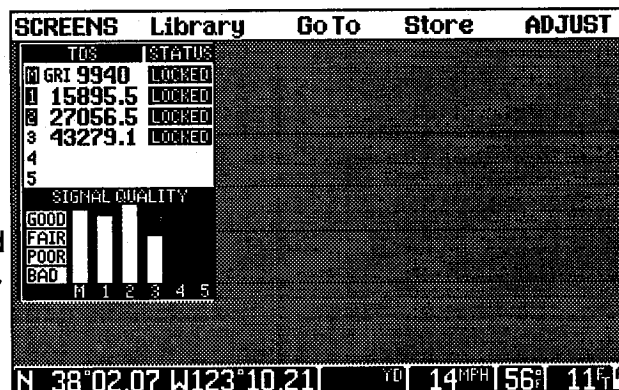
To correctly adjust the TVG setting:

1. Take your boat to a shallow area of water. A depth measuring 4-6 feet is suggested.
2. Set the Fish Finder Range to 20 feet (8 meters.)
3. Using the **UP** arrow, set the TVG value to 7. Using the **DOWN** arrow, decrease the TVG setting one step at a time until you get a correct and consistent Digital Depth reading on the data line at the bottom of the LCD. Each time you change the TVG setting, wait approximately one minute before changing it again so that you will have adequate time to observe and evaluate the behavior of the digital depth.

Once you have completed the TVG adjustment, it should not be necessary to perform it again unless your boating location changes, or if your Permanent Memory is erased.

To access the TD STATUS screen, you must choose the TD STATUS feature from the MENU SELECTION screen, and touch the word "Accept".

This screen displays the status of all LORAN C signals being received, error conditions, and warnings on the Message Board. Refer to this screen to determine if your Loran stations are locked so that you can rely upon them for accuracy of input. The quality of signals is displayed so that you can ascertain the best station(s) to use.



TD'S

This block of information displays the selected GRI (Group Repetition Interval) for the Master and the measured Time Differences (TD's) for the received Secondary Stations. The master (M) station and the two secondary stations selected will be highlighted with inverse characters within this block to let you know which stations the System 4040 is using to compute your position.

STATUS

The Status column shows the progress of searching, settling, and tracking of each signal being received from the Master and available Secondary transmitters in the present GRI chain. The Signal Status can be any of the following:

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 the 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.

LOCKED: When the unit is satisfied that the correct cycle has been established for a given station, the Search Status for that station will jump from SETTLE to LOCKED. When the three stations selected for navigation 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 LOCKED 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 through the Station Selection process.

BLINK CONDITION: When a transmitter station detects an abnormality in the chain (i.e. a station is out of tolerance) 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 System 4040 receives a blink condition from any of the stations, the TD block on the TD STATUS screen will alternate the message "BLINK" with the status for that station. If a station is in the blink condition, you should not use that station for navigation and should re-select another station.

MAN: If you have manually locked a station using the LOCK/JUMP screen, the status will indicate "MAN".

SIGNAL QUALITY

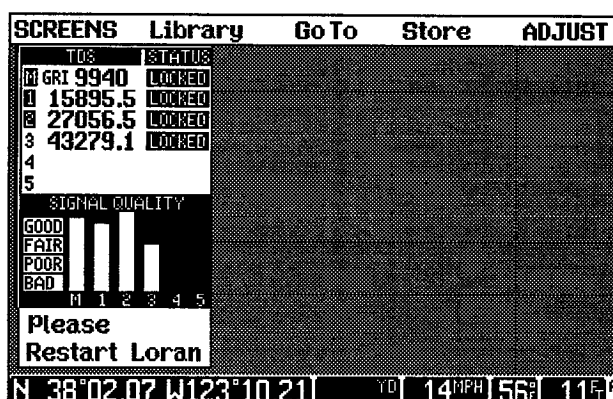
The Signal Quality block shows in bar graph format the relative strength of signals received from the Master and available Secondary transmitters. This bar graph is similar to a SNR (Signal to Noise Ratio) meter. The presence or absence of local in-band interference either on board or off board will cause these levels to decrease or increase dynamically. Generally, distant stations will have a lower Signal Quality and nearby stations will have a higher Signal Quality. As long as the unit is able to track a station and is in the LOCKED Status 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 the TROUBLE SHOOTING GUIDELINES in the Appendix of this manual for help in 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 LOCKED, the Signal Quality will be stable. If a station has a "LOCKED" search status, but displays a Signal Quality only one or two pixels high on the bar graph, the unit is in danger of losing its "lock" for that station.

MESSAGE BOARD

The Message Board will give a variety of warnings and error conditions listed below. Should one of these occur, check the TROUBLE SHOOTING GUIDELINES located in the Appendix of this manual.

- Coupler Short
- Please Restart Loran
- Looking for Signal
- Can't Compute Lat/Long
- Recommend Stations
- Recommend GRI
- Loran Inop
- Caution: OSC equals



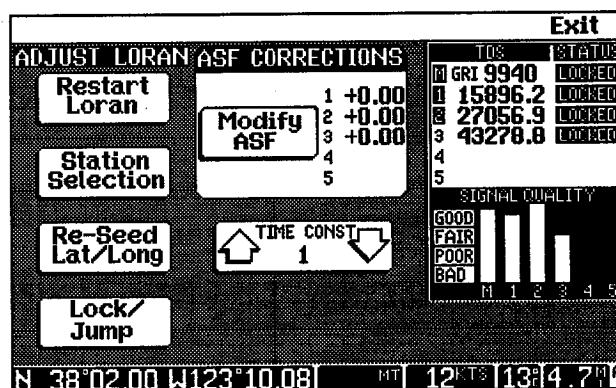
You should always check the TD's against local charts after the stations become LOCKED to verify that the correct cycle has in fact been established and periodically thereafter you should also refer to your LORAN charts. An incorrectly selected cycle will cause large errors in the unit's ability to correctly establish your position.

LORAN OPERATION: ADJUST TD/STATUS SCREEN (LORAN ADJUST SCREEN)

To access the ADJUST TD/STATUS screen, touch the word **"ADJUST"** in the SELECTION BAR on the top line of the LCD, and touch the TD/STATUS symbol. In the right hand section of the screen, your signal status and signal quality are displayed so that you can determine when the stations are locked on and can depend upon them for accuracy of navigation.

There are six ADJUST LORAN functions:

- RESTART LORAN
- STATION SELECTION
- RE-SEED LAT/LONG
- LOCK/JUMP
- MODIFY ASF
- TIME CONSTANT



EXIT

Touch **"Exit"** to return to the last screen you had selected prior to performing adjustments.

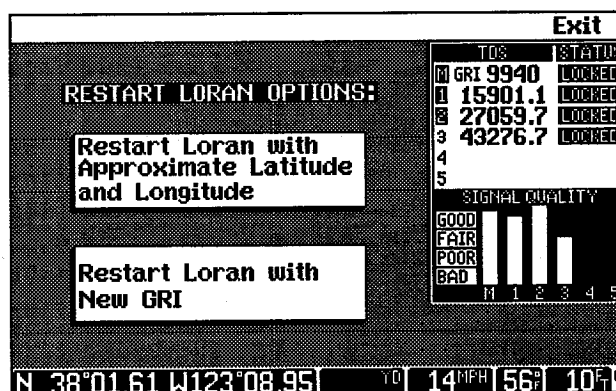
LORAN OPERATION: RESTART LORAN

Touching this selection gives you the following RESTART LORAN screen options:

- LATITUDE AND LONGITUDE
- NEW GRI

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:

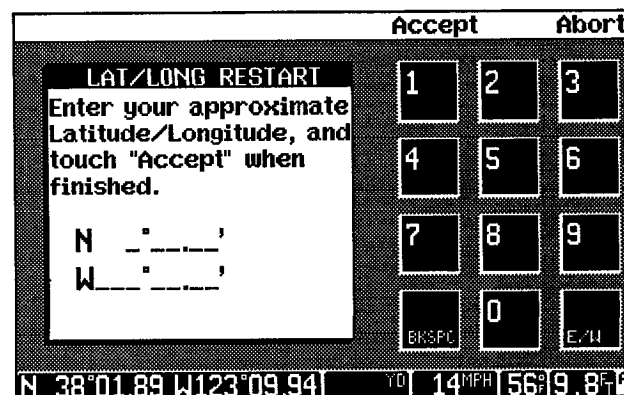
1. Your Loran has never been started, and a LORAN FIRST START is necessary.
2. You have moved the System 4040 with the power off more than 50 miles away from the start up location given to the instrument during the RESTART procedure.
3. The message on the bottom of the TD/STATUS screen says "PLEASE RESTART LORAN".
4. The message on the bottom of the TD/STATUS screen says "RECOMMEND NEW GRI" other than the one you are presently using.



RESTART WITH APPROXIMATE LATITUDE AND LONGITUDE

Touching this selection will display a screen entitled: LAT/LONG RESTART. Enter your approximate latitude/longitude coordinates by using the keypad located on the right side of the screen. If you do not know your latitude and longitude, refer to Appendix C at the back of this manual and/or use your local LORAN C charts.

You must enter the numbers in numeric sequence starting with the position that is blinking. This must be within +/- 1 degree. Although you may enter this within 1 degree, the unit will lock onto the signals slightly faster if you enter a more precise position.



You must enter leading zeroes, if necessary. For example, if West longitude is 85°41.12', you will need to enter 085 41 12.

Touch the E/W arrow key if you need to change to East longitude. If you make a mistake, touch the BKSPC (backspace) key. Touch **"Abort"** if you wish to return to the ADJUST TD/STATUS screen. Touch **"Accept"** when you have entered the correct latitude/longitude.

Once the Loran has been restarted, the System 4040 will automatically select the most appropriate GRI and stations used. It will also ensure that the coordinate converter will compute your correct latitude and longitude and there will be no need to re-seed the unit.

RESTART WITH NEW GROUP REPETITION INTERVAL (GRI)

GRI RESTART				
Touch the GRI you wish, and touch "Accept" to Restart				
9990 NORTH PACIFIC	7960 GULF OF ALASKA	8970 GREAT LAKES	9960 NORTHEAST U.S.	5930 CANADA E. COAST
4990 CENTRAL PACIFIC	5990 CANADA W. COAST	9940 U.S. W. COAST	7980 U.S. E. COAST	7990 MEDITER- RANEAN
MORE				
N 38°01.54 W123°08.64 TD 14 MPH 56° 10° A				

GRI RESTART			
Touch the GRI you wish, and touch "Accept" to Restart			
9610 S.CENTRAL U.S.	5970 KOREA	7930 LABRADOR SEA	7970 NORWEGIAN SEA
8990 SAUDI ARABIA N.	9970 JAPAN	9980 ICELAND	8290 N.CENTRAL U.S.
MORE			
N 38°01.82 W123°09.81 TD 14 MPH 56° 11° A			

If you wish to specify a different GRI than the one your unit would ordinarily select, you may restart using the GRI RESTART option from the RESTART LORAN screen. The GRI RESTART screen displays all GRI's that the System 4040 recognizes, with the currently selected GRI and its location in the world highlighted in white characters on a black background.

If you do not know your GRI, refer to the 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 which you generally use. Locate the MASTER and the optimal SECONDARIES, considering that the maximum range for transmitting stations is approximately 1,000 miles. In most cases, there is only one GRI available, however, in some areas you may have a choice of GRI's. For consistent accuracy, do not change either your GRI or selected stations on a given trip unless absolutely necessary.

Touch the word **"Abort"** to exit the screen without restarting the LORAN. Touch **"Accept"** to restart the System 4040 with the selected GRI. Upon restarting the LORAN, the unit will automatically switch modes to the TD/STATUS screen where you can observe the instrument acquiring, settling, and locking onto the signals. If the GRI you selected was different that the GRI you had previously been using, the System 4040 will select the MASTER and Secondary transmitters 1 and 2 for navigation by default. You may need to access the STATION SELECTION screen to select a more appropriate triad of stations. You should also access the RESEED LAT/LONG screen to ensure that the coordinate converter is properly initialized to produce a correct latitude and longitude reading.

