MICROLOGIC SUPERSPORT GPS NAVIGATOR

OPERATOR'S MANUAL

NOT FOR DEALER

FOR PURCHASER
ONLY

TABLE OF CONTENTS

SECTION 3 GETTING STARTED WITH THE SUPERSPORT

SECTION 4 WAYPOINTS

SECTION 5 POSITION, SPEED, AND COURSE

SECTION 6 NAVIGATING TO A DESTINATION

SECTION 11 MANUAL OPERATION

SECTION 12 CUSTOMIZING THE OPERATION OF YOUR GPS

SECTION 13 CONNECTION WITH OTHER EQUIPMENT

SECTION 14 ACCESSORIES AND OPTIONAL EQUIPMENT

INTRODUCTION

Your Supersport has been designed using the latest developments in technology. Each unit has been tested and passed stringent quality control standards prior to shipment.

Included with your Supersport is an Operator's Manual, and an Operator's Guide. The Operator's Manual contains a detailed explanation of the use of the Supersport for land, sea, and air navigation. The Operator's Guide is a summary of operating procedures and displays. Once the manual has been read, you can refer to the Operator's Guide (to be kept near your Supersport), for a list of operating procedures, and a quick description of how to do each one.

OPERATOR'S MANUAL

Read the manual to learn all about installation, operation, and the use of the GPS for navigation.

OPERATOR'S GUIDE

Keep the Guide with your GPS and use it as a quick reference while using the unit.

GENERAL INFORMATION

SYSTEM DESCRIPTION

The Supersport is a fully automatic GPS receiver and navigator, providing exceptional accuracy and reliability for all navigation requirements.

FEATURES

* Navigator and battery pack waterproof (will withstand temporary shallow submersion)

* Can be used as a handheld unit, or as a fixed mount unit

* Can use rechargable battery pack, alkaline batteries, or 10-18 VDC. Rechargable batteries can be charged from 10-18 VDC, or 110 VAC power

* A remote antenna can be used simply by plugging it into the back of the unit

* Continuous tracking of five satellites, at speeds up to 1000 knots, and accelerations up to 1.5 g

* Time to first fix - one minute if unit has been operating in the last few hours, 3 minutes if not

* Position accuracy - 15 meters with Selective Availability off - 50 meters with SA on

* One hundred and thirty-four map datums, plus one user entered datum

* Position update time - less than one second

* Waypoint memory with separate battery good for 8 years

* Storing up to 250 waypoints, which can be referenced by both numbers and five character names

* Simple SAVE, RECALL, GO TO, and MAN OVERBOARD functions

* 100 waypoints can be hidden from unauthorized users by a 4 digit key, set by the operator

* Steering to any waypoint by steering indicator and crosstrack error

* Single, double, or multiple waypoint navigation

* Present position and waypoint position can be input and displayed in Lat/Lon, MGRS, UTM, and loran TD coordinates

* Range and Bearing to any waypoint

* Waypoint arrival, anchor watch, crosstrack error, border crossing, automatic shutoff, and low battery alerts

* Crosstrack error and time-to-go

* Course and speed accurate to 0.1 knots (SA off)

* Velocity made good toward destination

* Position fix accuracy displayed

* Local time, month, day, year, day of week, time zone, UTC displayed

* Automatic computation of magnetic variation, to give bearings with respect to magnetic north

* Navigation calculator provides great circle range and bearing between any two points on earth

* Distance and speed displayed as nautical miles/knots, kilometers/kph or statute miles/mph

* Altitude, System Accuracy displayed in meters or feet

* Test and performance readouts to check GPS signals and system performance

* 0180, 0183, and other serial data outputs

The standard model Supersport GPS consists of the following items:

Standard Unit

- Supersport GPS with alkaline battery pack
- 6 AA alkaline batteries
- Spare alkaline battery pack
- Supersport GPS Operator's Guide
- Supersport GPS Operator's Manual (with secret code)
- Fabric Carrying Case
- Gift Box printed for Supersport GPS
- Warranty Card

A DeLuxe Accessory package is also available, which contains the following items:

DeLuxe Accessory Package

- Exterior GPS antenna with 25 feet of cable
- Table mount tilt stand with 2 knobs
- Power cable, 6 wire, 10 ft, with built in resistor for 10-18 VDC operation and battery charging, and wires for serial data I/O
- Cigarette lighter power cable, 2 wire, with resistor, for operation and battery charging in automobile
- 110 VAC 60 Hz (12 VDC 50 ma) battery charger (can charge battery only, from 110 VAC)
- Rechargeable battery pack
- Gift box printed for Supersport GPS Deluxe Accessory Package

Accessories can also be purchased singly, from the following list of optional equipment.

Optional Equipment

- Exterior GPS antenna with 25 feet of cable
- Exterior GPS antenna with 50 feet of cable
- Table mount tilt stand with 2 knobs
- Wall mount holder with 2 knobs (flush to wall, no antenna or power connections)
- Power cable, 6 wire, 10 feet, with built in resistor for 10-18 VDC operation and battery charging, and wires for serial data I/O
- Cigarette lighter power cable, 2 wire, with resistor, for operation and battery charging in automobile

110 VAC 60 Hz (12 VDC 50 ma) battery charger
(can charge battery only, from 110 VAC)
Rechargeable battery pack
6 AA alkaline battery pack
Bulkhead mounting kit
Supersport GPS Operator's Manual (with secret code)
Supersport GPS Operator's Guide
ML-95 Remote Control/Display Unit

SPECIFICATIONS

Maximum Speed -	1000 knots
Maximum Acceleration -	1.5 g
Satellites Tracked -	up to 5
Position Fix - by Kalman filter,	3-5 satellites
Time to First Fix - Hot Start -	1 minute
Cold Start -	3 minutes
Position Update Time -	1 second
Position Accuracy -	15 meters (SA off)
Velocity Accuracy -	0.1 knots (SA off)

PHYSICAL

Construction:	Water resistant fully gasketed impact resistant case
Width/Height/Depth:	3.55 x 7.6 x 2.6 inches 9.02 x 19.3 x 6.6 centimeters
Weight:	1.5 lbs. 0.68 Kilograms
Operating Temp.:	+14 to +158 degrees Fahrenheit -10 to +70 degrees Celsius

POWER SUPPLY SPECIFICATIONS

Input power:	10-18 VDC	250 ma (lights off) 350 ma (lights on)

WARNING

The Supersport is only an aid to navigation and does not reduce the need for caution or judgement. No electronic navigation system is perfectly reliable; outputs may occasionally be incorrect. The prudent navigator should never rely solely on one device, to the extent of endangering life or property.

* Any time the displays flash on and off, the outputs may be in error, and should not be used for navigation.

* GPS signals may become less reliable close to tall structures, under trees, and inside buildings or vehicles, when the view of the sky is obscured.

* Position and velocity accuracy may change with time, as the satellites change their positions in the sky.

SECTION 1

USING THE SUPERSPORT GPS AS A HANDHELD

The Supersport GPS is very different from fixed mount navigators, in that it can be used without external power, ground, or antenna connections. After power is turned on, it typically requires 1-3 minutes to acquire the GPS signals and begin to navigate. After that, the GPS may be in steady use for hours as you travel to your destination. You can operate the Supersport while holding it in your hand, or install one or more holders or mounting brackets on your boat or other vehicles at the places you might wish to use your GPS. Supersport can then be easily carried from one station to another while it is operating, without having to wait for it to reacquire the signals.

Take the Supersport home with you, when you leave your boat. Not only will this prevent the unit from being stolen, but it will allow you to enter waypoints and plan trips at home. It can also be used on other boats, in cars, on airplanes, or on foot. This convenience and availability for multiple uses sets the Supersport apart from fixed-mount GPS receivers, and makes it much more practical and useful for many people.

BATTERIES

The Supersport is shipped from the factory with two battery packs, each of which holds 6 AA alkaline batteries. To operate the unit, it is necessary to load 6 AA batteries into a battery pack. To do this, remove the battery pack from the unit, and remove the four small phillips head screws from the flat side of the pack. The cover of the pack can then be removed, and the batteries inserted. Be sure to install the batteries with the proper polarity, as shown on the inside of the pack. The cover can then be replaced, making sure to engage the rubber gasket properly. Tighten the screws **GENTLY**, and the pack will be waterproof. Six AA alkaline batteries will power the Supersport for about 6-8 hours.

Two battery packs are included, so you can keep a spare pack loaded with fresh batteries. This makes it very easy to change battery packs while you are using the Supersport.

WARNING

When loading new batteries into the battery pack, MAKE SURE THE POLARITY IS CORRECT - that is, each battery MUST be put in so that it matches the battery outline underneath it. If this is not done, the GPS will not turn on.

If you are using a rechargeable battery pack, it should be recharged before its first use. This can be done in one of three ways.

1. You can charge the battery pack from 10-18 VDC, by plugging the power cable into the six pin connector in the back of the unit, and connecting the power cable to 12 volts DC. The unit will both operate and charge from the 12 volts. It takes about 18 hours to fully charge a depleted battery, and the unit can be charged indefinitely without damage. For shipboard use, the tilt stand will normally be installed in a convenient location at the steering station, and connected to 12 volt power. The Supersport will then generally be operated in the tilt stand, where it will draw its power from 12 VDC and be maintained in a fully charged state, ready to be removed and used as a portable navigator.

2. You can operate the Supersport, and charge the battery in an automobile, by plugging the cigarette lighter power cable into a cigarette lighter socket, and the other end of the cable into the connector on the back of the GPS. The unit will operate and charge the battery simultaneously.

3. The battery can be charged from 110 VAC 60 Hz power, by plugging the optional AC charger into the back of the Supersport. The AC charger does not have enough current to operate the GPS and charge the battery simultaneously, but it will fully charge a battery in 18 hours.

The battery can be left charging indefinitely in all three configurations, without damage.

The rechargable battery pack will power the unit for about 2-3 hours. When the battery has about ten minutes remain-

ing, the unit will begin beeping and the display will read "LOW BATTERY ALERT, PRESS CLR" When you press the "CLR" key, normal operation will be resumed. The low battery alert is a warning that the batteries are nearly depleted. After about ten minutes of further operation, the unit will automatically shut itself off.

If you now reconnect to power, the unit can be operated right away, while it is charging. However, it will need 18 hours to fully charge for portable operation.

You can also slide off the battery pack, and replace it with a spare fully charged rechargable battery pack, or a nonrechargable battery pack. If the unit is operated with a nonrechargeable alkaline battery pack while connected to external power, the GPS will operate from the external power without discharging the alkaline batteries. They will, however, not be recharged.

You can change from rechargable to nonrechargable battery packs at any time. The GPS will work equally well with either source of power.

The life of alkaline batteries depends on the quality of manufacture, the shelf time (they lose about one-fifth of their life sitting on the shelf for three years), and the temperature. In general, batteries have a shorter life when used below 20 degrees F, or above 110 degrees F. The life is much shorter at extreme temperatures.

Two nonrechargable battery packs, each of which holds 6 AA alkaline batteries, are provided with the Supersport. Additional rechargable battery packs and alkaline battery packs are available from your dealer.

CHANGING THE BATTERY PACK

There is a spring clip on the bottom of the Supersport, which holds the battery pack in place. To remove the battery pack, press the spring toward the front of the unit, and slide the battery pack downward. A fresh battery pack can then be installed by starting the top end of the pack in the slide rails, and then sliding the pack along the rails all the way, until the spring clip snaps in place.

Whenever you install a fresh battery pack, you should set the BATTERY TIMER to zero. The battery timer display is shown every time the unit is turned on, immediately after the Identification Message display.


```
ANTENNA: internal
POWER:     battery
Time on battery
is 03:53 hr:min
```

Now set the the timer to zero.

The battery timer will now accumulate the time of operation when using the battery. The time will not increase when you are operating with external power.

By looking at the time in the above display, you can see how many hours of operation you have on the battery. You can expect an alkaline battery pack to last approximately seven hours, and a rechargable NiCad battery pack approximately two and a half hours.

The time you have on the battery (the time in the above display) is shown every time you turn the Supersport on, so that you can see how fresh your battery is.

CHARGING THE BATTERY PACK

The rechargable battery pack is charged by sliding it into place on the Supersport, and connecting the power cable to the six pin connector on the back of the unit. The batteries can then be charged by connecting to 12 volts DC. Approximately 18 hours are required to fully charge a depleted battery pack.

It is best to let the battery pack run all the way down before recharging. If the NiCad batteries are recharged several times after being only partly discharged, they will lose part of their capacity. If they are then fully discharged several times, the lost capacity will return.

USING THE SUPERSPORT GPS AS A HANDHELD

To use the Supersport GPS navigator, you need to know one very important fact:

TO RECEIVE GPS SIGNALS WELL, THE ANTENNA IN THE TOP OF THE UNIT MUST HAVE A GOOD VIEW OF THE SKY IN ALL DIRECTIONS. IF THE VIEW OF THE SKY IS CLUTTERED WITH TREES OR OVERHEAD OBJECTS, RECEPTION MAY BE POOR. IF YOU ARE INSIDE BUILDINGS OR VEHICLES, IT IS UNLIKELY YOU WILL BE ABLE TO OPERATE.

OPERATING INSTRUCTIONS

1. Look around you to see if you have a good view of the sky. If you are close to tall buildings or under objects that obscure your view of the sky, move away until you have a good view of most of the sky.

2. Press the **ON/OFF** key for about one second, until you hear a beep, and the display appears.

3. It will now take 1-3 minutes for the GPS receiver to acquire and process the signals from three or more satellites. As soon as this is done, the position displays will stop flashing, and the position and navigation data will be ready for use.

You can follow the process of satellite acquisition, by pressing the POS key twice. The display will then show the number of satellites available, and the number you are receiving. It may be about one or two minutes after you start to receive three satellites, before you get a position fix. The time depends on how recently you received those same satellites, and whether or not information on those satellites in memory is up to date.

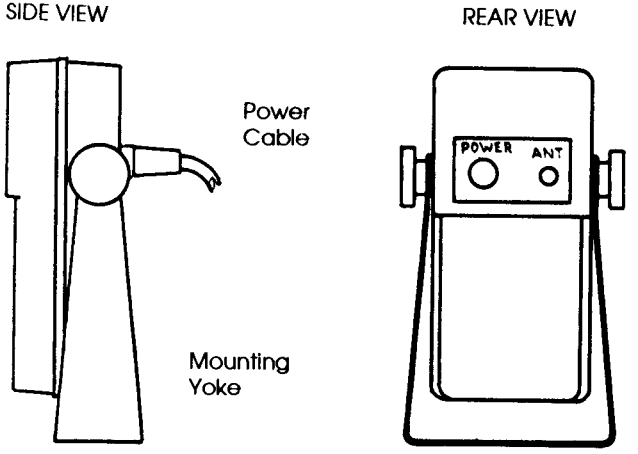
If fewer than three satellites are available, you will not be able to get a position fix. The satellites rise and set like the sun, so the number available changes with time. The reading and interpretation of the displays is covered in Chapters 3 through 12 of this manual.

INSTALLING MOUNTING YOKES

In places where you'll be using your Supersport a lot, such as your steering station, you can install a table mount tilt stand for it. The tilt stand is included in the DeLuxe accessory package, or it can be purchased by itself from your dealer. You should provide a power cable connected to 12 VDC at each stand, so you can plug it into the unit to operate it and charge the battery pack.

If you connect the unit to the power cable when it has an alkaline battery pack installed, it will not charge the batteries, but it will operate with the 12 VDC without discharging the batteries.

If the tilt stand is inside your cabin, the unit may not work very well with the built in antenna. In this case you can install an optional exterior antenna in a location with a good view of the sky, and route the antenna cable to the tilt stand. When the exterior antenna is connected to the unit with the BNC connector, the exterior antenna is selected instead of the internal antenna.



TILT STAND WITH EXTERNAL POWER AND ANTENNA CABLES

For many boats, several tilt stands will be useful -- one at the main steering station, one on the Tuna Tower or flying bridge, and one below in the cabin.

LIGHTNING

Using the **Supersport** as a handheld GPS slightly increases your chances of being struck by lightning during an electrical storm.

DO NOT USE THE SUPERSPORT DURING AN ELECTRICAL STORM
SEEK SHELTER AND WAIT FOR THE STORM TO PASS

GROUNDING

It is essential that the Supersport be used with the power cable connected, when it is used with an external antenna. It is also essential that the ground wire of the power cable be connected to the boat ground, with a seawater connection.

THIS IS BECAUSE LIGHTNING COULD STRIKE THE EXTERNAL ANTENNA, WHILE YOU ARE OPERATING THE UNIT. IF THIS HAPPENS, THE LIGHTNING ENERGY WILL FLOW THROUGH THE GROUND CONNECTION, INSTEAD OF YOUR BODY.

WATERPROOF LIMITS OF SUPERSPORT

The **Supersport** is fully equipped with low pressure gaskets and is suitable for use in pouring rain, or heavy salt spray. If the unit is soaked with salt water or spray, it should be washed with fresh water and dried before it is put away. If it is left in the sun for very long periods of time, the ultraviolet radiation will cause the case and gaskets and keyboard to gradually deteriorate.

LAND NAVIGATION

The **Supersport** is useful for general land navigation. Here are some cautions and helpful hints:

1. Operation will be very poor under metal roofs, and in side most automobiles, aircraft, and buildings. It may work inside vehicles and buildings if the roof is a nonconductor of electricity.

2. Operation will be slower, but generally satisfactory, under tall trees.

3. You can determine direction with the GPS, without a compass! If you walk or travel in a straight line, press the **SPEED** key and display speed and course. The course displayed will be the magnetic bearing of the direction you have been traveling.

4. The **Supersport** can help you return to places in the woods or in the desert with great precision. If you are at a place you want to return to, save that position in the waypoint memory and later you can display range and bearing to the saved point. This is described in Sections 4, 5, and 6.

WARNING

The Supersport GPS is not designed, tested, or certified for airborne navigation. Use of the Supersport GPS for airborne navigation could result in navigation errors leading to destruction of property or loss of life.

DO NOT USE THE SUPERSPORT GPS FOR AIRBORNE NAVIGATION

The Supersport GPS can be used for airborne instrumentation, or position reporting for data gathering or scientific purposes. It is fully compatible with aircraft speeds and acceleration, and will operate on an airplane.

The Supersport can be used with 28 VDC, if a 56 ohm 20 watt resistor is wired in series with the power cable. This will drop the 28 volts to 14 volts during operation of the Supersport. If aircraft power should fail, the Supersport battery (alkaline or rechargable) will automatically and instantaneously take over, and operation will continue.

The internal antenna will almost certainly not be satisfactory, and an exterior antenna will have to be used. The base of the antenna can be removed, and the top, which is 4.2 inches in diameter and 0.65 inches thick, can be mounted on the aircraft skin. It should be mounted on the top of the aircraft, above the cabin, where it is not shaded by the tail.

The line of sight from the antenna to one or more of the satellites will likely be interrupted at high bank angles, resulting in possible loss of navigation until 10 - 100 seconds after the aircraft returns to a level attitude. Normal turns with bank angles of thirty degrees or less are unlikely to result in loss of operation.

SECTION 2

INSTALLING THE SUPERSPORT IN A FIXED MOUNT

INSTALLING YOUR SUPERSPORT

The Supersport can be used as a handheld unit, or as a fixed mount unit. If you install it in a fixed mount, with external power and an external antenna, you can use it anytime as a handheld simply by disconnecting the power and antenna cables, and removing it from the mounting yoke. If the rechargable battery pack is installed, it will have been fully charged from the external power.

The GPS can be used as a fixed mount unit with external power, without an external antenna. In this case, the internal antenna will be used, which will work well when it has a good view of the sky down to the horizon in all directions. If the unit is inside a cabin, however, you will probably have to install an external antenna to get good signal reception.

This section provides important installation instructions for the Supersport. Installing electronic navigation equipment of any kind onboard a boat poses special problems. Proper installation of the receiver and antenna unit will help minimize these technical problems and potential limitations so you can get the most out of your set. The Supersport should be installed in accordance with the following sequence. This sequence is a checklist of installation procedures which are described in detail in the following section.

INSTALLATION SUMMARY

1. INSTALL THE RECEIVER UNIT
   Although your Micrologic is water resistant, it is a delicate electronic device that should be reasonably protected. Choose a receiver site free of moisture, weather, heat, shock, and vibration.

2. HOOK UP POWER CABLE
   Connect the power cable to 12 volt power. If you will be using serial data inputs or outputs, these should also be connected, as described later in this section. Double check to make sure that power and ground have been

connected to the correct wires, before you apply voltage to the unit.

3. GROUND THE RECEIVER CASE
   Connect the ground wire in the power cable to a ground plate with a surface area of at least one square foot. Use #18 AWG or heavier solid or stranded wire for connection. This ground will not necessarily improve receiver performance, but it is an important safety precaution, in case lightning should strike the boat, or the antenna.

4. INSTALL THE ANTENNA
   Mount the external antenna vertically so it has as clear a view of the sky as possible. It should be AS LOW AS POSSIBLE while still getting a clear view of the horizon. If it is mounted high on the boat, the course and speed readings will respond to the antenna motion caused by pitching and rolling of the boat. Provide at least 3 feet of separation from other antennas. Other antenna locations may be tried for better reception.

5. PERFORMANCE, INSPECTION AND EQUIPMENT HOOK-UP
   CAUTION Before connecting the GPS, check the power polarity and voltage. Make sure the antenna is securely mounted and all soldering is sound.

6. CONDUCT PERFORMANCE EVALUATION
   Evaluate the receiver's performance and test for on-board interference by turning everything off except the GPS. Observe the effects on the Signal Quality reading as each auxiliary piece of equipment is turned on. Use a power filter for each offending device.

7. PERFORM A FINAL CHECKOUT
   Make a final performance test and sea trial run at cruising speed. Recheck the Signal Quality readings.

8. AUTOPILOT CONNECTION AND OTHER ACCESSORIES
   Any autopilot unit compatible with NMEA 0180 standard output will work directly with the Micrologic.

CAUTION: IMPROPER INSTALLATION WITHOUT REGARD TO RECEIVER AND ANTENNA LOCATION, PROPER GROUNDING, AND SOURCES OF ELECTRICAL AND RADIO INTERFERENCE

CAN SEVERELY IMPAIR GPS RECEIVER PERFORMANCE.

These procedures will now be described in detail.

1. SELECTING AN INSTALLATION SITE

Observe the following when selecting the receiver site:

A. The receiver site should be protected as much as possible from the environment. Although the Supersport has been designed to withstand temporary submersion in sea water, it can be damaged by prolonged submersion or exposure to water.

B. Never mount the unit closè to a heater, stove or engine.

C. For optimum viewing and future maintenance, provide enough cable length to allow free movement of the receiver to any angle.

D. The GPS must be at least 0.5 meters (20 inches) away from a magnetic compass.

E. The receiver can be mounted on a bulkhead, overhead ceiling or table top.

F Secure the tilt stand to structures with screws.

2. POWER SOURCE HOOK-UP

Observe the following when selecting a suitable power supply for the Supersport.

A. Connect 12 VDC to the six conductor power cable, through a circuit breaker or fuse block with a current rating of 2 amperes. The negative (-) input should also be connected to the boat ground, or seawater ground.

B. Connect the orange wire of the power cable to 12 VDC and the black wire to the power ground. The black wire should also be connected to the boat (seawater) ground.

C. Avoid sharing circuit breakers with CB, VHF or SSB radios. It may cause transmission feedback which can cause interference to GPS reception.

D. The Supersport is designed to use (-) negative ground. For boats with a positive bias grounding, DO NOT CONNECT THE POWER CONVERTER GROUND DIRECTLY. Use a "MAR-LC" filter.

(MAR-LINE filters are manufactured by Marine Technology, Inc. of Long Beach, California, phone (213) 595-6521, or (800) 772-0796. They are also available through marine electronics dealers.)

CAUTION:

1. **DO NOT HOOK POWER CABLE TO GPS AT THIS TIME.**

2. **YELLOW WIRE SHOULD BE CUT OFF OR TAPED WHEN NOT CONNECTED TO AUTOPILOT UNIT.**

3. GROUNDING RECOMMENDATIONS

Connecting the black wire to a sea water ground serves as a means to bypass unwanted radio interference to the water. The black wire in the power cable should be directly connected to the ground system to effectively dissipate noise interference which may degrade signal reception. Proper grounding of the unit is a must for safety. It will reduce the chance of damage or injury if the boat is struck by lightning.

A. The grounding point on steel-hulled vessels must be as close to the receiver as practical.

B. Use #18 AWG or heavier, solid or stranded type copper wire to connect the black wire to the boat ground.

C. On wooden or fiberglass hulled boats, use an external ground plate with a ground surface area of at least 1 square foot, such as a "DYNAPLATE" (TM). The engine block may serve as an acceptable alternative when no ground plate is available, but should be tested during the performance evaluation.

D. Do not share the grounding wire with other electronic or radio equipment.

E. When in doubt, try out other available ground techniques by checking the Signal Quality reading.

LIST OF POSSIBLE GROUNDINGS:

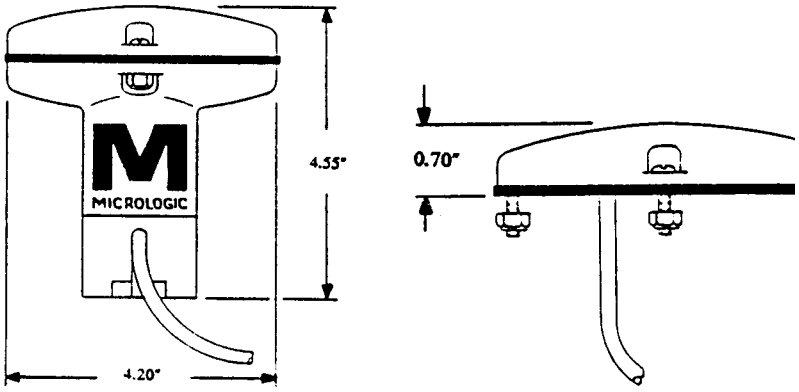
a) Dynaplate
b) Engine Block
c) Propeller Shaft
d) Zinc Plates
e) Trim Tabs
f) Bonded through-hull fittings

CAUTION: The Supersport is designed to use a negative (-) ground. On boats with positive (+) ground biasing use a MAR-LC/2 filter when grounding.

4. EXTERNAL ANTENNA INSTALLATION

If your GPS will be mounted inside a cabin, you will probably need an external antenna to get good performance. If the cabin roof is all fiberglass, you might get adequate performance from the built in antenna. The only way to tell is to try it and see.

The external antenna can be mounted on a standard mast with 1"-14 thread, or it can be mounted on a flat horizontal surface. To do this, remove the four nuts holding the antenna together, and mount the top half with the gasket on the flat surface. The antenna will then be 4.2 inches in diameter, and 0.7 inches tall. You will need four holes for the bolts or screws, and a half-inch hole for the connector and antenna cable. This is the usual method for mounting the antenna on aircraft or motor vehicles.



OPTIONAL EXTERNAL ANTENNA FOR SUPERSPORT GPS

Locating the external antenna is an important factor affecting receiver performance. Choice of a suitable antenna site is determined by the following physical and electrical considerations.

A. Position the antenna at the lowest point of the boat where it will have a good view of the horizon in all directions. Overhead masts, stays, and wires may cause temporary blockage of one of the satellite signals, but if they do not occupy too large an area, they will not cause significant signal reception problems.

SUGGESTED ANTENNA LOCATIONS:

a) Two feet above the rail, at the bow or as far astern as possible.

b) Pilot house roof

c) Inside the pilot house close to the roof, if the roof is fiberglass and the antenna has a good view of the horizon from there, with no large metal structures above it.

B. Mount the antenna vertically, with no more than a five degree tilt from the vertical. Use ratchet mount as required.

C. Keep the antenna away from your radar antenna's turning radius.

D. The optional external antenna comes with 25 or 50 feet of antenna cable. If you need more than 50 feet of cable, consult your dealer or Micrologic on the advisability of using a special low loss cable for optimum performance. There are several low loss cables available, which are stiffer and more expensive than RG-58, but have a lower loss for the 1575.42 MHz satellite signal.

E. Attach the antenna to withstand mast flexing and wind gusts. If cable is exposed, secure with plastic tie-wraps or stainless steel clamps.

F. Avoid hot spots which could damage the insulation when routing the antenna cable to the desired receiver location.

WARNING
DO NOT PAINT THE GPS ANTENNA
(paint will reduce the GPS signals)

5. GENERAL INSPECTION AND HOOK-UP

Before connecting a GPS receiver, it is always a good practice to perform checks on the power, polarity and voltage level, to prevent damage.

