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ST50 STEERING COMPASS

Installation and Operation



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Autohelm[™]

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1. Specifications

The ST50 Steering Compass replaces the traditional card compass by providing a clear digital display of compass heading combined with an analogue pointer for the steering indicator.

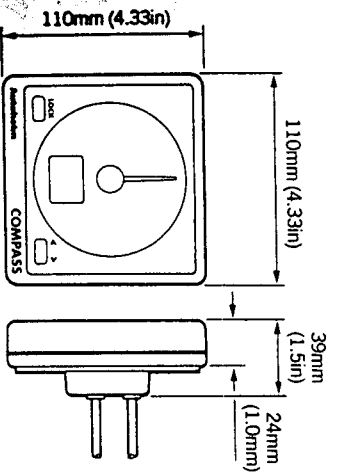
- The Steering Compass can be used two ways:
 - As a standalone instrument connected to its own compass transducer. The instrument can then supply the compass information to a second Steering Compass or multifunction display.
 - As a repeater to a Steering Compass or SeaTalk compatible Autotelem autopilot connected to its own compass transducer.

Every steering compass has an NMEA 0183 output which transmits data available on the SeaTalk bus (see Section 7).

Specifications

- Power Supply
 - 11V to 16V
- Current Consumption
 - 90ma (Illumination off)
 - 215ma (At maximum illumination)
- Operating Temperature
 - 0°C to +70°C.
- Size
 - 110mm (4.33in) x 110mm (4.33in) x 24mm (1in). Overall depth 39mm (1.5in).
- Computer
 - 8 bit Intel Microprocessor +8K Rom.
- Display
 - Custom 7 segment Liquid Crystal Display (LCD).
- Analogue Steering Indicator with $\pm 30^\circ$ range on magnified scale.
- Digital display of compass heading.
- Automatic deviation correction.
- Steering heading adjustable in 1° increments.
- Digital display of average course error from locked heading.
- Analogue display of Head/Lift.
- Automatic reciprocal course acquisition for man overboard.
- Illumination — 3 levels and OFF with backlight display and illuminated pointer.

2. Control Head Installation



Siting

The Steering Compass Instrument 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 230mm (9in) from a compass.
 - At least 500mm (20in) from radio receiving equipment.
 - Accessible from behind to secure in place and run cables.

Note: The back cover is designed to breathe through a duct in the cable boss to prevent moisture accumulation.

2.2 Mounting Procedure (Fig. 1)

- The mounting surface must be smooth and flat.
- Use the template provided to mark the centres of the two fixing holes and central boss.

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

- Drill to 4mm (5/32in) diameter.
- Use a 50mm (2in) diameter cutter to drill the hole for the central boss 1.
- 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).

Bracket Mounting (Fig. 2)

As an alternative to surface mounting, a bracket mounting kit (Cat. No. D130) is available to allow the instruments to be bracket mounted.