The STATION SELECTION screen allows you to select the three stations to be used for computation of Lat/Long and all other navigational information. The stations available in your area are labeled as M (MASTER), 1, 2, 3, 4 or 5 along with their corresponding locations. The TD/STATUS screen appears at the right, highlighting the stations which you have currently selected, along with the quality of each station. If you wish to choose a station other than one currently selected, touch the box corresponding to the station you desire, then touch the word "Accept". Your selection will be stored in Permanent Memory, so it is retained when power is removed.

Accept		Exit														
STATION SELECTION Select three stations, then Touch "Accept":																
M	3	<table border="1"> <thead> <tr> <th>TO:</th> <th>STATUS</th> </tr> </thead> <tbody> <tr> <td>GRI 9610</td> <td>LOCKED</td> </tr> <tr> <td>1 13258.3</td> <td>LOCKED</td> </tr> <tr> <td>2 25283.3</td> <td>LOCKED</td> </tr> <tr> <td>3 41450.9</td> <td>LOCKED</td> </tr> <tr> <td>4 58999.2</td> <td>SEARCH</td> </tr> <tr> <td>5 73522.5</td> <td>SEARCH</td> </tr> </tbody> </table> SIGNAL QUALITY GOOD FAIR POOR BAD H 1 2 3 4 5	TO:	STATUS	GRI 9610	LOCKED	1 13258.3	LOCKED	2 25283.3	LOCKED	3 41450.9	LOCKED	4 58999.2	SEARCH	5 73522.5	SEARCH
TO:	STATUS															
GRI 9610	LOCKED															
1 13258.3	LOCKED															
2 25283.3	LOCKED															
3 41450.9	LOCKED															
4 58999.2	SEARCH															
5 73522.5	SEARCH															
BOISE CITY, OK	LAS CRUCES, NM															
1	4															
GILLETTE, WY	RAYMONDVILLE, TX															
2	5															
SEARCHLIGHT, NV	GRANGEVILLE, LA															
N 38°01.29 W 123°07.92		TD HIGH 31A														

SELECTING THE BEST SECONDARIES

Some GRI chains 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 System 4040 will track the TD's for ALL stations being received, though only three stations (usually the Master and two Secondaries) are actually used to "triangulate" your position in Lat/Long.

The following criteria should be used to select the best pair of Secondaries (to be used in conjunction with the Master) to determine a position fix:

- **SIGNAL STRENGTH:** Reference the TD STATUS screen to verify that the selected Secondary stations are strong, as weak signals are easily distorted. Do not select a transmitter that is within ten (10) miles of your position, as errors can occur. Generally a secondary station between 100 and 500 miles away from your current position is a good choice. Do not select a station which is in "BLINK" condition.
- **TD GRADIENT:** The distance between two parallel Lines of Position (LOP's) for the same Master-Secondary pair is called the Gradient. A large gradient means that the positional error introduced by a small change in the TD is relatively large. You should select stations that have LOP's with small gradients. If you are near a transmitting station, there is a large change in gradients near the Baseline Extension. Therefore you should avoid any Secondary Station that is near a Baseline Extension.
- **CROSSING ANGLES:** Your position is determined by the crossing point of two intersecting LOP's from different Master-Secondary pairs. Ideally, these two LOP's would intersect at a 90 degree angle. However, as conditions are less than ideal, 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.

The System 4040 does not automatically change transmitter selections as you navigate. Instead, if the unit detects a condition whereby a different set of stations may be better than the presently selected set, the Message Board on the TD/STATUS screen will advise you with a "Recommend Stations" message. If this occurs, you should ascertain from your charts and the other information on the TD/STATUS screen whether it is appropriate to switch to the stations recommended.

The coordinate converter is a function which mathematically translates the received TD's into latitude/longitude. Since LORAN C is a hyperbolic navigation system, at least two Lat/Long pairs can be found for each TD pair received. To ensure that the coordinate converter is generating the correct solution, the **RE-SEED L/L** option is included in your System 4040.

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

1. Your unit is producing the correct TD's, but an obviously incorrect latitude / longitude is displayed.
2. The Message Board on the TD Status screen displays "CAN'T COMPUTE LAT/LONG".
3. After a GRI RESTART.

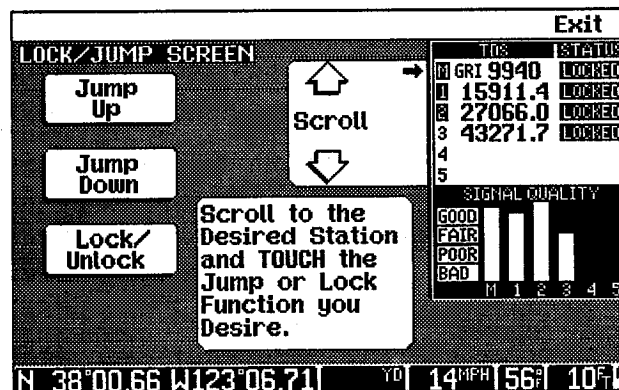
HOW TO RE-SEED LAT/LONG

Using the numeric keypad, enter your approximate location in latitude/longitude. You must enter leading zeroes if necessary to fill up all digit entry positions. For example, if the West longitude is 85°41.12', you must enter 085 41 12. Touch the E/W key if you need to change between EAST and WEST longitude. (Select East only if you are East of Greenwich, England.) If you make a mistake, touch BKSPC (Backspace). Touch the word **"Accept"** when you have entered the correct re-seed location. This will enter your position as a new seed for the coordinate converter and will exit the RE-SEED LAT/LONG screen. Touch **"Abort"** to exit without re-seeding the coordinate converter.

RE-SEED LAT/LONG		Accept	Abort
Enter your approximate Latitude/Longitude, and touch "Accept" when finished.		1	2
		4	5
		7	8
		0	E/W
N - - - - '		BKSPC	
W - - - - '			
N 38°01.33 W 123°07.56		TD	14 MPH 56° 10°

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 well acquainted with the nature of Loran signal reception.

The System 4040 is a totally automatic Loran-C receiver. Once the unit is initialized with a starting position (either automatically or manually from the RESTART LORAN 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 System 4040 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. Also, if the received groundwave signal is very weak, the unit may 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. Touch the **LOCK/JUMP** box on the ADJUST LORAN screen.
2. Touch either SCROLL arrow key to select a station.
3. Touch the **LOCK/UNLOCK** box 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. Touch the **JUMP UP** box 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. Touch the **JUMP DOWN** box 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 touch the **LOCK/UNLOCK** box 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 touching **JUMP UP**, **JUMP DOWN**, or **LOCK/UNLOCK** before the desired effect takes place.
- If the unit has a Status of SEARCH for a given station (on the TD/STATUS screen), that station may not be manually locked or jumped; you must wait until the station achieves a Status of either SETTLE or LOCK. If a signal corresponding to a manually locked station becomes very weak and the unit loses the signal for that station, the station is automatically unlocked and goes into search. When the signal is re-acquired, you may manually lock it again.
- It is possible to manually LOCK an incorrect cycle. This will cause the computed Lat/Long to be incorrect as well as the information going to the NMEA 0183. Therefore, the user is cautioned to BE CAREFUL when manually locking stations. Be advised that since a station has been **manually** locked, the unit **will not** flash the Lat/Long, indicating a Lat/Long error.
- 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 TD/STATUS screen, "MAN" appears next to the TD for each station that is manually locked.

Loran-C signals, like all radio signals, are affected by the water and terrain over which they must propagate. 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 traveled 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 may 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.

Exit	
TDs	STATUS
M GRI 9940	LOCKED
1 15911.5	LOCKED
2 27066.2	LOCKED
3 43270.7	LOCKED
4	
5	
SIGNAL QUALITY	
GOOD	1 2 3 4 5
FAIR	
POOR	
BAD	

ASF ENTRY OPTIONS:	
Enter ASF by giving exact position in Lat./Long.	
Enter ASF by giving the time to be added to measured TDs	
Clear all ASF corrections	

N 38°00.48 W123°06.84	YD 14 MPH 56° 10°F
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By using ASF Corrections, the absolute accuracy of the latitude/longitude displayed on a Loran-C receiver can 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.

Three options are provided for ASF modification.

- Enter ASF by giving exact position in Lat/Long.
- Enter ASF by giving the time to be added to measured TD's
- Clear all ASF corrections.

ENTERING ASF CORRECTION USING EXACT LAT/LONG

The **first method** for entering ASF corrections is to enter your exact Latitude and Longitude if it is known. Use the keypad located on the right side of the screen to enter the "correct" lat/long and then touch the word **"Accept"**.

To use this method, navigate your boat to a location where the exact latitude/longitude is known. 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, touch the first box labeled:

"Enter ASF by giving exact position in Lat./Long." At the prompt, enter your exact latitude/longitude. The System 4040 will automatically compute the corresponding TD offsets. Any previously stored ASF corrections will be discarded. You will see the ASF's modification upon returning to the ADJUST TD/STATUS screen.

Accept		Abort
1	2	3
4	5	6
7	8	9
BSPC	0	E/W

ASF CORRECTION	
Enter your exact Latitude/Longitude, and touch "Accept" when finished.	
N	° ' "
W	° ' "

N 38°00.20 W123°06.98	YD 14 MPH 56° 10°F
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ASF CORRECTIONS USING TIME TO BE ADDED TO MEASURED TD'S

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

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

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

If you make a mistake, touch the BKSPC key to erase. To exit this screen, touch the word "Exit".

The screenshot shows the 'ASF CORRECTION' screen. On the left, there are three buttons labeled 'Station 1', 'Station 2', and 'Station 3'. The main display area shows 'Select the station that you wish to enter the ASF corrections for.' followed by a list: '1 +0.00', '2 +0.00', '3 +0.00', '4', and '5'. At the bottom, there is a status bar showing 'N 37°59.98 W123°06.98', 'YD 14 MPH', '56°', and '10°A'. An 'Exit' button is in the top right corner.

The screenshot shows the 'ASF CORRECTION' screen with a numeric keypad. The main display area shows 'Enter the ASF correction. Touch Accept when done. Touch Exit to quit.' followed by a list: '1 +0.45', '2 +0.00', '3 -1.60', '4', and '5'. The keypad has buttons for digits 1-9, 0, +/-, and a 'BKSPC' key. At the bottom, there is a status bar showing 'N 37°59.74 W123°07.20', 'YD 14 MPH', '56°', and '10°A'. 'Accept' and 'Exit' buttons are at the top right.

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 System 4040, 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 latitude/longitude is calculated. Therefore, when the **Present Position** is displayed in latitude/longitude, it will have ASF corrections applied; **Present Position** in TD format will not.

Waypoints in the System 4040 are stored in latitude/longitude format, so any ASF corrections will be applied to a TD pair before storing a waypoint. If you operate your unit in TD mode, stored waypoints will be displayed with the ASF corrections that were applied when the waypoint was initially stored. Therefore, all **waypoints**, whether displayed in Lat/Long or TD format, will have ASF corrections applied.

When using ASF corrections in navigating to a waypoint, ensure that the ASF corrections you are presently using have not changed since the waypoint was stored. This is true whether you stored the waypoint using **"Store"** or if you used the Waypoint Library. For further discussion of how the System 4040 stores and navigates to waypoints, refer to the sections on Store, Go To and Waypoint Library.

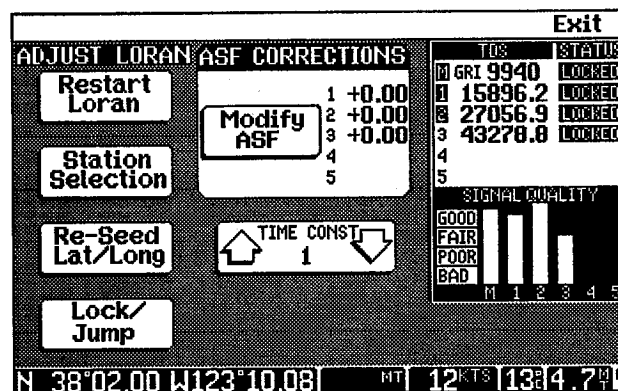
Entered ASF corrections are usually good for approximately a 25 mile radius, depending on the paths the signals take. In areas near cliffs, tall mountains, or where the signals must travel over a mountain range, ASF corrections are accurate for short distances only.

CLEAR ALL ASF CORRECTIONS

Entered ASF corrections are stored 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, select **"Clear all ASF corrections"**

The System 4040 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 System 4040 by touching the arrows in the **TIME CONSTANT** box on the ADJUST LORAN screen.