A. With a Voltmeter, check the following at the connector:

PIN 1	**ORANGE**	**(+) 12 VDC POWER**
PIN 4	**BLACK**	**(-) GROUND** (Connected to boat ground also)

B. Check that all connections that use screws or nuts have been tightened securely and that all solder connections are electrically and mechanically sound.

C. Connect the antenna cable to the BNC connector on the back of the Supersport.

D. Mount the unit to the bracket and tighten the knobs.

E. Turn OFF all 12V DC lights and TV sets or video display equipment such as video depth sounders, radar, etc.

F. Connect the power plug to the back of the Supersport. Turn on the unit by pressing the ON/OFF key for one second. To turn power off, hold the ON/OFF key down for three seconds until display lights turn off.

6. PERFORMANCE EVALUATION

After you have completed the connections and the ID message appears when you press the ON/OFF key, you can congratulate yourself on a job well done. Now it's time to evaluate the receiver's performance. This will help you determine if the boat is electrically "clean" or not. Follow the directions in Section 3.

Procedure:

A. With the engine and all other equipment OFF, including fluorescent lights, let the GPS receiver operate on battery power.

B. After performing a First Start (see Section 3) and the numbers on the display stop flashing, display the SIGNAL QUALITY reading, which is the second display under the POS key.

C. Turn all the electronic equipment and lights on one at a time while monitoring the Signal Quality reading. If the Signal Quality drops more than 10, a serious source of onboard interference needs to be corrected. Repeat the process several times, if necessary, to ensure that the interference has been eliminated.

D. Start the engine and bring it up to cruise RPM. Record the Signal Quality number. The alternator system is the most likely source of interference in the engine. Use MAR-LINE alternator filters (MAR-LINE 70A and 120A) to correct this problem. Different engine RPM will cause different levels of interference.

Note: It is expected that the measured Signal Quality will fall slightly from the reference level in step #2, on the

order of 5 or so as other electric equipment is operating. Any sharp drop in Signal Quality level, however, indicates a serious source of on-board interference that will have to be corrected. This can usually be done by proper shielding and grounding, or by consulting the manufacturer about offending equipment.

Re-site the antenna as necessary, or experiment with different grounding or cabling arrangements to minimize interference.

7. FINAL CHECKOUT

When performance evaluation is complete and you are convinced that your receiver is doing its best, it's time for a sea trial. For final checkout, check the Signal Quality, bearing in mind that this number varies slowly with time as the satellites move slowly across the sky. Check it again, making sure performance is still as tested. As a final test, you should navigate at cruising speed to check for such things as effects of prop shaft noise and to get a general feel for performance in an actual seagoing situation.

II. COMPARISON OF GPS AND LORAN INSTALLATION

Installing a GPS receiver is in many respects quite similar to installing a loran receiver. There are, however, a number of important differences. Since most people are much more familiar with loran installations, it is useful to list the differences.

1. It is usually desirable to mount a loran antenna as high as possible on a vessel, while the GPS antenna should be as low as possible, while still getting a good view of the entire sky.

2 A loran antenna should never be placed under a wire, since an overhead wire sharply reduces the low frequency loran signal. Overhead wires have very little effect on the high frequency GPS signal.

3. Loran antennas can almost never be placed inside a wheel house or cabin. GPS antennas can work well there, if the roof is a nonconductor (like fiberglass), and the antenna has a good view of the sky through the roof.

4. A person standing next to a loran antenna will have little effect. A human body will block the GPS signals, so the antenna should not be placed where people can walk around and above it.

5. Loran receivers require a good seawater ground for best reception. GPS receivers are much less ground sensitive, but the receiver should nevertheless always be grounded to protect it and the people around it if the antenna or vessel is struck by lightning.

6. Loran receivers are quite sensitive to vessel generated noise, especially from alternators. GPS receivers suffer much less from locally generated noise, but they can still be affected by radars, fluorescent lights, and radio and TV transmitters and receivers.

FLUSH MOUNTING KIT

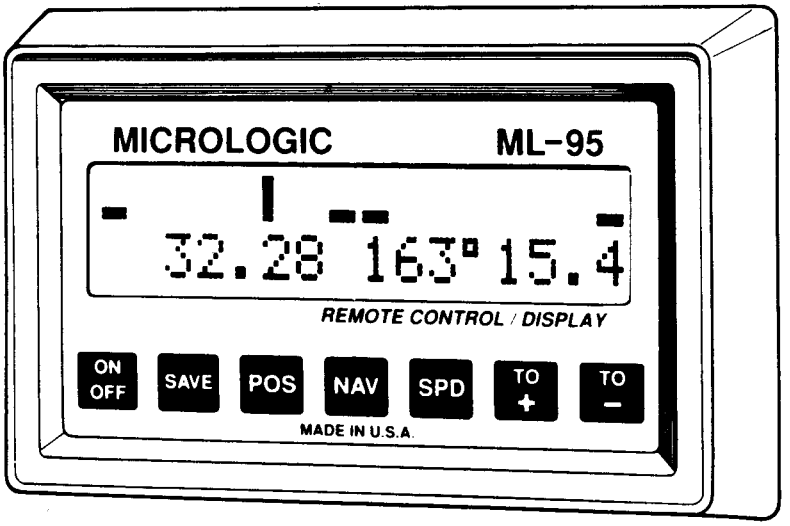
A flush mounting kit is available for those who want to mount the Supersport into a table or bulkhead. The kit includes a complete set of diagrams, templates, and hardware for installation. Contact your local Micrologic dealer for details.

ML-95 REMOTE CONTROL/DISPLAY

If you have only a very small space at your steering station, one installation option is to install the Supersport GPS somewhere else, and to install an ML-95 remote Control/Display unit at the steering station. The ML-95 is 5.50" x 3.65" x 1.40" WHD, and is designed to be mounted flat on a vertical surface.

Using the ML-95, the operator can select any of six navigation displays, step the TO and FROM waypoints, and SAVE

present position in a waypoint. In order to do anything else, the operator will have to go to the GPS. Up to four of the remote control/display units can be connected to one Supersport, and all of them can select their displays independently.



MICROLOGIC ML-95 CONTROL/DISPLAY UNIT

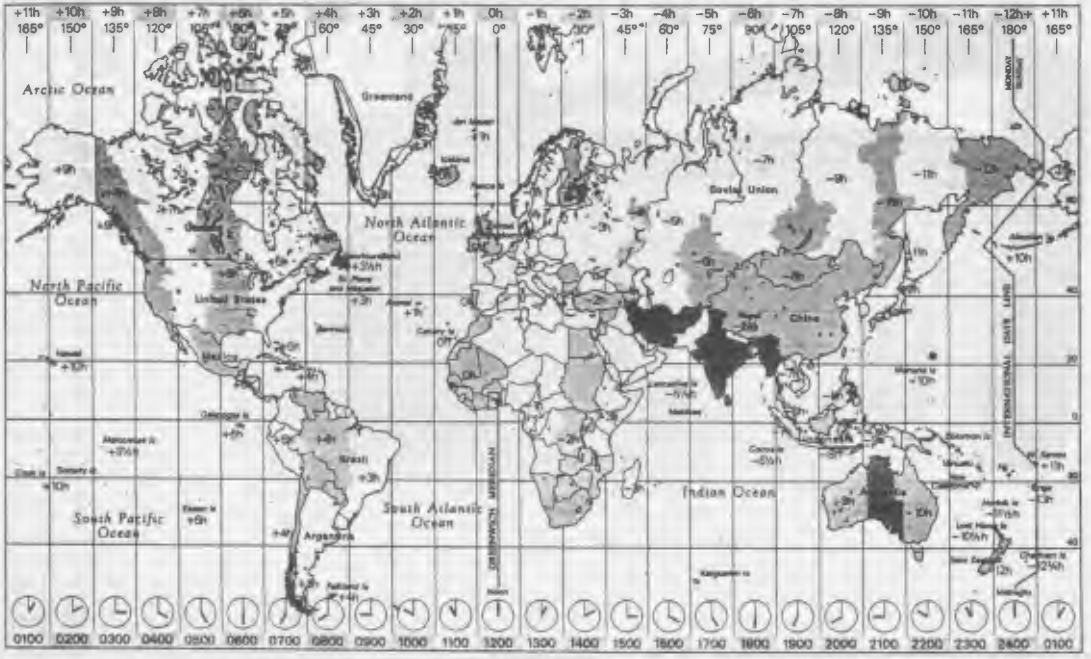
SECTION 3

GETTING STARTED WITH THE Supersport

The Supersport is turned ON and OFF by the same key. Pressing the ON/OFF key for about one second will turn the unit on, while pressing it for three seconds will turn the Supersport OFF.

SuperSport GPS

World Standard Times



FIRST START

Once you're familiar with the ON/OFF procedure, a First Start must be performed. DO THE FIRST START ONLY ONCE WITH A NEW UNIT. There is no need to do a First Start if your dealer has already set up your GPS, or if you've done the First Start before. If a First Start is performed after you begin using your GPS, all your waypoints and other information that you previously put into your GPS's memory will be cleared or changed.

TO DO A FIRST START:

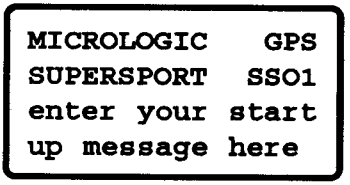
1) TURN POWER ON
Press the ON/OFF key briefly

NOTE: The SuperSport is turned off by pressing the ON/OFF key and holding it down for three seconds.

2) CLEAR MEMORY

WARNING Don't do this every time you turn the GPS on! Do it only once to start up a new unit for the first time. All waypoints are erased by this procedure!

Press the CLR key and hold it down for six seconds. In approximately six seconds, the Identification Message will appear.



The waypoints now have been cleared and the set-up items have been set to their initial or FIRST-START values.

3) ENTER YOUR LOCAL TIME. You need to do this only ONCE with a new receiver, as time will be kept afterward, even with power off. Time must be entered in the following order:

1 Time Zone
2 Standard or Daylight (Summer) time
3 Time of day
4 Day of Week
5 Month
6 Day of month
7 Year

These will probably already be correct, and will not need to be entered if already correct.

In some parts of the world, it may be difficult to figure out what time zone should be used, because the time zone name used in the Supersport may not be the one used in that area.The first SETUP display shows the time zone, standard/daylight selector, and the number of hours that local time is displaced from Universal Time. That is, the displacement shown is added to local time to get UTC. Universal Time, Coordinated is the same as Greenwich Mean Time (GMT), and is the Standard Time at zero degrees longitude.

If you do not know what time zone you are in, refer to the World Standard Time Chart several pages before this one, to find your displacement from Universal Time, which is shown at the top of the chart. Now, press the CLR key one or more times, until the cursor is in the Time Zone. Now press the + or - keys several times until the time displacement number on the right hand side of the display is correct. Pressing the ENT key will now set your local time to the correct value.

Example: It is 4:15 pm, Central Daylight time, on Monday, February 3, 1992. It is very important to enter this time correctly in every detail to within 30 minutes, or the receiver may not be able to receive the satellite signals and begin navigation.

First, display Time:

SETUP

```
PACIFIC   STD   +8
TIME     13:14:25
MON  FEB   3,1992
UTC/GMT  22:14:25
```

To change the time zone, first press CLR one or more times, until the cursor is in the time zone field. Then press the + or - key a number of times until the CENTRAL time zone appears, then press ENT.

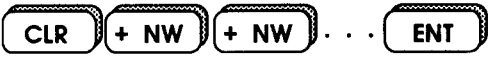
Now press CLR until the cursor is in the STD/DAY field, and then press the + or - keys a number of times, until DAY (daylight, or summer time) appears.


```
CENTRAL  DAY  +5
TIME     16:15:05
MON  FEB  3,1992
UTC/GMT  22:15:05
```

The remaining items (time of day, day of week, month, day of month, and year) will probably already be correct, having been entered at the factory for testing. If they are not correct, go on and enter the correct data.

Enter 16:15 (4:15 pm)

Enter the day of week by pressing CLR until the cursor is in the day of week field, and then press the + key one or more times until MON (Monday) appears.



Next, select the month in the same way. Press + until FEB (February) appears.

Set Day of the month to 3.

Set the year to 1992.


```
CENTRAL  DAY  +5
TIME     16:15:05
MON  FEB  3,1992
UTC/GMT  22:15:05
```

You have now finished entering the time zone, daylight-standard selector, time of day, day of week, month, day, and year. The time will now be kept correctly even with power off, and will be updated so that the time is accurate to within one half second, as soon as you start receiving satellites. That is, even if there is an error of a few minutes when you enter the time, it will automatically be corrected by satellite as soon as you start receiving.

If you later change time zones, or from Standard to Daylight time, it is necessary to change only the time zone or daylight-standard selector. The local time of day will automatically be corrected when you make the change.

4) ENTER YOUR APPROXIMATE LAT/LON. These must be accurate to within ten degrees.

EXAMPLE: Latitude 34° North
Longitude 077° West

Display system Lat/Lon


```
LAT n 00°00.000'
LON w000°00.000'
L/L +/-   9999 ft
ALTITUDE     0 ft
```

Press key one or more times, until the desired display appears

Enter Latitude

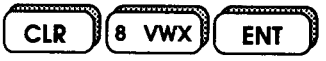
Enter Longitude


```
LAT n 34°00.000'
LON w077°00.000'
L/L +/-   9999 ft
ALTITUDE     0 ft
```

For small numbers of degrees, leading zeroes must be entered. North Latitude and West Longitude are automatically entered unless the "-" key is pressed at any time during the entry of numbers. The "-" key specifies South Latitude or East Longitude.

5) ENTER YOUR ALTITIDE, OR SELECT AUTOMATIC ALTITUDE (3D) MODE

If you are operating the SuperSport on a boat on the ocean, enter the height of the antenna above the water line into altitude, on the first POS display. For example, if the antenna is 8 feet above the water, press the CLR key one or more times until the cursor is in the altitude field, and then key in the desired altitude.



If your altitude is changing with time, or if you do not know what it is, you can set the GPS to compute altitude automatically. To do this, select the "ALTITUDE/VEHICLE" SETUP display.


```
ALTITUDE       MAN
VEHICLE       BOAT
speed and course
filter      2 sec.
```

To set ALTITUDE to AUTO, press the CLR key until the cursor is on the AUTO/MAN field, and then press ENT. This changes

altitude computation from manual to automatic.

YOU CAN ALWAYS COMPUTE YOUR ALTITUDE AUTOMATICALLY. HOWEVER, IF YOUR ALTITUDE IS CONSTANT, AND YOU KNOW WHAT IT IS, OPERATING IN THE MANUAL ALTITUDE MODE WILL MAKE THE COMPUTED LAT/LON SLIGHTLY MORE STABLE AND ACCURATE.

The SuperSport can also be adjusted, to account for how fast altitude is likely to be changing. This is done with the VEHICLE selector, (displayed under the SETUP key) which can be BOAT, CAR, or PLANE. BOAT is used if altitude is unchanging, CAR is used if altitude is slowly changing, and PLANE is used if altitude is likely to change rapidly.

Altitude is computed only when four or more satellites are received. If three are received, position is computed using the last remembered altitude.

Altitude and Lat/Lon accuracy can both be set to display in meters instead of feet. This can be done with the "ALT/ACC" format selector, which is the third item in the SETUP list.

6) IF YOU ARE USING THE GPS FOR MARINE NAVIGATION, YOU ARE NOW FINISHED WITH THE FIRST START PROCEDURE.

Navigation charts are prepared using a collection of survey data, which are used to compute numbers describing the shape of the Earth. This is called a map datum, and different ones are used on each continent, to best fit the local shape of the earth. The typical diffence in computed position from one datum to another is 100 meters.

When you cleared the memory, the datum selection was set to manual, and the datum selected was WGS-84. (World Geodetic Survey of 1984) This datum is used for most modern marine charts, everywhere in the world.

If you are operating on land, you should set the datum selection from MANU to AUTO, which will give you the correct datum selection for recent terrestrial charts in most places in the world. If the datum indicated in the margin of the charts you are using is not the one shown in the MAP DATUM Setup

display shown below, then you need to select the datum manually. This is described in detail in Section 11.

SETUP SETUP + NW + NW . . .

```
ACCURACY OF GPS
SYSTEM 100meters
MAP DATUM
AUTO          INT'L
```

To change from manual to automatic datum selection, press CLR several times until the cursor is in the MANU/AUTO field. Then press the ENT key to select automatic operation.

7) WAIT UNTIL THE DISPLAY STOPS FLASHING BEFORE USING THE NAVIGATION OUTPUTS. Whenever the GPS displays outputs that are likely in error, the display will flash on and off.

NEVER USE FLASHING DISPLAYS FOR NAVIGATIONAL PURPOSES.

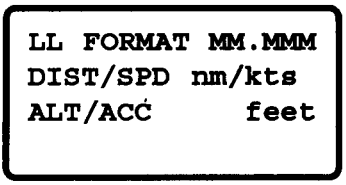
NORMAL START-UP

Turn power ON. After the five second startup message, the display will show present position in Latitude and Longitude. Wait one to three minutes for the display to stop flashing, and the navigation data are ready to use. If your GPS has been in recent use, it will usually have a position fix in one minute. If it has not been used for a day or more, it will take about three minutes. The longer time is needed because it must receive all the satellite data describing the orbital positions; if it has been used recently, the data will already be in memory, and a position fix can be generated as soon as the receiver locks onto the satellite signals.

DISTANCE AND SPEED FORMAT SELECTION

When the First Start procedure is performed, the unit is automatically set to display in nautical miles and nautical miles per hour (knots). To change the distance and speed displays, press the SETUP key twice, and then the "+" key a

number of times, until you see the "LL FORMAT" display.



To change the Supersport to statute miles and miles per hour, press the CLR key twice, until the cursor is on the "nm/kts" field. You can now step through all of the choices by pressing the "+" key several times. Stop when you are on the desired choice, and then press the "ENT" key. The choices are nm/kts, sm/mph, and km/kph. All displays and inputs, such as Alert trigger ranges, will now be in the units chosen. All numbers stored in the computer are independent of the format selected, so you can change the format anytime, and none of the information you have stored in the GPS will be affected. (That is, the numbers will change, but they will represent the same distance.) For example, 1.00 nautical miles will become 1.15 statute miles or 1.85 kilometers.

GENERAL OPERATION

After you do a first start, you are ready to get acquainted with the general operating procedures of your Supersport. Basically, two things can be done with the GPS. You can select any display you want to see, or you can enter numbers or letters into the display you've selected.

SELECTING DISPLAYS

The displays are split into six groups. These are position (POS), navigation information (NAV), waypoint information (WPT), speed (SPEED), route information (ROUTE), and setup information (SETUP). To display information, select one of the groups and press the key with the group name on it one or more times until the desired display comes up.

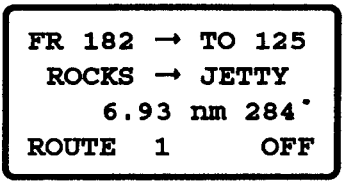
For example, to display present position in latitude and longitude, press the "POS" key one or more times until Lat/Lon are displayed.

ENTERING NUMBERS

There are four basic steps involved in entering numbers. First, press one of the display keys (NAV, WPT, ROUTE, SPEED, etc.) one or more times until a display appears that contains a number you want to change. Then press the CLR key one or more times to choose the area on the display you want to change. When small zeroes are in the area you wish to change, press the numbers you want to put in the selected area. Press the ENT key to finish your entry.

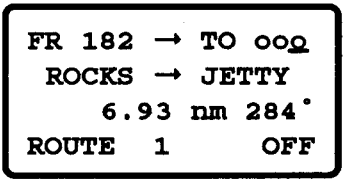
For example, suppose you want to tell the GPS that you wish to go to point 27. As you will learn in later sections, there is more than one way to do this. But for now, let's concentrate on a simple example to help you understand the entry process.

Since you are attempting to tell the Supersport to go to a destination, you're trying to tell it your route. The displays used to do this are located under the ROUTE key. Following our previous instructions, you should press the ROUTE key one or more times until a display similar to this one appears:



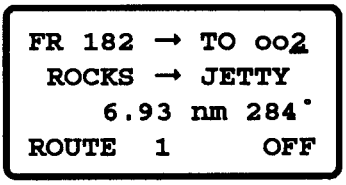
Now that you've selected the proper display, choose the area of the display you want to change by pressing the CLR key one or more times. As the CLR key is pressed, a series of small zeroes will appear in a portion of the display, representing the area that will be changed if you desire to make an entry. Repeated pressing of the CLR key steps through all possible areas that can be changed.

Since you are telling the Supersport to go to point 27, press the CLR key until the the cursor appears in the area next to TO.

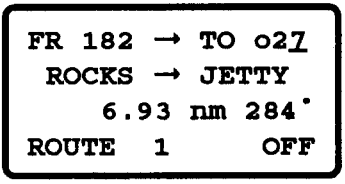


The small zero on the right is underlined, and flashes on and off. This is the cursor, which shows where the next digit will be entered.

Now that the proper area has been chosen, press the keys with the numbers on them. The numbers will appear in the area with the small zeroes. Notice that you can always see the numbers you're going to enter by looking at the display. Press the "2" key and the display will look like this:

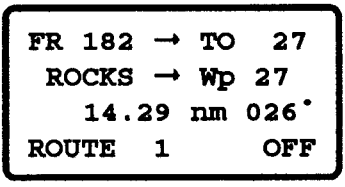


Press the "7" key and the display will look like this:



When the numbers you want are on display, press the ENT key.

The navigator will stop displaying the flashing cursor, and the display will be as follows:



The Supersport knows that you wish to go to point 27 from point 182. It will now make its navigation calculations, and depending on the displays you choose, will show you how to get to your destination. If you make a mistake during entry, don't worry. Press the CLR key, and the entry will be backspaced one digit. If you depress any of the display keys in the middle of an entry, no entry will be made, and the display that was selected will appear.

DISPLAY CONTRAST

To adjust the display contrast, press the ON/OFF key briefly, while the unit is on.


```
Press +/- to adj
display contrast
Press ON/OFFwhen
you are done
```

Press the + and - keys to adjust the display contrast, to make the display the easiest to read. Press the ON/OFF key briefly when you are done, to resume normal operation.

SECTION 4

WAYPOINTS

The following sections will describe the displays found under each key on the keyboard and explain how to use them. Keep in mind that all displays are selected by pressing one of the six display keys which are labeled: POS, NAV, WPT, SPEED, ROUTE, and SETUP. Pressing a display key repeatedly will allow you to look at all of the displays available under that key. Each display will be described separately, starting with the displays found under the WPT (WAYPOINT) key.

WAYPOINTS

Before you begin navigating with your Supersport, you must put waypoints into your GPS. A waypoint is a numbered storage area for the coordinates of a place that you will come from or go to. Your harbor entrance, the middle of the Golden Gate Bridge, and the southernmost tip of the Florida Keys are examples of waypoints.

Waypoints in the GPS are structured like post office boxes. Each one is individually numbered and contains individual pieces of information. The individual pieces of information contained in each waypoint are separate Latitude/Longitude coordinates of a place you wish to someday go to or come from. After you've put coordinates in, the GPS remembers them even when it is turned off, or the battery is removed.

There are 250 waypoints in the Supersport. The waypoints are numbered from 0 to 250. Waypoint zero (0) is a special waypoint because it is a waypoint into which the user has no access. The GPS's computer automatically stores its present location into waypoint zero each time it is told to navigate to a different place. Since waypoint zero is the place you're starting from, it is automatically given the name "START".

The advantage of using waypoint zero will become more obvious in the section explaining the NAV key.

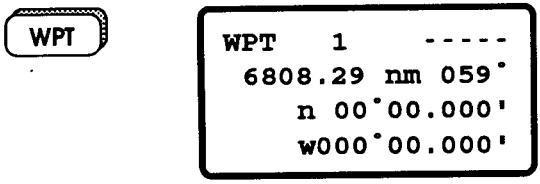
Waypoints 100-199 can be "hidden" from anybody who doesn't know your secret key, and should be used to store

locations of places that you don't want anyone else to find - secret fishing holes for example. Waypoints 1-99 are for general purpose and are used to store places that aren't "a secret place". Waypoints 200-250 are used by the GPS's computer to store your present location when the "SAVE" key is pressed. Keep in mind that when all 51 waypoints from 200-250 are occupied and you wish to press the SAVE key to store your present location, the oldest waypoint between 200 and 250 will be forgotten and the new present location will take its place. Therefore, these waypoints should not be used to store locations you wish to keep for a long time.

THE WAYPOINT KEY

The "WPT" key allows you to obtain the displays used to look at, move, and create waypoints. There is also a display used to tell the Supersport to go to a waypoint .

The first display under the WPT key is:



This display is used to enter waypoints or to simply look at them. The GPS is showing waypoint 1. The latitude/longitude coordinates of waypoint 1 are shown on the lower two lines of the display. In this case the latitude and longitude of waypoint 1 are all zeroes, signifying that the waypoint is "empty" and available for use. The name of the waypoint (if it were named), would be displayed in the upper right corner of the screen. In this example, waypoint 1 is not named, so small dashes appear where normally a name would be seen. The distance and angle displayed are the range and magnetic bearing from present position to the waypoint.

CREATING WAYPOINTS USING LATITUDE/LONGITUDE

Before taking a trip with your GPS, you must put in the coordinates of a place that you want to go to, or in other words, create a waypoint. Let's create a waypoint using latitude

and longitude numbers. To enter a waypoint, first you must choose the waypoint number (storage location) you want to use, then you'll put in the coordinates of your destination and name the destination.

For example, let's put in waypoint 5. Since the display we want to use is already on the screen, all you need to do is select the proper area of the display and enter numbers or letters into the area you select by following the entry process explained earlier in the manual.

To choose waypoint 5, press the CLR key until small zeroes appear at the right side of the letters WPT in the display. The display should look like this:


```
WPT  ooo   -----
 6808.29 nm 059°
    n 00°00.000'
    w000°00.000'
```

Now press:

A 5 should replace the small zeroes, signifying that you've chosen waypoint 5. Let's imagine that we want to go to a place, the coordinates of which are:

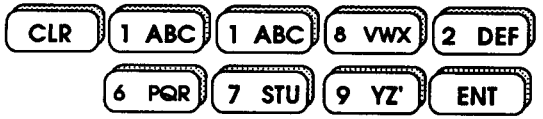
Lat: 34 45.21" north
Lon: 118 26.79" west

To put in the latitude coordinates, press:

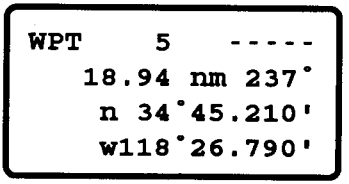
The display should look like this:

```
WPT    5    -----
 6808.29 nm 059°
    n 34°45.210'
    w000°00.000'
```

Next, enter longitude.



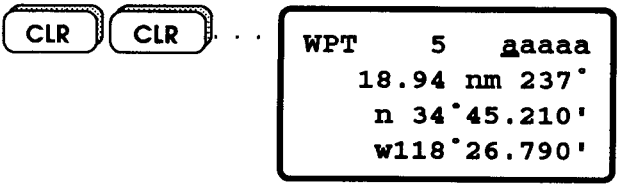
The display should look like this:



You are finished entering the coordinates of waypoint 5. Keep in mind that the latitude and longitude that you put in are North latitude and West longitude, unless the "-" key is pressed. If the "-" key is pressed at any time during the latitude entry, the GPS will recognize the numbers to be South latitude. If the "-" key is pressed at any time during the longitude entry, the GPS will recognize the numbers to be East longitude.

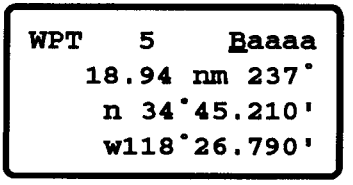
NAMING WAYPOINTS

Now that the latitude and longitude coordinates have been put into waypoint 5, you may want to name the waypoint. Names can be 1 to 5 characters in length and can include numbers and letters. To name the waypoint, press the "CLR" key until a row of "a"s replace the small dashes to the right of the waypoint number.

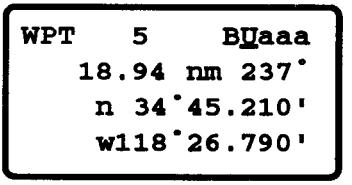


When the "Name" portion of the display is chosen, keys 1-9, when pressed, will make the display create the letters that

appear on the top of the keys according to the number of times you press each key. For example, the first depression of the #1 key will create an "A" on the display. The second depression of the #1 key will create a "B" on the display. The third depression will create a "C" and the fourth will create a "1". Once you're satisfied with the letter created on the display, you'll press the "+" key to tell the GPS you wish to add another letter to the name you're attempting to spell. Next you will press the numbered keys with the letters atop them, until the display creates the letter you want. Press the "+" key again. Simply repeat the same process until you spell the name of your waypoint. When you've spelled the entire name, press the "ENT" key. Continuing with our previous example, let's call waypoint 5 "BUOY". First (if you have not already done so), select the name portion of the display by pressing "CLR" one or more times. Since the first letter of our name is a "B", press the "1" key until you see a "B" on the display. The display should will look like this:



Press the "+" key to move the cursor to the space to the right of the "B". The next letter of our name is a "U", located on the "7" key. Press the "7" key until a "U" appears next to the "B".



