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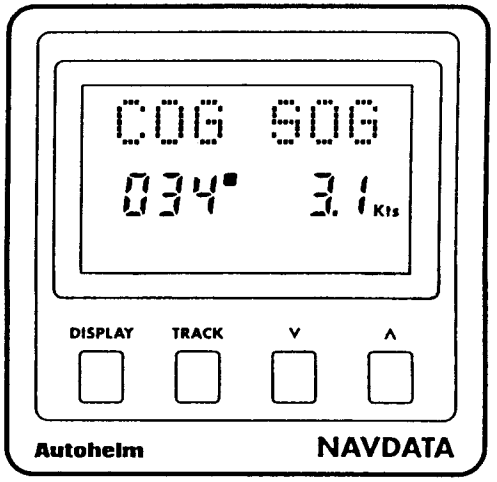
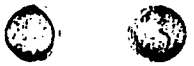
Autohelm™

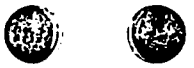
ST50

NAVDATA
Operation and
Installation

Contents







Chapter 1: Specifications

- Power Supply
  - 11 V to 16 V
- Current Consumption
  - 50 mA (Illumination off)
  - 175 mA (Maximum illumination)
- Operating Temperature
  - 0 °C to + 70 °C
- Size
  - 110 mm (4.33 in) x 110 mm (4.33 in) x 24 mm (1 in).
  - Overall depth 39 mm (1.5 in)
- Computer
  - 8 bit Intel microprocessor + 32 K Rom
- Display
  - Custom Dot matrix/7 Segment liquid crystal
- NMEA Input
- Local Time display
- Dead Reckoned facility
- 99 Waypoints (Master mode only)
- Route function
- Route reversal
- SeaTalk compatible
- Illumination
  - 3 levels and Off with back lit display.

Chapter 2: Introduction

The ST50 Navdata can be set up to operate in one of two modes:

- 'Repeater' mode
  - Where waypoints are entered into a Radio Navigation Receiver (Position transducer) or Navcenter and waypoint navigation information is then received by the Navdata from the NMEA input or SeaTalk bus.
- 'Master' mode
  - Where all waypoints are entered and stored in the Navdata.

In its simplest form the ST50 Navdata is a waterproof cockpit repeater for a Position transducer (GPS, Loran, Decca) repeating information such as :

- Current vessel latitude and longitude.
- Bearing & Distance to Target Waypoint.
- Cross Track Error.
- Time.
- Speed Over Ground (SOG) and Course Over Ground (COG)

A number of computed functions are also displayed :

- Tidal Direction and Speed (Set and Drift).
- VMG over the ground to windward.
- VMG over the ground to Target Waypoint.
- Arrival time at Target Waypoint.

A 'bargraph' display provides a continuous indication of Cross Track Error. This shows both the magnitude of error and the direction to steer to regain the Track set-up on the position transducer.

The Navdata is also a cockpit repeater for the Autohelm Navcenter and provides full track control from the cockpit.

In 'Master mode' the Navdata receives position information directly from a position transducer. Waypoints are directly entered into the Navdata via the keypad and can be built up into a pre-planned route for easy navigation to your destination.

The Route can also be reversed for the return passage.

Should the position transducer fail, the Navdata will automatically calculate a dead reckoned position for the vessel using the boat speed and heading information from the SeaTalk bus.

The ST50 Navdata shares all the benefits of the ST50 instrument range such as simple installation, single interconnect wiring, full information sharing, easy to use keypad and a large clear information display.

Warranty period is 1 year from date of purchase.

We strongly advise you to fill in the card supplied in the warranty booklet. This is for our records only and will help to provide the minimum of inconvenience should you require service at any of our world wide service centers.

Chapter 3: Operation

3.1:Initial setting up

To suit the installation, the following options can be set up:

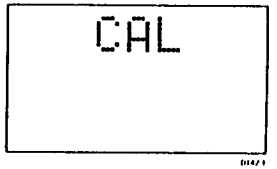
- Operating mode (Master or Repeater)
- Data port format (NMEA 0183/AH GPS/Navstar 2000D)
- Position Correction (On/Off)

These are factory set to Repeater, NMEA 0183 and Position Correction Off but can be changed to suit other installations. The settings are retained by the Navdata, even after power has been removed.

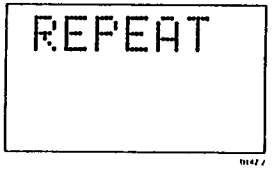
Operating Mode

Selection is carried out as follows:

- Press the **Display** and **Track** keys for 2 seconds

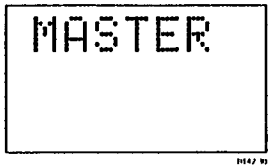


- Press the **Display** key



- To select 'Repeater' mode and return to normal operation press the **Display** and **Track** keys for 2 seconds or :
- Select 'Master' mode as follows:

■ Press the Λ key



■ Select 'Master' mode and return to normal operation by pressing the **Display** and **Track** keys for 2 seconds.

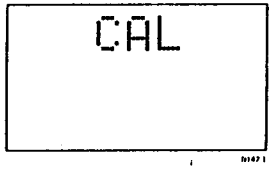
Data Port Format

The Navdata can be set up to receive one of the following data formats via the data port on the back of the instrument.