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 fluctuate more, especially at slow speeds. This setting is recommended if you change speed or direction often.

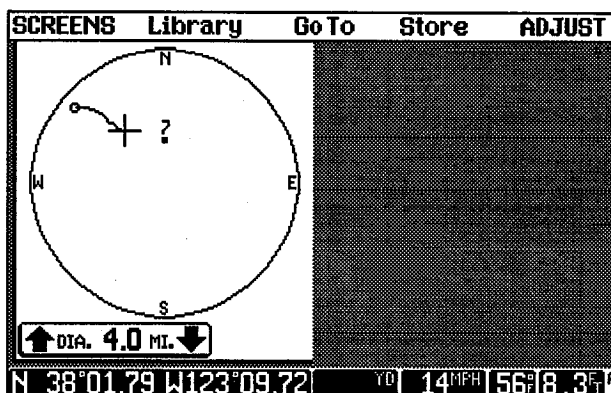
TIME CONSTANT = 2: This is a medium averaging time. The System 4040 is shipped from the factory with this as its default. For most applications, a Time Constant of 2 will work effectively.

TIME CONSTANT = 3: This is the slowest averaging time. Speed and Track will respond more slowly, though the reading will be smoother and will fluctuate less. 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 stored in Permanent Memory. Note that the Time Constant adjustment will affect the averaging time used in the computation of both Latitude/Longitude and Speed and Track. However, the display of TD's will not be affected.

The PLOTTER screen graphically displays your position relative to your track, present position, intended course, 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 is set by touching the **UP** or **DOWN** arrows located just below the Plotter circle. The smallest diameter range is .25 miles. Using the arrow, the diameter can be adjusted in the following increments: .25, .5, 1 mile, 2 miles, 4 miles, 8 miles, 16 miles, 32 miles, 64 miles, 128 miles, 256 miles, 512 miles.



GRAPHIC SYMBOLS: The following graphic symbols are used on the PLOTTER screen to help you identify key positions:

"+" 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 wait a few minutes in your harbor for this circle to appear at the beginning of the day, you will have a reference for your starting position of the day. This location is not stored in permanent memory, and so it may vary 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 INSTANT STORE or through the WAYPOINT LIBRARY screen. If you have selected waypoint 80 as your destination using the GO TO key, this triangle will be flashing.

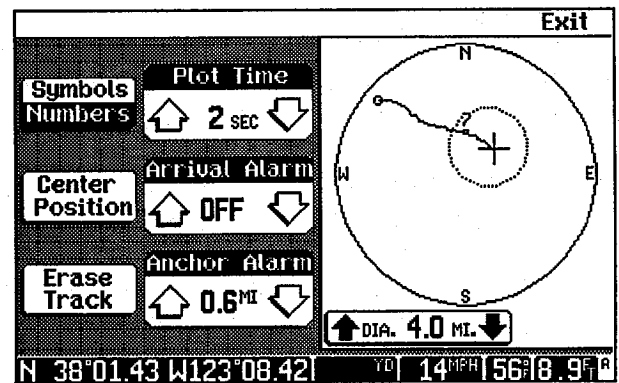
SMALL SQUARE: The small square represents any waypoint stored in locations 01 through 79. These positions are stored after power down in permanent memory until you change them, either through the "Store" function, or through the WAYPOINT LIBRARY screen. If you select one of waypoints 01 through 79 as 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 temporarily 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 information is 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, touching 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.

DOTTED LINE: The dotted line is the intended course of travel to your destination waypoint, which was selected when you touched the GO TO key.

The ADJUST PLOTTER screen is split in half, with the adjustment options on the left and the current PLOTTER screen on the right. This screen design assists you in seeing your adjustments immediately as you make them, as well as displaying important plotter changes which occur while you are making adjustments. The ADJUST PLOTTER screen allows you to perform the following:

- Choose **SYMBOLS** or **NUMBERS** for your Waypoints.
- **CENTER** your position within the Plotter circle
- **ERASE** your track on the screen
- Select the **PLOTTER UPDATE TIME**
- Set **WAYPOINT ARRIVAL** alarm
- Set **ANCHOR DRIFT** alarm



SYMBOLS: If this option is selected, the PLOTTER screen will display the symbols you have assigned to various waypoint positions. (Symbols are assigned through the WAYPOINT LIBRARY screen by choosing the "Modify Symbols" option. There are nine different waypoint symbols which can be displayed.)

NUMBERS: Choosing this option will display the Number of the waypoint position on the PLOTTER screen, rather than a symbol. (Numbers are assigned through the WAYPOINT LIBRARY screen. There are 80 different waypoint numbers available.)

CENTER POSITION: When you touch this option, the cursor indicating your current position is moved to the center of the Range scale you have chosen. This feature is helpful when you change ranges and the cursor is positioned off-center or out of the Plotter circle.

ERASE TRACK: This option erases the Plotter track from memory and clears it from the screen.

PLOT TIME: As programmed from the factory, the System 4040 is set to update the track shown on the PLOTTER screen every 2 seconds. The update time can be increased so that it most appropriately reflects your journey requirements by using the **UP** arrow and **DOWN** arrow. Plotter time update increments and corresponding track history is given below:

PLOTTER TIME	APPROXIMATE HISTORY
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

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.

Arrival alarm increments are set in 10ths of a nautical mile, and the circular alarm zone can range from .1 mile to 9.9 miles away from the waypoint. To change the arrival alarm increments, use the **UP** and **DOWN** arrows. As you change the zone, the dimension of the circle around the waypoint changes.

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. Touch "Exit" to acknowledge and clear this message. 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, the Arrival Alarm will wait for the previous message to disappear before sounding.

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.

The Anchor Alarm zone is set using the **UP** and **DOWN** arrows, and can range from .1 mile to a maximum of 9.9 miles. If you set an Anchor Alarm when you have enabled the GO TO function, it will cancel the GO TO function since the system assumes that if you are anchored you would not be requiring the GO TO feature.

If your boat travels outside the established Anchor Alarm zone, the alarm will start beeping, and a pop-up Loran Memo reading "ANCHOR DRIFT" will appear in the center of the display. Touch "Exit" to acknowledge this message. 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.

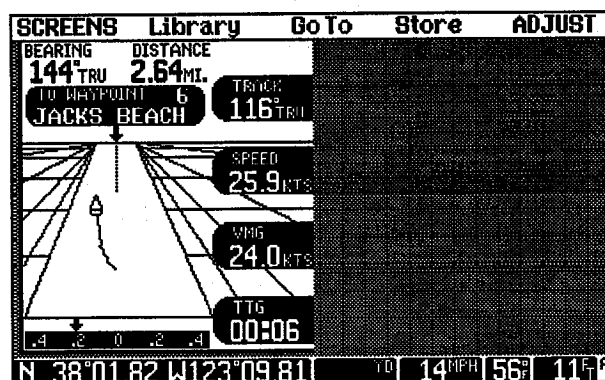
After setting an Anchor Alarm, it will be active in all modes and at all times, with the following exceptions:

- 1) If the unit loses its lock on any of the selected stations, or otherwise 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, the Anchor Alarm will wait for the previous message to disappear before sounding.

EXIT

Touch "Exit" to return to the last screen you had selected prior to performing adjustments.

The NAVIGATION screen is used when navigating to a destination after a "Go To" waypoint has been selected. The selected destination waypoint, any text description previously entered in the WAYPOINT LIBRARY screen, the numeric distance and bearing to the destination, and a 3-dimensional perspective Course Deviation Indicator (CDI) are all displayed. This screen shows your boat relative to the intended course as it travels toward the destination. (Course Deviation, or CDI, is sometimes also referred to as "Cross Track Error," or XTE.)



When the Go To function is enabled, an intended course is plotted to this destination. On the NAVIGATION screen, the moving boat indicates your position relative to this intended course. If you are on course, the boat will be exactly centered on the short dotted line just above the boat, and the small arrow at the bottom of the screen will be pointing directly at "0". If you have drifted to the left of your intended course, the boat will be shown to the left of center, and the small arrow at the bottom will indicate how far to the left of your intended course you are, in nautical miles.

Behind your boat is displayed a trail indicating the course you have actually followed relative to your intended course. You may use this actual course to ascertain the effect of course corrections you make while en- route to your GO TO destination. If your vessel moves further off course than the selected range will allow, the displayed boat and trail will remain on the edge of the CDI display. In this case, you must increase the range to view your actual Course Deviation. This is accomplished using the ADJUST NAVIGATION screen, described in the next section.

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. The CDI indicator only makes sense when you are traveling 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.

The following information is displayed on the half screen version of the NAVIGATION screen:

TRACK: average direction your boat has been traveling, measured in degrees with respect to either True or Magnetic North.

SPEED: average speed of your boat, measured in knots.

VMG (VELOCITY MADE GOOD): component of your Speed vector that is parallel to your intended course of travel, measured in knots.

TTG (TIME TO GO): estimated time to go until you reach your destination, assuming you maintain your current speed, measured in hours: minutes: seconds.

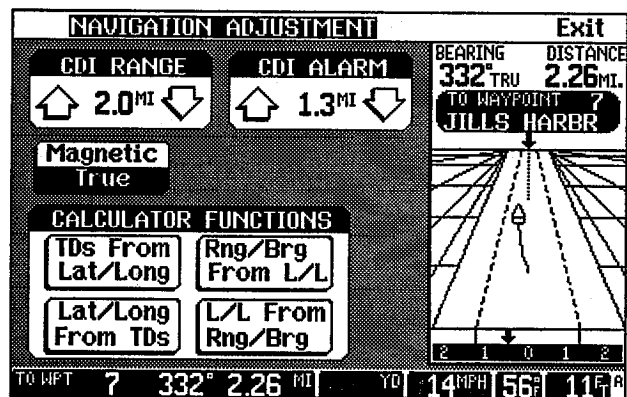
To access the ADJUST NAVIGATION screen, from the main operating screen, touch the word **"ADJUST"**, and touch the NAVIGATION symbol.

CDI RANGE

The 3-D CDI display on the NAVIGATION screen is graduated along the bottom in nautical miles. Its range may be changed as desired by touching the **UP** or **DOWN** CDI Range arrows to increase or decrease the range, respectively.

CDI ALARM

You may set a CDI boundary alarm to warn you when you travel too far off your intended course. To do this, touch the CDI Alarm **UP** arrow. Two dashed lines, or alarm boundary markers, are drawn to the left and the right in the 3-D CDI display. If the displayed boat crosses one of these markers, an alarm will sound. Touch the **UP** or **DOWN** CDI ALARM arrows to increase or decrease the width of the allowed "lane" that is established. Note that the lane created with the CDI ALARM is also displayed on the PLOTTER screen.



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

- The CDI alarm is active only when the NAVIGATION screen is displayed. Changing to a different mode, such as a menu or another adjustment screen, will prevent the CDI alarm from sounding. The alarm setting will be retained, though, so when you return to the NAVIGATION screen the CDI alarm will still be activated.
- The CDI alarm has a different sound than the depth alarm. The depth alarm (which is enabled from the DIGITAL ADJUSTMENT screen) 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 NAVIGATION screen is flashing on and off, the numbers are in question and should not be relied upon. You should select the TD/STATUS screen for problem determination.

MAGNETIC/TRUE

You may use this selection to specify whether the bearing, as computed by the Loran, will be with respect to Magnetic North or True North.

EXIT

Touch **"Exit"** to return to the last screen you had selected prior to performing adjustments.

Among the powerful features of the System 4040 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. The following selections will appear on the **ADJUST NAVIGATION** screen:

TD's From Lat/Long This screen will allow you to translate any latitude/longitude to a set of TD's for your present GRI.

Lat/Long 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.

Touch the box corresponding to the calculation you wish to make. The functions of these screens are described on the following pages. **NOTE: CALCULATOR FUNCTIONS WILL NOT WORK PROPERLY IN THE FOLLOWING CIRCUMSTANCES:**

- 1) When the System 4040 is in Simulator Mode.
- 2) When any of the following messages appear on the Message Board on the TD/STATUS screen:
 - "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). 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). Touch the E/W key if you need to change to east longitude. If you make a mistake, Touch the BKSPC key to clear your entry. Touch **"Accept"** when finished.