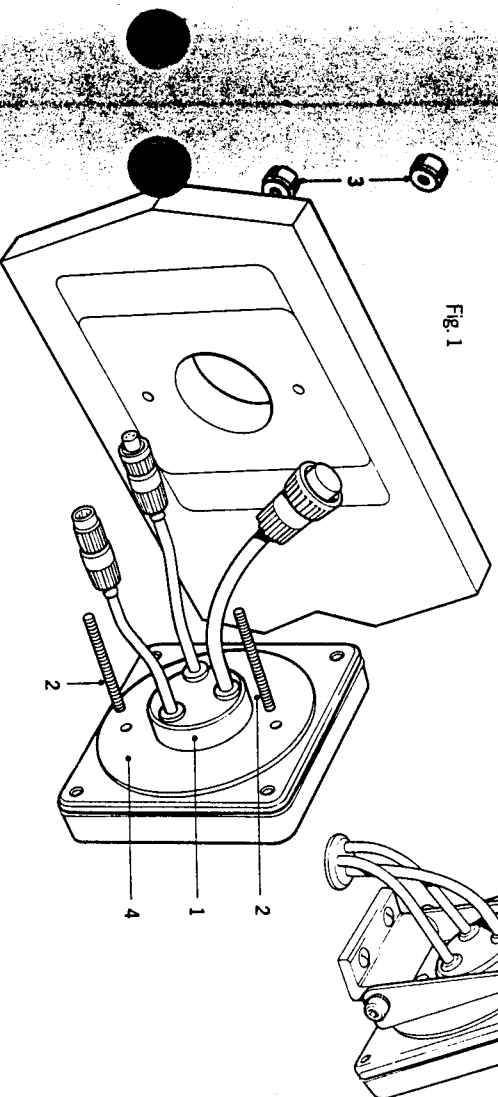
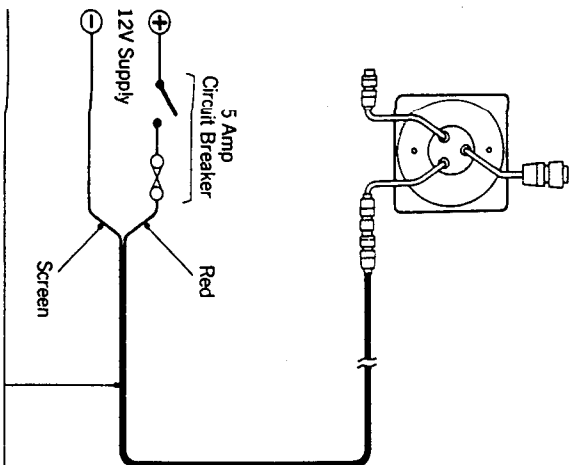


Fig. 1

Fig. 2

2.3 Power Supply (Fig. 3)

Fig. 3 To Transducer



Power Supply Cable	
2m (6ft)	+12V
Red	0V
Screen	

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

This is connected to the first SeaTalk

Instrument using the 2 metre cable supplied.

Plug the connector into the instrument and lead the other end back to the vessel's

distribution panel. Cut the cable to length,

connect directly to the distribution panel and

protect with a 5A circuit breaker. Connect the

red wire to +12V and the screen to 0V. The

yellow wire should be cut back and insulated.

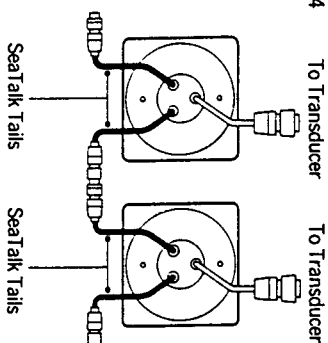
Longer runs to the power supply can be made

using the SeaTalk Extension Cable (Cat. No.

D131) which is 9m (30ft) long.

2.4 Connection to Adjacent Instruments (Fig. 4)

Fig. 4 To Transducer



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

2.5 Connection to Separated Instruments (Fig. 5)

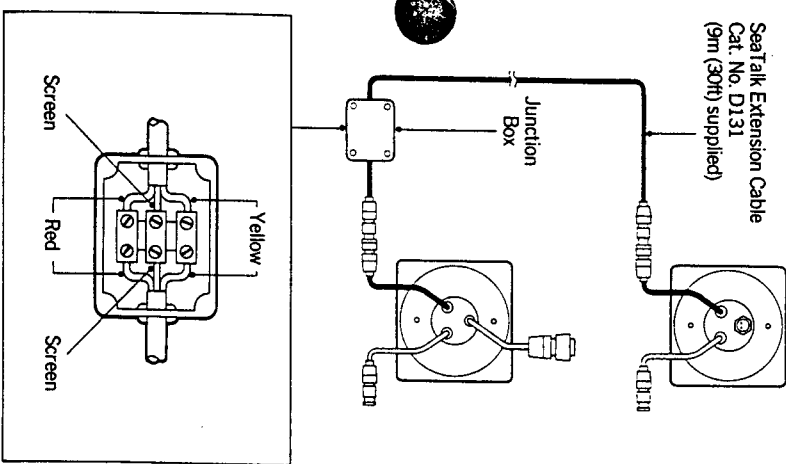
Separated instruments are connected using the SeaTalk Extension Cable (Cat. No. D131). This is supplied with a SeaTalk connector fitted to each end and with a junction box to rejoin the cable if it is cut to ease routing or for shortening.