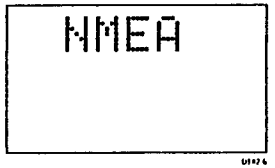
- NMEA 0183
- Navstar 2000D
- AH GPS (Future use)

Selection is carried out as follows:

■ Press the **Display** and **Track** keys for 2 seconds



■ Press the **Display** key until the display shows 'NMEA'

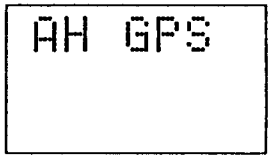


■ To set up the Navdata data port to receive NMEA 0183 data press the **Display** and **Track** keys for 2 seconds. The unit will then return to its normal operating mode.

Select Navstar format as follows:

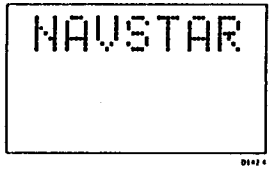
■ Select AH GPS format.

■ Press the Λ key.



Note: AH GPS mode is for future use.

■ Press the Λ key.

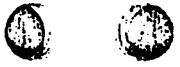


■ To set up the Navdata data port to receive data from a Navstar 2000D press the **Display** and **Track** keys for 2 seconds. The unit will then return to its normal operating mode.

Position Correction

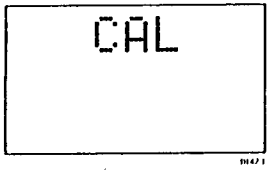
This is only available when the Navdata is in 'Master' mode and should only be used when the position transducer has no position correction facility and is connected to the Navdata via the data port.

Radio Position Transducers (Decca, Loran) suffer from radiowave interference which can be caused by atmospheric changes, local land masses and time of day. This interference produces position errors. If an accurate current position is known, a correction can be set up on the Navdata instrument. It is important that this is only used to correct for land mass induced errors. It should only be set up during the middle of the daylight period and when atmospheric conditions are fairly stable.

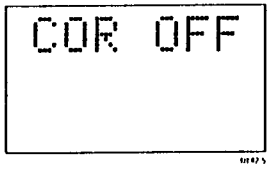


Set up a position offset correction as follows:

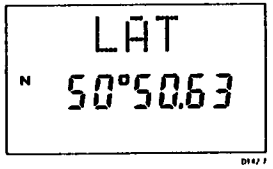
- Press the **Display** and **Track** keys for 2 seconds



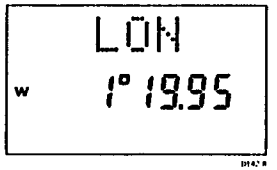
- Press the **Display** key until the display shows 'COR OFF'



- Press the **Λ** key to turn position correction on.
- Press the **Display** key



- Adjust the displayed latitude using the **Λ** and **V** keys to the corrected value.
- Press the **Display** key
- Adjust the displayed longitude using the **Λ** and **V** keys to the corrected value.

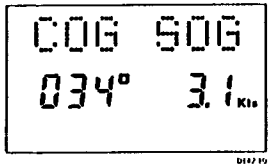


- To store the new corrected position press the **Display** and **Track** keys for 2 seconds. The unit will then return to its normal operating mode displaying and transmitting the corrected position.

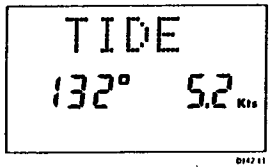
3.2 Display Key

This is used to cycle the following display options

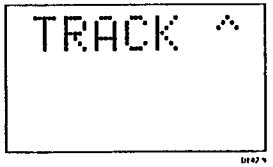
- Speed Over the Ground and Course Over the Ground
- Tidal direction and speed (Set and Drift)
- Position data (see p17)
- VMG data (see p18)
- Local time
- The unit will always power up displaying 'Course over the Ground' and 'Speed over the Ground'. You can then cycle through the other display options as follows:



■ Press **Display**



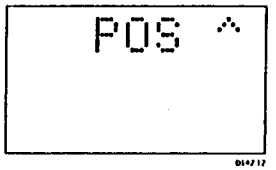
■ Press **Display**
(This display is by-passed if there is no waypoint information)



■ Press Λ to display:
- Cross Track Error (in 'Track Control' only)
- Bearing and Distance to Waypoint
- ETA at Target Waypoint

(See section 3.4)

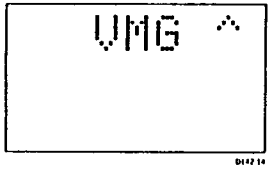
■ Press **Display**



■ Press Λ to display:
- Current vessel Latitude
- Current vessel Longitude

(See section 3.4)

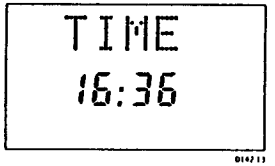
■ Press **Display**



■ Press Λ to display:
- VMG Over the ground
- VMG to Waypoint

(See section 3.4)

■ Press **Display**



3.3 Track Key

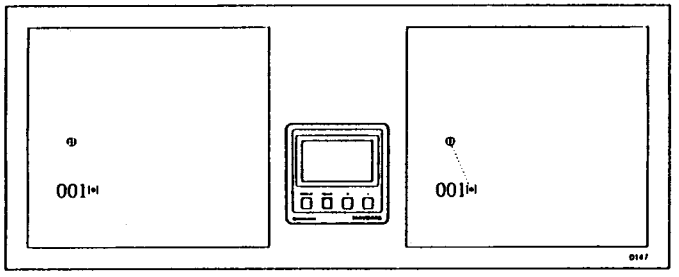
The function of the **Track** key depends upon the operating mode set up on the Navdata.