Press the "+" key again to move the cursor. Press the "5" key until an "O" appears next to the "U".


```
WPT   5     BUQaa
   18.94 nm 237°
    n 34°45.210'
    w118°26.790'
```

Now press the "+" key again to move the cursor. The last letter in our name is a "Y", which is located on the "9" key. Press the "9" key until a "Y" appears.


```
WPT   5     BUOYa
   18.94 nm 237°
    n 34°45.210'
    w118°26.790'
```

Now that the name "BUOY" appears, press the "ENT" key to enter the name into memory. You are finished naming waypoint 5.

At this point, let's reflect on what was done to put in a waypoint. First, the proper display was selected by pressing the "WPT" key. Then we selected the waypoint number we wanted to put into the waypoint. Finally, the waypoint was given a name. This process is repeated each time you put in a waypoint from a latitude/longitude chart. IT IS NOT ESSENTIAL TO GIVE A NAME TO A WAYPOINT. If you don't do this, you can refer to the waypoint simply as number 5. After a few weeks, however, you may forget where waypoint 5 is located. If you give it a meaningful name, you are much more likely to remember its location and what it represents.

GOING TO THE WAYPOINT

Now that you know how to put in a waypoint from a chart, the next thing you'll probably want to do is ask the GPS "How do I get there?" The next display under the "WPT" key helps answer that question.


```
TO GO TO WP     5
BUOY_, PRESS ENT
To recall saved
waypoints, hit +
```

The Supersport is giving you a command that says, "If you want me to show you how to get to waypoint 5, press the ENT key.Notice that the GPS has automatically asked you if wish to go to waypoint 5. Why? Because waypoint 5 was just displayed. If you had just displayed waypoint 25, this display would ask if you want to know how to get to that waypoint. To get instructions for going to waypoint 5, simply press one button, ENT. As you can imagine, this is a very valuable time-saving tool.

When ENT is pressed, the GPS will automatically set your present position into waypoint 0 (automatically named START), and compute from present position, the distance you must travel (Range) and the compass heading you must take (Bearing) to arrive at waypoint 5. It will then go to the first NAV display.


```
_       II       _
 START → BUOY
   18.94 nm 237°
   13.4 kts 175°
```

In this example, waypoint 5, or BUOY, is 18.94 nautical miles away from your present position. You should steer at a 237 degree compass heading to get there. Your present speed over the ground and course over the ground are 13.4 knots, and 175 degrees, magnetic.

Keep in mind that when performing this procedure, you not only tell the GPS how to get to waypoint 5, you also create a courseline between your starting location and waypoint 5, and tell the GPS to calculate all of its other navigational information (speed toward destination, off course information, etc.) with respect to your courseline. In other words, once ENT is pressed you are not limited to looking at range and bearing information related to waypoint 5. You can also look at other navigation information relating to your trip

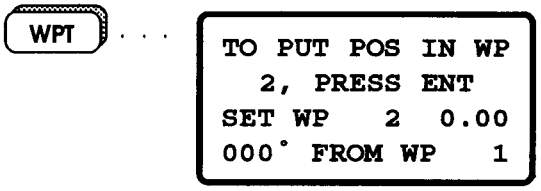
under any of the display keys. You will learn how to use this information in the sections discussing the NAV, and SPEED keys.

PUTTING PRESENT POSITION INTO A WAYPOINT

So far, you've learned to put in a waypoint from latitude/longitude numbers obtained from a chart or a book. Another, more accurate method to put in waypoints is to tell the GPS to remember its present location and put it in a waypoint automatically.

There are two methods in which to do this. You can tell the Supersport to show its present location in a waypoint that you, yourself, select, or in a waypoint automatically selected by the Supersport. The third waypoint display allows you to do this.

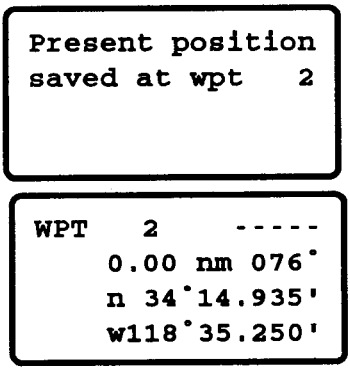
To select the waypoint yourself, press the WPT key several times until the following display appears:



The GPS is giving a command that says "If you want to put present position in waypoint 2, press the ENT key". In this example, the coordinates of the place you're at will automatically be stored in waypoint 2 when the ENT key is pressed.

The GPS has automatically selected waypoint 2 to store the coordinates of your present location. Why did it choose waypoint 2? Because waypoint 2 is the lowest numbered "empty" waypoint. If you had already put a destination into waypoint 2, and waypoint 3 was empty, the display would read: "To put pos in WP 3, press ENT In other words, if you want to store your present location in the lowest numbered unused waypoint, you should select this display, then press the ENT key.

ENT



Shows for 3 seconds

If you do not want the GPS to automatically choose the waypoint that your position will go into, you can choose one yourself. To do this, select the WPT display shown above, and key in the desired waypoint number. For example, if you want to put present position into waypoint 15, press the following keys:

CLR 1 ABC 5 MNO ENT ENT

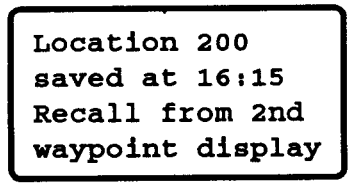
This will cause present position to be entered into waypoint 15.

USING THE SAVE KEY TO STORE PRESENT POSITION

Another, faster way to store your position is by using the SAVE key. When SAVE is pressed, the GPS will automatically store your present position and time of day in one of the waypoints numbered 200 to 250. The first time SAVE is pressed, the Supersport will store your position in waypoint 200. The next time SAVE is pressed, your position will be stored in waypoint 201, and so on.

When Save is pressed, a display similar to this will appear:

SAVE



The display will then go back to showing what was being displayed before the SAVE key was pressed.

To recall the saved points, go to the second waypoint display.


```
TO GO TO WPT   2
-----, PRESS ENT
To recall saved
waypoints, hit +
```

Now, press the "+" key.


```
RECALL   200
      LAST SAVED
Press + for
more saved wpts
```

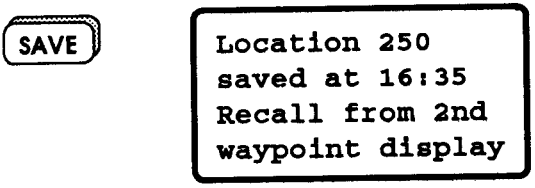
Shows for 3 seconds

```
WPT 200     S1615
    4.05 nm 178°
    n 34°18.376'
    w118°33.823'
```

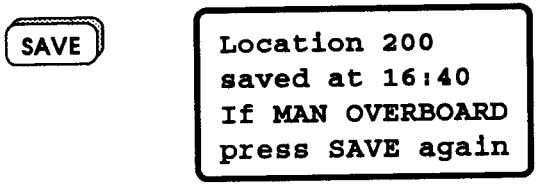
This display shows the latitude and longitude of the position that was last saved, its range and magnetic bearing from present position, the waypoint number it is stored in, and the time of day that it was stored.

Pressing the "+" key repeatedly will let you look at the 2nd, 3rd, etc., up to the 51st last saved locations. When all waypoints between 200 and 250 are full, the oldest location will be replaced with the newest each time the SAVE key is pressed. For example, let's imagine that you've saved 50 locations by using the SAVE key. Waypoints 200-249 are stored in these locations. You're at a good fishing hole and decide to save the location.

You press SAVE and see this display:



Five minutes later, your fishing buddy falls overboard. You press the SAVE key again and see this display:



At this point, the location that was previously stored in waypoint 200 is replaced with the location where your buddy fell overboard. The next time you press the SAVE key, your position will replace the position that was stored in waypoint 201, and so on. It is for this reason that waypoints 200-250 should not be used to store waypoints you want to keep for a long period of time.

The "Recall from 2nd waypoint display", and the "If MAN OVERBOARD press SAVE again" messages are shown alternately, after you press the SAVE key, to remind you of both operating procedures.

MAN OVERBOARD

When your buddy fell overboard, you could have used the MAN OVERBOARD function. To do this, simply press the SAVE key twice in quick succession. The Supersport will then save the location, and automatically set up the display to show you how to steer back to the place where your buddy fell overboard. This happens regardless of which of the two messages is shown after you press the SAVE key.

MOVING WAYPOINTS

At this point, you might be asking yourself, "What do I do if I want to keep a waypoint between 200-250?" The answer is

simple. You move it to a waypoint between 1 and 199. The next display under the waypoint key allows you to do this.


```
TO MOVE WP205 TO
WP 26, PRESS ENT
To use WP100-199
enter key ####
```

This display is giving you a command that says, "If you want to move the coordinates of waypoint 205 to waypoint 26, press the ENT key". Why is the GPS choosing to move waypoint 205 to waypoint 26? It has chosen to move waypoint 205 because waypoint 205 is the waypoint that was last used when the SAVE key was pressed. It chooses to move to waypoint 26 because waypoint 26 is the lowest numbered "Empty" waypoint. In other words, when a location is stored by pressing the SAVE key, you can move it into the lowest numbered unoccupied waypoint by using this display and pressing the ENT key. When ENT is pressed, the GPS automatically moves the coordinates of waypoint 205 to waypoint 26.

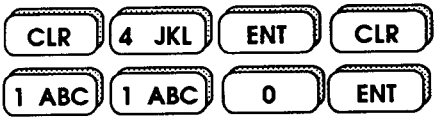

```
Moved WPT 205
  to WPT  26
```

After a few seconds, another display will appear showing the coordinates that were moved and the waypoint they were moved to.

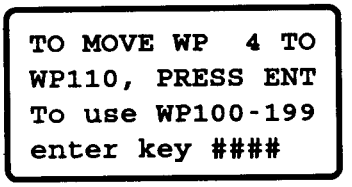
If you like, you can also use this display to move the coordinates of any waypoint to any other waypoint. To do this, simply key in the waypoint numbers you want moved FROM to TO, and then press the ENT key as before.

As mentioned earlier, waypoints 100-199 are "Secret" waypoints that you don't want anyone to see, while waypoints 1-99 are general purpose by any user having access to your GPS. As you use your GPS, you may decide that some of the waypoints between 1 and 99 are "Secret" places that should be moved to waypoints 100-199.

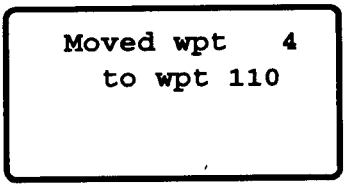
For example, let's imagine that about three weeks ago, you put the coordinates of a productive fishing spot into waypoint 4. You want to hide it from other people, and decide to move waypoint 4 to a secret waypoint - let's say waypoint 110. To do this, put the right numbers into the correct area of the display. For example, to move the coordinates of waypoint 4 to waypoint 110, press:

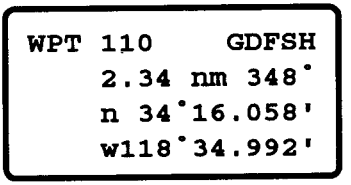


The display will look like this:



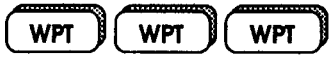
When you've put your numbers in the proper area of the display, press ENT. You will then see a display telling you that waypoint 4 has been moved to waypoint 110, followed by a display of waypoint 110.





MAKING A WAYPOINT A SPECIFIED RANGE AND BEARING FROM ANOTHER WAYPOINT

The third display under the WPT key (when you're not using MGRS or TD coordinates) looks similar to this:




```
TO PUT POS IN WP
 26, PRESS ENT
SET WP    2  0.00
000°FROM WP    1
```

This display is used to create a waypoint whose coordinates are a specific distance and a specific bearing from another waypoint. This feature allows you to make waypoints without looking at a chart.

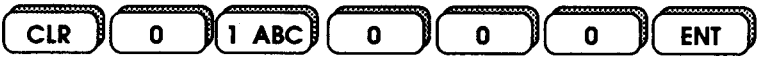
Imagine yourself at waypoint 5 - your harbor entrance buoy, and your buddy has radioed to tell you that he's catching fish like crazy. You ask him his location and he responds that he doesn't know - but that he is about 10 miles from the harbor entrance buoy. He tells you that he was steering around 260 degrees.

You can find the position of your buddy's fishing spot by telling your Supersport to create a waypoint (let's say waypoint 20) ten nautical miles away at a 260 degree compass bearing from your harbor entrance buoy (waypoint 5). To do this, first you must tell the Supersport the waypoint you want to create (in this case waypoint 20).

The display should look like this:

```
TO PUT POS IN WP
  26, PRESS ENT
SET WP   20  0.00
000°  FROM WP   1
```

Next, tell the GPS your buddy's distance from waypoint 5 (10 nautical miles).



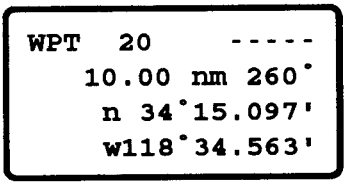
The display will read:

```
TO PUT POS IN WP
 26, PRESS ENT
SET WP   20 10.00
000°  FROM WP   1
```

Now, tell the Supersport the compass heading you want to maintain to arrive at your buddy's position (260 degrees).

Finally, you tell the Supersport the waypoint you're coming from (waypoint 5).

The new waypoint will then be displayed. You can now read your buddy's position, and the range and bearing from your present position to him.



The Supersport has calculated the coordinates of your buddy's location, put them into waypoint 20, and set up the waypoint 20 display showing lat/lon, and range and bearing from present position.

ENTERING WAYPOINTS IN MILITARY GRID REFERENCE SYSTEM (MGRS)COORDINATES

The Supersport provides the capability of creating or looking at waypoints in MGRS coordinates.

U.S. Topographical maps generally show an MGRS grid, with a few Lat/Lon marks on the side. Thus MGRS is much more convenient for use in land navigation with topographical maps.

MGRS is a very complicated system that is defined from 80° south latitude to 84° north latitude. This area is broken into squares 100,000 meters on a side, oriented north and east. The coordinates are the number of meters east and north of a reference point, and the reference points are defined by numbers and letters. It is technically a transverse cylindrical projection. The computations in the Supersport which do the coordinate conversion for MGRS have typical errors of 5

meters, and maximum errors of 15 meters.

The maps using MGRS are prepared using a specific mathematical description of the shape of the earth, called a map datum. There are one hundred and thirty-four such datums in the Supersport, plus a special datum that can be set in by the user, from the keyboard. The choice of the proper datum is very important. Using different datums will typically change the coordinates by 100 meters. There is a system of standard datums for all the 100,000 meter squares, and the Supersport can be set to use the standard datum for all locations. These standard datums are the first eleven in the list.

A substantial portion of all MGRS maps in existence do not use the standard datum. For good correspondence, it is necessary to check each map you use, and select the non-standard datum for the Supersport, if the map uses a non-standard datum.

To make matters worse, many MGRS charts available and in use are riddled with errors of all kinds. If you find an instance of substantial (more than 200 meters) difference between GPS and map coordinates, it is most likely that the map is in error. Most of the U. S. Government publications describing MGRS are likewise full of errors, and caution is to be urged in using these books.

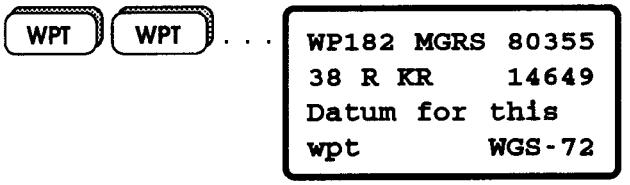
Micrologic has very meticulously prepared its MGRS and UTM programs, and tested the results extensively, as part of providing more than 12,000 electronic navigators to the U.S. Armed Forces. Of the substantial differences between navigator coordinates and charts that have been brought to our attention, all have been chart errors so far.

ENTERING WAYPOINTS IN MGRS COORDINATES

Waypoints can be entered in the GPS in MGRS (Military Grid Reference System) coordinates, only if the SETUP item MGRS/UTM is ON. If it is OFF, the waypoint display of MGRS coordinates will not appear.

If the SETUP item MGRS/UTM is ON, you can enter a waypoint in MGRS coordinates with the following steps;

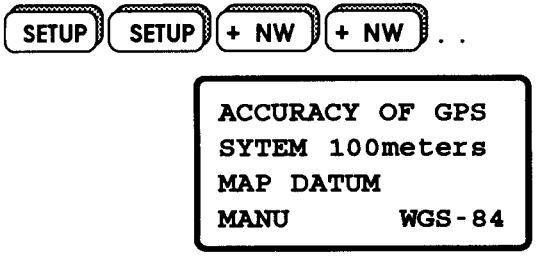
1. Press the WPT key one or more times until the MGRS display appears.



2. Select the desired datum for the coordinate conversion.

All MGRS and UTM charts are prepared using a specific map datum, or mathematical description of the shape of the earth. The SuperSport GPS can be set to automatically select the standard map datum, or you can manually select the datum. If the datum selection is set to AUTO, then the standard datum will be selected each time you enter a waypoint, based on the waypoint position.

To select automatic datum selection, call up the MAP DATUM display in the SETUP list.



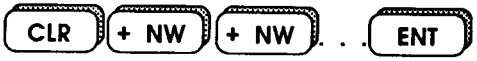
To change the datum selection to AUTO, press the CLR key several times until the cursor is in the AUTO/MANU field, and then press ENT. (The selection is changed from MANU to AUTO, or from AUTO to MANU by the same procedure.)

After entering the MGRS coordinates into the waypoint, check to see that the datum indicated in the margin of the navigation chart you are using is the same one that was chosen automatically, and shown in the MGRS waypoint display.

If it is not, then you will have to manually select the datum indicated in the chart margin, for best correspondence with chart coordinates.

To do this, press the CLR key several times, until the cursor is in the AUTO/MANU field. Now press the + key until the field reads MANU, and then press ENT.

The datum can now be selected by pressing CLR one or more times until the cursor is in the datum field on the bottom right hand part of the display. Then press the + key a number of times until the desired datum selection is on the display. When you get the desired datum, press the ENT key.




```
ACCURACY OF GPS
SYTEM 100meters
MAP DATUM
MANU     AUST. 66
```

The datum selected will be used for conversion of waypoint coordinates, and for computation of present position from the satellite signals. If you have changed the datum for purposes of waypoint entry, remember to change it back to the one you want to use for navigation.

There are 134 datums available in the Supersport, plus one user entered datum. The available datum selections are listed, and the subject of automatic and manual datum selection is described in more detail in Section 11 of this manual.

3. Select the waypoint.

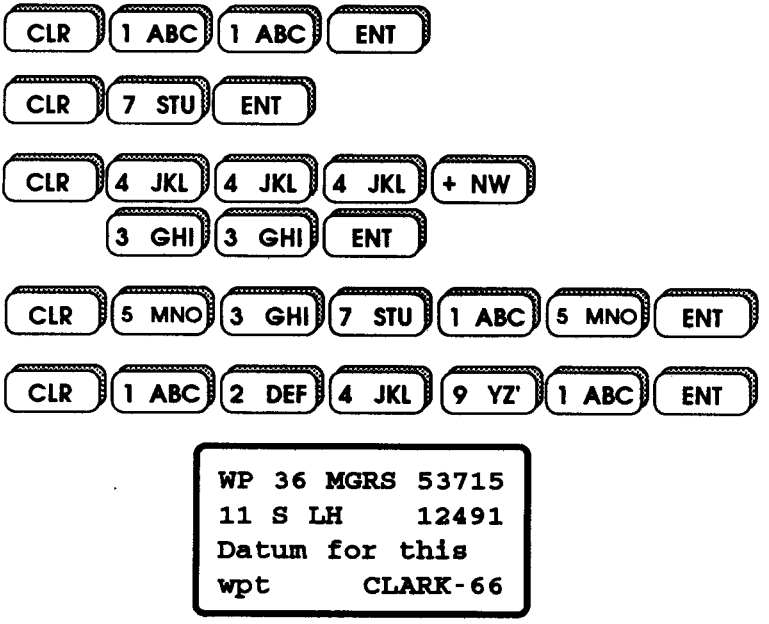
Select the MGRS waypoint display by pressing the WPT key several times until the desired display comes up. Then enter the waypoint number. For example, to select waypoint 36, do the following:


```
WP 36 MGRS 66022
31 N AA    00000
Datum for this
wpt
```

4. Enter the MGRS coordinates into the waypoint MGRS display.

For example, let's enter the following coordindates:

Grid Zone	11 S
100,000 meter square designator	LH
Easting	53715 meters
Northing	12491 meters




```
WP 36 MGRS 53715
11 S LH    12491
Datum for this
wpt      CLARK-66
```

The MGRS coordinates are entered and converted into lat/lon, UTM, and TD coordinates, which can be seen on the other WPT displays.
The datum shown was the one used for this waypoint entry, and will be remembered even if the datum in the SETUP list is changed for operation in other parts of the world.

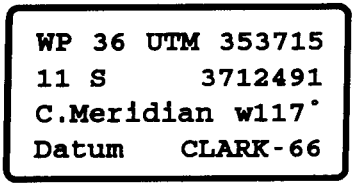
To view any waypoint in MGRS coordinates, that was entered in Lat/Lon or other coordinates, simply press the WPT key several times until the MGRS display comes up, and then select the desired waypoint number.

ENTERING WAYPOINTS IN UNIVERSAL TRANSVERSE MERCATOR (UTM) COORDINATES

To enter a waypoint in UTM coordinates:

1. Press the WPT key several times until the UTM display appears.
If it never appears, it means that the SETUP item MGRS/UTM is OFF, and it will have to be turned ON to get the UTM display under the WPT key.

. .



2. Select a datum.
3. Select a waypoint number
4. Enter the UTM coordinates into the UTM display.

You must enter the Grid Zone, Easting, and Northing. The Grid Zone is used to automatically compute the Central Meridian. (The Central Meridian cannot be input manually) Steps 1, 2, 3, and 4 are essentially the same as for MGRS coordinates. After the waypoint is entered in UTM coordinates, the corresponding lat/lon, MGRS, and TD coordinates can be seen in the other WPT displays.

ENTERING WAYPOINTS IN LORAN TD COORDINATES

If you usually use Latitude and Longitude, you might think to yourself "What am I going to use Loran TDs for?". Well imagine yourself at waypoint 5 - stranded, and you need help fast. You use the radio, only to find that the nearest ship is equipped with a Loran that only shows TDs. The ship's Captain informs you that he only can locate you if you know your position in Loran TDs. With the Supersport GPS, you can observe your TDs, radio your position in TD numbers, and are soon rescued.

Or imagine you've invited some friends to go fishing, and one of them, crafty old fisherman that he is, has brought along his black book of neverfail fishing locations. The only problem is, they're all in TDs, since they were gathered long

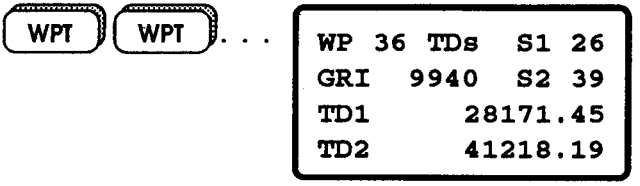
before the age of satellite navigation. With the Supersport, you can enter them directly into a waypoint and go directly there.

The truth is, you can go close to there. The GPS measurement of position converted to TDs doesn't have the landpath errors of the loran system of navigation, so the point you go to will not be exactly the same as with a loran. You can expect a hundred yards of error, or more if the loran geometry is not good.

Another use of GPS TDs is in the fringe areas of loran. In the edges of loran coverage, loran may work well only in good weather, or there may be frequent 10 microsecond errors, because the loran signals are too poor for reliable cycle selection. If you have the Supersport GPS and a loran receiver, you can use the GPS to detect the 10 microsecond errors, and calibrate the bias errors between loran and GPS in that area to get accurate navigation in all weather. You can then make good use of old fishing data gathered in TDs. This can be done by using the GPS to make certain there are no 10 microsecond errors, using the loran to go to the precise spot in good weather, and then use the GPS again to get the precise coordinates of the spot for future GPS navigation.

To enter a waypoint in loran TD coordinates:

1. Press the WPT key several times until the TD display appears.If if never appears, it means that the SETUP item LORAN TD is OFF, and it will have to be turned ON to get the TD display shown below.



2. Select the 4 digit GRI, and enter it into the above display. To enter a waypoint in TDs, only GRI, TD1, and TD2 are required. The following list gives the GRI and Secondary Identification (S1 and S2) numbers for all the loran transmitters in operation in 1992:

LORAN TRANSMITTER LIST

4990
Central Pacific
10 Upolo Pt.
28 Kure

5930
East Canadian
10 Nantucket
24 Cape Race
37 Fox Harbor

5970
East Asian
10 Hokkaido
30 Hamp Yong
41 Gesashi

5990
West Canadian
10 Shoal Cove
26 George
40 Port Hardy

6780
South China
11 Unknown
24 Unknown

7170
S. Saudi Arabian
10 Salwa
25 Afif
38 Al Lith
51 Al Muwassum

7930
Labrador Sea
10 Cape Race
25 Angissoq

7950
Eastern Russia
10 Petropavlovsk
29 Ussuriysk
45 Kuril'sk
60 Okhotsk

7960
Alaska Gulf
10 Narrow Cape
25 Shoal Cove
43 Port Clarence

7970
Norwegian Sea
10 Boe
25 Sylt
45 Sandur
59 Jan Mayen

7980
Southeast US
10 Grangeville
22 Raymondville
42 Jupiter
58 Carolina Beach

7990
Mediterranean Sea
10 Lampedusa
28 Kargabarun
46 Estartit

8000
Western Russia
9 Petrazavodsk
24 Slonim
49 Simferopol'
64 Syzran

8290
North Central US
10 Baudette
26 Gillette
41 Williams Lake

8970
Great Lakes
10 Malone
27 Seneca
43 Baudette
58 Boise City

8990
N. Saudi Arabian
10 Salwa
24 Ar Ruqi
39 Ash Shaykh Humay
55 Al Lith
68 Al Muwassum

9610
South Central US
10 Gillette
24 Searchlight
39 Las Cruces
51 Raymondville
64 Grangeville

9940
US West Coast
10 George
26 Middletown
39 Searchlight

9960
Northeast US
10 Caribou
24 Nantucket
38 Carolina Beach
53 Dana

9970
Northwest Pacific
10 Marcus
29 Hokkaido
54 Gesashi
80 Barrigida

9980
Icelandic
10 Angissoq
29 Ejde

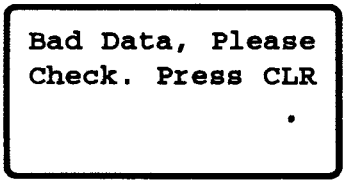
9990
North Pacific
10 Attu
28 Port Clarence
42 Narrow Cape

Enter the desired loran TD coordinates into the bottom two lines of the display.

After the second TD is entered, the navigator will automatically convert the TD pair to lat/lon, MGRS, and UTM, and store the waypoint lat/lon in memory.

NOTE

Not all TD pairs correspond to a Lat/Lon position! If you enter a TD pair that is not valid, or one that exists in a region of very poor loran geometry, the conversion will not take place, and you will get the following display:



If you get the above display, and you are trying to use a TD pair with poor geometry, you can sometimes get a successful conversion by entering a Lat/Lon into the waypoint that is close to the correct position, before entering the TD pair.

For a TD pair entered by keyboard to be successfully converted to Lat/lon (so that it can be used by the GPS navigator), the following conditions must be satisfied:

1 The TD pair must correspond to an actual Lat/Lon location, and the loran geometry at that place must be adequate for a good position fix.

2 The four digit GRI number must correspond to the TD pair entered.

If any of these conditions are not met, the waypoint Lat/Lon field will be left alone and you will get a display of "Bad Data, Please Check. Press CLR".

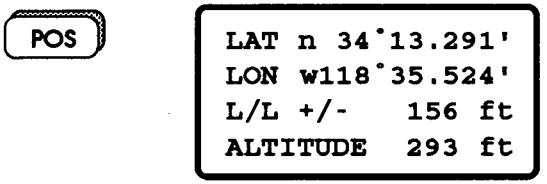
SECTION 5

POSITION, SPEED, AND COURSE

The displays available under the "POS" key will show your position, just as the abbreviation "POS" on the key suggests. You can also look at the quality of the GPS signals at your present location.