If preferred, any 2 core screen cable which has the following specification may be used in the place of the SeaTalk cable.

Minimum Copper Area		
Screen	0.5mm ²	22
2 Cores	0.5mm ²	22

Fig. 5

SeaTalk Extension Cable
Cat. No. D131
(9m (30ft) supplied)



2.6 Ring Connection

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

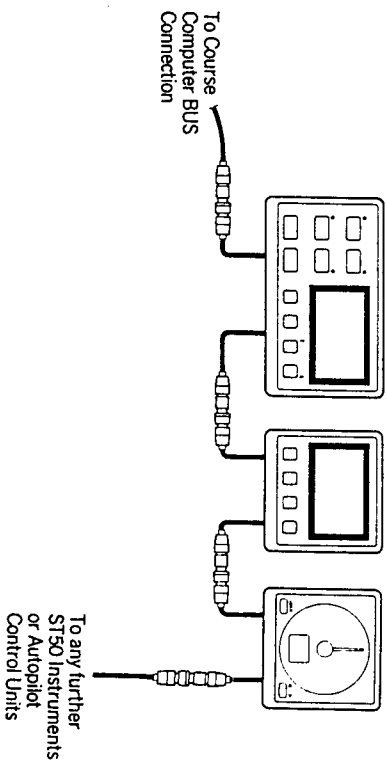
SeaTalk Cable Length	Max. Number of Units	
	Single Connection	Second Connection
Up to 10m (33ft)	13	26
Up to 20m (66ft)	7	13

The second connection should be made to the spare lead on the last instrument and led back to the circuit breaker.

2.7 Connection to SeaTalk Compatible Autopilots (Fig. 6)

If the vessel's installation includes a SeaTalk Compatible Autopilot the ST50 instruments may be connected into 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.

Fig. 6



3. Transducer Installation

3.1 Introduction

The Autohelm fluxgate compass (Fig. 7) has been especially developed for marine applications. The compass contains a gimbal mechanism to permit accurate readings with pitch and roll movements up to $\pm 40^\circ$. The compass is normally bulkhead mounted below decks however it may be mounted above deck on steel vessels. The unit is weatherproof but performance may be degraded due to the increased motion.

If the installation already contains a SeaTalk Compatible Autopilot the ST50 Steering Compass does not require a compass transducer. The Steering Compass will simply read and display compass heading information transmitted by the autopilot onto the SeaTalk bus (Fig. 8).

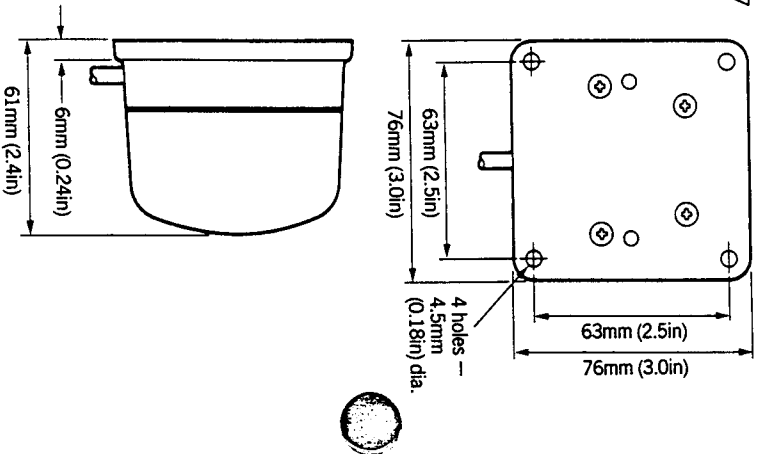
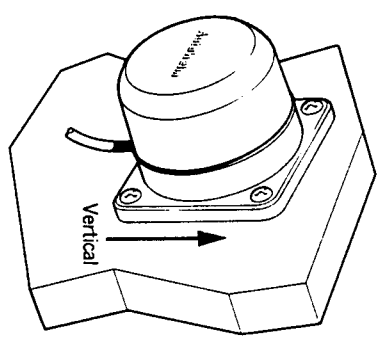