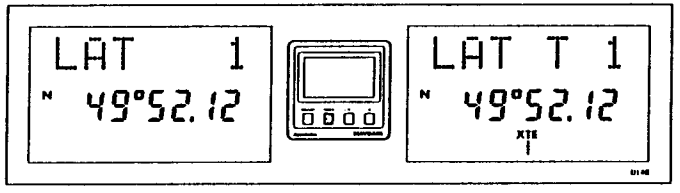
Repeater

In this mode the waypoint(s) are set up on a Navcenter or 'Master' Navdata.

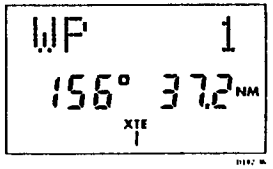
Track initiation

Provided a target waypoint has been set up on a Navcenter or 'Master' Navdata a single press of the Track key will define a track from the vessels current position to the target waypoint.



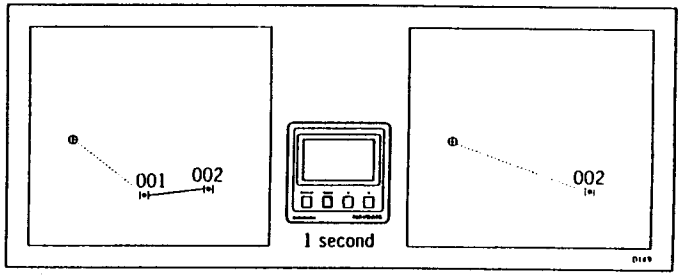


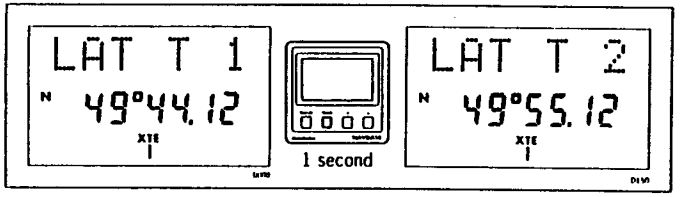
The Navcenter/'Master' Navdata will then transmit navigation information, relating to the target waypoint, onto the SeaTalk bus. This will be received and displayed by the 'Repeater' Navdata.



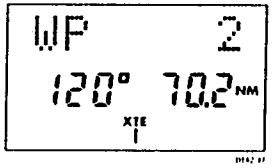
Waypoint Advance

A one second holdown of the Track key will advance the target waypoint on a Navcenter or 'Master' Navdata onto the next waypoint in the route.





The Navcenter/Navdata will then transmit navigation information relating to the new waypoint onto the SeaTalk bus which will again be received and displayed on the 'Repeater' Navdata.



Master

In master mode the Track key is used to set up and display waypoints and routes. It also puts the Navdata into 'Track Control' – transmitting navigation information relating to the target waypoint onto the SeaTalk bus.

For further information relating to the entry of waypoints please refer to chapter 4.

3.4 Λ and V keys

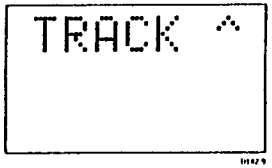
Some display options selected using **Display** have more than a page of information. These are:

- Track
- Position
- VMG

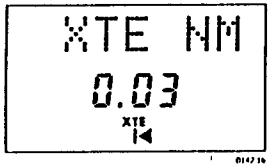
These additional pages are selected using the **Λ** and **V** keys.

Track Display

Track displays are only available if a target waypoint has been set up.

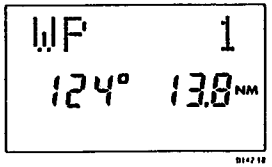


■ Press the Λ key



Note: Cross Track error information will only be displayed if the Navdata is in 'Track Control'.

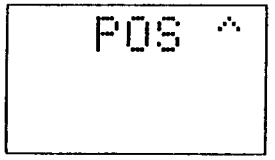
■ Press the Λ key



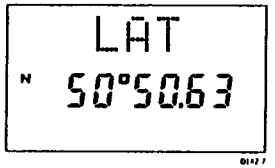
■ Press the Λ key

■ Press Λ to roll over to the XTE display again or **Display** to call-up the next function.

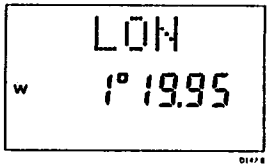
Position Display



■ Press the Λ key

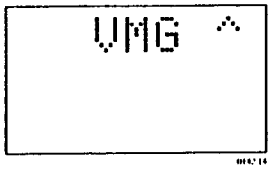


■ Press the Λ key

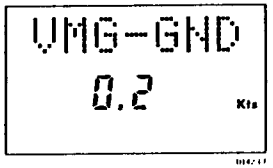


■ Press the Λ key to roll over to the Latitude display again or the **Display** key to call-up the next function.

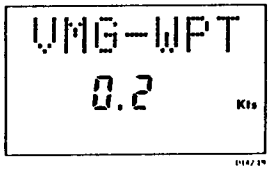
VMG Display



- Press the Λ key



- Press the Λ key



Note: To display 'VMG – WPT' information a target waypoint must be set up.

- Press Λ to roll over to the 'VMG – GND' display again or **Display** to call-up the next function.