PRESENT POSITION LAT/LON

Upon first depression of the "POS" key, the following display will appear:



The computed latitude, longitude, and altitude coordinates of your present location are displayed. In this example, the GPS is at 34 degrees, 13 minutes and 291 thousandths minutes north latitude and 118 degrees, 35 minutes and 524 thousandths minutes west longitude. This display also shows your altitude above mean sea level, and the expected accuracy of the Lat/Lon position. The above display shows an altitude of 293 feet, and that a typical error in the displayed position with respect to true geodetic latitude and longitude is 156 feet. The actual error may sometimes be less and sometimes more, but on average the error will be 156 feet.

The accuracy number may change slowly, or it may quickly jump to a different value. The accuracy is affected by the position of the satellites in the sky, and these rise, move across the sky, and set like the sun. They are in twelve hour orbits, so they will rise and set at very nearly the same times each day. Thus the satellite positions in the sky will be very nearly the same, at the same time each day. The accuracy number may suddenly drop when a new satellite is first received, and it may suddenly increase when a satellite is lost as it nears the horizon. The minimum elevation angle a satellite can be tracked is about five degrees above the horizon,

because at lower elevations multiple reflections of the radio signal from the satellite, off land or water, make the signal too unclear to receive accurately.

When using the GPS on land, the typical minimum usable elevation angle above the horizon is 15 - 20 degrees. This is because the signals of lower elevation satellites are cut off by hills, trees, and buildings.

The position and navigation displays are updated every second.

FLASHING DISPLAYS

Whenever the accuracy number exceeds 1000 feet, the Lat/Lon displays, and all the navigation displays will flash on and off. This is a warning signal - When the display flashes, the displayed information may be greatly in error. The speed displays, such as Speed and Course, will flash on and off whenever the accuracy number is 500 feet or larger. That is because the computed speed may develop significant errors when the accuracy number is between 500 and 1000 feet.

ALTITUDE, ACCURACY, AND SIGNAL QUALITY

Typical altitude errors are about twice as large as position errors. Thus altitude errors are typically 400 feet, and they can be much larger if the satellite geometry is poor. For marine navigation, lat/lon errors are slightly reduced by setting the GPS in the manual altitude mode, and entering accurate altitude from the keyboard. This operating mode is automatically chosen after the First Start procedure.

SELECTIVE AVAILABILITY

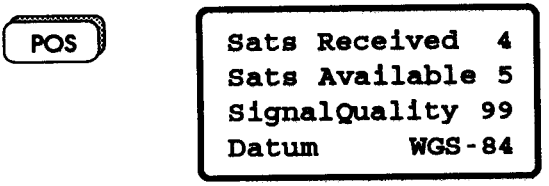
The GPS system normally provides position accuracies of 300 feet or better, 95 per cent on the time.

When the system was first put up, and during the war in the Persian Gulf, the accuracy was much better, with accuracies of 50 feet or better 95 per cent of the time. The satellites are operated by the U. S. Air Force, which deliberately de-

grades the system accuracy, most of the time. This is called SELECTIVE AVAILABILITY, and is done to deny high accuracy operation to military users other than the United States and its allies. Selective availability may be changed or turned off from time to time, but at the present time the accuracy will be no worse than 300 feet 95 per cent of the time, when three or more satellites can be received at once.

SATELLITE AVAILABILITY, SIGNAL QUALITY, AND MAP DATUM

Satellite information can be obtained by pressing the POS key a second time.



The GPS must track at least three satellites to compute latitude and longitude, and at least four satellites to compute latitude, longitude, and altitude. Satellites are being launched at a rate of five per year. The general availability of three satellites reached nearly 100 per cent in 1991, and four satellites at all times are scheduled by 1994. The display above tells us that 5 satellites are available, and four are being received. When the GPS is first turned on, this display will show zero satellites received, and the number that are available (have an elevation angle of at least 15 degrees above the horizon). The Supersport will generally find and track the available satellites within one to three minutes after being turned on. It may take longer if the antenna does not have a good view of the horizon, but has a view obstructed by masts, rigging, and ship's structure.

The number of satellites available will change with time, as the satellites rise, move across the sky, and set. Since February of 1991, however, three satellites or more have been available almost all of the time.

The Supersport will sometimes acquire and track satellites with elevations lower than 15 degrees. When this happens, the newly acquired satellite is added to the lists of both re-

ceived and available satellites. Thus it may happen that the display initially shows only two satellites available, and then shows three several minutes later. Although the GPS will easily acquire and use satellites with elevations of 5-15 degrees under ideal conditions, the minimum elevation necessary for reliable operation under average to severe conditions is fifteen degrees.

RECEIVED SIGNAL QUALITY EVALUATION

The second POS display also shows a two digit number called "Signal Quality". This display is the average signal quality for all of the received satellites. It varies from 0 to 99, and has the following meaning:

80-99	Superb receiving conditions, typical of clear antenna view of satellites and little antenna motion caused by pitching and rolling.
50-79	Average receiving conditions while under way, with moderate pitching, rolling, and bounding from waves.
30-49	Adequate receiving conditions with severe pitching and rolling, and sharp shocks from rising and falling on waves.
Below 30	Reception may be unreliable. The antenna may be mounted in a place where its view of the horizon is severely cluttered by the ship's structure. Other antenna locations should definitely be tried.

WARNING INDICATOR

Keep in mind, when the digits on any display are flashing, the information the GPS is showing may be in error. DO NOT USE ANY DISPLAY FOR NAVIGATION UNTIL THE FLASHING STOPS.

MAP DATUM

The displayed present position Lat/lon and other coordinates are computed from the map datum displayed in the

SETUP list. Datum selection is set at MANUAL, and the datum is set at WGS-84 by the First Start Procedure. If you want a different datum, you must manually select it, or set the selection from MANU to AUTO. In general, automatic datum selection is appropriate only for terrestrial use, as marine charts now use WGS-84 in most places in the world. To change the datum, call up the following display:

SETUP SETUP + NW + NW . . .

```
ACCURACY OF GPS
SYSTEM 100meters
MAP DATUM
MANU          WGS-84
```

To change the datum, press CLR several times until the cursor is in the datum field, and then press the + key a number of times until the desired datum is shown. Then press the ENT key to complete the selection. The datum selection process is further described, and a list of available datums is given in Section 11.

SPEED AND COURSE

To see your Speed and Course, press the SPEED key.

SPEED

```
SPEED     13.4 kts
COURSE     175°mag
VMG       12.5 kts
TO BUOY4      179°
```

The display shows that your speed over the ground is 13.4 knots, and your magnetic course over the ground is 175 degrees. Note that this is not necessarily your speed through the water, or your vessel heading. They will be different if you are affected by winds and currents.

VMG, or Velocity Made Good is the Speed Over The Ground in the direction of the "TO" waypoint. It is the same as Speed Over The Ground if you are heading directly toward the "TO" waypoint; it is zero if you are headed at right angles to the direction to the waypoint, and it is negative if

you are headed away from the destination waypoint. The display above shows a VMG of 12.5 knots in the direction of the TO waypoint, which is named BUOY4. The TO waypoint is at a bearing of 179 degrees from present position.

VMG is particularly useful for sailors sailing upwind. In this case one cannot sail directly upwind, and must tack at an angle to make progress. You can test the effect of small sail or direction changes by observing their effect on VMG.

SPEED AND COURSE FILTER

The Supersport GPS receiver measures the speed and course over the ground of the receiving antenna. This measurement is generally accurate to about one-tenth knot (0.1 knots, with Selective Availability off) and responds to changes in speed within one second.

The antenna speed, however, is affected by pitching and rolling of the vessel. For this reason, it is best to mount the antenna as low as possible on the vessel, while still having a view of the sky with few obstructions. Sometimes it is necessary to mount the antenna high on the vessel, with the result that the displayed speed and course will wander back and forth due to the pitching and rolling of the boat.

For this reason, the Supersport is equipped with a Speed and Course Filter, which averages the speed and course for a period of time to diminish the effects of pitching and rolling. You can set the filtering time to give the best results. A large filtering time reduces the effects of vessel rolling, but gives a display that is slow to respond to changes in vessel speed.

The filter is initially set to 2 seconds. If you would like to reduce the variation in your speed and course displays, first try setting the filter time to five or ten seconds, and then larger if you want the display to be smoother.

The Speed and Course Filter display can be seen by pressing the SETUP key twice, and then the + key a number of times until the desired display comes up:

SETUP SETUP + NW + NW

```
ALTITUDE      MANU
VEHICLE       BOAT
speed and course
filter      2 sec.
```

To set the filtering time to 10 seconds, do the following:

CLR CLR CLR 1 ABC 0 ENT

ELAPSED DISTANCE

Elapsed Distance is available on the second press of the SPEED key.

SPEED SPEED

```
ELAPSED DISTANCE
    104.65 nm
To reset to zero
Press CLR, ENT
```

Elapsed Distance is exactly the same as the odometer on an automobile. It will tell you how far you have travelled, since it was last set.

To reset Elapsed Distance to zero, select the above display and press the CLR and ENT keys.

NAUTICAL MILES, STATUTE MILES, OR KILOMETERS?

Up to now, all the distances and speeds displayed by the GPS have been expressed in nautical miles and nautical miles per hour (knots).

It is possible to change the navigator so all distances and speeds are expressed as statute miles and statute miles per hour (mph), or as kilometers and kilometers per hour (kph).

This can be done in the SETUP list.

SETUP SETUP + NW + NW + NW

```
LL FORMAT MM.MMM
DIST/SPD  nm/kts
ALT/ACC     feet
```

The selection can be changed as follows:

CLR CLR + NW + NW . . . ENT

Each time the plus key is pressed, a new selection is presented. When the units you want are on the display, press the "ENT" key, and that selection will be entered into the computer memory.

The available selections are:

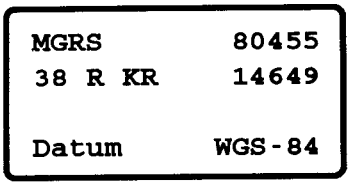
nm/kts
sm/mph
km/kph

The selection can be changed at any time, and it does not affect how any of the data are stored in memory. That is, if you have been using nm/knot, it has not had any affect on how waypoints are stored, so you can change to sm/mph and back anytime you wish.

PRESENT POSITION IN MGRS, UTM, AND TD COORDINATES

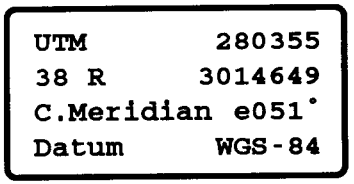
Present position can be displayed in MGRS, UTM, and TD coordinates, as well as Lat/Lon coordinates. Because many navigators do not use these coordinates, they are shown only if SETUP items controlling them are turned ON. They can always be turned OFF, to simplify the position displays.

If the SETUP item MGRS/UTM is ON, then the following two displays appear for the third and fourth presses of the POS key. If it is OFF, they do not appear.



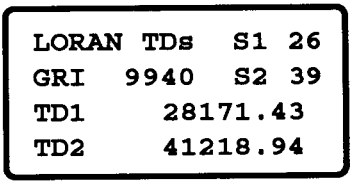
MGRS easting,
grid zone, northing

Map datum for all present position coordinates



UTM easting, 100,000 meter square designator, northing, central meridian, map datum.

If the SETUP item LORAN TD is ON, then the following display will appear for the next press of the POS key. If it is OFF, then the following display will not appear.



Secondary 1 selector
Loran GRI, Sec. 2 selector
Time Difference 1
Time Difference 2

The selection of map datums, and the GRI, S1, and S2 numbers has already been covered in Section 4. That section describes the use of MGRS, UTM, and TD coordinates in setting up and reading waypoint positions.

SECTION 6

NAVIGATING TO A DESTINATION

After putting in waypoints and finding your present position, the next thing you are probably asking is, "How do I go to a Waypoint?" The simplest way to do this is to press the WPT key twice, and follow the directions.

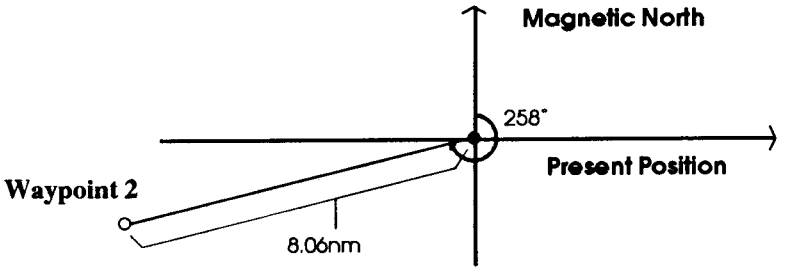
TELLING THE GPS TO GO TO A WAYPOINT NUMBER


```
TO GO TO WPT   2
BUOY4, PRESS ENT
To recall saved
waypoints, hit +
```

If you want to go to BUOY4 (waypoint 2), follow the directions and press the ENT key.


```
_        II        _
 START → BOUY4
   8.06 nm   258°
  13.4 kts   252°
```

The upper line of the window is a graphic steering display, which tells you that you are on course. That is, you are on the desired courseline from waypoint 0 (Automatically named START) to waypoint BUOY4. The destination waypoint BUOY4 is 8.06 nautical miles away from your present position. You should take a 258 degree compass heading to get there. Your present speed and course are 13.4 knots, and 252 degrees, magnetic. The following diagram represents the information contained in this display.



At this point you're probably asking yourself, "What if I don't want to go to waypoint 2? What if I want to go to a waypoint not shown in the display?" Good question. In that case, you would simply enter the waypoint number you want to go to. For example, if you want to go to waypoint 4 (named ROCKS) instead of waypoint 2, you should make the following entry:


```
TO GO TO WPT   2
BUOY4, PRESS ENT
To recall saved
waypoints, hit +
```


```
_       II       _
 START → ROCKS
  32.28 nm  163°
  13.4 kts  252°
```

Waypoint 4 (named ROCKS) is 32.28 nautical miles away. You must steer at a 163 degree compass heading to get there. Turn your vessel to a compass heading of 163 degrees to proceed to waypoint 4.

If waypoint 4 had not been named (the name field was left at -----, when the waypoint was created), the navigation display would appear as follows:

```
_       II       _
 START → Wp  4
  32.28 nm  163°
  13.4 kts  252°
```

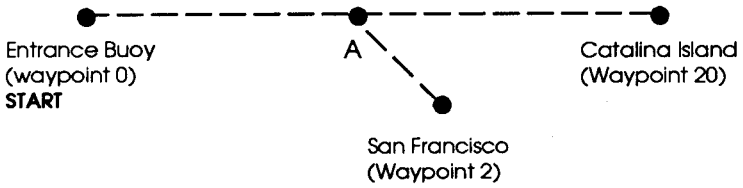
WAYPOINT 0

In the previous example, notice that the Supersport computed its courseline from START, which is waypoint 0. As mentioned earlier, the computer automatically stores its present location into waypoint 0 each time it is told to navigate to a different place.

Please keep in mind that waypoint 0 is your present position ONLY AT THE POINT YOU TELL THE GPS TO GO TO ANOTHER

LOCATION. When you are halfway towards your destination, waypoint 0 is not your present location anymore. Waypoint 0 is the location you started from, which is why it has automatically been given the name START. All other waypoints can be named by the operator, or referred to by number.

Using a diagram will allow a better understanding of waypoint START.



Now imagine you're at the entrance buoy. You tell the GPS to go to waypoint 20, Catalina Island. The GPS shows you that it is computing navigation data from waypoint 0 to waypoint 20.

In its computation process, the GPS remembers the position of your starting point (entrance buoy) by putting it into waypoint 0. It compares the buoy's position to the position of waypoint 20 to develop a courseline between waypoint 0 (entrance buoy) and waypoint 20 (Catalina Island). When you arrive at point A, waypoint 0 is not your present position anymore. Waypoint 0 is still the entrance buoy.

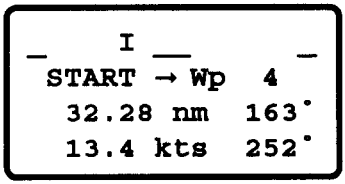
At point A you decide to tell the loran to go to waypoint 2 (San Francisco). The GPS automatically changes waypoint 0 from the coordinates of the entrance buoy to the coordinates of point A. If then computes a courseline between waypoint 0 (point A), and waypoint 2 (San Francisco).

Waypoint 0 is a valuable feature because it allows you to tell the GPS where you would like to go without having to tell it where it is coming from. Just as you did in the previous examples, the GPS automatically tells itself where it is coming from so you do not have to. Once the GPS knows the place it's coming from and the place it's heading, it can develop a courseline.

CHANGING THE DESTINATION WAYPOINT

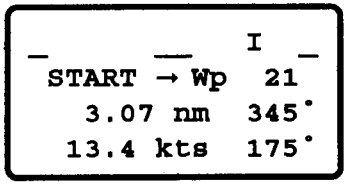
If you press the NAV key, you will get the basic navigation display.

NAV



If you want to change the destination waypoint to a higher numbered waypoint, simply call up the above display and press the + key. The destination will be changed to the next higher numbered waypoint that isn't empty. All empty waypoints will be skipped. The waypoint name will show up in the field to the right of the arrow, if the waypoint is named. If it isn't, its number will be shown. For example, if the next nonempty waypoint is waypoint 21, and it isn't named, then pressing the + key will have the following effect:

+ NW



To step upward to the second nonempty waypoint, simply press the + key twice.

If you have to slew through many waypoints, hold the + key down and you will go rapidly through the waypoint list.

Pressing the - key will have a similar effect, except you will step downward to smaller numbered waypoints.

HOW THE DESTINATION WAYPOINT STEPPING WORKS

When you step the TO, or destination, waypoint, the FROM waypoint is changed also. If From is START, it is left at START, and present position is loaded into START (waypoint 0) at that time. Thus the courseline will automatically be set up from where you starting from, to the TO waypoint. Remember that waypoint 0 is automatically named START.

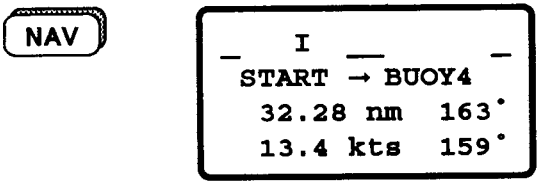
If FROM is not Wp 0, and you change the TO waypoint, the previous TO waypoint will be put into FROM. This enables you to navigate along a sequence of waypoints by simply calling up the NAV display, and pressing the + or - keys.

STEERING WITH THE OFF COURSE METER (GRAPHIC STEERING)

With the Supersport you can steer toward your destination by using a meter on the display. The meter is shown on the top display line for the first two NAV displays.

The meter shows where you are in relation to your courseline. The two horizontal bars in the center of the meter represent your boat. The vertical bar represents your courseline. In the previous example, since the vertical bar (your courseline) is to the left of the center bars (your boat), you would have to steer left to get back to your courseline.The meter not only tells you that you're off course, it tells you the distance you're off course (Crosstrack Error), as well.

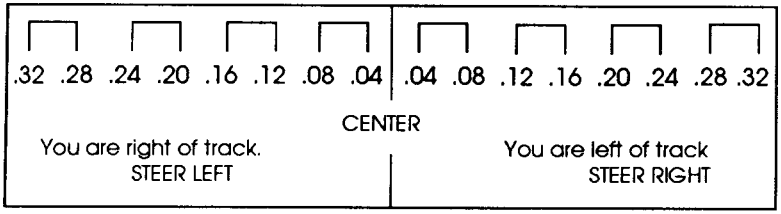
The normal scaling of the graphic crosstrack error display is +/- 0.32 nm. This means that 0.32 nautical miles separate the center and the far right portion of the meter, and 0.32 miles separate the center and the far left portion of the meter.



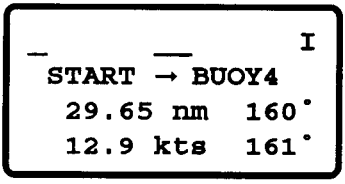
In this example, the courseline is left of the center of the meter, about a quarter of the way between the center and

its farthest left portion. One quarter of the total left side scaling is 0.08 nautical miles. Therefore, the meter is telling you to steer left; you are 0.08 nautical miles to the right of your courseline. The bottom line of the display shows that you are 32.28 nautical miles from your destination. You should follow a compass heading of approximately 163 degrees to get there. Your speed over the ground is 13.4 knots, and your course over the ground is 159 degrees magnetic. If you want to calculate your exact crosstrack error using the meter, we have prepared the chart below that shows possible positions at which to observe the courseline and their corresponding off course values.

OFF-COURSE METER VALUE CHART



If you're off course more than the maximum scale value (in this case, 0.32 nautical miles), the courseline will be at the meter's limit.



STEER RIGHT - You are at least 0.32 nautical miles to the left of your courseline. If you want a different scaling of the graphic steering display, you can change it using a display located under the "SETUP" key, which will be explained later. If you are on course, two vertical bars will appear in the center of the meter.

OTHER NAV DISPLAYS

If you press the NAV key a second and third time, you will get the following displays:

NAV

```
_          ___     I    _
BOUY4    4.36  093°
13.4 n  34°13.291'
085°   w118°35.524'
```

Graphic Steering Display. TO Waypoint, Range and Bearing. Speed and Course. Present position Latitude and Logitude

NAV

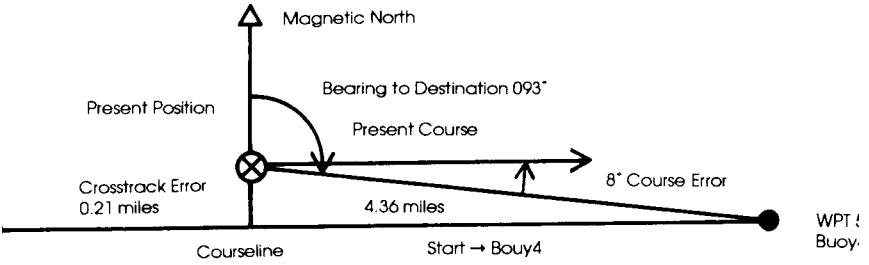
```
CTE→0.21  CE→008°
Wp  5     4.36  093°
TTG         00:17:23
ETA         15:14:06
```

Crosstrack error, Course Error, TO waypoint, Range and Bearing to the TO Waypoint, Time To Go, Estimated Time of Arrival.

The second NAV display gives you present position latitude and longitude, along with the steering information.

The third display shows numerical crosstrack error, and course error.

The above display shows the following situation:



The upper line of the display shows Cross Track Error (CTE), and Course Error (CE). Crosstrack Error is a term that represents the perpendicular distance between your current position and the courseline. In other words, if you want to know how far off course you may be, you look at Crosstrack Error to get the answer. In this example, you are 0.21 nautical miles away from the courseline. The arrow to the right of the letters CTE shows the direction you should steer to get back on the courseline. In this example, you need to steer right to return to your courseline. Course Error is the difference between the course that you're on and the course that you

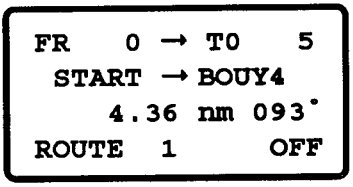
should be on to get to your destination. In other words, Course Error represents your course correction. In the above example, the course that should be maintained to arrive at your destination is 093 degrees (designated by the bearing to waypoint). Course Error is reading 8 degrees, with an arrow beside it pointing to the right. This means that you should change course 8 degrees to the right to travel directly toward your destination, from your present position.

The bottom part of the display gives you your Time To GO (TTG), and Estimated Time of Arrival (ETA). The display shows that you will arrive at the destination waypoint in 17 minutes and 23 seconds at your present speed, and your arrival time will be 3:14:06 pm.

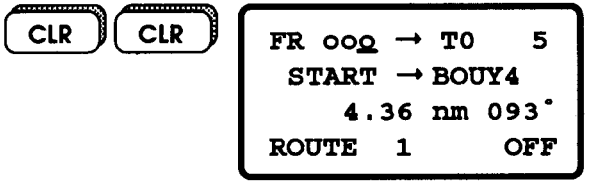
Thus far you've learned how to make half of a courseline. In the previous section you learned how to tell the Supersport to go somewhere, but at this time you still don't know how to tell it where you're coming from. In the preceding examples, the GPS automatically told itself where you were coming from by using waypoint zero (START) as a reference.

At this point, you're probably asking, "How do I tell the GPS where it's coming from if I don't want to use waypoint 0? What if I'm coming from waypoint 1. Can I tell the GPS that? Of course you can. To do this you would use the first "ROUTE" display.

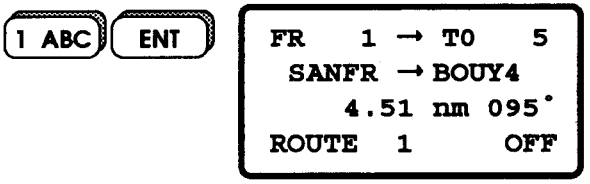
ROUTE



Suppose you've already told the GPS you want to go to waypoint 5. You notice, after selecting the above display, that the GPS has calculated a courseline from waypoint 0 to waypoint 5, but waypoint 0 confuses you a bit. You know you're still close to waypoint 1, so you decide to eliminate the confusion by telling the GPS to calculate its courseline between waypoint 1 and waypoint 5. To do this, press the "CLR" key until you see small zeroes next to the "FR" in the display.



Tell the GPS you want to come from waypoint 1 by pressing:



Notice that the GPS has calculated a different courseline from waypoint 1, to waypoint 5. A little later on, if you want to use waypoint 0 as a reference, put in a zero beside the letters "FR" in the display exactly the way you previously entered waypoint 1. As you can imagine, it's very important that you set up a proper courseline because crosstrack error (distance off course) is calculated in reference to your courseline. You cannot accurately obtain "Off course" information if you don't set up the courseline you want to be on.

AN EXAMPLE OF BASIC NAVIGATION

Now that you're familiar with the navigation displays in your Supersport let's take an imaginary trip and show how to use the GPS to guide you to a destination.

Let's imagine that you've finished putting ten waypoints into your GPS, one of which is an oil platform. You want to tell the GPS to go to the platform, which is waypoint 8 named OIL. To go to waypoint 8, you will:

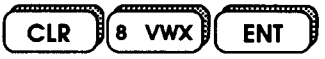
1. Tell the Supersport to go to waypoint 8.
2. Set up a courseline.
3. Use the navigational displays enroute to your destination.

There are several ways of setting up a courseline in the Supersport, all of which will result in the same navigation dis-

plays. One of the easiest ways is to use the waypoint display.


```
TO GO TO WP  182
ROCKS, PRESS ENT
To recall saved
waypoints, hit +
```

Tell the Supersport you want to go to waypoint 8.




```
TO GO TO WP    8
OIL   , PRESS ENT
To recall saved
waypoints, hit +
```

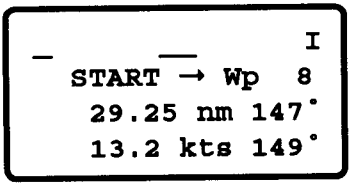
Now set up the courseline from waypoint 0 to waypoint 8. (Using the GO TO display under the "WPT" key always sets the FROM waypoint to 0, regardless of what it was before.)


```
_       II       _
  START → Wp  8
    88.34 nm 146°
    12.0 kts 175°
```

Crosstrack error is zero (you're not off course). Range is 88.34 nautical miles at 146 degrees compass bearing; your groundspeed is 12 knots, and course over the ground is 175°. You set off at an initial heading of 146 degrees. After traveling twenty miles, the display will look something like this:

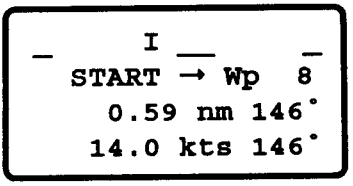
```
_        __   I   _
  START → Wp  8
    68.34 nm 145°
    15.1 kts 146°
```

You must travel 68.34 nautical miles at 145 degrees compass heading to arrive at waypoint 8. Your average groundspeed is 15.1 knots. You must drift to the right by about 0.2 nautical miles to get back on course. Steer starboard. Three hours later, you see this display:



You're 29.25 nautical miles away from waypoint 8, at a 147 degree compass heading. Steer right, because you're at least 0.32 miles to the left of your desired courseline.

When you're almost there, you see this display:



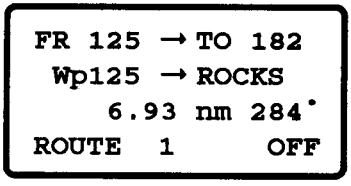
You're 0.59 nautical miles away from your destination at 146 degrees. No course adjustment needs to be made. You're about one tenth of a mile off course. Steer to Port (left) to get back to the courseline. When the range is 0.00, you've arrived at your destination.