		Accept	Abort
Compute TDs from a Lat/Long pair.		1	2
Enter a Lat/Long:		4	5
N	_____	7	8
W	_____	0	E/W
N 38°00.66 W123°06.71		YD 14 MPH 56° 10°	

The message "PLEASE WAIT" will appear for a few seconds while the unit performs the calculation. The unit will then display at the right of the screen the computed TD's for all secondaries in the present GRI. The latitude/longitude you entered will remain at the left 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, Touch **"Exit"** to continue. You may then enter another latitude/longitude to translate if you wish, or you may exit the screen by Touching **"Abort"**. 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 detect any signal. The System 4040 ignores this fact, and will translate 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, Touch the BKSPC key to clear your entry. Touch **"Accept"** "when finished.

		Accept	Abort
Compute a Lat/Long given a TD pair		1	2
Enter a TD pair		3	4
_____		5	6
_____		7	8
		9	0
		BKSPC	
TO WPT	7 356° 2.26 MI	YD	14 MPH 56° 12' R

The message "PLEASE WAIT" will appear for several seconds while the unit performs the calculation. The unit will then display at the right of the screen the computed latitude/longitude corresponding to the TD's which you entered. These TD's will remain at the left of the screen for reference. After copying the numbers from the screen into a notebook, touch **"Exit"** to continue. You may then enter another pair of TD's to translate if you wish, or you may exit the screen by touching **"Abort"**.

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 for some reason, the unit 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 LAT/LONG

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 a leading zero, if necessary (for example, if the west longitude is 85°41.12' you will need to enter 085 41 12). Touch the N/S/E/W key if you need to change to east longitude. If you make a mistake, touch BKSPC to clear your entry. Touch **"Accept"** when finished.

		Accept	Abort
Compute Range and Bearing from L/L		1	2
Enter L/L pair:		3	4
N	_____	5	6
From: W	_____	7	8
N	_____	9	0
To: W	_____	BKSPC	N/S/E/W
N 38°01.89 W123°09.94		YD	14 MPH 56° 9.8' R

The message "PLEASE WAIT" will appear for a short time while the unit performs the calculation. The unit will then display 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 ADJUST NAVIGATION screen). The positions you entered will remain at the left of the screen for reference.

After copying the numbers from the screen into a notebook, touch "Exit" to continue. You may then enter another Lat/Long pair to translate if you wish, or you may exit the screen by touching "Abort".

COMPUTING LAT/LONG FROM RANGE/BEARING

The fourth option on the Calculator Menu will allow you to compute the position in latitude/longitude of a location at a given range and bearing from a specified 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 ADJUST NAVIGATION screen). Again, you will need to enter leading zeroes, if necessary.
- 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). Touch the N/S/E/W key if you need to change to east longitude.





		Accept	Abort
Compute L/L at given Range and Bearing		1	2
Enter Rng, Brng, and Starting Lat/Long:		4	5
RANGE: _____ MI		7	8
BEARING: _____		0	N/S/E/W
From: N _____		BKSPC	
W _____			
N 38°01.82 W 123°09.76		YD	14 MPH 56° 12°

If you make a mistake, touch BKSPC to clear your entry. Touch "Accept" 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 right of the screen the computed latitude/longitude of the destination point. All of the information you entered will remain at the left of the screen for reference.

After copying the numbers from the screen into a notebook, touch "Exit" to continue. You may then enter another range/bearing/lat/long group to translate if you wish, or you may exit the screen by touching "Abort".

Touching the word **"Library"** in the SELECTION BAR on the top line of the screen enters you into the WAYPOINT LIBRARY screen. This is the area where all of your Waypoints are itemized and stored in numeric sequence. To position the cursor at a particular waypoint position, either touch one of the Scroll arrows or use the Jump function. The small scroll arrows move one waypoint position at a time. The larger scroll arrows move five waypoint positions at a time. If you wish to move more than 5 waypoints at a time use the Jump function described below.

Erase	Copy	Jump	Exit	
WAYPOINT LIBRARY				
79	N 0°00.00 W 0°00.00	   	MODIFY <div>Position</div> <div>Symbols</div> <div>Text</div>	
80	N 0°00.00 W 0°00.00			
1	N 38°22.00 W 122°10.10			
2	N 38°02.15 W 121°53.15	IMPULSE		
3	N 38°02.15 W 121°53.15	PITTSBURG		
<div>N 37°59.74 W 123°07.20</div> <div>YD 14 MPH 56° 10°</div>				

MODIFY "POSITION"

Locate the right hand column labeled "MODIFY". Touch the word **"Position"** when you want to enter a latitude/longitude (TD's) of a location into a waypoint number.

Use the keypad which appears at the right of the screen to enter the lat/long numbers into waypoint positions. Touch **"Accept"** when you have entered the complete number or touch **"Abort"** if you wish to exit the screen without storing into a position.

MODIFY "SYMBOLS"

The Waypoint Library in the System 4040 allows you to assign a graphic symbol to each waypoint. Each assigned symbol will be plotted on the PLOTTER screen above its associated waypoint if the **Numbers/Symbols** switch on the PLOTTER ADJUST screen is set to **Symbols**.

If you wish to assign a symbol to a waypoint, or change or delete a previously assigned symbol, scroll or jump to the desired waypoint. Then, touch **"Symbols"** within the MODIFY block on the right side of the WAYPOINT LIBRARY screen.

A keypad of symbols then appears on the right side of the screen. If there was a previously assigned symbol for the selected waypoint, it begins flashing on the left side of the screen. You may then select a new symbol by touching the appropriate keypad location.

The symbols and their meanings are as follows:



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.



ANCHORAGE - 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 or reefs, or perhaps to mark the position of an island which must be avoided in the fog.



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



RESTAURANT - Assign this symbol to a seaside restaurant or lounge.



BRIDGE - Use this symbol to denote the location of a bridge along your route.

If you wish to remove a symbol from a waypoint, simply touch the CLEAR key. To permanently enter your selection of a symbol, touch **"Accept"**. If you wish to leave the previous selection unchanged, touch **"Abort"**. You may change the assigned symbol at any time by re-entering the MODIFY SYMBOL screen from the Waypoint Library.

MODIFY TEXT

The System 4040 allows you to store up to 11 characters of text with each waypoint. This string, composed of letters, numbers, and punctuation, serves as a reminder of the purpose of each waypoint stored.

If you wish to assign text to a waypoint, or modify or delete previously assigned text, scroll or jump to the desired waypoint. Then, touch **"Text"** within the MODIFY block on the right side of the WAYPOINT LIBRARY screen.

The waypoint you have selected then moves to the upper left corner of the display. An alphanumeric keypad appears on the screen, prompting you to enter new text. The keypad is arranged as 25 keys containing the letters A through Y. In the upper right corner of some keys is a smaller character. These represent the digits 0-9, punctuation, and the letter Z.

To enter text, simply touch the characters you wish to enter. The modified text appears within the waypoint block at the top of the display. To access the smaller characters, touch SHIFT in the lower left corner of the display. This will activate the digits, punctuation, and the letter Z. The keypad remains in the shifted state until you touch SHIFT a second time.

If you would like to enter a space in your text, touch SPACE. If you make a mistake, touch BKSPC (backspace).

Once you have entered the entire string of text (up to 11 characters), touch **"Accept"** at the top of display to permanently store the string. The display will revert to the WAYPOINT LIBRARY screen.

If you change your mind and do not wish to change the original string, touch **"Abort"** at the top of the MODIFY TEXT display. In this case, the display will also revert to the WAYPOINT LIBRARY screen.

You may change the assigned text at any time by re-entering the MODIFY TEXT screen from the Waypoint Library.

ERASE

The ERASE function will allow you to remove the latitude/longitude (TD's) which you have entered in a particular waypoint position. To enable this function:

1. Touch the word **"Erase"** located on the top line of the screen. The words WAYPOINT LIBRARY disappear and are replaced with the words ERASE WAYPOINT.
2. Using Scroll or Jump, position the cursor over the waypoint you want to erase. A message on the right will read "Erase Waypoint 80". Touch **"Confirm"** to erase the waypoint which is highlighted.
3. Touch **"Exit"** to leave the ERASE WAYPOINT screen.

JUMP

The JUMP function will allow you to automatically jump to a specified waypoint number in the waypoint library. (This is sometimes faster than scrolling.) The JUMP function is available on the main WAYPOINT LIBRARY screen, as well as throughout the COPY WAYPOINT and STORE WAYPOINT functions. To enable this function:

1. Touch the word **"Jump"** located on the top line of the screen. An overlay window will appear on the screen which will read, "Enter the waypoint number that you wish to Jump to." A numeric KEYPAD will also appear at the right of the screen.
2. Using the keypad, enter the number (01 - 80) of the waypoint you wish to select. Upon entering the second digit of the waypoint number, the System 4040 will automatically jump to highlight your selected waypoint.

COPY

The COPY function will allow you to COPY waypoint information from one waypoint number to another.

1. Touch the word **"Copy"** located on the top line of the screen. The words WAYPOINT LIBRARY disappear and are replaced with the words COPY WAYPOINT.
2. Using the Scroll arrows or the Jump function (described above), position the highlighted bar over the waypoint to be copied. Touch **"Accept"** to tell the System 4040 this is your Source waypoint.
3. Upon touching **"Accept"**, the words "Scroll or Jump to highlight your new waypoint number and touch Accept" will appear at the right. Using the Scroll arrows or the Jump function, position the highlighted bar over the new waypoint number. Touch **"Accept"** to tell the System 4040 that this is your Target waypoint. Note that the Target waypoint number cannot be the same as the Source waypoint number.
4. Upon touching **"Accept"**, a confirmation screen will appear displaying the waypoint to be copied and the new waypoint entry to be overwritten. Touch **"Confirm"** to copy the Source waypoint information to the new waypoint entry, or touch **"Exit"** to quit without copying the waypoint.







Jump	Accept	Abort
COPY WAYPOINTS		
80	N 0°00.00 W 0°00.00	Scroll or Jump to highlight Waypoint to be Copied and touch "Accept."
1	N 38°22.00 W 122°10.10 WAYPOINT 1	
2	N 38°02.15 W 121°53.15 IMPULSE	
3	N 38°02.15 W 121°53.15 PITTSBURG	
4	N 38°03.20 W 122°11.20 HERMANS	
N 38°01.26 W 123°07.11 TO 14 MPH 56° 11°F		

Jump	Accept	Abort
COPY WAYPOINTS		
15	N 38°02.30 W 123°15.60 DARK SLOUGH	Scroll or Jump to highlight New Waypoint Number and touch "Accept."
16	N 0°00.00 W 0°00.00	
17	N 0°00.00 W 0°00.00	
18	N 0°00.00 W 0°00.00	
19	N 0°00.00 W 0°00.00	
N 38°01.19 W 123°06.89 TO 14 MPH 56° 11°F		

		Abort
COPY WAYPOINTS		
Copy Source Waypoint		
2	N 38°02.15 W 121°53.15 IMPULSE	Touch Confirm to copy or "Abort" to quit.
to Target Waypoint		
17	N 0°00.00 W 0°00.00	
		Confirm
N 38°00.73 W 123°06.66 TO 14 MPH 56° 11°F		

Touching the word **"Store"** on the selection bar allows you to Instant Store your present position into one of 80 Waypoint Library entries. This powerful function operates when you are in the Fish Finder functions as well as Loran C operation. It can be enabled as follows:

1. Touch the word **"Store"** to enter the Waypoint Library. Waypoint numbers 1 - 20 are designated as Instant Store Waypoints. One of these will be automatically selected upon entering the Store function.
2. To store your present position into a different entry than the one selected, Scroll or Jump to select your desired waypoint number.
3. Touch the word **"Accept"** if this is the correct Waypoint Library entry.
4. Touch the word **"Abort"** if you want to exit this screen without storing a waypoint.