3.5 Display Contrast

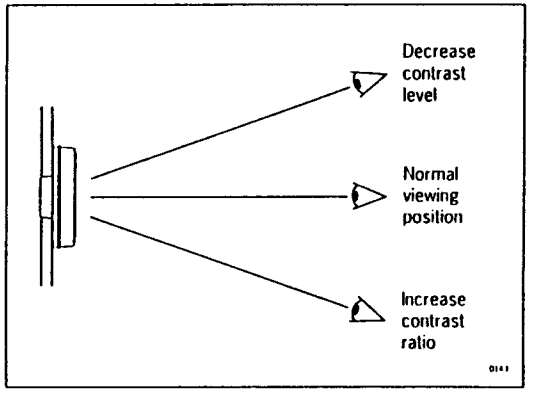
Adjustment

The Navdata liquid crystal display is designed to provide good legibility over a wide range of viewing angles. However, it is recommended that wherever possible the instrument is mounted so that the viewing angle is normal to the lcd display. If the Navdata is mounted so that the usual viewing position is at an angle to the lcd display, the display contrast can be adjusted to improve legibility as follows:

- Push **Display** and **Track** together momentarily.
- Push Λ to increase, **V** to decrease contrast level.

  Adjust so that the display has optimum legibility when viewed from the usual operating position.
- Push **Display** and **Track** together momentarily to store the selected contrast level.

  Note: Increasing the contrast level will suit installations where the instrument is normally viewed from below.



3.6 Display Illumination

- Push and hold down **Display** for 1 second to switch on illumination.
- Push **Display** within 10 seconds to select illumination level.

High	3
Medium	2
Low	1
Off	OFF

(Illumination level is displayed for 10 seconds only)

The selected level will then be transmitted down the SeaTalk bus to all other instruments and autopilot control units.

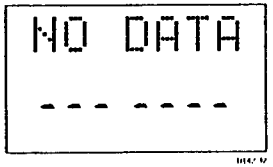
3.7 Dead Reckoned Mode

If the Navdata stops receiving a position signal from the position transducer it will sound an alarm and display a warning – NO DATA on the display for 10 seconds.

If the Navdata is receiving boat speed and heading information from the SeaTalk bus, it will automatically calculate a dead reckoned position for the vessel using the SeaTalk data. Position displays will change to indicate a dead reckoned position:

Any transmission of bearing and distance to waypoint, waypoint number and crosstrack error will stop. It is not possible to reselect 'Track Control' when the navdata is dead reckoning.

If the position signal returns, the Navdata will automatically return to normal operation.



Chapter 4: Master Mode Operation

4.1 Introduction

In 'Master' mode up to 99 waypoints can be entered into the Navdata via the keypad. Waypoints are grouped together sequentially to form a route. One waypoint can then be selected as the 'target' so that navigation data relating to that waypoint is displayed and transmitted onto the SeaTalk bus.

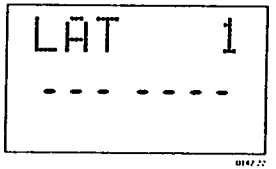
As the vessel passes its Target waypoint the Navdata will automatically advance to the next waypoint. This will continue until the end of the route which can be marked with an empty waypoint location. It is also possible to reverse the route direction for the return passage.

If the installation has more than one Navdata, only one should be set up in 'Master' mode. The remaining Navdata's should be left in 'Repeater' mode and will read the information transmitted by the 'Master' Navdata from the SeaTalk bus.

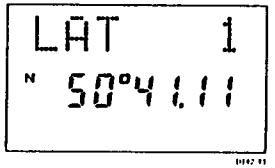
4.2 Waypoint Display Mode

Up to 99 waypoints can be entered into the Navdata as follows:

- Press **Track** to enter 'Waypoint Display Mode'.
  This is how the display will look if no waypoint data is stored.



- Press **Λ** or **V** to view any one of the waypoint stores.
- Press and hold down **Λ** or **V** to fast scroll.
- If a waypoint store is occupied the display will indicate:

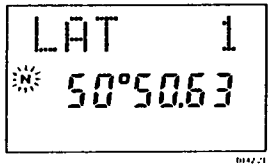


4.3 Waypoint Entry

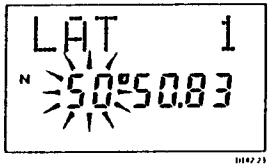
Enter a waypoint as follows:

Select the store you wish to save the waypoint in – see 4.2
There are two locations for each store – one for latitude and the other for longitude. Select the latitude first.

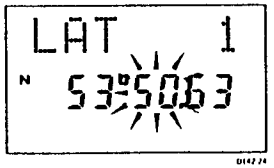
- Momentarily press Λ and V together.
  This will display the latitude of the vessels current position and the N/S legend will start to flash.



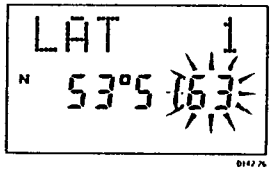
- Toggle between North (N) and South (S) as required using the Λ or V key.
- Momentarily press Λ and V together.
  (The degree figures will flash)



- Set-up waypoint degrees using Λ and V
- Momentarily press Λ and V together.
  (The minutes figures will flash)

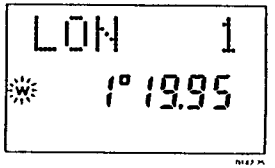


- Set up the waypoint minutes using Λ and V
- Momentarily press Λ and V together.
  (The hundreths of minutes will flash)

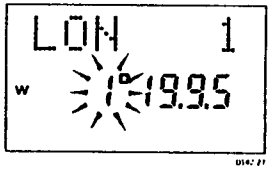


Set up the waypoint hundreths of minutes using Λ and V

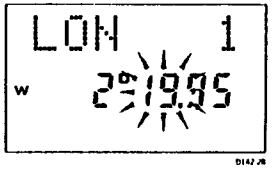
- Momentarily press Λ and V together to store the latitude.
- Press the Λ key to set up the Waypoint longitude.
- Momentarily press Λ and V together.
  This will display the longitude of the vessels current position and the E/W legend will start to flash.