Fig. 7

3.2 Installation

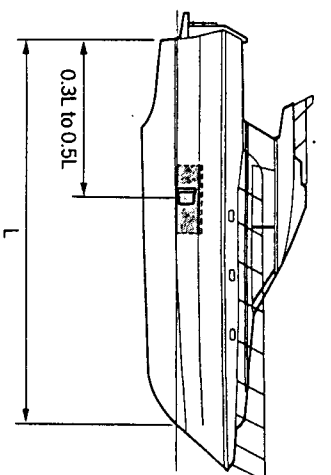
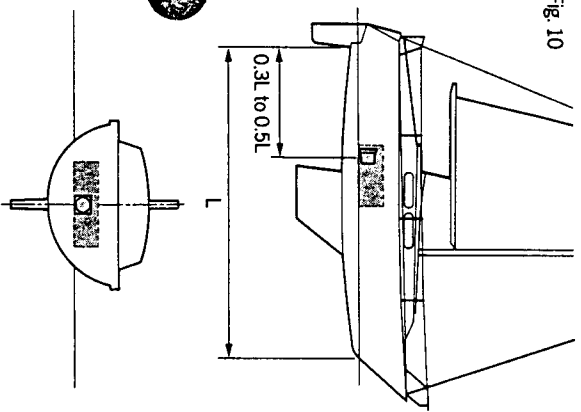
Fig. 9



The fluxgate compass should be attached to a convenient bulkhead using the self tapping screws provided (Fig. 9). The orientation of the fixing location relative to the boat's centreline is not critical but the mounting surface unit must be VERTICAL and the compass mounted with the CABLE EXIT at the base.

Correct positioning of the fluxgate is crucial if ultimate performance from the Steering Compass is to be achieved. The fluxgate should be ideally positioned as near as possible to the pitch and roll centre of the vessel in order to minimise gimbal disturbance (Fig. 10).

Fig. 10



It is very important to ensure that the fluxgate is positioned at least 0.8m (2ft 6in) away from the vessel's steering compass in order to avoid deviation of both compasses. The fluxgate must also be positioned as far away as possible from large iron masses, such as the engine and other magnetic devices which may cause deviation and reduce the sensitivity of the sensor. If any doubt exists over magnetic suitability of the chosen site, the position may be surveyed using a simple hand bearing compass.

The hand bearing compass should be fixed in the chosen position and the vessel swung through 360° . Relative differences in reading between the hand bearing compass and the vessel's main steering compass should ideally not exceed 10° on any heading.

3.3 Cabling

When used as either a stand-alone steering compass or as part of an ST50 instrument system (no autopilot) the fluxgate compass is connected directly to the Z103 compass display unit. The fluxgate compass is provided with a 6m long cable fitted with a 7 way connector which plugs directly into the steering compass (Fig. 11a).