Jump	Accept	Abort
STORE PRESENT POSITION		
14 	N 38°04.90 W120°09.20 BETHEL ISLD	  SCROLL  
15 	N 38°02.30 W123°15.60 DARK SLOUGH	
16	N 0°00.00 W 0°00.00	
17	N 0°00.00 W 0°00.00	
18	N 0°00.00 W 0°00.00	
N 37°59.95 W123°06.98 YD 14 MPH 56° 10°F		

WHEN THE STORAGE FUNCTION WON'T WORK:

The Storage function is disabled in the following situations:

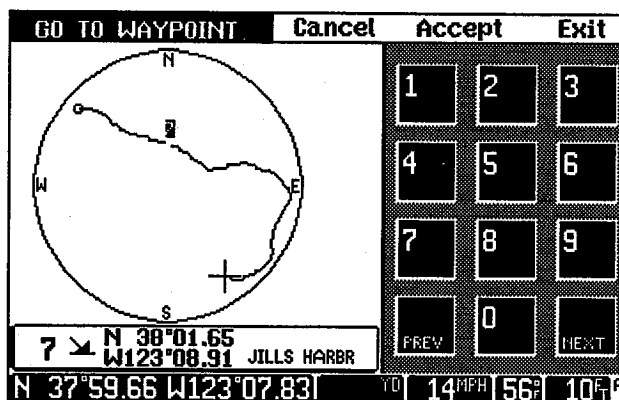
- If one or more of the stations selected for use are not Locked
- If your unit cannot determine your latitude/longitude for some reason
- If a Message appears indicating "PLEASE WAIT". Storing a waypoint will not be possible until this message clears.

OPERATION:**"GO TO" WAYPOINT**

The GO TO function allows you to select a destination waypoint to Go To. When you enter a Go To, you will enable all navigation functions that require a destination such as bearing to destination, distance to destination, and cross track error.

To use the Go To function, you must have previously stored your destination in one of the eighty (01-80) waypoint locations in Permanent Memory. Waypoints are entered by one of the following methods:

1. Touching the **"Store"** function while at the location.
2. Entering the coordinates of the waypoint manually when you are in the WAYPOINT LIBRARY screen.



Before selecting the Go To function, all stations selected for navigation must have already achieved a Status of "LOCKED". Until the stations are locked, a Go To will have no effect.

ENTERING A GO TO WAYPOINT:

To use the Go To function, touch the words **"Go To"** on the top line of the LCD screen. The unit will suggest a waypoint number which will be displayed as a flashing number on the PLOTTER screen.

1. Use the KEYPAD which appears at the right of the screen to enter the Go To number. There is a flashing cursor under the rightmost digit of the Waypoint number. To enter a Go To number, enter "023" on the keypad and the unit will show "23".
2. To plot your Go To waypoints in numeric sequence, touch the NEXT or PREVIOUS keys on the keypad. The unit will then Route you to the next waypoint.
3. Touch **"Accept"** to establish the selected waypoint as your Go To destination. If you change your mind, you may touch **"Exit"**. This will leave any previously selected Go To destination intact. To disable the Go To function entirely, touch **"Cancel"**, and then touch **"Accept"**.

CAUTION: When using the Go To function, it is important to keep in mind that the ability of the System 4040 to help navigate your boat to a destination is greatly dependent on the accuracy of the data it uses to compute your intended course. This assumes the following:

1. The unit is "locked" on the correct cycle for each of the three stations selected for navigation. This must be true when you are storing your destination waypoint, as well as when you are navigating to it. You must verify your coordinates with local charts overprinted with LORAN C lines of position.
2. You must use the same stations when you are navigating to your Go To destination as when you stored its coordinates.

The System 4040 contains 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." The information 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 waypoints, in latitude/longitude (TD's) format
- A pointer to the next Instant Store waypoint to be stored
- Information used for automatic LORAN restart: last known position, last used GRI, last stations selected
- ASF Corrections
- Loran Time Constant
- Lat/Long vs. TD mode setting
- Units (Feet/Meters) setting
- NMEA 0180/0183 setting
- Magnetic vs. True setting as used in NAVIGATION screen
- FISH ID setting
- Symbols vs. Numbers setting as used in PLOTTER screen
- Plotter Update Time setting
- TVG setting
- Contrast setting

When your System 4040 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.

HOW TO ERASE PERMANENT MEMORY:

If you have determined that you have a need to erase Permanent Memory, it can be performed as follows:

1. Touch and HOLD the ON/LAMP key while you touch the word "**ADJUST**" in the SELECTION BAR on the top line of the LCD. The ERASE PERMANENT MEMORY screen appears, with a WARNING advising you that this screen will erase "all Permanent Memory including Waypoints".
2. Touch the word "**Erase**". A message screen appears advising you to "**PLEASE WAIT**".
3. When Permanent Memory is erased, a "**RESETTING**" message will appear, and the System 4040 will return to the Opening screen.

NMEA 0180 AND NMEA 0183 INTERFACE :

Your System 4040 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 System 4040 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

WIRING INFORMATION:

The NMEA interface is provided on the 7-pin male AUXILIARY connector on the rear panel of the System 4040. You will need the following parts in order to connect your system.

1. 24 gauge stranded, shielded, twisted-pair cable (Belden 9501 or equivalent)
2. 7-pin female connector. (Impulse P/N 703-033)

(These parts are not included as standard with your System 4040 since the percentage of vessels requiring them is very small. You may order the 7 Pin Female connector directly from IMPULSE by completing and mailing the postcard included with this manual. The connector will be mailed to you immediately upon receipt.)

- Pin 1 should be connected to the return (common) line of the listening instrument, as well as the shield of the cable.
- Pin 6 should be connected to the signal line of the talking instrument.
- Pin 7 should be connected to the signal line of the listening instrument.

The NMEA standard requires listening devices to electrically isolate their Ground from the Talker; therefore you must attach the shield only at the System 4040.

DATA FORMAT:

You may select either one of two data formats from the DIGITAL ADJUST screen:

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

To change the selected NMEA AUTOPILOT data format, perform the following steps:

1. From the MAIN OPERATING screen, touch the word **"SCREENS"** in the upper left hand corner of the screen, which will display the MENU SELECTION screen.
2. Touch the **"DIGITAL"** option, and then touch **"Accept"**.
3. Now touch **"ADJUST"** on the SELECTION BAR at the top of the screen. Touch the DIGITAL Icon in the center of the screen which will display the ADJUST DIGITAL screen.
4. One of the options on the ADJUST DIGITAL screen allows you to select NMEA 0180 or NMEA 0183. Touch this box to change the option. The option highlighted in white characters on a dark background is the selected data format.
5. Touch the word **"Exit"** to return to the DIGITAL screen. Your new selection will be retained in Permanent Memory, so you should not have to perform this procedure again unless you erase Permanent Memory.

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 4040 have a Baud Rate of 4800, 8 data bits, 2 stop bits, and no parity bits.

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.

ADDITIONAL SECONDARY FACTORS-ASF: 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).

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. 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.

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.

BEARING: Bearing from Present Position to Destination: The bearing from your present position to your destination is measured in degrees, relative to Magnetic North. This value is updated continuously as you navigate.

BLINK: A LORAN system alarm warning the operator of technical problems or faulty timing at any of the LORAN transmitters.

CCT: Cold Cathode Tube lighting which backlights the LCD in the System 4040.

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).

DISTANCE: Distance from Present Position to Destination: The distance from your present position to your destination is measured in nautical miles. This value is updated continuously as you navigate.

DUAL RATED STATION: A LORAN station which operates in two LORAN chains.

FULLY AUTOMATIC LORAN RECEIVER: 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. The System 4040 pixels are square in shape and provide high quality pictures and resolution of targets.

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 same 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 W, X, Y, Z and referenced to the Master (M) station GRI. The System 4040 refers to these secondaries as 1, 2, 3, and 4.

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 water speed.

SUPERTWIST LCD: Liquid Crystal Display. An liquid organic compound between two layers of glass with polarizing abilities. The display screen of the System 4040 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-TD: 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.

TIME TO GO: This is the estimated time to go until you reach your destination, assuming the current 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.

TRACKING: Is the process of maintaining the synchronization of the receiver with the selected signals.

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.

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).

TROUBLE SHOOTING:**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 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 touch the word SIMULATOR.

TROUBLE SHOOTING:**FISH FINDER**

1. **SYMPTOM:** FISH FINDER screen not showing the bottom, fish, etc.
CHECK: With the engine(s) shut down, locate the boat in water between 10 feet and 30 feet deep. Check the contrast level of the LCD display to make sure it is not turned down too low. Check the GAIN and Clutter Filter settings by using the ADJUST FISH FINDER screen. Make sure they are not turned too low. Rev the engine(s) to cruising RPM to see if the screen continues to operate properly. Look for "black snow" on the screen. This would indicate that noise from the engine(s) is getting into the system.
 - Suggested solution is to order Alternator Filter from MAR LINE.
Phone (213) 595-6521 in U.S.A.
2. **SYMPTOM:** Under way at high speeds, FISH FINDER screen does not show bottom or fish.
CHECK: Stop the boat to see if the screen picture quality appears and the bottom reading shows clearly on the screen.
 - Suggested solution is to relocate the transducer to achieve clean smooth flow of water over face of transducer.
3. **SYMPTOM:** FISH FINDER screen quality is very poor and does not always show the bottom.
CHECK: Check the frequency of the transducer to make sure that it matches the frequency of your instrument. The System 4040 is 120 KHz. Check the mylar tag located approximately 12" from the connector end of the transducer cable to make sure that it is 120 KHz as well. IMPULSE transducer part numbers begin with the prefix "650"-XXXX and IMPULSE speed/temperature impellers begin with the prefix "653"-XXXX. In the back of this manual is a listing of spare and replacement parts.
4. **SYMPTOM:** Surface Clutter appears at the top of the screen when using the fish finder.
CHECK: Use the Clutter Filter adjustment on the ADJUST FISH FINDER screen to adjust the filtering of the receiver. The Clutter Filter should be adjusted to the lowest setting which produces a relatively clear Fish Finder image.
5. **SYMPTOM:** Digital depth in lower right corner jumps around but fish finder update information looks OK.
CHECK: Use the Digital Depth - TVG adjustment on the ADJUST DIGITAL screen to perform the following procedure:
 - Take the boat to a shallow area of water. (We suggest 4-6 feet deep.)
 - Using the UP arrow, set the TVG equal to 7. (Highest setting for TVG).
 - Use the DOWN arrow to decrease the TVG setting until you get a solid bottom reading in the DATA LINE on the bottom of the LCD.
 - It should not be necessary to use the TVG adjustment again unless your boating location or unusual circumstances occur.

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

CHECK: Unplug the Antenna Coupler Unit from the back of the SYSTEM 4040. If the message remains, the SYSTEM 4040 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"

The Message Board on the TD/STATUS screen reads "LORAN INOP."

CHECK: Turn your SYSTEM 4040 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.

"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 presents the risk of extremely large errors in position.

CHECK: Determine from charts and 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 "Station Selection".

"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 two 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. Refer the section entitled "Restart with New GRI".

CAUTION: OSC = ____"

This message indicates that 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, as there is a possibility of a cycle jump or a 10 micro second error in position.

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 picking up some
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 successfully 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 TD's 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 (TD's) is wrong.
CHECK: If the latitude/longitude (TD's) 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 (TD's) 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 (TD's) 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.

In most cases, the installation and operation of your SYSTEM 4040 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 TD/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, above, 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 System 4040 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, below), including your boat's engine.
- Then, turn on the SYSTEM 4040. 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 SYSTEM 4040 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.

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 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.

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 TD/STATUS 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.

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 Locktite® 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.