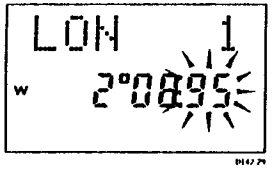
- Toggle between East (E) and West (W) as required.
- Momentarily press Λ and V together.
  (The degree figures will flash)



- Set-up waypoint degrees using Λ and V
- Momentarily press Λ and V together.
  (The Minutes figures will flash)



- Set up the waypoint minutes using Λ and V
- Momentarily press Λ and V together.
  (The hundreths of minutes will flash)



- Set up the waypoint hundreths of minutes using Λ and V
- Momentarily press Λ and V together to store the longitude.

4.4 Setting up a Route

Each time a waypoint is reached and if the next waypoint store has a lat / long entered, the Navdata will automatically select this as the new target.

Setting up a route is simply a matter of entering each waypoint along your route next to one another in the waypoint store.

For example a route can be:

12, 13, 14, 15 or 20, 21, 22, 23, 24, 25, 26 etc.

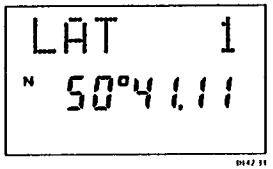
If you want to save a number of routes permanantly it is a good idea to start route 1 at 10, route 2 at 20 etc. The first 9 waypoints can then be used for temporary waypoint storage.

4.5 Track Control

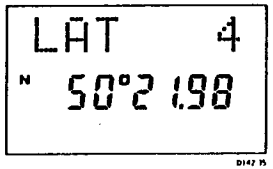
Selecting

Once the latitude and longitude of a waypoint have been entered it can then be selected as a target waypoint as follows:

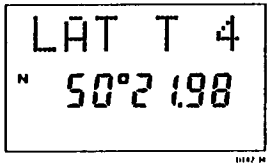
- Press the **Track** key to display waypoint information.



- Display the intended Target Waypoint number (lat or long) using the **Λ** / **V** keys.



- Press the **Track** key to select 'Track Control'.



This will define a Track from current position to the displayed waypoint.

The following Navigation information will be displayed on the Navdata and also transmitted onto the SeaTalk bus.

- Cross Track Error (XTE)
- Bearing to Target Waypoint
- Distance to Target Waypoint
- Target Waypoint Number
- ETA at Target Waypoint
- VMG to Target Waypoint

To exit 'Track Control' press **Track**. Transmission of cross track error onto the SeaTalk bus will stop, but waypoint distance, bearing and number will continue.

Changing Target Waypoint

The Target waypoint may be changed as follows:

- Press **Track** to enter Waypoint Display mode
- Press **Track** again to exit 'Track Control'
- Use **Λ** and **V** to select the new waypoint number (either lat or long).
- Press **Track** to enter 'Track Control' and select the displayed waypoint as the target.

Navigation information relating to the new target waypoint will now be transmitted onto the bus.

Waypoint Advance

The Navdata will automatically advance onto the next waypoint in a route when it is within 0.2 nm of a target waypoint. Waypoint Advance can also be manually selected to join a route part way through, or simply cut a corner by advancing the target waypoint.

- Select 'Track Control' by pressing **Track.**
- Press **Track** for 1 second to advance the Target Waypoint by one.

The display will show the new target waypoint number and longitude. This procedure can then be repeated until the desired target waypoint is reached.
At the end of a route, the Navdata will automatically exit 'Track Control'.

Route Reversal

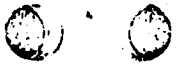
Once a passage is completed it can be useful to reverse a route for the homeward journey.

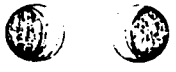
This can be carried out as follows:

- Press **Track** to enter waypoint display mode
- Select the last waypoint number in the route using **Λ** and **V**
- Enter Track Control by pressing **Track**
- Press **V** within 2 seconds to reverse the route direction.

The display will show ROUTE/REVERSE for 10 seconds.

The Navdata will now automatically advance through the route in reverse order and end up back at the start of the route.





4.6 Operation with SeaTalk autopilots

When a Seatalk autopilot is included in the system, 'Track Control' is available in the cockpit using the autopilot control unit.

The autopilot control unit allows you to:

- Put the Navdata into 'Track Control'
- Re-define your desired Track from current position to the target waypoint.
- Advance your target waypoint along your pre – planned route.
- Look at bearing and distance to target waypoint, the target waypoint number and the cross track error.

The Navdata has an automatic waypoint advance feature which allows you to sail a complete pre-planned route under autopilot control *without leaving the cockpit.*

Autohelm have combined the Navdata and autopilot together with safety uppermost in mind.

When the autopilot is in Track mode and the Navdata advances onto the next waypoint, the following will happen :

- The autopilot waypoint advance alarm will sound
- The bearing to the next waypoint and the direction in which the vessel will turn will be displayed on the autopilot control unit.

Once you have checked that it is safe to turn pushing **Track** on the autopilot will turn the vessel onto the new bearing and start tracking to the new target waypoint.

Chapter 5: Data Format

The Navdata will accept navigation data transmitted to the following formats:

- NMEA0183
- Navstar 2000D
- Autohelm SeaTalk

5.1 NMEA 0183

The following NMEA 0183 data will be decoded if connected to the data port on the rear of the unit.