SECTION 7

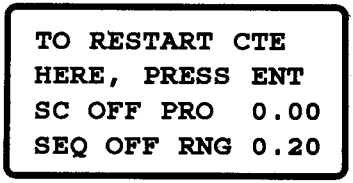
SETTING UP AND FOLLOWING ROUTES

The displays obtained by pressing the "ROUTE" key will allow you to set up courselines and navigate automatically through a series of waypoints. The ROUTE displays are shown below:

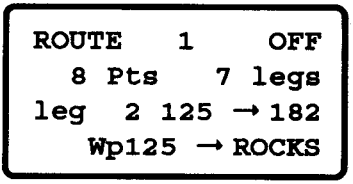
ROUTE



FROM and TO waypoint numbers
FROM and TO waypoint names
Range and Bearing to TO waypoint from FROM waypoint.
Shows if Route Function is on.



Press ENT key to zero crosstrack error
Specified Course Angle, and Parallel Route offset. Automatic Sequence control and trigger range.



Route number and ON/OFF control
Number of points and legs.
Waypoint numbers in leg
Waypoint names in leg.

These displays will now be explained in detail.

TWO POINT RANGE AND BEARING

The first "ROUTE" display shows the range and bearing between the beginning and ending waypoints of your courseline. As you navigate toward your destination, the range and bearing in this display will never change. It will remain constant because the information in the display is only a calculation between two points that are always the same.

Normally, you'll do two things with this display. You'll use it to set up a courseline, or calculate the entire distance of a trip that you want to take.

The second display line shows the FROM and TO waypoint names. If either waypoint has not been named, its name in this display will be shown as WpXXX, where XXX is the waypoint number, 0 - 255. (Waypoint 0 is automatically named START by the GPS)

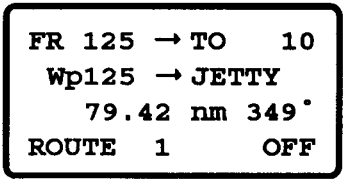
SETTING UP A COURSELINE

To set up a courseline, put the waypoint number that you're going to into the space beside the word "TO". Then, put the waypoint number that you're coming from, in the space beside the letters "FR". Then, the Supersport will calculate a courseline between the two waypoints, and show you the range and bearing between the two.

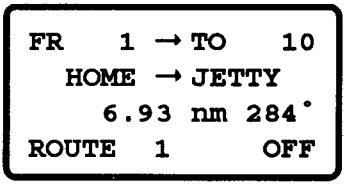
For example, imagine you're at waypoint 1, and you want to go to waypoint 10. As previously mentioned, the first two steps of GPS navigation are:

1) Tell the GPS to go to a waypoint.
2) Set up a courseline. With this display, you can do both of these steps at once.

To tell the Supersport to go to waypoint 10 press:



After that, tell it where you're coming from. Press:



In this example, 6.93 nautical miles separate waypoint 1 and waypoint 10. The compass heading from waypoint 1 to waypoint 10 is 284 degrees.

At this point, you may be asking yourself, "Didn't I already know two ways to tell the GPS where I want to go and how to set up a courseline to get there?" Yes, you did - by using the WPT key, or the NAV key. This is just another way of doing it.

CALCULATING THE TOTAL DISTANCE OF A TRIP

As mentioned earlier, you can also use this display to calculate the entire distance of a trip. You may want to do this to estimate fuel consumption.

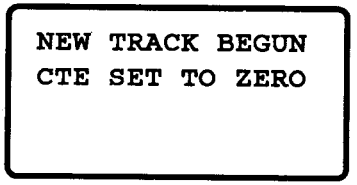
Imagine that you're about to take a trip to four different places in the same day. The four places are stored in waypoints 1, 2, 3, and 4. You plan to go from your harbor entrance (waypoint 1), continue to waypoint 2, 3, then to waypoint 4, and finally return to the harbor entrance. Before going out to sea you wonder if you have enough fuel/provisions to complete the trip. You want to find out how many total miles you're going travel. To calculate the total distance you're about to travel, simply tell the Supersport to calculate a courseline between each pair of waypoints. You can then compute the distance from 1 to 2, from 2 to 3, from 3 to 4, and from 4 to 1. Adding these four distances together will give you the total trip distance. Now, let's look at the second ROUTE display:


```
TO RESTART CTE
HERE, PRESS ENT
SC OFF PRO  0.00
SEQ OFF RNG 0.20
```

REESTABLISHING A COURSELINE FROM PRESENT POSITION

The above display is giving you an instruction. The display is saying "If you want to re-establish a courseline from the place you're at to the place you're trying to get to, press the ENT key". As you might have already guessed, you

would use this feature if you're a long distance away from your courseline. If you're far away from your courseline, you probably don't want to go back to the courseline. You probably want to head directly toward the place you're going to. In that case, you can tell the GPS to forget about your old courseline and instruct it to set up a new one - from the place you're at to the place you want to go to. You can do this by following the directions on this display. To re-establish your courseline, choose the above display, then press ENT. When ENT is pressed, the GPS will show you that it's created another courseline.



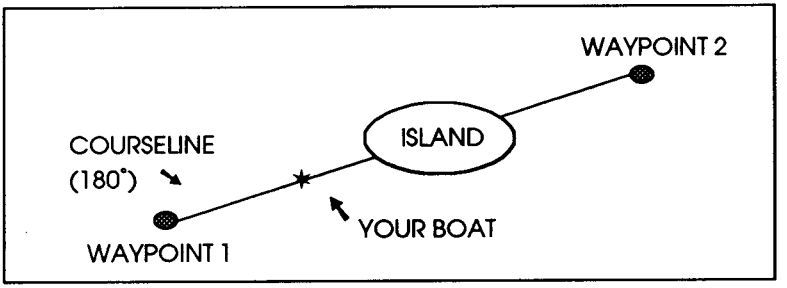
Afterwards, the NAV displays will show you that you're exactly on course (CTE is 0.00). You're on course because you're actually at the beginning point in the new courseline. Using the new courseline, you can steer toward your destination just as you normally would.

In the left hand portion of the display the letters "SC" appear, which mean "SPECIFIED COURSE". The letters "PRO" stand for "Parallel Route Offset". In the bottom portion of the display, the letters "SEQ" represent "Sequencing", while the letters "RNG" stand for "Sequencing Range". Each of these will now be explained separately.

SPECIFIED COURSELINE

Specified courseline is a new feature not commonly found in other GPSs, although it is quite useful. This feature allows you to efficiently approach a destination at any bearing you desire.

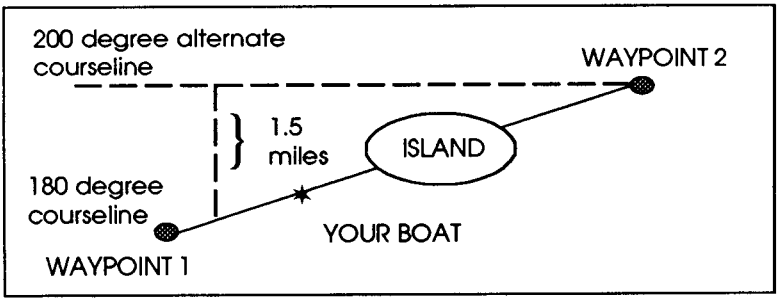
Imagine for a moment that you're at sea attempting to navigate between Waypoint 1 and 2. There is an island between the two waypoints. If you attempt to stay on the courseline, you will hit the island.



There are two ways you can efficiently navigate around the island with your GPS. One way is to create a waypoint beside the island and tell the GPS to go to that waypoint. After you've reached the waypoint, create a courseline that will let you steer toward waypoint 2.

Another way to steer around the island is to tell the GPS that you want to travel on another courseline (a specified courseline), that will allow you to reach waypoint 2 safely. It's called a specified courseline because you are allowed to specify the bearing of an alternate courseline you wish to use to get to your destination. After you choose an alternate bearing, the GPS automatically calculates a courseline that will allow you to approach your destination at the bearing that was chosen. After this is done, you can steer to the alternate courseline using the NAV displays, which show Cross Track Error (Distance off course) numerically as well as graphically.

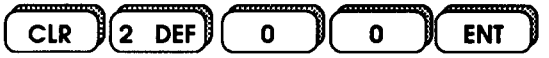
Using the previous example, let's imagine you could safely approach waypoint 2 on a 200 degree compass bearing. You therefore want to tell the GPS to create an alternate courseline (a Specified Course), that approaches waypoint 2 at 200 degrees.



To set up an alternate courseline that approaches your destination at 200 degrees, press the "Route" key until you see this display.


```
TO RESTART CTE
HERE, PRESS ENT
SC OFF PRO  0.00
SEQ OFF RNG 0.20
```

Then, press:




```
TO RESTART CTE
HERE, PRESS ENT
SC 200°PRO  0.00
SEQ OFF RNG 0.20
```

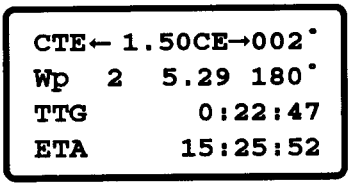
At this point you might be guessing that the GPS will forget about the original courseline between waypoints 1 and 2, and recalculate all of its navigational data from the "New courseline". Don't worry! It still remembers your original courseline. The only recalculation that it makes is that of Crosstrack Error. Crosstrack Error (Distance Off Course), is recalculated in reference to the alternate courseline, instead of the original courseline.

Looking at the previous diagram, notice that your boat is exactly on the original courseline. Before telling the Supersport to calculate an alternate courseline, the NAV display showed you this:


```
CTE→0.00 CE→002°
Wp  2  5.29 180°
TTG      0:22:47
ETA     15:25:52
```

Notice that your Crosstrack error is zero. (You're exactly on the courseline). After telling the GPS to make an alternate

courseline, the display changes to this:

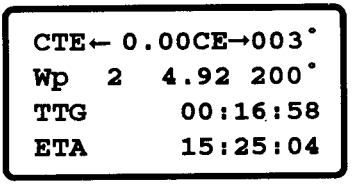


Notice that the crosstrack error indication is now telling you to steer left, you're a mile and a half away from the courseline (The alternate courseline).

By making a left-hand steering adjustment, you will:

1. Miss the island
2. Intersect the alternate courseline.

As you come closer to the alternate courseline, crosstrack error will decrease. You will also notice that the bearing to your destination will get closer and closer to 200 degrees. When crosstrack error is zero, and bearing to your destination reads 200 degrees, you've arrived at the courseline.



Now that you've reached the "Specified Courseline", use the steering displays as you normally would to go to your destination. After reaching your destination, turn the Specified Course OFF by pressing the "CLR" key until you see small zeroes beside the letters "SC" in the Specified Course display. Then, press the "ENT" key.

There are many other situations in which to use a specified courseline. Commercial fishermen might use this feature to "Drag" an area at sea, or set up a border, Pleasure boaters may use it in a tack, or to approach buoys. You'll probably think of other uses as well. Experiment and have fun!

PARALLEL ROUTE OFFSET

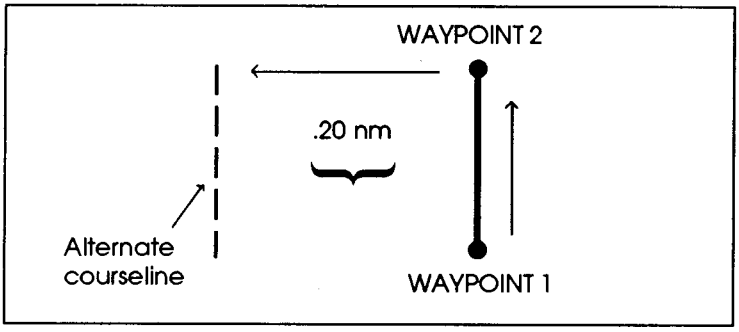
On the third line of the second ROUTE display, the letters "PRO" appear, representing Parallel Route Offset.


```
TO RESTART CTE
HERE, PRESS ENT
SC OFF PRO  0.00
SEQ OFF RNG 0.20
```

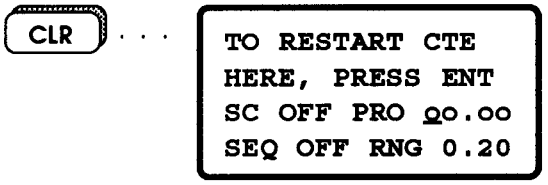
This feature allows you to create an alternate courseline exactly parallel to the original courseline. PRO is useful for running search patterns in a grid-type fashion.

Setting PRO to 0.10 and steering so that Crosstrack Error is zero will take your vessel along a line 0.10 nautical miles to the RIGHT of your original courseline. Setting PRO to -0.10 would allow you to steer to a line 0.10 nautical miles to the LEFT of your original courseline.

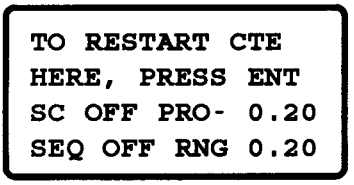
To illustrate, imagine you're a fisherman attempting to drag between waypoints 1 and 2. You want to drag an area 0.20 nautical miles to the left and exactly parallel to your original courseline, as represented in the following diagram.



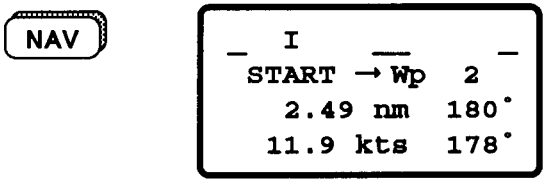
To do this, you would initially tell the Supersport to set up a courseline from waypoint 1 to waypoint 2. Next, you would tell the GPS to create an alternate courseline 0.20 miles to the left of the original courseline. Press the ROUTE key, until you see the PRO display. Press CLR until the display looks like this:



Next, press:



The Supersport will automatically create an alternate courseline 0.20 miles to the left of your original courseline. It will tell you how to get to the alternate courseline. After you have told the GPS to create an alternate courseline, choose the NAV display to look at Crosstrack Error:



Notice that the display shows that you are 0.20 miles to the right of the alternate courseline, steer left. As you steer left and approach the alternate courseline, you'll notice the Crosstrack Error indicator gets closer and closer to zero. In other words, you're getting closer and closer to the courseline. When Crosstrack Error is zero, you've arrived at the alternate courseline. Steer in the direction of waypoint 2, keeping Crosstrack Error at 0 to stay on the alternate courseline.

AUTOMATIC WAYPOINT SEQUENCING

The bottom line of this display is used for Automatic Waypoint Sequencing.


```
TO RESTART CTE
HERE, PRESS ENT
SC OFF PRO  0.00
SEQ OFF RNG 0.20
```

Waypoint sequencing is an easy way to navigate to a series of waypoints stored in numerical order. For example, waypoint sequencing would be used if you wanted to go from waypoint 1 to 2, then continue to waypoint 3, then 4, and so on.

When using the waypoint sequencing feature, navigation to a series of waypoints is simple because you're only required to set up the initial courseline of your trip. The GPS will set up all the rest of the courselines in your trip automatically. For instance, if you wanted to go from waypoint 1 to waypoint 2, to waypoint 3, to waypoint 4, the only courseline you'll need to create is the one between waypoints 1 and 2. When you're within a certain range of waypoint 2, the GPS will automatically tell itself that you want to go to waypoint 3 from waypoint 2 by creating a courseline itself - automatically. When you're within a certain range of waypoint 3, the GPS will again tell itself to go to the next waypoint in your route (in this case, waypoint 4), and create its own courseline to show you how to get there. The Supersport will repeat this process again and again, until you arrive at the final waypoint in your route.

There is a three step process involved in order to follow a "string" of waypoints. First you must set up your initial courseline, then you will tell the Supersport you want to follow the waypoints in an increasing or decreasing order. Finally, you will give the GPS a "Sequence Range". The sequence range is best described by answering this question: "How close do I want to approach a waypoint in my route before the GPS automatically shows me how to get to my next destination?" If you want the GPS to show you how to get to your next destination when you're within 0.20 nautical miles of each destination in your route, you would set the sequence range at 0.20. For example, imagine that you want to go from waypoint 5 to waypoint 6, then to waypoint 7. After you arrive at waypoint 7, you want to turn around and return to waypoint 5 along the same route.

When you come within 1/10th of a mile of each destination, you want the GPS to show you how to get to your next destination in your route - automatically.

To do this, tell the GPS to set up your initial courseline to waypoint 6 from waypoint 5. Select the ROUTE display:


```
FR 125 → TO 182
 JETTY → ROCKS
    6.93 nm 284°
ROUTE  1      OFF
```

Then press:


```
FR   5 → TO   6
 Wp  5 → BUOY3
    7.09 nm 008°
ROUTE  1      OFF
```

Next you will tell the GPS that you want to go to waypoints in either increasing or decreasing order. To do this, select the second ROUTE display.


```
TO RESTART CTE
HERE, PRESS ENT
SC OFF PRO  0.00
SEQ OFF RNG 0.20
```

Next, press the CLR key until the cursor is in the three character field to the right of SEQ. Then press the "+" key a number of times, and the field will sequence through the three choices OFF, FWD, and BWD. (Off, Forward, and Backward) If you want to follow consecutive waypoints in increasing order, step to FWD, and press the ENT key. If you want to follow waypoints in decreasing order, step to BWD, and press the ENT key to enter your selection into the computer. In our example, in the first portions of our route, we want to go from waypoint 5 to 6, then to 7. In other words, you want

to go to consecutive waypoints in increasing order, so you would set SEQ to FWD. Press CLR until you see the cursor to the right of SEQ. Then press:


```
TO RESTART CTE
HERE, PRESS ENT
SC OFF PRO  0.00
SEQ FWD RNG 0.20
```

After setting up your initial courseline and the telling the Supersport to follow waypoints in increasing order, you must tell it the "Sequence Range". Recall that once you arrive within 1/10 of a mile of each destination, you want the GPS to show you how to get to the next destination in your route. Therefore, you will set the sequence range to 0.10. To do this, press CLR until the small zeroes appear in the bottom right portion of the display.


```
TO RESTART CTE
HERE, PRESS ENT
SC OFF PRO  0.00
SEQ FWD RNG 0.00
```

Then press:


```
TO RESTART CTE
HERE, PRESS ENT
SC OFF PRO  0.00
SEQ FWD RNG 0.10
```

You are finished setting up an automatic sequence to get from waypoint 5 to 6, and on to 7,8,9, etc.

At this point, you can use any of the Supersport's navigation displays to steer to waypoint 6 just as you normally would. When you arrive within 1/10th of a mile from waypoint 6, you will notice that the GPS will automatically show you how to get to waypoint 7. Now, imagine that you've arrived at waypoint 7. Following our example, you want to

turn around and return to waypoint 5 along the same route. In other words, you want to go from waypoint 7 to waypoint 6, then to waypoint 5, following waypoints in decreasing order.

To do this, simply follow the same three step procedure. However, instead of entering a "FWD" next to SEQ, enter a "BWD" in the same area. This tells the GPS to follow the sequence in a decreasing order.

When you arrive at waypoint 5, the final point in your route, turn the automatic sequence feature OFF by pressing CLR until you see the cursor to the right of SEQ in this display. Now press the "+" key one or more times, until OFF apprears to the right of SEQ. Now press ENT to turn the automatic sequencing off.

MANUAL WAYPOINT SEQUENCING

The process described above is known as Automatic Waypoint Sequencing. Sequencing was automatic because the Supersport automatically told itself to show you how to go the next waypoint in sequence. This happened when you arrived within a certain range of one of the waypoints in the route.

As an alternative, you can manually tell the GPS to show you how to go to the next consecutive waypoint in a route by simply depressing the "+" or "-" keys while looking at any NAV display. This will step to the next higher or lower numbered waypoint, except that empty waypoints (those with latitude and longitude of zero) will be skipped.

For instance, let's imagine that you want to go to waypoint 6. When you reach waypoint 6, you intend to continue to waypoint 7, then to waypoint 8, just as you did in the previous example. The first step in MANUAL WAYPOINT SEQUENCING is exactly the same as in Automatic Waypoint Sequencing - you must set up your initial courseline. In this example, you would tell the GPS to come from waypoint 5 and go to waypoint 6, just as you did before.

The next step is performed when you arrive at waypoint 6. When you arrive at waypoint 6, simply press NAV one or more times, so the GPS will show you any NAV display. Then, press the "+" key to tell the Supersport you want to go to the next highest waypoint in sequence -in this case, waypoint 7. The Supersport will automatically create a courseline from waypoint 6 to waypoint 7 and show you how to get to waypoint 7 through the displays under the NAV key. (If waypoint 7 were empty, you would automatically step to the next highest non-empty waypoint.)

When you arrive at waypoint 7, and want to go to the next lowest waypoint in sequence (in this case waypoint 6), simply press the NAV key so the GPS will show you any of the NAV displays. Then, press "-" to tell the GPS you want to go to the next lowest waypoint in sequence (in this case waypoint 6). The GPS will automatically compute a courseline from waypoint 7 to waypoint 6, and show how to get to waypoint 6 through the navigation displays.

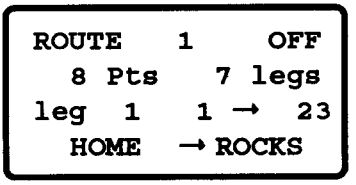
Whether automatic or manual waypoint sequencing is used is a matter of personal preference. Both methods accomplish the same task. Some people prefer to sequence manually because the process involves fewer steps. However, if your GPS is interfaced to an autopilot, automatic sequencing is advantageous because the Supersport automatically tells the autopilot to change its course without requiring the attention of the boat operator.

SECTION 8

THE ROUTE FUNCTION

The Route Function allows you to set up and follow a sequence of waypoints that are not in numerical order. Once the sequence is set up, it is kept in memory, and available for use at any time.

The third ROUTE display shows the Route Function.



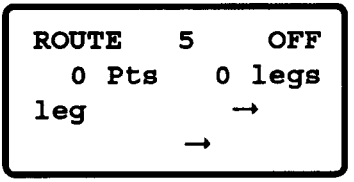
If you frequently travel the same series of waypoints, you may find it advantageous to use this display to store the series of waypoints for present and future use. A stored sequence of waypoints is called a Route. After you store a Route, you can simply tell the GPS that you want to go on a certain Route, rather than to each and every waypoint separately. The GPS will create all of the courselines in the Route automatically - exactly as in a waypoint sequence, only that the waypoints in the Route don't have to be arranged in numerical order.

A Route can contain up to 20 waypoints. Waypoint 0 cannot be used as a waypoint in a Route. You can store up to 9 Routes in the Supersport. To store a Route or activate an existing Route, use the display shown above. In the example, the top portion of the display shows that Route 1 is off. The bottom portion shows that Route 1 contains 8 waypoints, or 7 legs. A leg is a straight line (great circle, actually) from one waypoint to another.

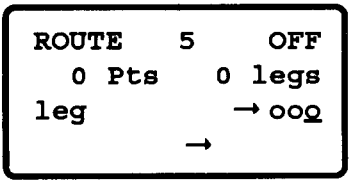
To store a Route, first you must tell the GPS the Route number you want to use. Then you will enter the waypoint numbers into the Route in the order you want.

The numbers 1 and 23 represent two waypoint numbers in

the Route, in the above example. You'll discover that these numbers represent beginning and ending waypoints in a particular leg (courseline) of the Route, and will change depending on the portion of the Route you're traveling upon and the direction in which you're traveling. Imagine that you want to go from waypoint 1 to waypoint 8, then to waypoint 22, on to waypoint 15, then back to waypoint 1. You want to store this trip as Route 5. After selecting the ROUTE display, select Route 5 by pressing:



Now, simply tell the GPS the waypoint you want to start from, followed by the waypoints you want to go to, in the order you want to go to them. In our example, you want to start from waypoint 1 and go to waypoints 8, 22, 15, and 1, in that order. To enter the waypoints in Route 5, press CLR until the cursor appears on the right in the third line.



Now you're ready to enter the series of waypoints into your Route. Remember that you want to go from 1 to 8 to 22 to 15 and back to 1. You can enter this series by pressing the following keys:

```
ROUTE    5     OFF
  5 Pts    4 legs
leg  4    15 → 1
  Wp 15   → HOME
```

You've created Route 5.

ACTIVATING A ROUTE

To activate a Route, select the number of the Route you want, then turn the Route from OFF to FWD or BWD. (Forward or Backward). For example, imagine that on Sunday morning you want to travel on Route 5. Tell the GPS you want to travel on Route 5 by pressing the ROUTE key until you see the ROUTE display.


```
ROUTE    1     OFF
 12 Pts   11 legs
leg   1   1 → 23
   HOME → Wp 23
```

Now select Route 5.


```
ROUTE    5     OFF
  5 Pts    4 legs
leg 4    15  → 1
   wp 15 → HOME
```

Now turn Route 5 from OFF to Forward.


```
ROUTE    5     FWD
  5 Pts    4 legs
leg  1    1 →   8
  HOME → LEDGE
```

When the Route is turned on, the GPS automatically creates the first leg, which is the courseline between the starting waypoint in the Route and the next waypoint in the Route. In our example, the GPS would automatically create a courseline from waypoint 1 to waypoint 8 - refer to the third line of the display. The numbers 1 and 8 (representing waypoints 1 and 8) are separated by an arrow pointing toward the 8, indicating that the GPS is instructed to go from waypoint 1 to waypoint 8. The bottom line gives the names of waypoints 1 and 8. If they were not named, they would show on the bottom line as Wp 1 and Wp 8.

FOLLOWING A ROUTE

Now you're ready to navigate to waypoint 8 by using the navigation displays as you normally would. When you arrive at waypoint 8 and want to continue to the next waypoint in the Route, press the NAV key. While looking at any of the NAV displays, you can press "+" to tell the GPS that you want to continue along your Route. After you press "+", the GPS will automatically create a courseline to the next waypoint in the Route and show you how to get there through its navigation displays. In our example, when you arrive at waypoint 8 and want to continue to waypoint 22, press NAV, followed by "+". The GPS will automatically create the next courseline in the Route from waypoint 8 to waypoint 22, then show you how to get to waypoint 22 in the NAV displays. After you arrive at each waypoint in your Route, you would repeat the process of NAV "+" to tell the GPS to automatically create a courseline. As you arrive at the final destination in the Route, the GPS will show you this message:

```
END OF ROUTE  5
FWD REACHED.
(WAYPOINT    1)
ROUTE IS NOW OFF
```

As this message is shown, the GPS automatically turns the ROUTE function off.

FOLLOWING A ROUTE BACKWARDS

When you arrive at the final destination in your Route, you may want to turn around and return to the place you started from. In other words, you might want to go backwards along the Route. In our example, let's imagine that you've arrived at waypoint 1, your final destination. After a few hours, you decide to follow Route 5 backwards, going from waypoints 1 to 15 to 22 to 8 to 1. To do this, select Route 5 exactly as you did when you started your trip. However, when you turn the Route on, change from OFF to BWD. This can be done by pressing CLR several times until the cursor is in the upper right hand field, pressing the "+" key until BWD appears in the field, and then pressing ENT. Now you can press the "-" key while displaying any NAV function, to step one leg backward through the Route.

TURNING A ROUTE OFF

To turn a Route off, you can display any NAV function, and press the "+" key a number of times until the END OF ROUTE display is obtained. In this case, you're simply stepping quickly through the remaining legs until you reach the end.

You can also call up the Route display, and change it from FWD or BWD to OFF, in exactly the same way you set it from OFF to FWD or BWD.

You may wonder why you should turn off a Route. Imagine you're in the middle of a Route and decide to go to a waypoint that isn't in the Route. You attempt to tell the GPS to go to the waypoint and realize that the GPS shows you this display:

```
Route is on,must
be turned OFF to
go to waypoints
not on Route
```

Actually, when a Route is on, the GPS won't allow you to go anywhere other than the waypoints in the Route. For this reason, you need to turn the Route off whenever you want to deviate from your Route.