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
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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. Hueneme	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
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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 Ritchey	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°20.00
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

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
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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	38°00.00	75°50.00
Lexington Park	38°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°45.00	92°00.00
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
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LORAN C START UP LOCATIONS

NEBRASKA		
Omaha	41°15.00	95°56.00

NEW HAMPSHIRE		
Portsmouth	43°00.00	70°45.00

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 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 Berm	35°10.00	77°00.00
Washington	35°30.00	77°00.00
Wilmington	34°15.00	78°00.00

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

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

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

TEXAS		
Aransas Pass	27°50.00	97°10.00
Baytown	29°40.00	95°50.00
Beaumont	30°00.00	94°10.00
Corpus Christi	27°45.00	97°20.00
Houston	29°45.00	95°25.00
Dallas	32°47.00	96°48.00
Freeport	28°55.00	95°10.00
Galveston	29°20.00	94°40.00
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

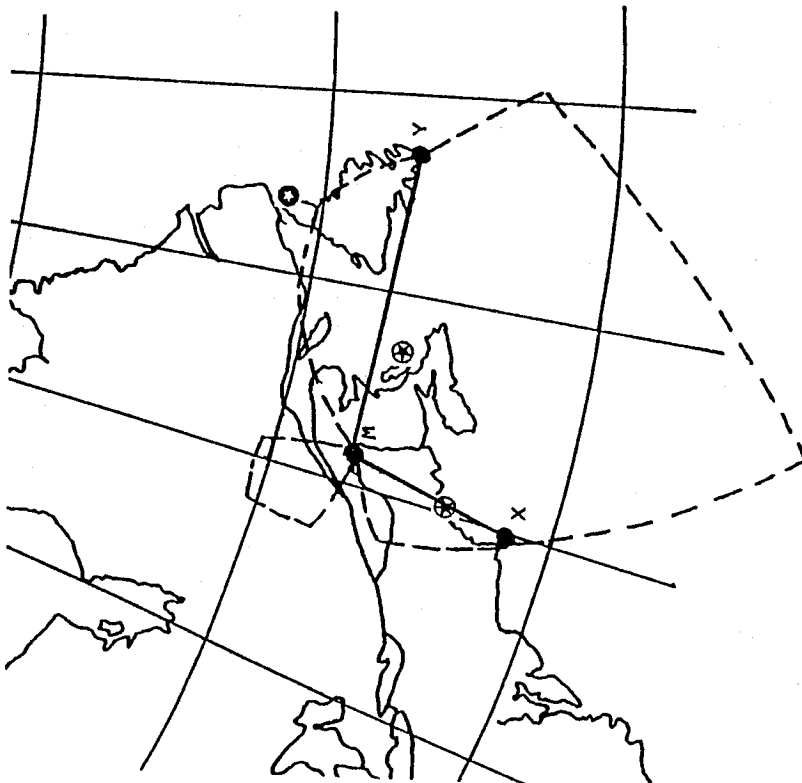
VIRGINIA		
Burgess	37°50.00	76°15.00
Cape Charles	37°15.00	76°00.00
Hampton	37°00.00	76°15.00
Virginia Beach	36°50.00	76°00.00

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
Part 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
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

CANADIAN WEST COAST CHAIN - GRI 5990
CANADIAN EAST COAST CHAIN - GRI 5930

GRI 5930
CANADIAN EAST COAST CHAIN

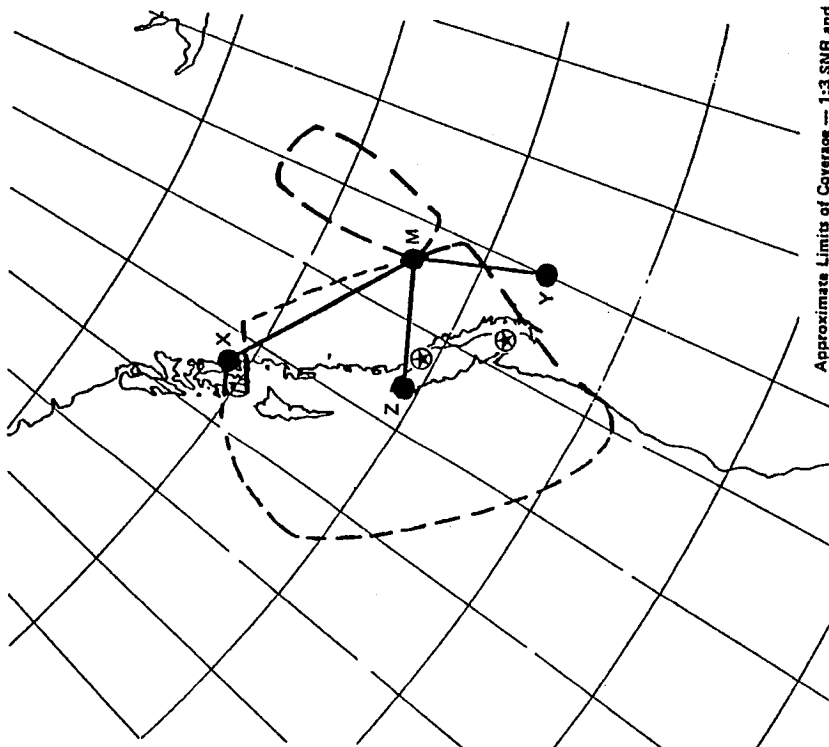


Approximate Limits of Coverage -- 1:3 SNR and
% NM Fix Accuracy (95% 2dRMS)

LEGEND:
● TRANSMITTING
⊗ MONITOR
⊗ MONITOR (AUTOMATED)
M CARIBOU
X NANTUCKET
Y CAPE RACE

Station Location	Function Chart	Coordinates	Coding Delay/ B. Line Length	KW Power
Caribou, ME	Master: M	N 46°48 27.2 W 67°55 37.7		350
Nantucket, MA	X-ray X, 1	N 41°15 11.9 W 69°58 39.1	11000/2131.88	275
Cape Race, NFLD	Yankee Y, 2	N 46°46 32.2 W 53°10 28.2	25000/3755.02	1500

GRI 5990
CANADIAN WEST COAST CHAIN

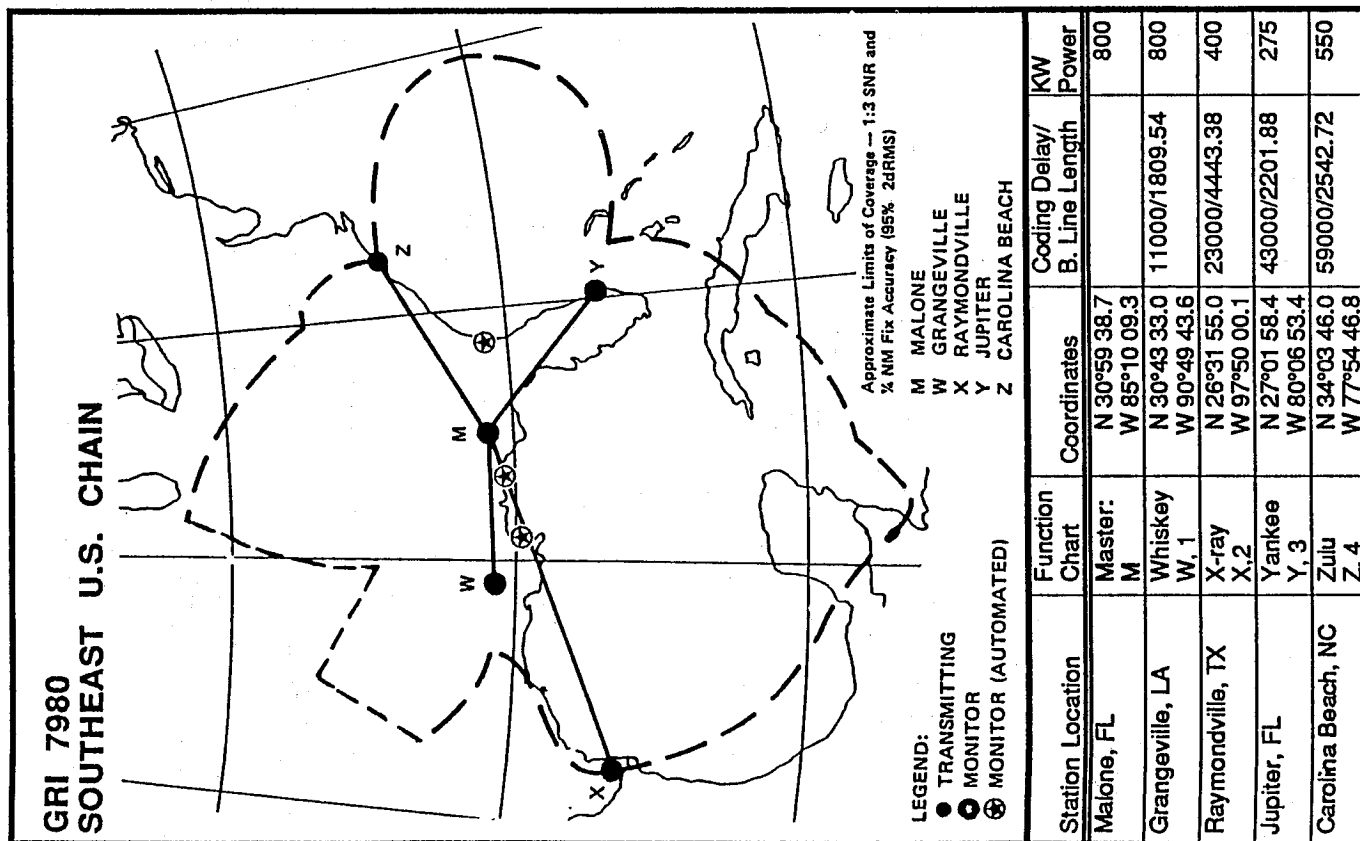
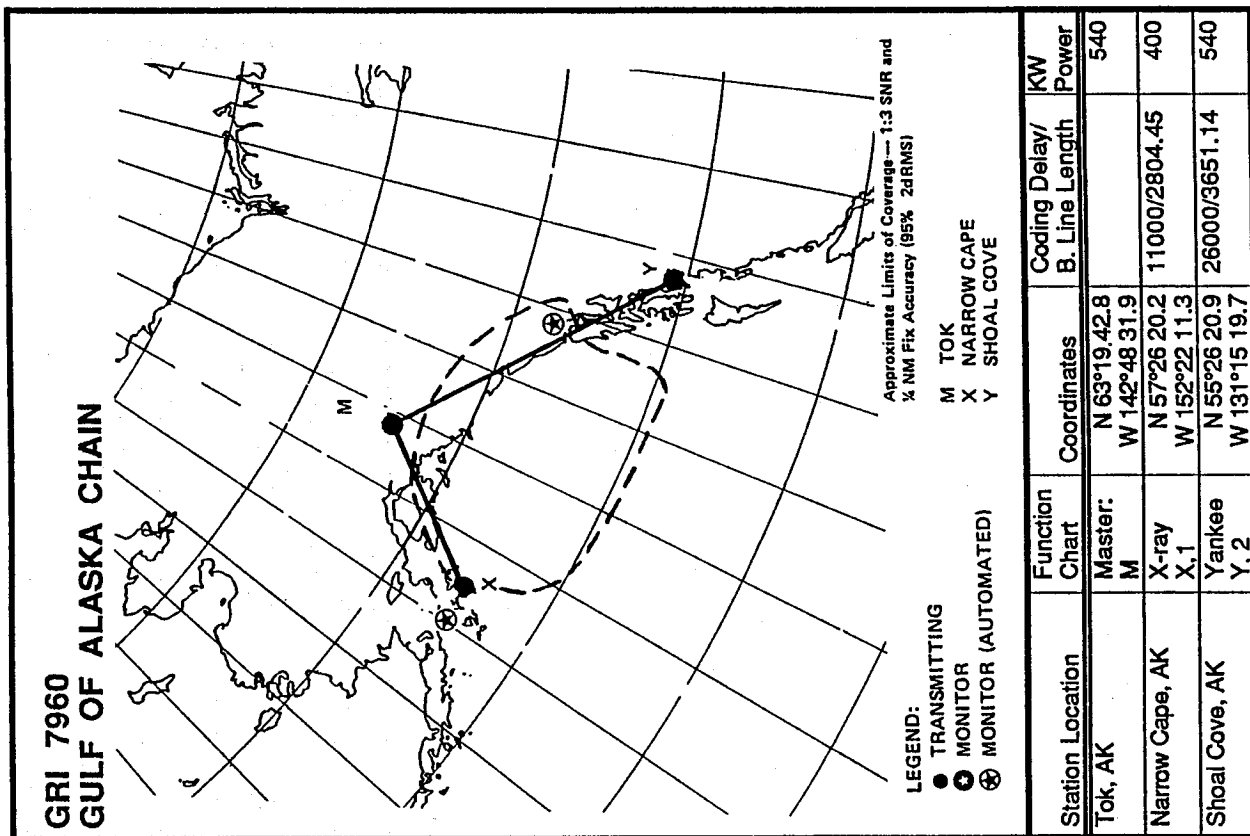


Approximate Limits of Coverage -- 1:3 SNR and
% NM Fix Accuracy (95% 2dRMS)