Data	NMEA 0183 Header
Longitude & Latitude	GLL,IMA,GXP,GXA,GDF,GDP,GDA,GOF,GOP, GOA,GLF,GLP,GLA,GGA,RMA,RMC
Course Over Ground	VTG,VTA,RMA,RMC
Speed Over Ground	VTG,VTA,RMA,RMC
Variation	HVD,HVM,RMA,RMC
Cross Track Error	XTE,XTR,APA,APB,RMB
Bearing To Waypoint	BPI,APB,BWR,BWC,BER,BEC,RMB
Distance To Waypoint	BPI,BWR,BWC,BER,BEC,WDR,WDC,RMB
Waypoint Number	BOD,WCV,WDR,WDC,APA,APB,BPI,BWR, BWC,BER,BEC,RMB
Time	ZZU,ZLZ,ZDA,ZFI,ZFO,ZPI,ZTA,ZTE,ZTG,ZTI, ZWP,ZEV,RMC

5.2 Navstar 2000D

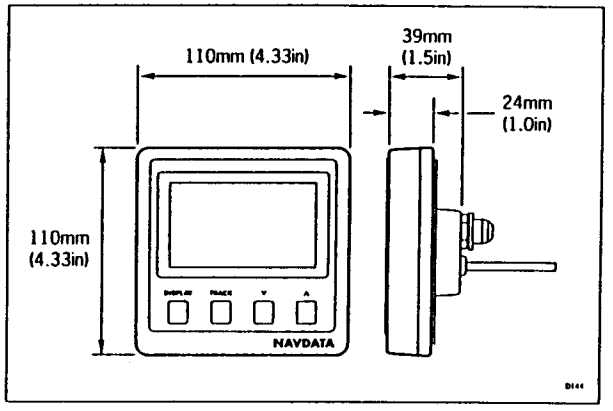
The Navstar 2000D Decca Position transducer has its own special output data format. The Navdata will decode this data if received via its data port. It will then display the following information without the need for a special interface:

- Longitude and Latitude
- Speed over Ground
- Course over Ground
- Bearing and Distance to waypoint
- Cross Track Error
- Waypoint Number

5.3 Autohelm SeaTalk

The Navdata can accept Navigation information transmitted via the SeaTalk bus. This will automatically take preference over any data being received via the data port.

Chapter 6: Installation



6.1 Siting

The Navdata is designed for above or below deck installation.

Position where it is :-

- Easy to read by the helmsman
- Reasonably well protected from physical damage.
- At least 230 mm (9in) from a compass.
- At least 500 mm (20in) from radio receiving equipment.
- Accessible from behind to secure in place and run cables.

Note: The back cover is designed to breath through a duct in the cable boss to prevent moisture accumulation. This must be protected from the weather by following the 'surface mounting' instructions.

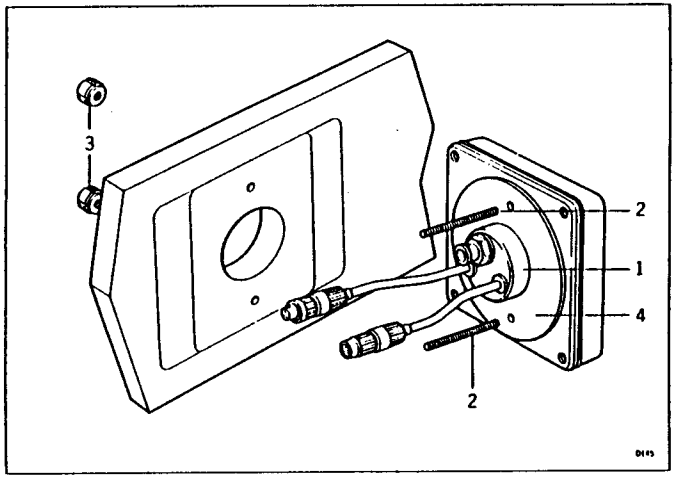
6.2 Mounting procedure

Surface Mounting

- The surface must be smooth and flat .
- Use the template provided to mark the centers of the two fixing holes and cable boss (**1**).

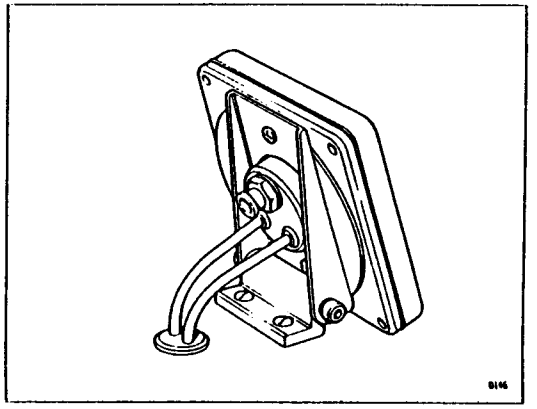
Note: Adjacent units should have 6mm (1/4 in) separation to allow room for the protective covers.

- Drill to 4 mm (5/32 in) diameter.
- Use a 50 mm (2 in) diameter cutter to drill the hole for the cable boss.
- Screw the two fixing studs (**2**) into the back cover.
- Pass the cable tails through the central hole and secure the instrument with the thumb nuts provided (**3**). A sealing gasket (**4**) is already attached to the back cover of the instrument.