ADDING A WAYPOINT TO AN EXISTING ROUTE

At certain times, you may find it convenient to insert an additional waypoint in a Route. To insert another waypoint in an existing Route, first you need to select the Route number and make sure the Route is OFF. Next, you'll press the "+" or "-" keys until two waypoints are displayed, between which you want to insert the new waypoint. Finally, you will put the new waypoint number into the right side of the third line of the display. For instance, let's add anther waypoint to Route 5 that was created a few pages earlier. Recall that the second and third waypoints in the Route are waypoints 8 and 22. Imagine that the next time you use Route 5 you want to go from waypoint 8 to waypoint 14, and then on to waypoint 22, finally continuing to your final destination. To insert waypoint 14 between waypoints 8 and 22, select Route 5 and make sure that it's off. Then the display should look like this:

```
ROUTE    5      OFF
  5 Pts     4 legs
leg  1     1 →   15
   HOME   → Wp 15
```

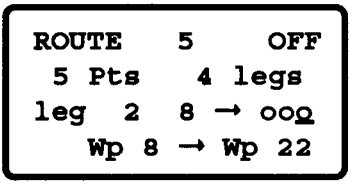
Now press "+" a number of times until you see an 8 and a 22 separated by an arrow in the middle portion of the display. The display should look like this:

```
ROUTE    1      OFF
  5 Pts     4 legs
leg  2     8 →   22
   Wp   8 → Wp 22
```

If you press "+" and cannot get the display to look like the one above, press the "-" key a few times. At some point, you should see the proper waypoints on the display.

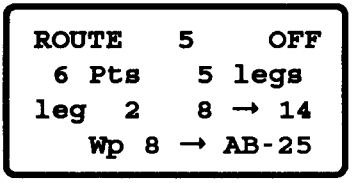
When the two waypoints between which you want to enter a new waypoint appear on the display - enter the additional waypoint number (in this case waypoint 14) in the right side of the second display line. To do this, press CLR until you see the small zeroes (cursor) in the desired field.

CLR CLR . . .



Then press:

1 ABC 4 JKL + NW

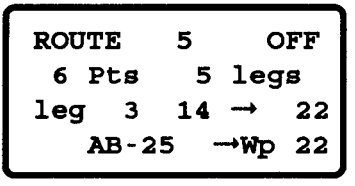


Notice that the GPS shows 6 waypoints are now in Route 5. A new waypoint has now been added between waypoints 8 and 22. .

DELETING A WAYPOINT IN AN EXISTING ROUTE

Continuing from our previous example, imagine that you want to travel directly from waypoint 14 to waypoint 15 when you use Route 5. To do this, you decide to delete the waypoint that lies between waypoint 14 and 15, which is waypoint 22. Deleting a waypoint from a Route is almost the same as adding a waypoint to a Route. The initial steps are the same. First, select the Route number and make sure the Route is turned OFF. Then press "+" or "-" until you see the waypoint number you want to delete appear on the right side of the second display line from the top. In our example, you want to delete waypoint 22 from Route 5, so press the "+" or "-" keys until the display looks like this:

+ NW or - SE . . .



To delete waypoint 22 from the route, press CLR until small zeroes replace the number 22. Then press the "-" key to delete the point.

CLR CLR CLR - SE

```
ROUTE    5      OFF
 5 Pts    4 legs
leg  3 14 →     15
  AB-25 →   Wp 15
```

Notice that the GPS shows that Route 5 now contains only 5 waypoints instead of 6. You are finished deleting waypoint 22 from Route 5.

CLEARING A ROUTE

Now imagine that the following week construction begins for an off-shore oil rig right in the middle of your Route 5. You decide to change your entire Route in that area and wish to clear all of the waypoints in the Route. Clearing a Route is almost the same as adding and deleting waypoints from a Route. Select the Route number you want to clear, then make sure the Route is OFF. Then press CLR until the cursor appears in the Route number field in the top line of the display.

CLR

```
ROUTE    0      OFF
 5 Pts    4  legs
leg  3   14 →  15
  AB-25   →  Wp 15
```

Next, press the ENT key, and you will get the following display:

ENT

```
To clear ROUTE 5
Press ENT ENT
```

Now press the ENT key twice, and the Route will be cleared.

AUTOMATICALLY SEQUENCING THROUGH A ROUTE

The Automatic Sequence Control can be used in conjunction with a Route. Recall in our navigational example, you were told to press the "+" or "-" keys to tell the Supersport you wanted to create the next courseline in the Route. If the Automatic Sequence control was on (FWD or BWD), you wouldn't have had to do that. The GPS would have automatically created the next courseline when you arrived within the sequence range of the waypoints in the Route.

To use the Automatic Sequence Control with a Route, select a Route and turn it to FWD or BWD. Then, select the Automatic Sequence display and turn it on by selecting either FWD or BWD. After you put in the sequence range, you're ready to automatically travel through the Route.

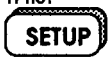
The Automatic Sequence Control is really very simple. When it is set to FWD, every time you come within the sequence range of the destination waypoint, it automatically presses the "+" key for you, to go to the next waypoint. When it is set to BWD, it presses the "-" key automatically when you reach the destination waypoint. It does this whether Route is OFF, FWD, or BWD. The operation of Automatic Sequencing is EXACTLY the same as if you had pressed the "+' or "-" keys yourself.

SECTION 9

THE CLOCK AND YACHT RACING TIMER

THE SUPERSPORT'S CLOCK AND YACHT RACING TIMER

Upon the first press of the SETUP key, the GPS will show you this:




```
PACIFIC    STD +8
TIME      15:47:02
WED   FEB 26,1992
UTC/GMT  23:47:02
```

SETTING THE CLOCK

Setting the clock is covered in Section 3. There is one thing that bears repeating, however.

If you change from Standard (STD) to Daylight (DAY) time, the local time on the second line will be off one hour. **DO NOT CHANGE THE TIME! CHANGE INSTEAD, THE STANDARD-DAYLIGHT SELECTOR, AND THIS WILL CORRECT THE LOCAL TIME.**

If you change the time instead, you will put UTC/GMT off one hour, and lengthen the time it takes to acquire satellites. As soon as you acquire a satellite, it will reset UTC/GMT to the correct value, and your local time will be reset back to what it was, off one hour.

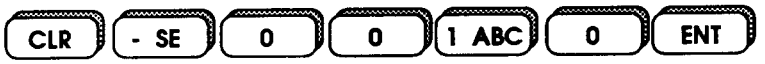
The Satellite Receiver uses only UTC/GMT, and the year and date. The local time, time zone, and standard-daylight indicator are only for the convenience of the operator.

The same thing holds when you change time zones. Change the time zone, not the local time!

YACHT RACING TIMER

The Supersport's clock can also be used as a Yacht Racing Timer.

To start the Timer, put the number of minutes to go before the race is to begin, along with a minus "-" sign, into the local time portion of the display. For example, 10 minutes before the start of the race, make the following entry that shows 10 minutes to start.



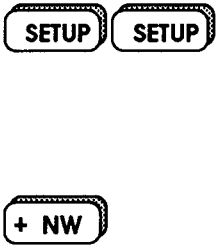
The time will then count down. At 5 minutes to go, the internal speaker will give 5 half-second tones; at 4 minutes to go, you'll hear 4 half-second tones; at 3 minutes to go, you'll hear 3 half second tones, etc. When the timer gets to zero, a 5 second tone will sound, and the time will be reset to time of day.

SECTION 10

ALERTS

ALERTS

The Supersport has the capability to give you visible and audible warning signals when certain events happen. These are called Alerts. The Supersport contains Alerts for Waypoint Arrival, Excessive Crosstrack Error, Border Crossing, Excessive drift from Anchor Point, Automatic Shutoff, and Low Battery conditions.



ARRIVAL ALERT

The ARRIVAL alert is used only if you want an alarm to sound when you arrive at a destination. To use the alert, you must turn it ON, then set the alarm range. The alarm range is best explained by answering this question: "How close do I want to approach my destination before my alarm sounds?" If you want your alarm to sound when you're within 1/10th of a nautical mile of your destination, you will put in an alarm range of 0.10.

For example, imagine you're going to waypoint 2. You're halfway there and you decide that you want the GPS to sound an alert when you arrive within 1/10th of a nautical mile of your destination. To set the alert, select the above display and turn it on by simply pressing CLR until you see a flashing cursor in the word OFF. Then, press ENT to turn the alert ON. Next, change the arrival range to read 0.10. To do this, press CLR until small zeroes appear in the Arrival Alert

Range Field. Then, press:


```
ARRIVAL ALERT
OFF, RANGE   0.10
CROSSTRACK ALERT
OFF, RANGE   0.10
```

When you are within one 10th of a nautical mile of waypoint 2, or if you pass waypoint 2 within two times the alert range, the GPS will sound an audible "beep". The alert beep will be as loud as the beeps you hear when you press any of the Supersport keys.

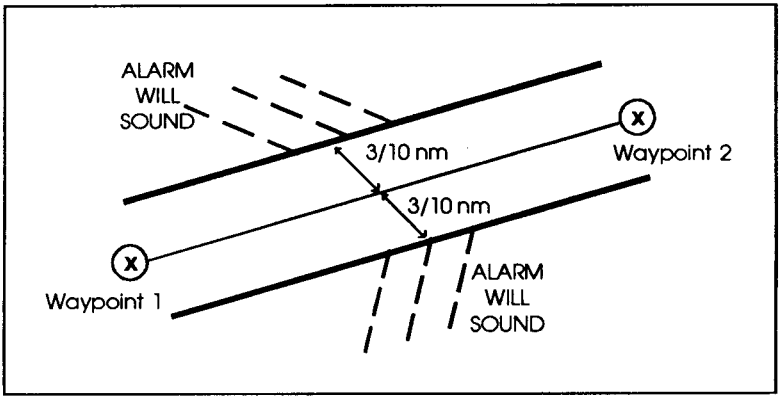
While the alarm is sounding, the display will read, "WAYPOINT ARRIVAL ALERT, PRESS CLR". To acknowledge the alert, and turn it off, press the CLR key. The alert will sound for at least 12 seconds, even if it has been turned OFF. If you turn it off after it has sounded for at least 12 seconds, the alarm will turn off immediately.

To turn the alarm off permanently, select the above display, and press:


```
ARRIVAL ALERT
OFF, RANGE   0.10
CROSSTRACK ALERT
OFF, RANGE   0.10
```

CROSSTRACK ALERT

The Crosstrack alert is used if you want an alarm to sound when you're a certain distance off course. For example, imagine that you want to go from waypoint 1 to waypoint 2 without traveling more than 3/10ths of a nautical mile away from the courseline. You want the GPS to sound an alert if you surpass the 3/10ths mile limit.



To set the Crosstrack alert, select the first SETUP display (the last one shown above), and press the CLR key several times until the cursor is in the OFF field below CROSSTRACK ALERT. Then press the ENT key.

Put in the 3/10th of a nautical mile figure by pressing CLR until you see small zeroes in the bottom right corner of the display. Then, press:


```
ARRIVAL ALERT
OFF, RANGE  0.10
CROSSTRACK ALERT
 ON, RANGE  0.30
```

As the above diagram suggests, if you travel more than 3/10th of a nautical mile away from your courseline, an audible alert will sound. Turn the alert OFF by selecting the Crosstrack alert display, pressing the CLR key one or more times until the cursor is in the ON field following "CROSSTRACK ALERT", and then pressing the ENT key. This will change ON to OFF.

BORDER ALERT

A border alert would be used if you wanted an alert to sound when you arrive within a certain distance of a boundary at sea. This feature is mainly used by commercial fishermen who are charged stiff fines when they are found

fishing in certain areas of the ocean. These areas are separated from legal fishing areas by an imaginary line between two points. A border alert is created by using the Crosstrack alert display. To set up a border alert, follow these steps:

1. Put the ending points of the border into the Supersport as two separate waypoints.
2. Tell the GPS to create a courseline between the two waypoints.
3. Use the Crosstrack alert to set up your alert.

Using an example, imagine that you're a fisherman in Alaska and that the Alaska Department of Fish and Game has established a boundary on the 55 degree latitude line in Kvichak Bay, Alaska. If you go over this line in the direction of Bristol Bay, you have to pay a $5000.00 fine. Therefore, you decide to set up a border alert to let you know when you're within a half nautical mile from the boundary.

To create a border alert, first choose two positions on the 55 degree latitude line between which you want to set up your border. Following step 1 in our step-by-step process, put the coordinates of the two positions into two of the Supersport's waypoints. For this example, let's imagine that you put the positions into waypoints 10 and 11.

Following step 2 in our process, create a courseline between waypoints 10 and 11. This courseline will represent the border line.

After creating the border line, you must set up the border alert using the Crosstrack alert display. To do this, select theCrosstrack alert display and turn the Alert ON. Next, put in the alert range to tell the Supersport how close you want to come to the border before the alert sounds. DO NOT PUT IN AN ALERT RANGE LESS THAN 0.05 nm. You must put in the range with a minus "-" sign.

For instance, if you want the alert to sound when you arrive within 1/2 nautical mile of the border, put the alert range in as - 0.50. To do this, press CLR until you see small zeros in the bottom right portion of the display.

CLR CLR . . .

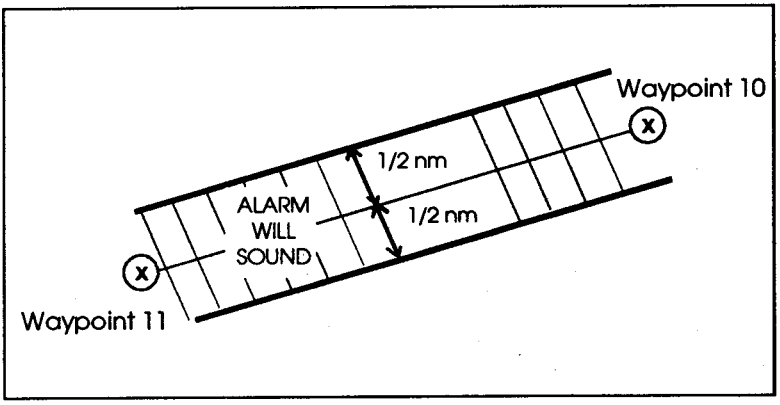
```
ARRIVAL ALERT
OFF, RANGE   0.10
CROSSTRACK ALERT
 ON, RANGE   0.00
```

Then press:

- SE 0 5 MNO 0 ENT

```
ARRIVAL ALERT
OFF, RANGE   0.10
CROSSTRACK ALERT
 ON, RANGE  -0.50
```

By putting in the border range of 0.50 with a minus "-" sign, you've told the Supersport to sound the alert when you come to within a half mile of either side of the border, as represented below.



When finished using the alert, turn it OFF the same way as you would Crosstrack alert.

ANCHOR ALERT

The next press of the "+" key when displaying the SETUP list will allow you to look at the Anchor Watch alert.


```
ANCHOR WATCH
OFF, RANGE  0.10
auto magvar   ON
mag var     e014°
```

You will use the Anchor Watch alert if you want an alert to sound in the event that your vessel drifts a certain distance from the place it was anchored.

To use the Anchor alert, do the following:

1. Drop Anchor and wait for your boat to come to a steady position.

2. Select the Anchor Watch alert display shown above.

3. Turn the Anchor Watch alert ON by pressing CLR, ENT.

When the Anchor alert is turned ON, the Supersport will automatically store your present location. The GPS needs to do this so it can identify the place you want to be anchored.

Next, put in the Anchor range. Anchor range can best be described by answering the question, "How far from my anchor position is it safe to drift?" If you don't want to drift more than 0.10 nautical miles from your anchor position, put in a drift range of 0.10. This is done the same way as for the Arrival Alert range.

When your vessel drifts more than 0.10 nautical miles from its anchor position, an alert will sound, and the display will read, "ANCHOR WATCH ALERT, PRESS CLR". To turn the alert OFF, press the CLR key. The alert will sound for at least 12 seconds. When using the Anchor alert, please keep in mind that upon change in current, your vessel will swing from the position of your anchor within a circle almost as wide as the amount of the extended anchor line. Therefore, to prevent false alerts, remember to set the anchor alert range large enough to compensate for this drift factor.

AUTOMATIC SHUTOFF ALERT

When operating on batteries, the SuperSport will automatically shut itself off, if left unattended for a period of time. This is to save the batteries, if the unit is accidentally left on.

An alert will be given, if the elapsed time since the last key was pressed exceeds the SHUTOFF TIME. The display will read "Auto Shutoff Alert, Press CLR". If CLR is not pressed within one minute after the display appears, the unit will be automatically shut off.

The SHUTOFF TIME is programmable from 5 - 99 minutes, and is found in the eighth display in the SETUP list. It is set to 20 minutes by the FIRST START procedure. If the shutoff time is set to 99 minutes, it is deactivated; That is, it will never automatically shut itself off.


```
LightTime    20 s
ShutoffTime  20 m
TO SET KEY,ENTER
CODE         ######
```

For example, to set the shutoff time to 30 minutes, do the following:


```
LightTime    20 s
ShutoffTime  30 m
TO SET KEY,ENTER
CODE         ######
```

The LightTime, shown on the top line of the display, operates the same as the Automatic Shutoff. When operating on batteries, the keyboard and display lights are normally off. To turn them on, press the LIGHT key.

The lights will automatically turn themselves off to save

power, as soon as a period of time equal to LightTime (in seconds) has elapsed since the last key was pressed. LightTime is adjustable from 5 to 255 seconds.

LOW BATTERY ALERT

When the batteries are nearly exhausted, you will get the alert message, "Battery Power is Low, Press CLR".

This tells you that you have about 20 minutes of battery life left with alkaline batteries, and about 10 minutes left with rechargeable batteries. Press the CLR key to resume normal operation. The warning alert will reappear every five minutes, until the batteries are exhausted and the unit will automatically shut itself off.

SECTION 11

MANUAL OPERATION

MANUAL ALTITUDE INPUT

In the GPS navigator, altitude is necessary to compute a position fix. You can choose to have the altitude computed automatically, or you can enter it by keyboard if it will not be changing, and you know what it is.

If you are operating on an ocean, altitude is simply the height of the antenna above the water line, in feet. If you enter the altitude manually, it will always be correct, and your position display will be more stable and accurate. This is the recommended operating method, and it is described in Section 3, under the First Start procedure.

If altitude is computed automatically, it may be in error by as much as 600 feet, or even more if the satellites geometry is poor. This is because the system error has been purposely degraded by the U. S. Government, in a policy known as Selective Availability. When SA was off, as it was during the Persian Gulf war in late 1991 and early 1992, position errors were typically 50 feet and altitude errors typically 100 feet. With SA on, errors are typically 3 - 6 times as large.

The sixth display in the SETUP list is:


```
ALTITUDE      AUTO
VEHICLE       BOAT
speed and course
filter      2 sec.
```

ALTITUDE is selectable as AUTO or MANU, and VEHICLE is selectable as BOAT, CAR, or PLANE.

If ALTITUDE is MANU (manual input), it will never be updated automatically, and it can be input by keyboard in the first POS display.

If it is AUTO, then it is updated as follows:

VEHICLE — BOAT - Altitude updated very slowly, only with 5 satellites
CAR or PLANE - Altitude updated rapidly, only with 4 or 5 satellites.

If you are on a boat in a lake, and you don't know what the altitude is, select ALTITUDE AUTO, VEHICLE BOAT. As you operate, the altitude will gradually be refined, but it still may be in error by several hundred feet.

MAGNETIC VARIATION

The second display in the SETUP list contains the control for magnetic variation.


```
ANCHOR WATCH
OFF, RANGE  0.10
auto magvar   ON
mag var     e014°
```

The Supersport normally computes magnetic variation automatically. Once the GPS has computed magnetic variation, it applies the variation to its navigation bearings. Therefore, when you ask the GPS to show you the bearings to destinations, and between destinations, the GPS is able to show compass bearings instead of true bearings.

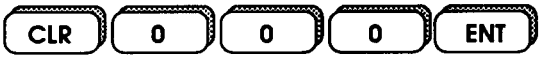
If you want to tell the GPS the magnetic variation yourself, you must turn "auto magvar" from ON to OFF, and put in the desired magnetic variation in the bottom of the display.

This can be done as follows:


```
ANCHOR WATCH
OFF, RANGE  0.10
auto magvar  OFF
mag var     e014°
```

Next, put the desired magnetic variation into the bottom portion of the display. To do this, press CLR until the cursor appears in the bottom right corner. Then enter magnetic variation. To enter East magnetic variation, you must include a "-" with your entry. For instance, to enter 13 degrees East magnetic variation, press CLR until the cursor appears on the bottom right portion of the display. Then, press:

If you want the GPS to show true North headings (no magnetic variation), turn automatic magnetic variation OFF, then press:



SATELLITE SELECTION

The GPS satellites are in 12 hour orbits, so the receiver automatically stops using satellites as their elevation angle approaches the horizon, and selects new ones with better elevation angles. If you change the satellite selection to manual, the selection will stay the same, and the satellites will not be deselected and replaced when they become unreceivable. Nevertheless, the option of manual selection is included in the Supersport, for the purpose of testing its performance on low elevation satellites, and its operation with poor satellite geometry.

DO NOT CHANGE THE SATELLITE SELECTION FROM AUTOMATIC TO MANUAL FOR NORMAL NAVIGATION

To manually select the satellites to be tracked, first call up the satellite selection display, under SETUP.


```
SAT. SELECT AUTO
  13  9  3 12 20
MGRS/UTM      OFF
LORAN TD      OFF
```

To change from automatic to manual selection, do the following:

Now you can enter up to five satellite numbers. The satellites are numbered 1 - 32, and not all of the satellites are up. A zero in the satellite number space means no satellite is selected. To enter the satellite numbers, press CLR X X ENT, where X X represents the satellite number.

To restore the GPS to automatic operation, press CLR one or more times until the cursor is in the AUTO/MANU field, and then press ENT.

DATUM SELECTION

Latitude, Longitude, and Altitude are computed from the received satellite signals using a mathematical description of the earth's shape, called a datum. (sometimes called a chart datum) The datum is also used to prepare navigational charts. Slightly different datums have been found by experience to fit the earth's shape best, in different parts of the world. The Supersport allows the operator to choose the datum to match the charts being used.

The datum selected by the First Start procedure is called WGS-84 (World Geodetic Survey of 1984), which is the one used by almost all modern marine charts.

In general, choosing a different datum will change the computed Latitude and Longitude by only a small amount, on the order of 100 meters. Even so, using the same datum that your charts are based upon will give you the best correspondence between GPS position and chart position.

Most land charts are prepared using datums different from marine charts. If the datum selection is set to automatic, the standard datum for land use will automatically be selected, based on position.

To set the datum to automatic selection, search the SETUP list

for the following display:

SETUP SETUP + NW + NW . . .

```
ACCURACY OF GPS
SYSTEM 100meters
MAP DATUM
MANU          WGS-84
```

To change from manual to automatic, press CLR several times until the cursor is in the MANU/AUTO field, and then press ENT.

Some older or specialized charts will show a different datum, from that selected automatically. The Supersport has 134 datums, plus one that can be user entered.

To select a nonstandard datum, first change datum selection to MANU, if it is AUTO. This is done the same way as changing it from MANU to AUTO, as previously described.

To step through the datum selections, press CLR several times until the cursor is in the field where the datum name is shown, and then press the + key one or more times until the selection you want is on the display. Then press ENT to enter the selection displayed.

CLR CLR + NW + NW . . ENT

There are 134 choices of datum available, plus one user entered datum. The choices are listed below, as well as instructions for use of the user entered datum.

The first 11 datum selections in the list are the standard datums, which are used for automatic selection. They are not in alphabetical order, and are as follows:

WGS-72	WORLD GEODETIC SYSTEM 1972	
INT'L	INTERNATIONAL	
CLARKE66	CLARKE 1866	Yes this is the Clarke of Lewis & Clarke
CLARKE80	CLARKE 1880	
EVEREST	EVEREST - survey of Nepal & China	
Mod EVER	Modified EVEREST	
AIRY	AIRY	

Mod AIRY	Modified AIRY
BESSEL	BESSEL 1841
WGS-84	WORLD GEODETIC SYSTEM 1984

The following datums are available only by manual selection. The first 12 are the most common, listed in alphabetical order. They are followed by 111 less commonly used datums, also in alphabetical order.

AUSTRLIA	AUSTRALIAN NATIONAL
FISCHE60	FISCHER 1960 (MERCURY)
MFISCH60	Modified FISCHER 1860 (SOUTH ASIA)
FISCHE68	FISCHER 1968
GRS-80	GEODETIC REFERENCE SYSTEM 1980
HELMERT	HELMERT 1906
HOUGH	HOUGH
KRASVSKY	KRASSOVSKY
S.AMER69	SOUTH AMERICAN DATUM 1969
WGS-60	WORLD GEODETIC SYSTEM 1960
WGS-66	WORLD GEODETIC SYSTEM 1966
WAROFFIC	WAR OFFICE

ADINDAN	ADINDAN /ETHIOPIA,MALI,SENEGAL,SUDAN
AFGOOYE	AFGOOYE /SOMALIA
AINELABD	AIN EL ABD /BAHRAIN ISLAND
AN1ASTRO	ANNA 1 ASTRO 65 /COCOS ISLANDS
ARC-1950	ARC 1950 /BOTSWANA, LESOTHO, MALAWI, SWAZILAND, ZAIRE, ZAMBIA, ZIMBABWE
ARC-1960	ARC 1960 /KENYA, TANZANIA
ASCNSION	ASCENSION ISLAND 1958
AUSTR-66	AUSTRALIAN GEODETIC 1966 /AUSTRALIA AND TASMANIA
AUSTR-84	AUSTRALIAN GEODETIC 1984 /AUSTRALIA AND TASMANIA
AZORES	OBSERVATORIO / CORVO AND FLORES ISLANDS (AZORES)
BELLEVUE	BELLEVUE (IGN) /EFATE AND ERROMANGO ISLANDS
BERMUDA	BERMUDA ISLANDS
BOGOTA	BOGOTA UNIVERSITY /COLOMBIA
BRAZIL	CORREGO ALEGRE / BRAZIL
BRITAIN	ORDNANCE SURVEY OF GREAT BRITAIN 1936 / MEAN VALUE (ENGLAND, ISLE OF MAN, SCOTLAND, SHETLAND ISLANDS, WALES)

BUKITRIM	BUKIT RIMPAH / INDONESIA
CANARYIs	PICO DE LAS NIEVES / CANARY ISLANDS
CANAVERL	CAPE CANAVERAL /FLORIDA AND BAHAMA
CARTHAGE	CARTHAGE / TUNISIA
CHATHAM	CHATHAM 1971 / CHATHAM ISLAND (NEW ZEALAND)
DJAKARTA	DJAKARTA (BATAVIA) /SUMATRA ISLAND (INDONESIA)
DOS-1968	DOS 1968 GIZO ISLAND (NEW GEORGIA ISLANDS)
EASTERIs	EASTER ISLAND 1967
EGYPTIAN	1906 OLD EGYPTIAN / EGYPT
EUROPE50	EUROPEAN 1950 MEAN VALUE/AUSTRIA, BELGIUM, DENMARK, FINLAND, FRANCE, FRG,GIBRALTER, GREECE, ITALY, LUXEMBOURG, NETHERLANDS, NORWAY, PORTUGAL,SPAIN,SWEDEN, SWITZERLAND
EUROPE79	EUROPEAN 1979 MEAN VALUE/AUSTRIA, FINLAND, NETHERLANDS, NORWAY, SPAIN, SWEDEN, SWITZERLAND
FALKLAND	SAPPER HILL / FALKLAND ISLAND
GANDAJKA	GANDAJIKA BASE / REPUBLIC OF THE MALDIVES
GHANA	GHANA
GUAM-63	GUAM 1963
GUNANGSG	GUNANG SEGARA / BORNEO
GUNANGSR	GUNANG SEGARA / BORNEO
GUX1ASTR	GUX 1 ASTRO / GUADALCANAL
HAWAIIAN	OLD HAWAIIAN MEAN VALUE
HAWAMAUI	OLD HAWAIIAN MAUI
HAWAOAHU	OLD HAWAIIAN OAHU
HAWAKAUA	OLD HAWAIIAN KAUAI
HJORSEY	HJORSEY 1955 / ICELAND
HONGKONG	HONG KONG 1963
HUTZUSHN	HU-TZU-SHAN / TAIWAN
INCHAUSP	CAMPO INCHAUSPE / ARGENTINA
INDIA	INDIAN / BANGLADESH, INDIA AND NEPAL
IRELAND	IRELAND 1965
ISTS-073	ISTS 073 ASTRO / DIEGO GARCIA
IWO-JIMA	ASTRO BEACON "E" /IWO JIMA ISLAND
JOHNSTON	JOHNSTON ISLAND 1961
KANDAWAL	KANDAWALA / SRI LANKA
KERGULEN	KERGUELEN ISLAND
KERTAU	KERTAU 1948 / WEST MALAYSIA AND SINGAPORE
LC5ASTRO	L. C. 5 ASTRO / CAYMAN BRAC ISLAND
LIBERIA	LIBERIA 1964
LUZON	LUZON PHILIPPINES (EXCLUDING MINDANAO ISLAND)
MAHE-71	MAHE ISLAND 1971
MARCO As	MARCO ASTRO / SALVAGE ISLANDS