LEGEND:
● TRANSMITTING
⊗ MONITOR
⊗ MONITOR (AUTOMATED)
M WILLIAMS LAKE
X SHOAL COVE
Y GEORGE
Z PORT HARDY

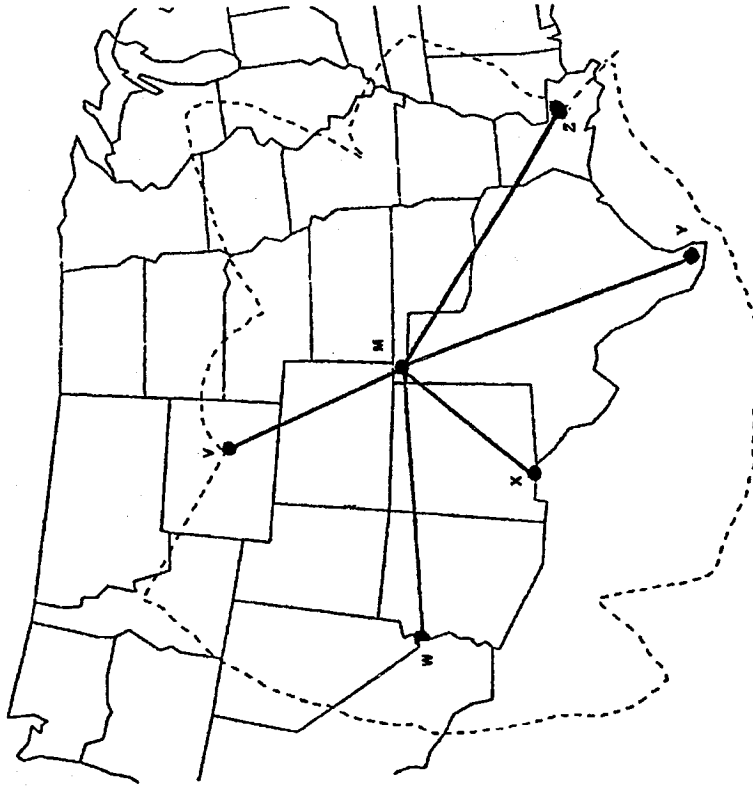
Station Location	Function Chart	Coordinates	Coding Delay/ B. Line Length	KW Power
Williams Lake, B.C.	Master: M	N 51°57 58.8 W 122°22 02.2		400
Shoal Cove, AK	X-ray X, 1	N 55°26 20.9 W 131°15 19.7	11000/2343.60	540
George, WA	Yankee Y, 2	N 47°03 48.0 W 119°44 39.5	27000/1927.36	1600
Port Hardy, B.C.	Zulu Z, 3	N 50°36 29.7 W 127°21 29.4	41000/1266.63	400

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



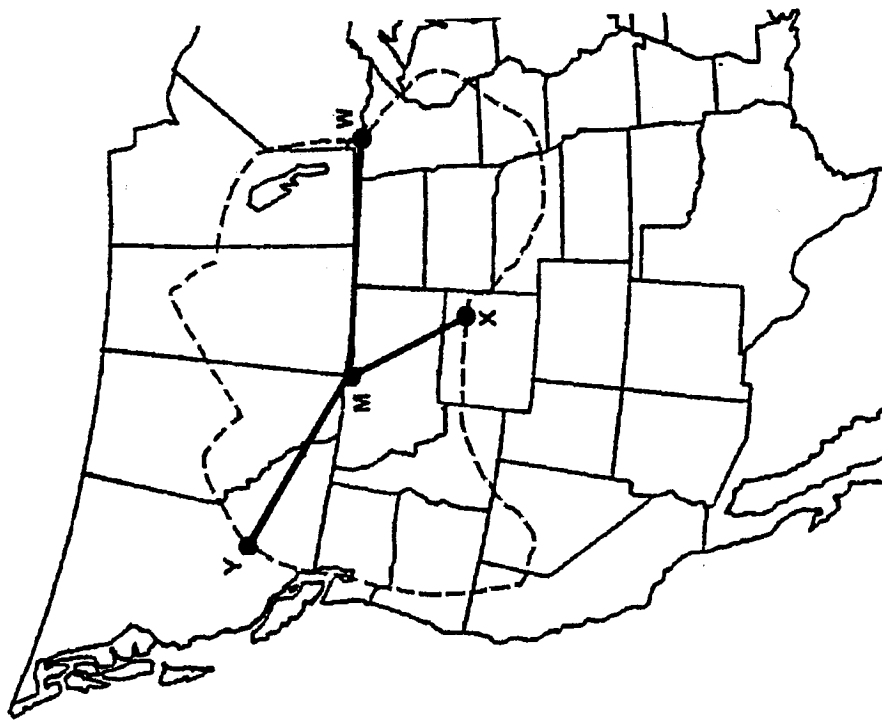
NORTH CENTRAL U.S. (NOCUS) CHAIN - GRI 8290
 SOUTH CENTRAL U.S. (SOCUS) CHAIN - GRI 9610

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



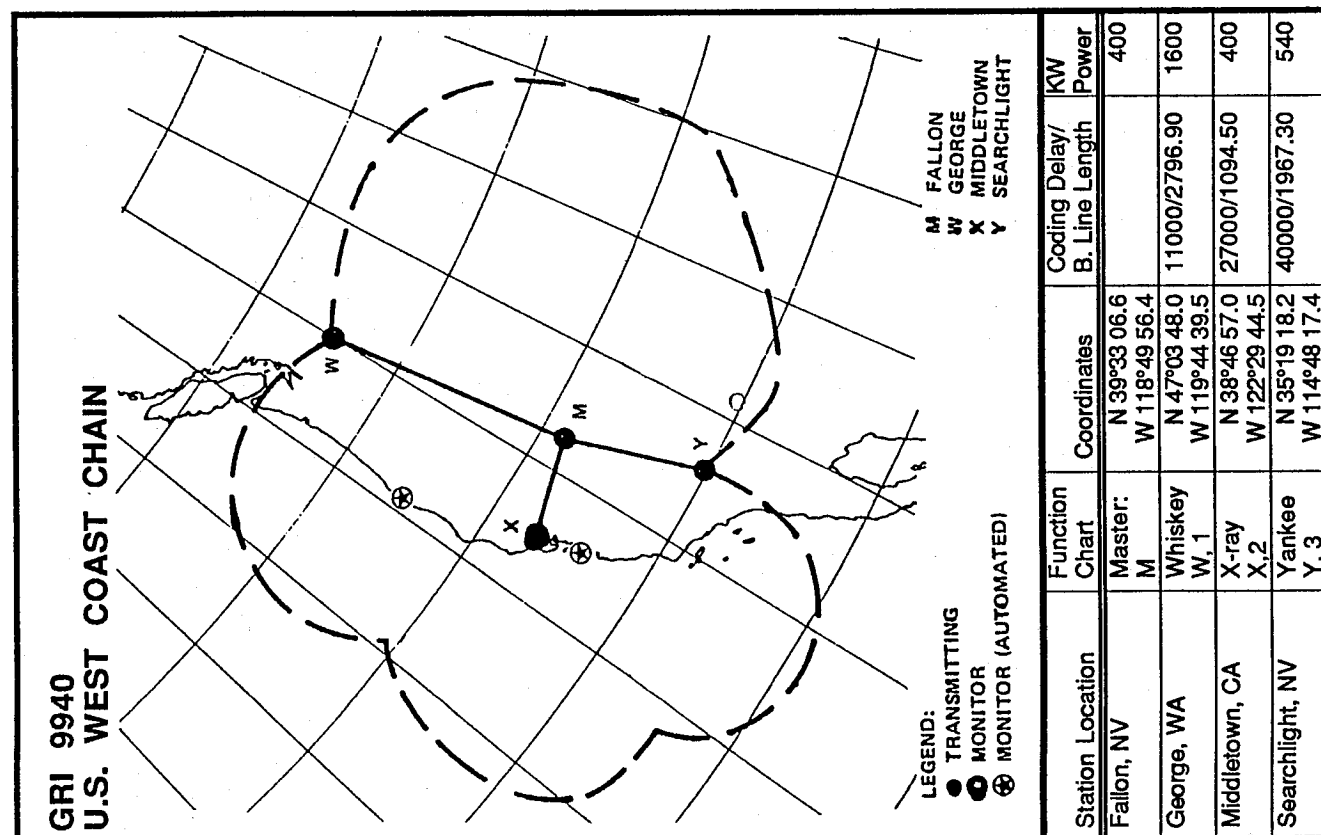
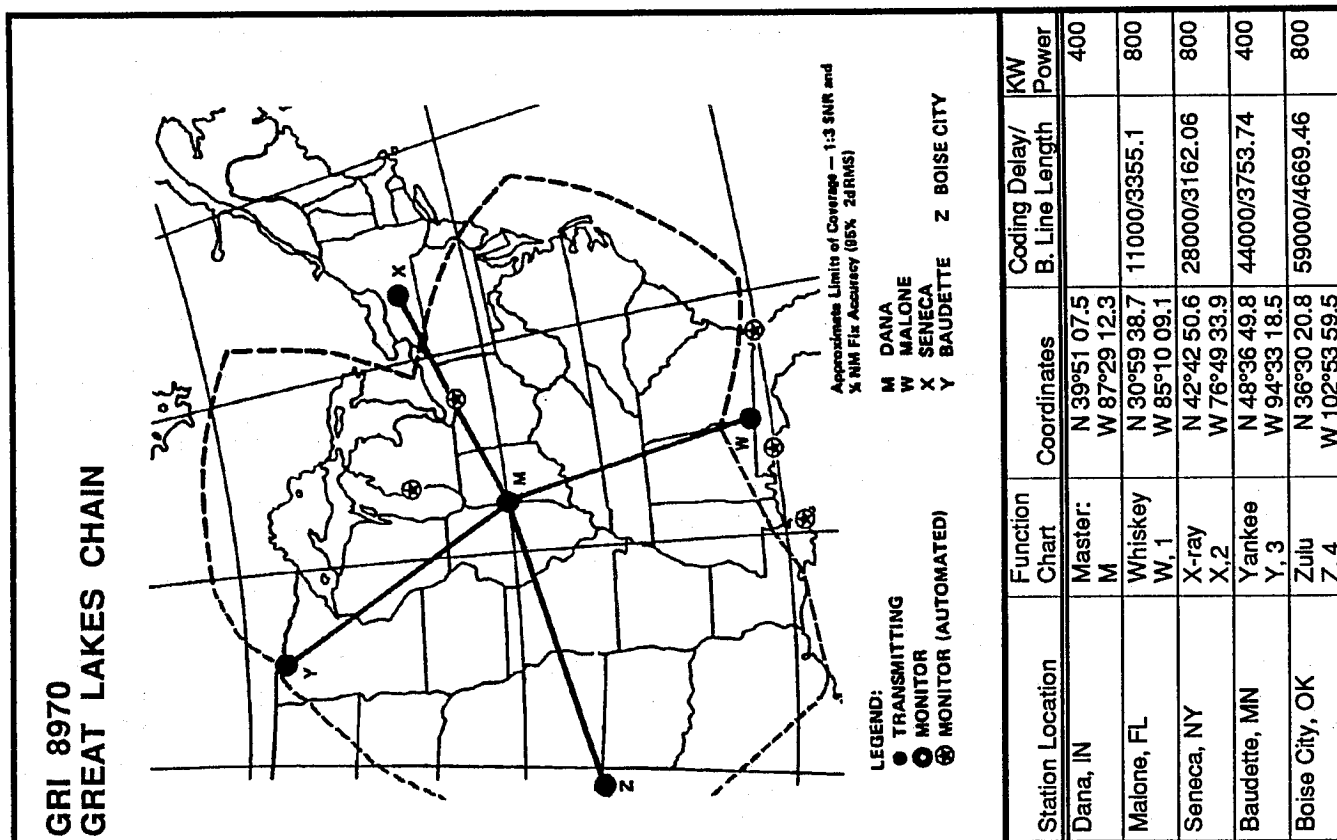
Station Location	Function Chart	Coordinates	Coding Delay/ B. Line Length	KW Power
Boise City, OK	Master: M	N 36°30' 20.8 W 102°53' 59.5		800
Gillette, WY	Victor V, 1	N 44°00' 11.3 W 105°37' 23.9	11000/2884.48	400
Searchlight, NV	Whiskey W, 2	N 35°19' 18.3 W 114°48' 16.9	25000/3611.81	540
Las Cruces, NM	X-ray X, 3	N 32°04' 18.1 W 106°52' 04.4	40000/2044.93	400
Raymondville, TX	Yankee Y, 4	N 26°31' 55.1 W 97°49' 59.5	52000/4024.80	400
Grangeville, LA	Zulu Z, 5	N 30°43' 33.1 W 90°49' 43.0	65000/4304.00	800