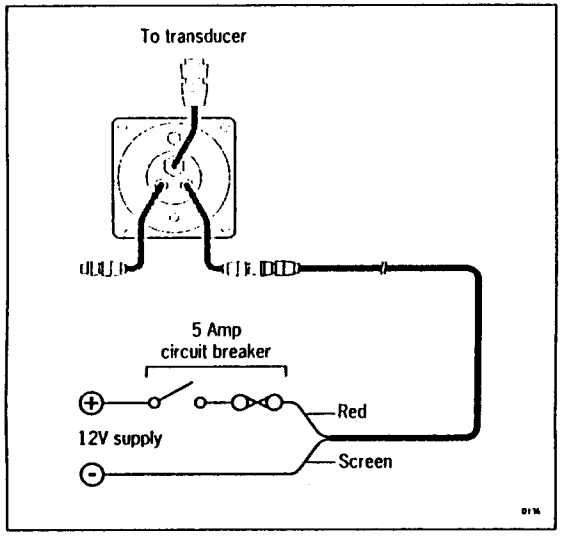
Bracket Mounting

As an alternative to surface mounting, a kit (cat no D130) is available to bracket mount the instrument.



When bracket mounting the instrument it must be mounted in a sheltered position protected from the weather.

.3 Power supply

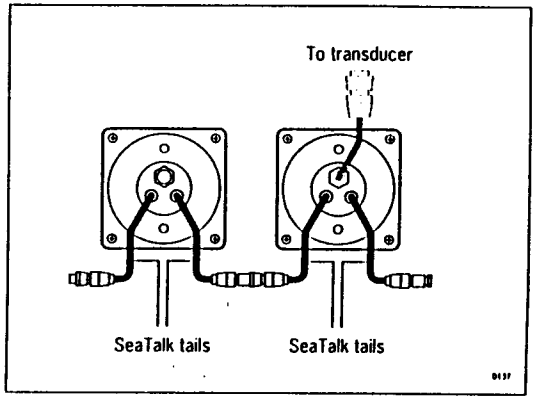


Most installations only require one connection to the 12v power supply.

This is connected to the first SeaTalk instrument using the 2M cable supplied. Plug the connector into the instrument and lead the other end back to the vessels distribution panel. Cut the cable to length, connect directly to the distribution panel and protect with a 5A fuse or circuit breaker. Connect the red cable to +12v and the Screen to 0v. The yellow wire should be cut back and insulated to reduce radio interference.

Longer runs to the power supply can be made using the SeaTalk extension cable (cat no D131) which is 9M (30ft) long.

6.4 Connection to adjacent Instruments



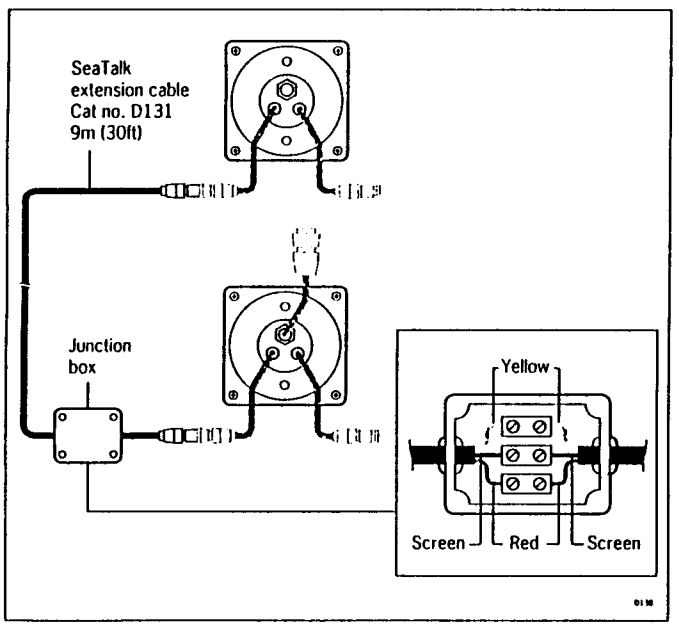
All additional instruments receive both power and information via the SeaTalk bus. Each instrument has two SeaTalk connectors (3 pin) on short 150 mm (6 in) tails to allow adjacent units to simply plug together.

6.5 Connection to separated Instruments

Separated instruments are connected using the SeaTalk extension cable (cat no D131) This is supplied with a SeaTalk connector fitted to each end and with a junction box to rejoin the cable if it is cut to ease routing or for shortening.

If preferred , any two core screened cable to the following specification may be used in the place of the SeaTalk cable.

	Minimum Copper area	A.W.G
Screen	0.5 mm2	22
2 Cores	0.5 mm2	22

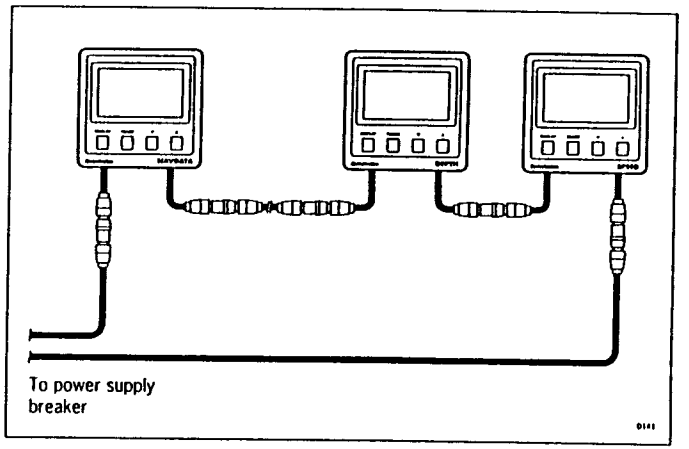


6.6 Ring Connection

Installations with a large number of instruments on the SeaTalk bus may require a second ring main connection to avoid excessive voltage drops. This can be checked using the table below:-

SeaTalk Cable length	Max number of units Single Connection	Second Connection
Up to 10m (33ft)	13	26
Up to 20m (66ft)	7	13