MARCUSIs	ASTRONOMIC STATION 1952 /MARCUS ISLAND
MARSHALL	WAKE-ENEWETOK 1960 / MARSHALL ISLANDS
MASIRAH	NAHRWAN / MASIRAH ISLAND (OMAN)
MASSAWA	MASSAWA / ERITREA(ETHIOPIA)
MERCHICH	MERCHICH / MOROCCO
MIDWAY61	MIDWAY ASTRO 1961 / MIDWAY ISLAND
MINDANAO	MINDANAO ISLAND
MONTJONG	MONTJONG LOWE
NAD27ALA	NORTH AMERICAN DATUM 1927 / ALASKA
NAD27BAH	NORTH AMERICAN DATUM 1927 / BAHAMAS EXCLUDING SAN SALVADOR ISLAND
NAD27CAN	NORTH AMERICAN DATUM 1927 / CANADA (INCLUDING NEW FOUNDLAND)
NAD27CAR	NORTH AMERICAN DATUM 1927 / CARIBBEAN (BARBADOS, CAICOS, CUBA, DOMINICAN REPUBLIC, GRAND CAYMAN, JAMAICA, LEEWARD, TURKS ISLANDS)
NAD27CTR	NORTH AMERICAN DATUM 1927 / CENTRAL AMERICA (BELIZE, COSTA RICA, EL SALVADOR, GUATEMALA, HONDURAS, NICARAGUA)
NAD27CUB	NORTH AMERICAN DATUM 1927 / CUBA
NAD27GRN	NORTH AMERICAN 1927 / GREENLAND / HAYES PENINSULA
NAD27MEX	NORTH AMERICA 1927 / MEXICO
NAD27PAN	NORTH AMERICAN DATUM 1927 / CANAL ZONE (PANAMA)
NAD27SAL	NORTH AMERICAN DATUM 1927 / SAN SALVADOR
NAD27USA	NORTH AMERICAN DATUM 1927 / MEAN VALUE CONUS
NAD-83	NAD 1983 / ALASKA, CANADA, CENTRAL AMERICA, CONUS, MEXICO
NIGERIA	MINNA / NIGERIA
NAMIBIA	SCHWARZECK / NAMIBIA
NAPARIMA	NAPARIMA / TRINIDAD AND TOBAGO
NWZEALND	GEODETIC DATUM 1949 / NEW ZEALAND
OMAN	OMAN
PORTRICO	PUERTO RICO / PUERTO RICO AND VIRGIN ISLANDS
PARAGUAY	CHUA ASTRO / PARAGUAY
PHOENXIs	CANTON ASTRO 1966 / PHOENIX ISLANDS
PITCAIRN	PITCAIRN ASTRO 1967 / PITCAIRN ISLAND
QATAR	QATAR NATIONAL
QORNOQ	QORNOQ / SOUTH GREENLAND
REUNION	REUNION / MASCARENE ISLAND
ROME-40	ROME 1940 / SARDINIA ISLAND
S.AFRICA	CAPE / SOUTH AFRICA
S.ARABIA	NAHRWAN / SAUDI ARABIA
S. ASIA	SOUTH ASIA / SINAPORE

S. CHILE	PROVISIONAL SOUTH CHILEAN 1963 / SOUTH CHILE NEAR 53 DEGREES SOUTH
SAD-56	PROVISIONAL SOUTH AMERICAN 1956 / MEAN VALUE (BOLIVIA, CHILE, COLOMBIA, ECUADOR, GUYANA, PERU, VENEZUELA)
SAD-69	SOUTH AMERICAN 1969 / MEAN VALUE (ARGENTINA, BOLIVIA, BRAZIL, CHILE, COLOMBIA, ECUADOR, GUYANA, PARAGUAY, PERU, VENEZUELA, TRINIDAD, TOBAGO
SantoDOS	SANTO (DOS) / ESPIRITO SANTO ISLAND
SAO BRAZ	SAO BRAZ / SAO MIGUEL SANTA MARIA ISLANDS (AZORES)
SE.BASE	SOUTHEAST BASE / PORTO SANTO AND MADERIA ISLANDS
SW.BASE	SOUTHWEST BASE / FAIAL, GRACIOSA, PICO, SAO JORGE, TERCEIRA ISLANDS (AZORES)
SRRLEONE	SIERRA LEONE
StHELENA	ASTRO DOS 71/4 /ST. HELENA ISLAND
TANANARV	TANANARIVE /OBSV. 1925, MADAGASCAR
TERN Is.	ASTRO B4 /TERN ISLAND
THAILAND	INDIAN / THAILAND, VIETNAM
TIMBALAI	TIMBALAI 1948 / BRUNEI AND EAST MALAYSIA (SARAWAK AND SABAH)
TOKYO	TOKYO / MEAN VALUE (JAPAN, KOREA, OKINAWA)
TRISTAN	TRISTAN ASTRO 1968 / TRISTAN DE CUNHA
U.ARAB E	NAHRWAN / UNITED ARAB EMIRATES
VITILEVU	VITI LEVU 1916 / VITI LEVU ISLAND (FIJI)
VOIROL	VOIROL
YACARE	SOUTH AMERICA / YACARE, URUGUAY
ZANDERJI	ZANDERJI / SURINAM
USER DEF	USER DEFINED DATUM. This is a special datum, that can be specified by keyboard, by entering five parameters. This feature allows the Supersport to be used for surveying, using a highly specialized local datum.

USER DEFINED DATUM

The user defined datum can be input by calling up the USER DEF.DATUM display in the SETUP list.

SETUP SETUP + NW + NW . . .

```
USER DEF. DATUM
DF    -0.00000000
A      0.00 X     0
Y      0    Z     0
```

The five input parameters are as follows:

DF Delta f(x 10,000). This is the difference in flattening from the WGS-84 model to the local datum. Flattening is (a-b)/a, where a is the semi-major axis, and b is the semi-minor axis.

A Delta a. This is the difference in the semi-major axis from WGS-84 to the local datum, in meters.

X Delta x.
Y Delta y.
Z Delta z.

These are the differences in height from the center of the earth from the WGS-84 model of the earth's surface to the local datum's model of the earth's surface, in meters.

EXAMPLE: For the MINNA/NIGERIA datum, the five parameters are as follows:

Delta f	-0.54750714	(nondimensional)
Delta a	-112.14	meters
Delta x	-92.	meters
Delta y	-93.	meters
Delta z	122.	meters

When these are entered into the user defined datum, the display will be as follows:

```
USER DEF. DATUM
DF    -0.54750714
A- 112.14 X-  92
Y-  93    Z  122
```

To use the user defined datum just described, the datum selection USER DEF must be manually selected.

A manually selected datum will stay in memory until it is changed, or the selection is set to automatic. In the AUTO mode, the datum is reselected every time you change waypoints, or enter new coordinates into a waypoint.

SELECTIVE AVAILABILITY

The GPS satellites transmit a highly precise navigational signal for military purposes. (PPS, or Precise Positioning Service) This signal is encoded, and cannot be received by non-military receivers.

The satellites also transmit a less precise signal, for general civilian use. (SPS, or Standard Positioning Service) The Micrologic Supersport, and all other commercially available receivers, receives the SPS signals.

It is the stated policy of the United States Air Force, which operates the GPS satellites, to deliberately degrade the SPS signals to give an accuracy of 100 meters or better 95% of the time. This represents an error standard deviation of 50 meters. This policy is called Selective Availability (SA). If SA were not turned on, the GPS position fix would be about six times as accurate.

The satellites were operated for test purposes with SA off until April, 1990, when SA was turned on. The Air Force stated at that time that SA would be on thereafter.

SA was turned off in August, 1990, in response to the Persian Gulf Crisis, apparently because the U. S. Military did not yet have enough military receivers delivered, and was using civilian receivers. (Which are a great deal cheaper) SA was turned back on in April of 1992, and is expected to remain on for the indefinite future.

Many people think that, because of the improved cooperation with Eastern Europe, and general easing of world tensions (except for the Middle East), Selective Availability will be turned off at some future time, to give everyone the benefit of the maximum system accuracy.

The Supersport GPS has a SETUP item called "ACCURACY OF

GPS SYSTEM", which can be from 15 to 200 meters. It is set by the First Start procedure to 100 meters. This number is used to estimate the position fix accuracy, which is displayed under the POS key.

If Selective Availability is turned off, the GPS SYSTEM ACCURACY should be set to 15 meters. If you don't do this, it will primarily affect the display of estimated position accuracy. The real accuracy of the computed Lat/Lon will be affected only slightly. Thus it is not essential that the SETUP item "ACCURACY OF GPS SYSTEM" be changed when Selective Availability is turned ON or OFF.

MANUAL POSITION CORRECTIONS

If it should happen that the position displayed by the GPS is consistently offset from the true geodetic position, position offsets or biases can be added to Lat/Lon to remove the offset. This should not normally be necessary, but there may be places in the world where the computed position is biased.

To enter the manual position corrections, go to a precisely known location, such as a navigation buoy. For example, suppose that you are beside a buoy whose chart coordinates are:

Lat 33 22.185' n
Lon 118 57.629' w

By pressing the POS key, you notice that the GPS shows your present position as:

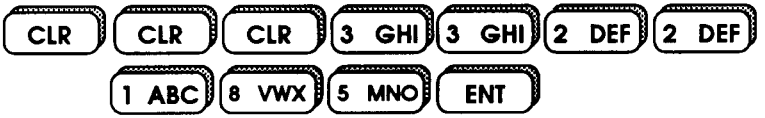
Lat 33 22.234' n
Lon 118 57.575' w

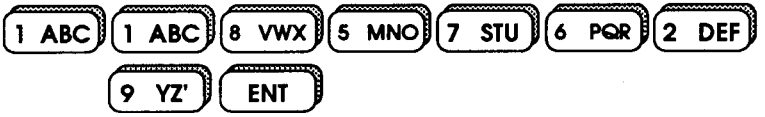
To enter a position offset to make the GPS agree with the chart coordinates, select the DLA/DLO display in the SETUP list.

. . .

```
DLA s 00°00.000
DLO w000°00.000
Max graphic CTE
is +/-  0.32 nm
```

Now enter your chart position, exactly.





As soon as the longitude is entered, the GPS will show you the correction it will make to its present position readings.

```
DLA s 00°00.049
DLO w000°00.054
Max graphic CTE
is +/-  0.32 nm
```

Press POS, and you will see that the position has been corrected.


```
LAT n 33°22.185
LON w118°57.629
L/L  +/- 109 ft
ALTITUDE  15 ft
```

The DLA/DLO correction will now remain in the GPS until it is changed. As a warning, it will be shown every time you turn the unit on, after the startup messages. This will remind you that there is an offset being applied to the measured position.

If you want to remove the offset, display DLA/DLO, and enter zeros by pressing CLR, ENT, CLR, ENT.

AN ALTERNATE METHOD

Enter the offsets directly. They will be added if they are North latitude or West longitude, or subtracted if they are South latitude or East longitude. Enter the offsets using an input sequence similar to that shown above, except that the offsets, which must be less than 30 minutes in magnitude, are entered instead of the lat/lon of the reference point.

SECTION 12

CUSTOMIZING THE OPERATION OF YOUR GPS

There are a number of selections you can make, that alter the way your Supersport works, or the way navigation information is input and displayed.

These are set to the most common values by the First Start procedure, and after that you can change them using the displays available under the SETUP key.

LAT/LON FORMAT CONTROL

The third display in the SETUP list gives the latitude and longitude format control.

SETUP SETUP + NW + NW + NW . . .

```
LL FORMAT MM.MMM
DIST/SPD nm/kts
ALT/ACC      feet
```

The top portion of the display is used to manipulate the appearance of every Latitude/Longitude display in the Supersport. In the above example, the letters MM.MMM appear next to "LL Format", indicating that every Lat/Lon number seen in the GPS will be shown in degrees, minutes and thousandths of minutes. It also indicates that all Lat/Lon entries (for waypoints or position offsets), can only be made in degrees, minutes and thousandths of minutes. After a "First Start" is performed, the GPS will automatically show Latitude/Longitude numbers in degrees, minutes and thousandths of minutes.

If you prefer Latitude/Longitude displays in degrees, minutes and seconds, the Latitude/Longitude format can be changed to read MMSS.S, instead of MM.MMM. To do this, select this display and press the CLR key, followed by the ENT key. Afterwards, you will notice that the Latitude/Longitude numbers that are stored in waypoints will be shown in degrees, minutes, seconds, and tenths of seconds. Corre-

spondingly, the Supersport will only allow you to put in Latitude/Longitude entries using the degrees, minutes, seconds, and tenths of seconds, format.

To change back to minutes and thousandths of minutes, simply call up the LL FORMAT display and press CLR, ENT again. This entry procedure is used to switch all variables in the Supersport, that have two values. (Such as ON/OFF)

If you have some waypoints that were input in minutes and thousandths of minutes, and others that were input in minutes,seconds, and tenths of seconds, it will not matter. Changing the format selection does not change the position that is stored, only the way it is input and displayed. Thus you can change back and forth without affecting any of your stored waypoints.

DISTANCE/SPEED FORMAT CONTROL

The second line of the last display shown above shows the distance and speed format selector. After the FIRST START procedure, it is set to nm/kts (nautical miles and knots), which are the usual marine units.

By pressing CLR, CLR, the "+" key one or more times, and ENT, you can select sm/mph (statute miles/miles per hour), or km/kph (kilometers/kilometers per hour) instead. These are the usual land units. The displayed distances are annotated with nm, sm or km, so you won't mistake one set of units for another. This is easy to do, so be careful. One marine magazine tested an earlier Micrologic product, and reported in their magazine that the distances and speeds were very inaccurate, always reading about 15 per cent too high! The navigator had obviously been set to statue miles/miles per hour, and they were expecting nautical miles/knots, and never noticed the "sm" following the readings. Once selected, the serial data format and the distance/speed format will rèmain until they are changed.

SERIAL DATA I/O CONTROL

The next press of the "+" key will produce this display:


```
DATA 1 NMEA 0180
DATA 2 NMEA 0183

BEEPER IS      ON
```

There are two serial data output ports. Both are programmable with a variety of formats. The serial data can be used to drive an autopilot, an electronic charting system, a remote control/display unit, a personal computer, or an information system like the Datamarine LINK or Signet SmartPak.

There is one serial data input port, which uses the format selected for DATA 2. The serial data input and outputs are available on the six pin connector on the back of the Supersport.

To select the serial data format, press the CLR key one or more times until the cursor is in the desired field, and then press the "+" key one or more times, until the format you want is on the display. Then press the ENT key to make the selection. The data formats available are as follows:

OFF	No data are transmitted or received.
NMEA 0183	This is the standard data format for interface to electronic charting systems, radars, and most other marine equipment. It is also used with the ML-95 remote Control/Display unit which provides another, independent, 2 x 16 display of navigation data anywhere on your boat.
NMEA RMc	This is the short form - high repetition rate data output, which is preferred for some electronic charting systems.
MCHART	This is a high repetition rate output optimized for electronic charting systems.
7 x 40	This is designed for laptop personal computers, which can be used for remote displays.
24 x 80	This is a similar format, designed for using standard CRT display personal computers to display data.

NMEA RMa — This is similar to RMc, but with a loran label. Some older instruments won't work unless they see a loran label, so they will work with this.

NMEA 0180 — This is the standard autopilot output.

180 + CDX — This is the standard autopilot output with additional range data that can be displayed on a Datamarine CDX.

NAVLINK — This is the NMEA 0183 output, with a loran instead of a GPS label, provided for compatibility with older instruments that require a loran label.

WPUPLOAD — When this format is selected, the entire waypoint memory will be transmitted, at a rate of 2wpts/second. It can be used to enter waypoints into a Personal Computer. (As described in Section 13)

The serial data output consumes a small amount of power. For this reason, it is available on the six pin connector on the back of the unit, only when external 12 volt power is applied. There will be no serial data outputs available while operating on battery power.

GRAPHIC CROSSTRACK CONTROL

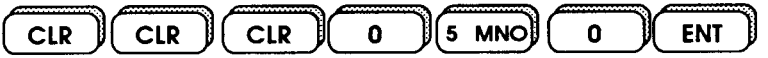
The bottom part of the fourth SETUP display is used to control the scaling of the graphic crosstrack error shown in the NAV displays.

```
DLA N 00°00.000
DLO w000°00.000
Max graphic CTE
is +/- 0.32 nm
```

You can use this display to manipulate the scaling of your graphical crosstrack error display. As previously mentioned, the graphic crosstrack display normally shows 0.32 nautical miles on each side of the center portion of the display.

If you want this display to have a different scaling, you can change its scaling by manipulating the "Graphic Crosstrack Control". For instance, if you want the Graphic Crosstrack dis-

play to show 1/2 nautical mile on both sides of center, you select the Graphic Crosstrack Control, press the CLR key several times until the cursor is in the input field on the bottom line of the display, and then key in the desired scaling.



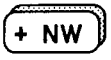
Afterwards, the display will look like this:

```
DLA N 00°00.000
DLO W000°00.000
Max graphic CTE
is +/- 0.50 nm
```

Consequently, the graphic representation of crosstrack will be re-scaled so that 1/2 nautical mile appears on both sides of the center portion of the display.

SPEED AND COURSE FILTER

The next display in the SETUP list shows the speed and course filter.




```
ALTITUDE    MANU
VEHICLE     BOAT
speed and course
filter      2 sec.
```

The GPS computes speed, course, and velocity made good with a response time of less than one second. Remember that this is the speed and course of the antenna, not the boat. For this reason, it is best to mount the antenna as low as possible, while still getting a good view of the sky and horizon.

If this is impossible, and the antenna must be mounted high on the vessel, then the displayed speed, course, and VMG may need to be filtered to reduce the effects of pitching and rolling of the boat. Under these conditions, setting the speed and course filter to 5 - 20 seconds will make the displays much more stable and useful. Setting the filtering time is further discussed in Section 5.

BEEPER CONTROL

When the Supersport's buttons are pressed, the GPS will "Beep" to let you know that you have completed a key depression. If desired, you can tell the GPS not to sound when you press the buttons. To do this, you must turn the beeper OFF. First, find the following display in the SETUP list.

SETUP SETUP + NW + NW . . .

```
DATA1   NMEA 0180
DATA2   NMEA 0183

BEEPER IS      ON
```

To turn the beeper OFF, select the above display, press CLR several times until the cursor is in the bottom display line, and then press ENT. If you want to turn the beeper back on again, follow the same process.

USING YOUR SECRET KEY AND CODE

LOCKING AND UNLOCKING WAYPOINTS 100-199

As mentioned earlier, waypoints 100-199 are "Secret" waypoints. The secret waypoints can only be used by those who know your secret four digit number, called the Key. It is called a key because it allows you to use, or unlock waypoints 100-199 when it is entered in the last WPT display.

```
TO MOVE WP205 TO
WP 26, PRESS ENT
To use WP100-199
enter key ####
```

For example, if your secret "Key" is 1234, after selecting the above display, you can "Unlock" waypoints 100-199 by pressing:

CLR CLR CLR 1 ABC 2 DEF 3 GHI 4 JKL ENT

You can now use waypoints 100-199. When waypoints 100-199 are unlocked, the bottom two lines of the above display will read "WP100-199 unlocked".

If you want to use waypoints 100-199, the waypoints must be unlocked each time you turn the unit on.

By now, you're probably asking yourself, "What's my secret key?" The answer is that your secret key for now is "0000". Every Supersport key is set to "0000" at the factory, and as long as the key is "0000" the secret waypoints are always unlocked.

The waypoints become secret only after you enter a key that is not "0000".

IMPORTANT: IT IS NOT NECESSARY TO SET THE KEY, OR TO HAVE SECRET WAYPOINTS. IF YOU DO NOT SET THE KEY, ALL WAYPOINTS WILL BE USABLE BY ANYONE. SET THE KEY ONLY IF YOU WANT TO PROTECT WAYPOINTS 100-199 FROM UNAUTHORIZED USE.

SETTING YOUR SECRET KEY

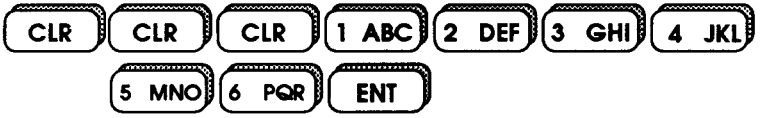
Setting your secret key is done by using displays available in the SETUP list. First, find the following display in the SETUP list.

. . .

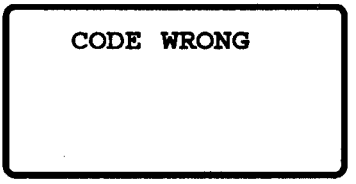
```
LightTime    20 s
ShutoffTime 20 m
TO SET KEY,ENTER
CODE        ######
```

This display is instructing you to enter a six digit code. A six digit code must be entered before you are allowed to set your secret key. This feature is built into the GPS so that only the person knowing the six digit code can change the key. Your code is located inside the front cover of this manual in the plastic envelope with a window. It states "NOT FOR DEALER -- FOR PURCHASER ONLY". After reading the card

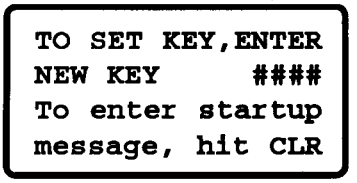
inside the envelope, you'll know what your six digit code is. If you should lose this card, contact MICROLOGIC with the serial number of the unit and after your ownership has been verified, you will be given your code. For example, if you code number is 123456, enter it into the above display by pressing:



If you enter a number other than six digit code found in your envelope, the GPS will show you this display:



If you enter the correct code correctly, the GPS will show you this display:



To set your secret key, you'll use this display.

WARNING

If your key is not 0000, be SURE to unlock waypoints 100-199 before entering a new key. If you don't do this, waypoints 100-199 will be cleared. This feature means that another person who does not know your key cannot read waypoints 100-199, even if he knows your code and resets your key. If your key is 0000, your GPS is always unlocked and you can enter a key without disturbing any waypoints.

If you want to set your secret key to 1234, press:

As previously mentioned, after setting your secret key, you can unlock waypoints 100-199 using the process that was explained earlier.

ENTERING THE IDENTIFICATION MESSAGE

When the Supersport is turned ON, a special 32 character identification message is shown on the display for about four seconds. This message identifies your GPS, and provides some protection against theft.

Remember, that in the preceding section, after entering your six digit code, you got the following display:

```
TO SET KEY,ENTER
NEW KEY      ####
To enter startup
message, hit CLR
```

To enter the Identification (startup) message, follow the instructions in the display, and press the "CLR" key.


```
Enter your new
startup message
aaaaaaaaaaaaaaa
aaaaaaaaaaaaaaa
```

Now enter your identification message in the same way waypoint names are entered. Blanks can be obtained by pressing the "+" key. A centerline dash can be made with the "-" key. If you make a mistake, press the CLR key to backspace one character. When the desired message is on the display, press ENT to enter the identification message into memory. After an identification message is entered, you will see the message every time you turn power ON. An identification message example is as follows:

```
MICROLOGIC  GPS
SUPERSPORT SS01
SEA WOLF J SMITH
213-996-7777
```

SECTION 13

CONNECTION WITH OTHER EQUIPMENT

NMEA 0180 AUTOPILOT INTERFACE

The autopilot interface will provide automatic point-to-point piloting of your vessel with the accuracy of satellite navigation.

This feature will allow you to use your autopilot to follow the most fuel-efficient great circle course to your selected destination.

The autopilot data are available as one of the selectable serial data outputs. The output signal data for the autopilot are available from the six pin connector on the back of the unit. You may use the serial data 1 (or 2) output pin and select DATA1 (or DATA2) NMEA 0180 output under the SETUP list. DATA2 should be selected if you plan to interface to an ML-95 remote display or other bidirectional NMEA 0183 campatible device. The First start procedure selects NMEA 0180 as the default output for DATA2.

The Supersport autopilot interface meets all NMEA 0180 specifications autopilot interfaces.

INSTALLATION AND SET-UP

1. Install the Supersport according to the directions in this manual.
2. Install the autopilot according to the manufacturer's instructions.
3. The signal going to the autopilot is provided on the six-conductor cable that plugs into the back of the Supersport. For Serial data 2 - connect the YELLOW wire to the autopilot signal input; and the BLACK wire to the autopilot signal ground.
4. Turn the GPS on, and verify under the SETUP key that DATA 2 is set to NMEA 0180. Enter a "TO" and a "FROM" waypoint (as described below), in order to test the system.

The BAUD rate will be set to 1200, and the signal levels are

"INVERSE TTL". Both are set by the selection of NMEA 0180 as the output data. If the autopilot gives a "NO DATA" or "BAD DATA" alarm, after the GPS has reached operating mode, check to see that the cable was properly fabricated as in step 3 (Installation and Set-up).

AUTOPILOT OPERATION

We assume that you have read and are familiar with the Operator's manual for the GPS and the autopilot. If you do not understand the nature of both the GPS and autopilots, serious errors in navigation may result. Use the following procedure to operate the GPS in conjunction with an autopilot.

1. Turn the Supersport ON and wait for the numbers to stop flashing.

2. Enter the destination into a waypoint, set TO to that waypoint number, and set FROM to 0 (zero).

3. Display Range and Bearing to get the bearing to your destination. Steer your vessel to the initial course and steady up on that bearing.

4. Display Crosstrack Error and steer the vessel toward the steering line until the indicated crosstrack error is at or near 0.00, and the ship's compass indicates the desired course.

5. Follow the autopilot manufacturer's instructions for engaging the GPS to autopilot interface.

6. Upon arrival at the destination, or when changing destination in mid-course, be sure to disengage the autopilot and repeat steps 2 through 5 to set your new course to a destination.

NOTE: Under the NMEA standards, 0.31 nautical miles is the largest crosstrack error that can be output through an autopilot interface. Although the Supersport will display up to 9.99 nm of crosstrack error, 0.31 nm is the largest error it can transmit to the autopilot.

NMEA 0183 AND DATAMARINE LINK INTERFACE

To use the DataMarine LINK system, or any device using NMEA 0183 serial data, set the SETUP item "DATA1" or "DATA2" to NMEA 0183. The Supersport has two programmable serial data output ports, each of which can drive up to three receiving devices. Connect the device to the six conductor cable running to the back of the Supersport, as shown in the diagrams later in the section.

DATAMARINE CDX AND CDI INTERFACE

The Supersport is capable of interfacing to a Datamarine CDX meter. This accessory will allow you to obtain off-course and distance information in a remote location away from the GPS. The CDX output signal is provided on the Supersport 6 pin cable from Serial data 1 or 2 output when NMEA 0180 is selected by DATA1 or DATA2. The installation, set-up, and operation of the GPS/CDX interface is similar to that of the GPS/autopilot interface previously described.

INSTALLATION AND SET-UP FOR CDX

1. Install the Supersport according to the directions in this manual.

2. Install the CDX according to the manufacturer's instructions.

3. Interconnect the Supersport to the CDX according to the diagram provided at the end of this section.

4. A three amp circuit breaker is recommended to avoid accidental GPS turn on, and is a convenient way of turning the CDX ON and OFF.

5. Make sure DATA1 or DATA2 (under the SETUP key) are set to 180 + CDX.

CDX OPERATION

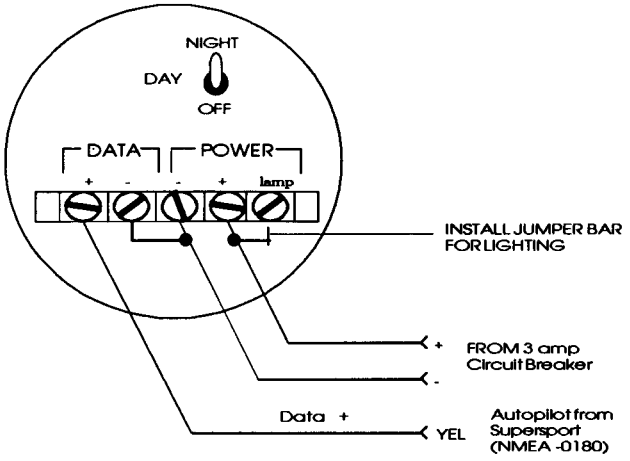
1. After turning the GPS and CDX on, wait until the numbers stop flashing. The CDX needle will sweep for approximately three minutes, until the navigation data are valid.
2. Set-up a courseline from the place you are at to the place you want to go.

REMINDERS:

A. The Supersport's CDX output has a scaling of +/- 0.3 nm full scale, which cannot be changed.

B. On the Supersport's graphic steering display, if the vertical bar is to the left of center, you must steer left to get on course. However, on the CDX, if the needle is to the right of center, you must steer left to get on course.