GRI 8290
 NORTH CENTRAL U.S. (NOCUS) CHAIN

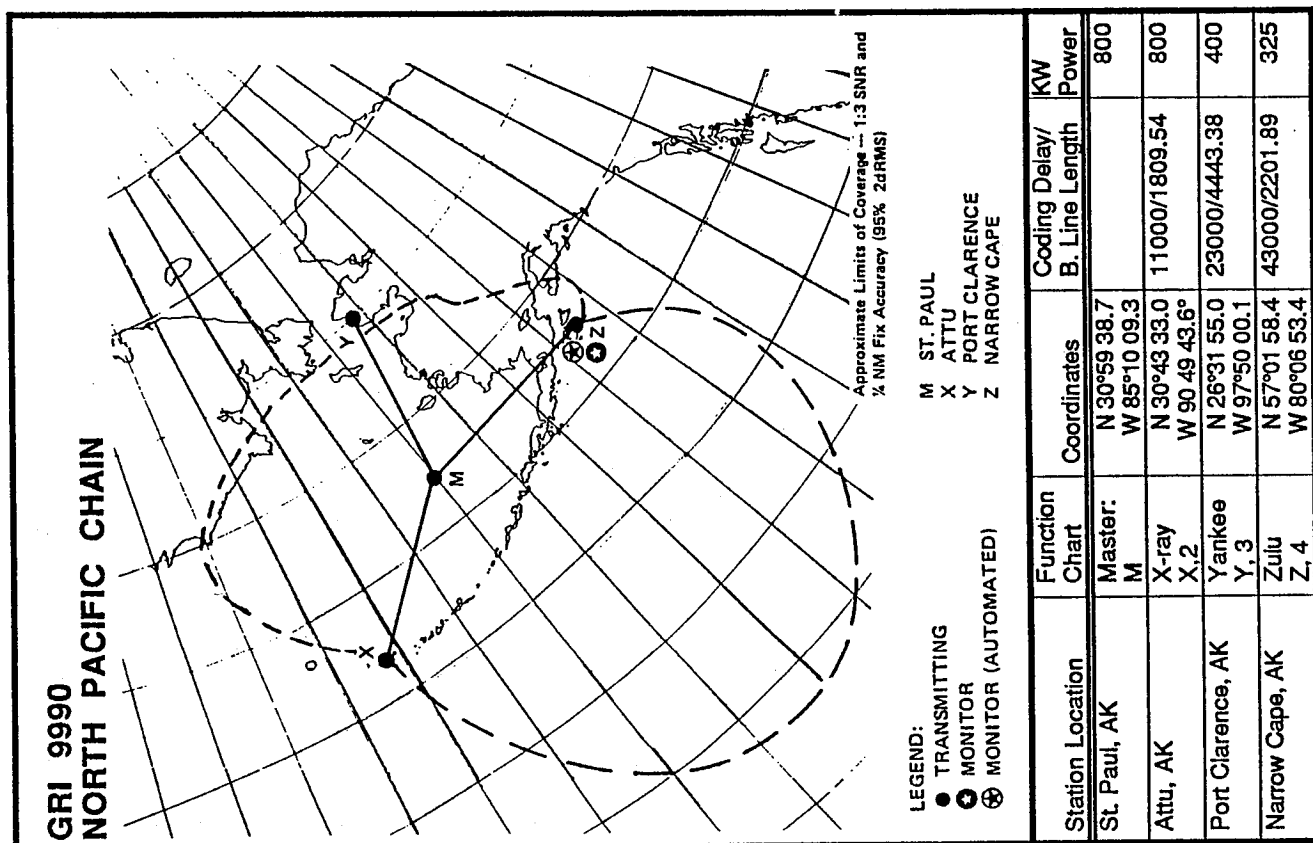
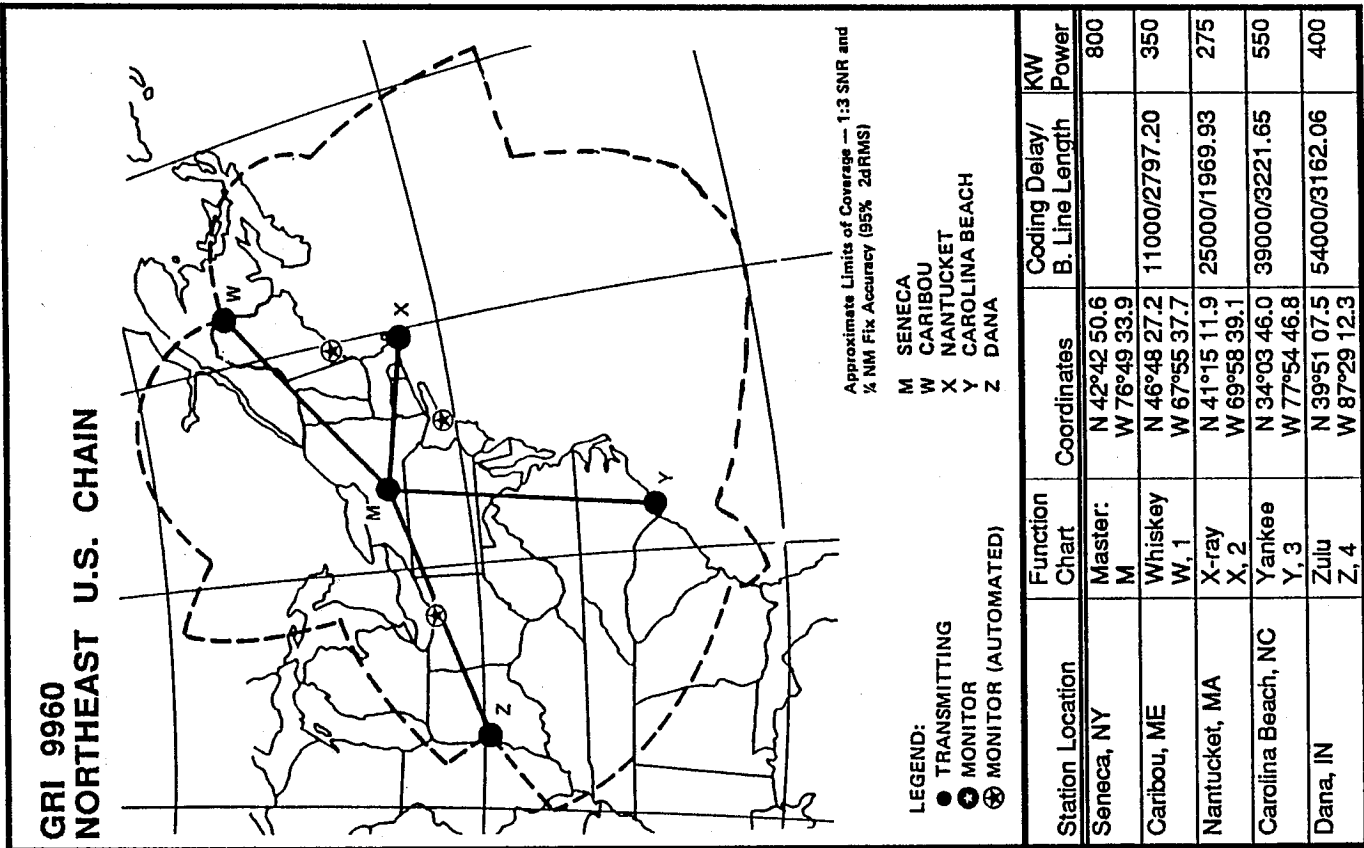


Station Location	Function Chart	Coordinates	Coding Delay/ B. Line Length	KW Power
Havre, MT	Master: M	N 48°44' 38.6 W 109°58' 53.6		400
Baudette, MN	Whiskey W, 1	N 48°36' 49.9 W 94°33' 17.9	11000/3786.56	500
Gillette, WY	X-ray X, 2	N 44°00' 11.3 W 105°37' 23.9	27000/2084.44	400
Williams Lake, BC	Yankee Y, 3	N 51°57' 58.9 W 122°22' 01.7	42000/3171.62	400

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



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



FISH FINDER FEATURES

	<u>Minimum Range</u>	<u>Maximum Range</u>
Depth Ranges		
Feet:	45° beam 0-6 feet	0-480 feet
	20° beam 0-6 feet	0-960 feet
Alarms:	Shallow Water	
Transducer Frequency:	120 KHz	
Transducer Beam Angle:	Standard beam is 45 degrees	
	Optional beam is 20 degrees	
Transmit Power:	800 Watts Peak to Peak	
	100 Watts RMS	
Power Requirements:	11.5 - 16 volts DC, Draws .75 amps Max	
Speed:	Standard is Miles Per Hour	
Speed Range:	Instrument: 1.0 knot to 80 knots	
	Impeller: 1.0 knot to 40 knots	
	*Manufacturer's specification rates impeller accuracy at +/-3%	
Trip Log:	0-999 Miles, able to reset	
	Resets to 0 when power turned off.	

LORAN C FEATURES

Waypoints:	80 total waypoints
	20 Instant Store
Primary Graphic Screens:	LORAN Plotter screen
	TD/STATUS screen
	Course Deviation screen (Navigation screen)
Pixel Resolution:	320 X 200 square pixels
LCD Window Size:	6-1/2" Wide x 4-1/4" High
Physical Dimensions of	10-3/16" Wide x 7-3/16" High x 3-1/4" Deep
Instrument:	(without mounting bracket/knobs)
Coupler Dimensions:	2" Diameter x 6 1/2" High with 24 feet of RG-58 cable with PL-259 connector attached
Autopilot Interface:	NMEA 0180, NMEA 0183 Output
Notch Filters:	6 preset internal filters
Antenna:	Not included with instrument.
	Use standard 3/8", 24 thread, 8' Loran antenna
	We recommend Shakespeare 4208 or 4231 or
	Radio Shack 21-905

ALL SPECIFICATIONS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

• Coupler	Model 3500	
• Gimbal Mounting Bracket	950-035	
• Knobs - Side Thumbscrew type (each)	410-004	
• Knob Detent - Rubber (Against Case)	208-052	
• Knob Detent - Plastic (Against Bkt.)	208-053	
• Knob Screws (4 each black anodized)	201-003	
• Power Cord with 2 amp fuse	719-031	
• 360° Swivel Mounting Bracket	950-012	(option)
• 2 Pin Female Connector (Power)	703-021	
• 3 Pin Female Connector (Transducer)	703-002	
• 4 Pin Female Connector (Speed/Temperature)	703-007	
• 6 Pin Female Connector (Compass)	703-034	
• 7 Pin Female Connector (Remote I/O)	703-033	
• Stainless Steel Kick Up Bracket	652-013	(option)
• Clip On Bracket for Speed/Temperature	652-015	(option)
• Replacement Clips for Transom Impellers	652-022	
• Switch Box - 2 Units to 1 Transducer	652-024	(option)
• Switch Box - 1 Unit to 2 Transducers	652-023	(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
• Tri-ducer, 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*)

TRANSDUCER

10'.....P/N 720-001

20'.....P/N 720-002

30'.....P/N 720-003

SPEED/TEMPERATURE

10'.....P/N 720-005

20'.....P/N 720-006

30'.....P/N 720-007

Note: We do not recommend that the transducer cable be extended to more than a total of 50 feet. (Transducers are supplied with approximately 20' of cable. An additional 30' of cable may be purchased if 50' of total cable length is desired.)

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

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**

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

OWNER'S NOTES AND COMMENTS:

[illegible]

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

Corporate Offices:

329 Railroad Avenue
Pittsburg CA 94565
Telephone: 510-439-2072
Facsimile: 510-427-1920

Service and Manufacturing Facility:

695 Railroad Avenue
Pittsburg CA 94565
Facsimile: 510-427-4459

P/N: 103-059
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