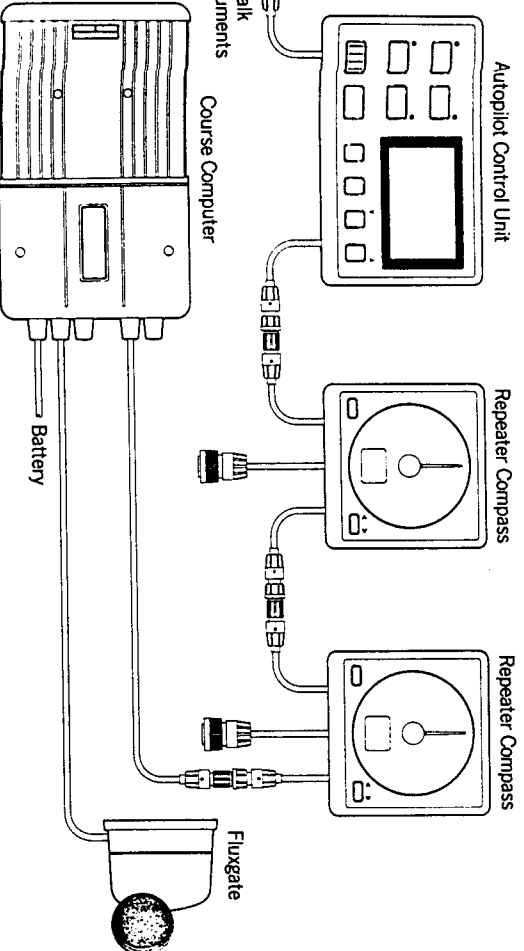


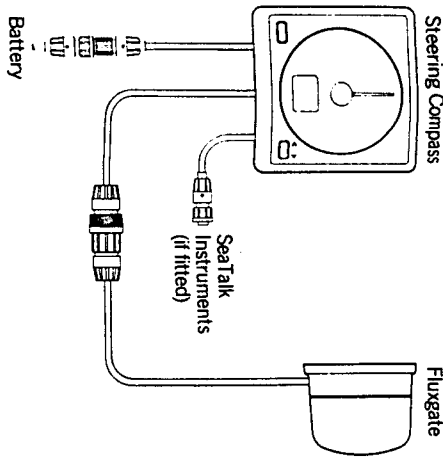
Fig. 8

4. 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.

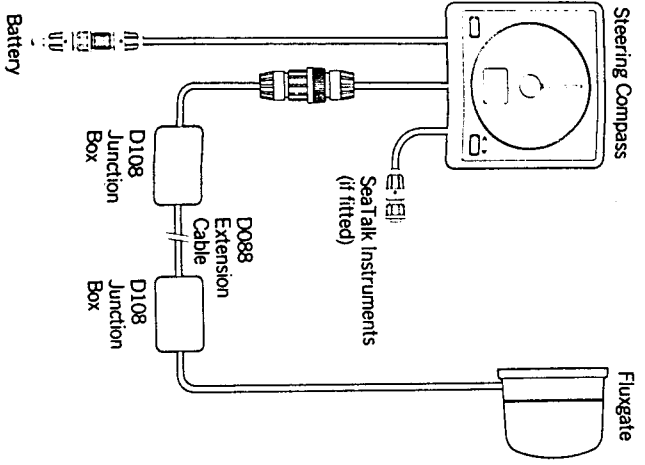
Fault	Cause	Action
Instrument Display Blank	No Supply	Check Supply Check Cabling and Security of SeaTalk Connectors. Check Fuse/Breaker Return ST50 Steering Compass for repair
Exchange of Information between SeaTalk Instruments (i.e. illumination levels compass heading etc.)	SeaTalk Cabling or Connector 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
Displayed Heading differs from that shown on Ship's Card Compass	Deviation Present	Carry out Compass Correction procedure (see Section 6.1.2)
Ships Compass in Error		If boat has dual steering stations check both Ships Compass agree. If not swing Ships Compass. Contact Nautech Product Support Department for further advice

Fig. 11a



Should an extended cable length be necessary use a standard 4 core screened compass extension cable (D088) and junction boxes (2 x D108) (Fig. 11b).