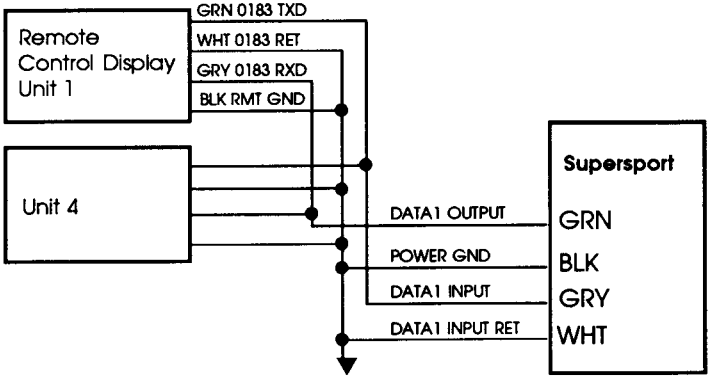
DATAMARINE



ML-95 REMOTE CONTROL/DISPLAY

The Micrologic ML-95 Remote Control Display unit can be used with your Supersport DATA1 serial input/output port to provide navigation data for a remote location on your vessel. It can also provide your Supersport unit with data from the remote location. Up to four ML-95 units can be used with the GPS. Their displays are all independent and can display different information from each other. The ML-95 makes remote installations possible on vessels with limited space. A typical use is to provide extra navigational stations on a flying bridge, tuna tower or cockpit. The host Supersport is turned on, and the vessel started along a route of waypoints. From then on the route can be followed using the remote control/display unit. From the remote location the operator can display navigation and steering data, save waypoints from present position, and change waypoints to steer the vessel along the route. Entry of waypoints in Lat/Lon, and setting up the route must be done in the Supersport.

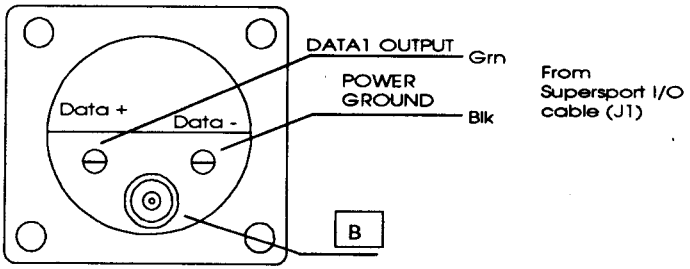
Size: 5.6" X 3.6" X 1.4" WHD (14.2 X 9.1 X 3.6 cm)
Weight: 0.7 lbs 0.32 kg
Power: 10 - 18 VDC 120 milliamperes



Single/Multi Remote System Configuration
SERIAL PORT (0183) WIRING DIAGRAM

Supersport GPS System Wiring Diagram With Micrologic ML-95 Remote Control / Display Unit

DATAMARINE
NAV-LINK MODEL 841T, REMOTE



Notes: Installation/Operation (Nav-Link Remote)

A. Prior to installation check that the Nav-Link revision on the rear panel label is "B3".
B. Connect to link system via BNC T connector and R68X cable as provided or called out by Datamarine Nav-Link Owner's Manual. For use without a Link system provide DC power via BNC connector, center pin +12v.
C. Connect Data (-) minus to black (power ground) wire and data (+) positive to green (DATA1 OUTPUT) wire of Supersport GPS power cable (J1).
D. After application of power to Nav-Link remote, the display will show all digits and annuciators for approximately three seconds. Following this, the software revision number will be displayed. THIS MUST BE REVISION 003 for proper operation.

General Information

The Supersport has two output ports and one input port which provide a programmable serial data stream. The format selection is done in the DATA1 and DATA2 display under the SETUP key. The choices are:

OFF
NMEA 0183
NMEA RMc
MCHART
7x40
24x80
NMEA RMa
NMEA 0180
180 + CDX
NAVLINK
WP UPLOAD

NOTE: In order to use the serial data input and output, the Supersport MUST be connected to external power. The serial I/O drivers are not connected to battery power.

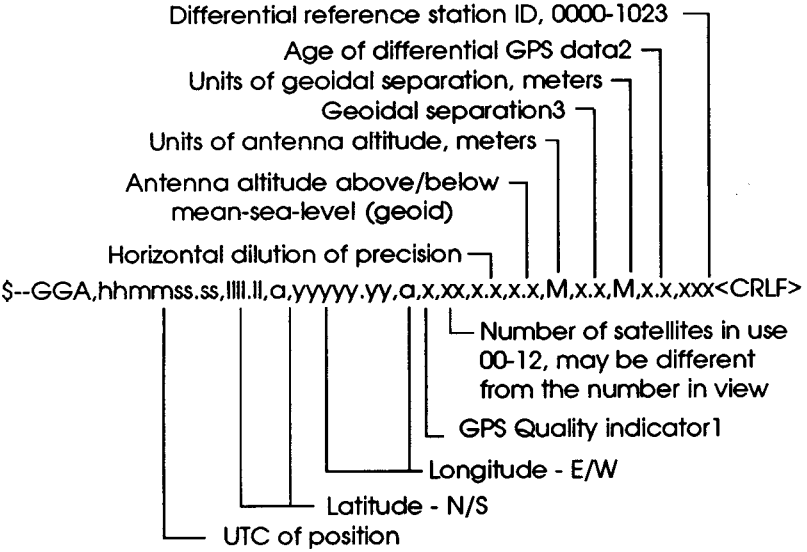
Each output port can be connected to several devices at once. For example, if the NMEA 0183 output is selected, it can be connected to a Micrologic ML-95 remote control/display, an electronic charting system, and to a personal computer, all at the same time. There may be some cases where this will not work, particularly when connected to older equipment.

Data transmitted from the Supersport follow the NMEA 0183 specification as to bit pattern (1 start, 8 data, 2 stop, no parity), baud rate (4800 baud), sentence structure and electrical configuration. We have selected 17 sentences for transmission at the rate of 2 sentences every second. Fields are delimited by commas and each sentence ends with a carriage return and a line feed (<CRLF>). The $GP identifies the data source as being GPS , and the 3 characters which follow identify the data. Some of the fields are not transmitted and are delimited by a pair of commas, unless they are at the end of a sentence, in which case they are delimited by a single comma.

NMEA 0183 SENTENCES

1: Autopilot format
$GPAPA,A,A,X.XX,L,N,A,A,XXX,M,XXXX<CRLF>
Field 1: Data valid A=valid, V=invalid
Field 2: Cycle lock
Field 3: Cross Track Error
Field 4: Direction to steer L=left, R=right
Field 5: Nautical miles
Field 6: Arrival circle
Field 7: Arrival perpendicular
Field 8: Bearing to destination waypoint from source waypoint
Field 9: Magnetic
Field 10: Destination waypoint

2: GGA - Global Positioning System Fix Data
Time, position and fix related data for a GPS receiver



Notes:
1. GPS quality indicator: 0 = fix not available or invalid
   1 = GPS fix
   2 = Differential GPS fix
2. Time in seconds since last SC104 Type 1 or 9 update, null field when DGPS is not used
3. Geoidal Separation: the difference between the WGS-84 earth ellipsoid and mean-sea-level (geoid), "-" = mean-sea-level below ellipsoid.

3: Waypoint closure velocity
$GPWCV,XX.X,N,XXXX<CRLF>
Field 1: Velocity made good
Field 2: Nautical miles
Field 3: Waypoint number

4: Cross track error
$GPXTE,A,A,X.XX,L,N<CRLF>
Field 1: Status of data A=ok, V=invalid
Field 2: Cycle lock
Field 3: Cross track error
Field 4: Left or Right
Field 5: Nautical miles

5: Course over Ground/Speed over ground
$GPVTG,XXX,T,XXX,M,XX.X,N,XX.X,K<CRLF>
Field 1: Course
Field 2: True
Field 3: Course
Field 4: Magnetic
Field 5: Speed
Field 6: Nautical miles

Field 7: Speed
Field 8: Kilometers

6: Time and position
$GPGLP,XXXXXX,XXXX.XX,N,XXXXX.XX,W,XXXX,<CRLF>
Field 1: Time
Field 2: Latitude of present position
Field 3: North or South
Field 4: Longitude of present position
Field 5: East or West
Field 6: Waypoint number

7: GPS position
$GPGLL,XXXX.XX,N,XXXXX.XX,W<CRLF>
Field 1: Latitude of present position
Field 2: North or South
Field 3: Longitude of present position
Field 4: East or West

8: Course and Distance to waypoint
$GPBWC,XXXXXX,XXXX.XX,N,XXXXX.XX,W,XXX,T,XXX,M,XXX.X,N,XXXX<CRLF>
Field 1: Time
Field 2: Latitude of waypoint
Field 3: North or South
Field 4: Longitude of waypoint
Field 5: East or West
Field 6: Bearing to waypoint
Field 7: True
Field 8: Bearing to waypoint
Field 9: Magnetic
Field 10: Range to destination
Field 11: Nautical miles
Field 12: Waypoint number

9: Time and date
$GPZDA, XXXXXX,XX,XX,XXXX,-XX<CRLF>
Field 1: Time in hour, minute, second
Field 2: Day
Field 3: Month
Field 4: Year
Field 5: Time zone

10: Time and Date
$GPZZU, XXXXXX<CRLF>
Field 1: Time in hour, minute, second

NOTE: Sentences 11, 12, and 13 are loran sentences. They are included because some older equipment will not work unless they are present.

11: Blink status
$GPSBK,V<CRLF>
Field 1: Any transmitter blinking
A = good status, V = bad (display is blinking)

12: Cycle status
$GPSCY,V<CRLF>
Field 1: A=good status, V=bad (display is blinking)

13: Signal-Noise Ratio status
$GPSNU,V<CRLF>
Field 1: A=good status, V=bad (display is blinking)

14: Accuracy
$GPSGD,XXXX,N,X.XX,f<CRLF>
Field 1: GDOP in nautical miles
Field 2: Nautical Miles
Field 3: GDOP in feet
Field 4: Feet (lower case f)

15: Bearing from source waypoint to destination waypoint
$GPBWW,XXX,T,XXX,M,XXXX,XXXX<CRLF>
Field 1: Bearing
Field 2: T for true
Field 3: Bearing
Field 4: M for magnetic
Field 5: Destination waypoint
Field 6: From waypoint

16: Time and time to go to destination
$GPZTG,XXXXXX,XXXXXX,XXXX<CRLF>
Field 1: Time in hour, min, sec
Field 2: Time to go in hour, min, sec
Field 3: Destination waypoint

17: Micrologic proprietary sentence "C" for ML-95
$PMCLC,X.XX,+00000.00,00000.00,XXXX.XX,V<CRLF>
Field 1: CDI display scale
Field 2: Time difference 1 to .01 (set to 0 in GPS)
Field 3: Time difference 2 to .01 (set to 0 in GPS)
Field 4: Range to .01 NMI
Field 5: Status

NOTE: When "NMEA RMa" or "NAVLINK" are chosen as the serial data output, the data are transmitted with the identifier $LC, instead of $GP. There are some older pieces of equipment in use, that will not work unless they receive the identifier $LC in all sentences. These choices are included, so that the GPS can be used with these older devices, which were made before GPS was developed.

EXAMPLES OF SERIAL DATA OUTPUTS

The following are some examples of sentences transmitted by the Supersport GPS, for some of the available format choices.

NMEA 0183 DATA OUTPUT

$GPAPA,V,V,9.99,L,N,V,V,166,M,0001*2F
$GPSGD,5.399,N,9999,f*47
$GPGLP,212109,3400.00,N,11800.00,W,0001*62
$GPZTG,212110,+995959,0001*59
$GPBWC,212110,0000.00,N,00000.00,W,073,T,060,M,999.9,N,0001*13
$GPWCV,00.0,N,0001*28
$GPBWW,180,T,166,M,0001,0000*45
$GPGGA,212112,3400.000,N,11800.000,W,V,0,999,+00,M,+000,M*1C
$GPXTE,V,V,9.99,L,N*67
$PMCLC,0.32,+00000.00,00000.00,6784.58,A*26
$GPGLL,3400.00,N,11800.00,W*76
$GPVTG,014,T,000,M,00.0,N,00.0,K*4B
$GPZZU,212114*6B
$GPZDA,212115,06,04,1992,+07*4D
$GPSBK,V*37
$GPSCY,V*24
$GPSNU,V*25

DATAMARINE NAVLINK NMEA 0183 VARIATION
GP IDENTIFIER REPLACED BY LC

$LCAPA,V,V,9.99,L,N,V,V,166,M,0001*37
$LCSGD,5.399,N,9999,f*5F
$LCGLP,212206,3400.00,N,11800.00,W,0001*76
$LCZTG,212206,+995959,0001*45
$LCBWC,212207,0000.00,N,00000.00,W,073,T,060,M,999.9,N,0001*0E
$LCWCV,00.0,N,0001*30
$LCBWW,180,T,166,M,0001,0000*5D
$LCGGA,212208,3400.000,N,11800.000,W,V,0,999,+00,M,+000,M*0C
$LCXTE,V,V,9.99,L,N*7F
$LCCLC,0.32,+00000.00,00000.00,6784.58,A*34
$LCGLL,3400.00,N,11800.00,W*6E
$LCVTG,014,T,000,M,00.0,N,00.0,K*53
$LCZZU,212211*75
$LCZDA,212211,06,04,1992,+07*52
$LCSBK,V*2F
$LCSCY,V*3C
$LCSNU,V*3D

MICROLOGIC MASTERCHART/DATAMARINE CHARTLINK NMEA 0183 VARIATION WITHOUT CHECKSUMS

$GPAPA,V,V,9.99,L,N,V,V,166,M,0001
$GPSGD,5.399,N,9999,f
$GPGLP,210700,3400.00,N,11800.00,W,0001
$GPZTG,210700,+995959,0001
$GPBWC,210701,0000.00,N,00000.00,W,073,T,060,M,999.9,N,0001
$GPWCV,00.0,N,0001
$GPBWW,180,T,166,M,0001,0000
$GPGGA,210702,3400.000,N,11800.000,W,V,0,999,+00,M,+000,M
$GPXTE,V,V,9.99,L,N
$PMCLC,0.32,+00000.00,00000.00,6784.58,A
$GPSNV,V
$GPSLC,4,3
$GPGLL,3400.00,N,11800.00,W
$GPVTG,014,T,000,M,00.0,N,00.0,K
$GPZZU,210706
$GPZDA,210706,06,04,1992,+07
$GPSBK,V
$GPSCY,V
$GPSNU,V

NMEA 0183 MINIMUM REQUIRED SENTENCES FOR GPS

$GPRMC,210634,V,3400.00,N,11800.00,W,00.0,014,060492,14,E*77
$GPRMB,V,9.99,L,0000,0001,0000.00,N,00000.00,W,999.9,073,00.0,V*11

NMEA 0183 MINIMUM REQUIRED SENTENCES FOR LORAN FOR SYSTEMS THAT DO NOT ACCEPT RMC/RMB

$LCRMA,V,3400.00,N,11800.00,W,00000.0,00000.0,00.0,014,14,E*66
$LCRMB,V,9.99,L,0000,0001,0000.00,N,00000.00,W,999.9,073,00.0,V*09

7X40 DATA SENTENCES

n	34	00.000	w	118	00.000		+0		ACC		9999	
ID	MD	X	E	SC	SN	ELV	DOP		MAG		T2247	1.79
19	24	0	9	10	01	62v		+12	091		Q00/5	Me14
16	23	0	9	10	01	15^		-10	079		S 0.0	C000
11	32	0	9	11	04	33v		-07	098		OSC	-3.5Hz
02	22	0	9	10	10	48^		-09	077		14:07:43	3
18	25	0	9	10	06	35v		+12	080		04/06/1992	

24X80 DATA SENTENCES

```
n  34 00.000 w118  00.000        +0      ACC   9999
ID MD X E SC SN ELV DOP  MAG  T2249  1.79
19 22 0 9 10  00 62v  +12  119  Q00/5 Me14
16 23 0 9 10  00 15^  -10  060  S 0.0  C000
11 32 0 9 10  00 33v  -07  096  OSC   -3.8Hz
02 22 0 9 10  00 48^  -10  063  14:08:14    3
18 25 0 9 10  00 35v  +05  066  04/06/1992
```

WP UPLOAD

This feature allows waypoints to be saved in a personal computer. Select DATA1 (or DATA2) WP UPLOAD in the SETUP list after setting up your PC's communication software to 4800 baud, 8 data bits, no parity, 1 stop bit, and selecting ASCII download.

Waypoints 1 - 250 are formatted in the following manner and sent at the rate of 2 waypoints per second. If the KEY is not equal to 0000 or waypoints are not unlocked then the transmission of waypoints 100 - 199 will be skipped.

```
$GPWPL,3400.01,N,11800.00,W,0001
$GPWPL,3400.02,N,11800.00,W,0002
                .
                .
                .
$GPWPL,3402.49,N,11802.49,W,0249
$GPWPL,3402.50,N,11802.20,W,0250
```

WP DOWNLOAD

Transmission of waypoints can be done from a personal computer or Yeoman video plotter to the GPS. This is done while the GPS is operating normally. The data format is the same as Upload except for the sender identification field (aa) in the header message, which may contain any 2 ASCII characters. If a waypoint numbered 100 - 199 is sent to the GPS, the old waypoint will be written over whether the Supersport is unlocked or not. When using a personal computer please be aware of the following restrictions: Select ASCII format, make sure that the communications program sends both a carriage return and a line feed, and transmit waypoint data to the GPS at no more often than 1 line every 2 seconds, or the GPS may miss some of the waypoints.

```
$aaWPL,3413.00,N,11835.90,W,0100<CRLF>
```

SERIAL DATA INPUT TEST

The serial data input port is on the following lines:

Serial data input port - Pin 6, Gray Wire
Serial Input Port Return (ground) - Pin 2, White Wire

The Serial Input data buffer is 80 characters long. It is possible to display the first 64 characters in the buffer. If the input data record is longer than 80 characters, it will wrap around in the buffer; IE, the 81st character will go into the first buffer position, the 82nd into the 2nd, etc.

The input data baud rate is 4800, and the data format is 8 bit no parity. The format is for NMEA 0183, and is not adjustable.

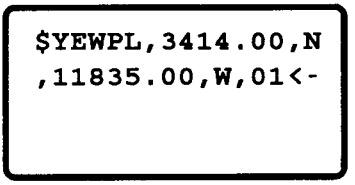
To display the first 64 characters in the 80 character input data buffer:

1. Press the SETUP key 3 times. (TEST function)
2. Press the - key once. (display all pixels)
3. Press the ENT key 2 times.(you will see a condensed mode, SNR, elevation display for product testing)
4. Press the ENT key 2 times. The display will be blank if no serial data have been received, or it will be filled with what may look like random characters.

Display Characters: Characters 00h to 0fh may resemble the special characters used in the graphic cross track error display, except for 0dh (carriage return) which is shown as a left pointing arrow, and 0ah (line feed), which is shown as a - sign.

Characters above 7fh will show as the display driver's extended character set, most of which is ASCII.

Example: Waypoint download from a Yeoman Plotter.



This represents 34°14.00 n, 118°35.00 w, 01, carriage return, line feed.

SECTION 14

ACCESSORIES AND OPTIONAL EQUIPMENT

LIST OF ACCESSORIES AND THEIR USES

1 ML-95 REMOTE CONTROL/DISPLAY UNIT

Your Supersport can be connected to up to four remote control/display units, which can be installed anywhere on your boat. The ML-95 unit provides a second, larger display, which can be used to display different information from what the Supersport is displaying. It can also by used to step waypoints, and save present position. The ML-95 is ideal for installation on a flying bridge, or second steering station.

2 EXTERIOR ANTENNA

When the exterior antenna is connected to the BNC connector on the back of the Supersport, it supersedes the internal antenna. The exterior antenna can be used to make a permanent installation on a boat, with optimal signal reception in all weather.

3 BULKHEAD MOUNTING KIT

This kit simplifies making an installation of the Supersport in a vertical bulkhead or wall.

4 TABLE MOUNT TILT STAND WITH TWO KNOBS

This is a convenient mounting on a horizontal surface.

5 WALL MOUNT HOLDER WITH TWO KNOBS

This provides a convenient holder on a wall. The unit is flush with the wall, and is not designed to permit installation of external antenna or power cables.

6 POWER CABLE, 6 WIRE, 10 FEET, WITH BUILT IN RESISTOR FOR 10-18 VDC OPERATION AND BATTERY CHARGING

This cable is used for connecting to 12 volt power, and to serial data input and output.

7 CIGARETTE LIGHTER POWER CABLE, 2 WIRE, WITH BUILT IN RESISTOR

This will power the Supersport and charge the batteries simultaneously, when plugged into the cigarette lighter of an automobile. It does not have any connections for serial data input or output.

8 110 VAC 60 HZ BATTERY CHARGER

This unit will charge a rechargeable battery pack overnight, but does not have enough current to operate the unit.

9 RECHARGEABLE BATTERY PACK

This battery pack will operate the unit for 2 to 3 hours, and can be recharged from 12 VDC or 110 VAC. It is waterproof, and can be removed from the Supersport by sliding off two guide rails. A fresh battery pack can then be slid into place in a few seconds.

10 NONRECHARGEABLE BATTERY PACK

This unit is waterproof, and holds 6 AA Alkaline batteries. It will power the GPS for about 7 hours. If 12 volt external power is applied while a nonrechargeable pack is used, the batteries will not be discharged or charged while the GPS is operated. The batteries will continue operation of the GPS, if the 12 volt power is cut off.

TROUBLE SHOOTING GUIDE		
SYMPTOMS	**CAUSES**	**REMEDIES**
After turn-on, it takes more than 5 minutes to lock on and provide a position fix.	1. There may be fewer than 3 satellites available.	1. Check second POS display. Wait until three satellites are available.
	2. You are operating under the shade of hills or buildings.	2. Move the antenna to a clear area.
Unit will not lock on and provide a position fix.	1. Lat/Lon of present position not initialized within ten degrees.	1. Do a first start procedure. (See section 3)
	2. Time not set within 45 minutes.	2. Check present position displayed with POS key.
	3. Fewer than three satellites are available.	3. Check Time displayed with SETUP key.
		4. Check number of satellites available, with second POS display.
		5. Wait for satellites.
Supersport will not turn ON.	1. Batteries are run down.	1. Change battery packs.
	2. External power is not connected.	2. Recharge battery pack if rechargable.
		3. Change 6 alkaline AA batteries, if non-rechargable battery pack is being used.
		4. Check external power.

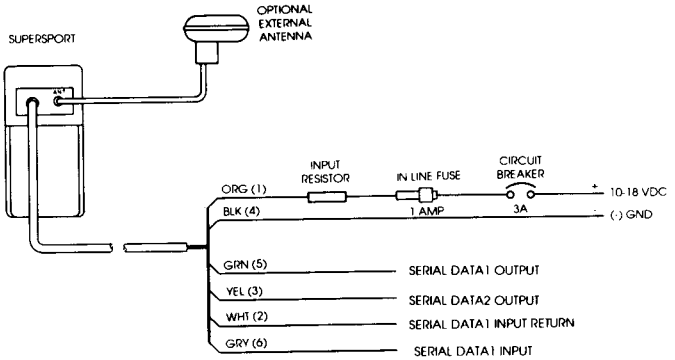
SUMMARY OF SETUP FUNCTIONS

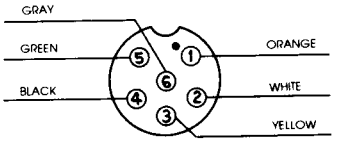
NAME	RANGE OF VALUES	DESCRIPTION	VALUES AT FIRST START
Arrival Alert	ON-OFF	Waypoint Arrival Alert Control	OFF
Range	0.00-9.99 nm	Waypoint Arrival Alert Range	0.05 nm
Crosstrack Alert	ON-OFF	Crosstrack Error Alert Control	OFF
Range	0.00-9.99 nm	Crosstrack Error Alert Range	0.10 nm
Anchor Watch Alert	ON-OFF	Anchor Watch Alert Control	OFF
Range	0.00-9.99 nm	Anchor Watch Alert Range	0.10 nm
auto magvar	ON-OFF	Automatic Magnetic Variation Control	ON
mag var	e180°-w180°	Manually Input Magnetic Variation	-
LL Format	MM.MMM or MM SS.S	Lat/Lon Format Control	MM.MMM
DIST/SPD	nm/kts, sm/mph km/kph	Distance and Speed Format Control	nm/kts
ALT/ACC	feet, meters	Altitude and Accuracy Format Control	feet
DLA DLO	+/- 30.000 min +/- 30.000 min	Latitude Offset Longitude Offset	n 00°00.000' w000°00.000'
Max. Graphic CTE	0.00-9.99 nm	Graphic Crosstrack Error Scaling	0.32 nm
DATA1	OFF, NMEA 0183, NMEA RMc, MCHART, 7x40, 24x80, NMEA RMa, NMEA 0180, 180 + CDX, NAVLINK, WP UPLOAD	Channel 1 Serial Data Output Control	OFF
DATA2	SAME AS DATA1	Channel 2 Serial Data Input/Output Control	OFF

Beeper	ON/OFF	Control to turn off audio tone when keys are pressed. Does not turn off Alerts.	ON
ALTITUDE	AUTO -MAN	Automatic/Manual alt. computation selector	MAN
VEHICLE	CAR,BOAT, PLANE	Vehicle selector - Used to control speed of altitude computation	BOAT
SPEED AND COURSE FILTER	1-255 seconds	Speed and course filtering time	2 sec.
SAT. SELECT	AUTO-MAN	Manual or automatic satellite selection	AUTO
SAT NUMBERS	0-32	Satellite numbers, can be input only if SAT. SELECT is MAN	-
MGRS/UTM	ON/OFF	Position and waypoint displays of MGRS and UTM coordinates shown only if ON	OFF
LORAN TD	ON/OFF	Position and waypoint displays of loran TD coordinates shown only if ON	OFF
ACCURACY OF GPS SYSTEM	15-200 meters	Accuracy of the GPS system This should be set to 100 if SA on, 15 if SA off	100 meters
MAP DATUM	AUTO-MANU	Controls if map datum is selected automatically or manually	MANU
MAP DATUM	WGS-84,WGS-72 INT'L, GRS-67 CLARK-66, CLARKE-80 EVEREST, Mod EVER AIRY, Mod AIRY, BESSEL and 123 others listed after BESSEL	Map datum used to compute present position, and to convert from one coordinate system to another.	WGS-84
USER DEF. DATUM		Five numbers which can be input to provide a non-standard datum, which can be accessed by selecting the Datum named USER DEF. See Section 11 for instructions.	

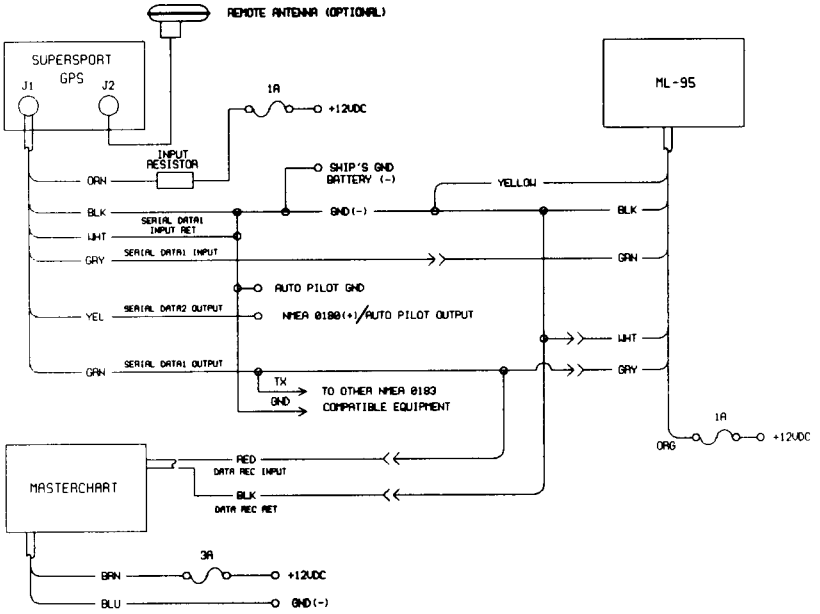
BATTERY TIMER	00:00 - 99:59 hr:min	Timer to keep track of how long battery has been used	00:00
LightTime	5-255 seconds	Timer to control automatic turnoff of lights	20 sec
ShutoffTime	5-99 minutes	Timer to control automatic shutoff of navigator	20 min
TO SET KEY ENTER CODE	-	Special code to enable setting Key and startup (identification) message	-

SUPERSPORT SYSTEM WIRING DIAGRAM





SUPERSPORT SYSTEM WIRING DIAGRAM WITH NMEA 0183



9610 DESOTO AVENUE
CHATSWORTH, CA 91311

OMSSP5-92