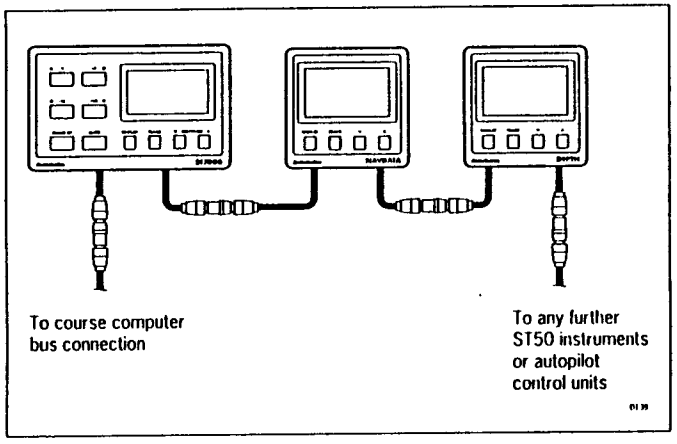
The second connection should be made to the spare lead on the last instrument and led back to the circuit breaker, or if fed via an autopilot to the connector box and connected to the terminal marked 'Bus'.



6.7 SeaTalk compatible Instruments / Autopilot

If the vessels installation includes a SeaTalk compatible autopilot the ST50 instruments may be connected to the SeaTalk bus at any point.

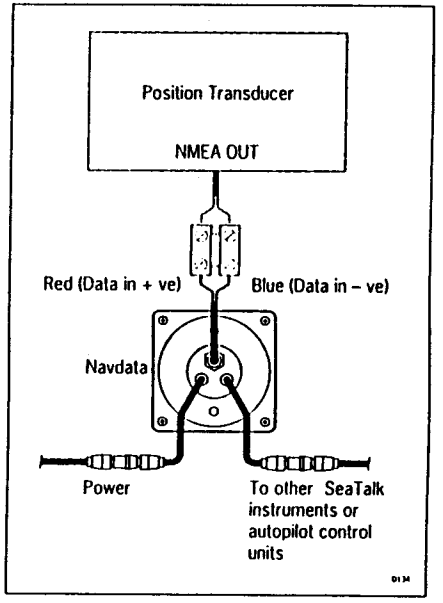
No separate connection to the 12v power supply is necessary as the instruments will receive power via the bus from the autopilot course computer.



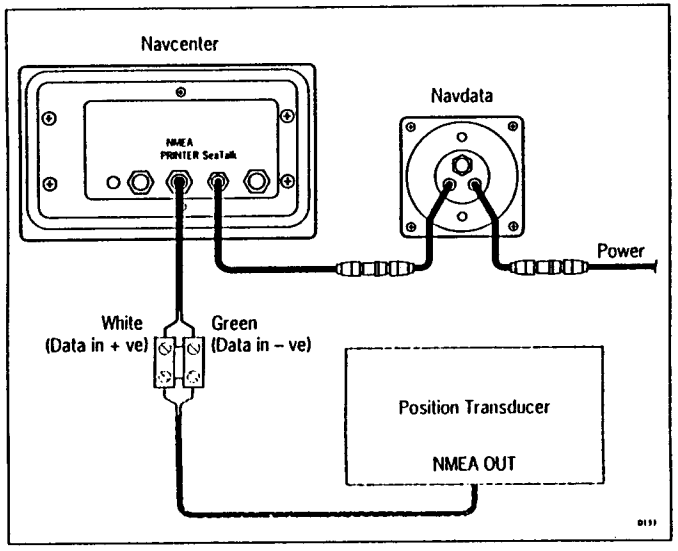
6.8 Connection to a Position Transducer

The Navdata must receive basic navigation information from a position transducer. This should be connected in one of the following ways:

1. Directly to the Navdata data port (NMEA 0183 or Navstar data)



2. Via an Autohelm Navcenter (NMEA 0183 data)



Note: When operating with a Navcenter the Navdata can only be used in 'Repeater' mode.

Please refer to the Navcenter handbook for accepted NMEA sentances.

Chapter 7: Fault finding

All Autohelm products are subject to a comprehensive test procedure prior to packing and shipment. In the unlikely event that a fault does arise the following check list should help cure the problem.

Fault	Cause	Action
Instrument display blank	No Supply	Check Supply. Check cabling and security of SeaTalk connectors. Check fuse / breaker. Return ST50 Navdata for repair.
No exchange of information between SeaTalk instruments (ie. Illumination levels, Position information etc.).	SeaTalk cabling / Connector problem.	Check security of SeaTalk connectors. Remove instruments one by one to isolate faulty unit.
Failure of a group of instruments in the SeaTalk chain.	SeaTalk cabling / connector problem	Check security of SeaTalk connectors between functioning and non functioning instruments.
No Navigation information	Loss of information from Position Transducer	Check Transducer signal status. Check cabling between transducer and Navdata / Navcenter.

Chapter 8: Maintenance

8.1 Display units

- In certain conditions, Condensation may appear on the window. This will not harm the instrument, and can be cleared by switching on the illumination to the brightest level.
- Never use any chemical or abrasive materials to clean your ST50 Navdata instrument. If the instrument becomes dirty wipe clean with a damp cloth.

8.2 Cabling

- Avoid running cables through bilges where possible and secure any coiled lengths at regular intervals.
- Avoid running cables close to fluorescent lights,engines,radio transmitting equipment etc
- Check cabling for chafing or damage to outer casing, replace where necessary and re-secure.

Advice

Should any difficulties arise, please consult Nautech's Product Support department in the U.K. or your own National Distributor who will be able to provide expert assistance.

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