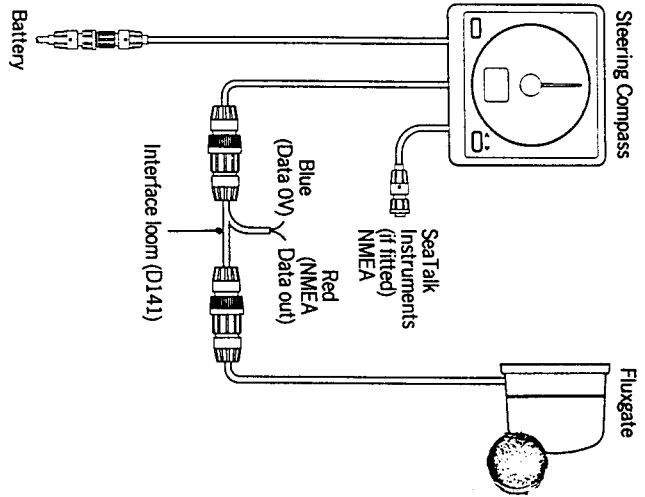
Fig. 11b Fluxgate Compass Cable Extension



3.4 Connection to External Equipment (N.M.E.A. 0183)

The ST50 Steering Compass has an N.M.E.A. 0183 Data output. To interface to external equipment a cable loom (D141) is required and should be connected as shown (Fig. 12).

Fig. 12 NMEA 0183 Interfacing



5. Maintenance

5.1 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 Steering Compass. If the instrument becomes dirty wipe clean with a damp cloth.

5.2 Cabling

- Avoid running cables through bilges where possible and secure any coiled lengths at regular intervals.
- Avoid running cables close to fluorescent lights, engine, 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 Product Support Department in the U.K. or your own National Distributor who will be able to provide expert assistance.

6. Operation

The ST50 Steering Compass can be used as an individual module or connected to other ST50 instruments to provide a fully integrated instrumentation system. They can be linked to any of the Autohelm SeaTalk compatible autopilots and can provide NMEA 0183 data to navigation receivers, chart plotters or to other navigational equipment.

6.1 Set Up

As supplied all ST50 Instrument Modules are Tested and Calibrated to factory standards. It is important that before using these instruments for Navigation purposes the following calibration procedures are carried out for your specific installation.

6.1.1 Setting Up Compass Display

When the Steering Compass is connected to its own compass transducer (i.e. when a SeaTalk Autohelm autopilot is not included in the system), it should be set up to display Magnetic headings.

It is set up as part of the compass correction procedure (see next section) by aligning with a known transit bearing. This bearing should be magnetic.

Note: For True headings — if a Multi is included in the system the local variation should be entered on the Multi (see Multi handbook). The Multi will then use the value entered for variation to calculate and display True headings.

6.1.2 Compass Correction

SeaTalk Autohelm Autopilot included

No additional correction for the Steering Compass is necessary if a SeaTalk Autohelm Autopilot is included in the system. The Autopilot Compass correction procedure should be carried out after which the Autopilot will transmit corrected heading information on the SeaTalk bus.

SeaTalk Autohelm Autopilot not included

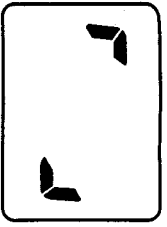
When the Steering Compass is connected to the compass transducer, the Steering Compass will correct for any deviating magnetic fields and for any compass transducer heading offset.

This procedure should be carried out in calm conditions preferably in flat water. It may be carried out from any Steering Compass instrument as follows:

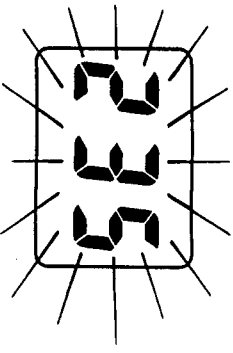
- To select compass correction push and hold **Lock** for 3 seconds until outer segments are displayed on the LCD as shown.



These segments will move around the outside of the display to indicate correction has started.



- Keeping boat speed below 2 knots, turn the vessel slowly so that it takes at least 3 minutes to complete 360°. Keep turning until the display shows the heading (flashing).



Note: The pointer will show the amount of deviation corrected, if this exceeds 15° it is recommended the compass transducer is reset.

6.1.3 Compass Alignment

Having completed the compass correction it is now necessary to align the heading indication with a known bearing.

- It is recommended that the vessel is aligned with a known transit bearing.
- Use the rocker button to adjust the heading display until it agrees with the known bearing.
- Alternatively the heading display may be aligned with the ship's compass (provided this has been properly swung and compensated).
- To exit compass correction, push and hold down lock for 3 seconds. Pressing lock momentarily will exit without saving data.

Note: To adjust the displayed heading without completing the full correction procedure, repeat the above procedure, but when the 4 rotating outer segments appear, push Lock momentarily to bypass that section and display the heading. The displayed heading may now be adjusted without disturbing the current deviation correction.

6.1.4 Pointer Alignment

It is unlikely that pointer realignment will be required — it is preset at the factory during manufacture — and should not normally change

If it is noticed that in Standby mode the pointer is not pointing to 0° by more than 1/2°, the pointer should be realigned as follows:

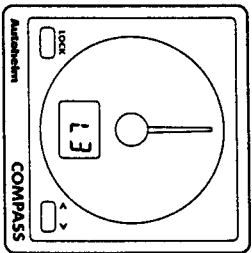
- With the Steering Compass in Standby mode push and hold down Lock and > for 3 seconds until the numbers on the LCD start to cycle. This indicates pointer alignment can start.
- Adjust the pointer position to 0° using < and >
- Push Lock momentarily to exit pointer alignment.



6.2 Illumination

Control of Illumination levels is common to all ST50 Instrument Modules. The control is always selected using the left-hand push button.

- Push and hold down the Lock button for 1 second to switch ON (if OFF), or to display current illumination level (if already on).



- Push Lock button within 8 seconds to select required illumination level.*
- L3 High
- L2 Medium
- L1 Low
- L0 Off

*Display returns to previous status after 8 seconds.



6.3 Operating Modes

The Steering Compass has 2 basic modes of operation:

Standby — The heading is displayed on the LCD. The pointer remains at 0°.

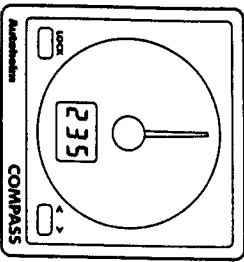
Lock — The locked heading is displayed on the LCD and the pointer displays the helmsmans off course error.

When connected to a SeaTalk compatible Autohelm autopilot a third mode is included:

Auto

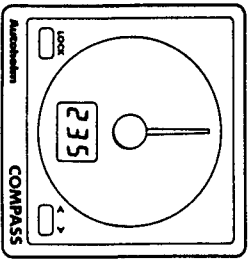
— Whenever the autopilot is engaged, the autopilot automatic heading is displayed on the LCD and the pointer displays the autopilots off course error. The Steering Compass pushbuttons are disabled. Every change in operating mode is confirmed by flashing the LCD for 5 seconds.

Standby Mode

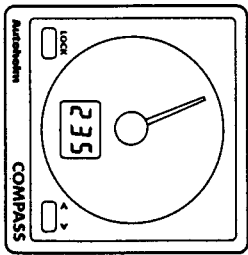


- LCD displays current compass heading.
- Pointer remains at zero.

Lock Mode

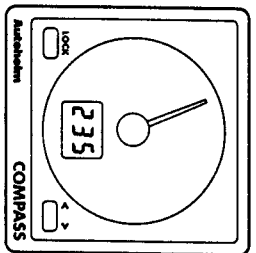


- Push Lock momentarily to lock into current heading.
- OR
- Push Lock momentarily twice to lock onto previous locked heading.

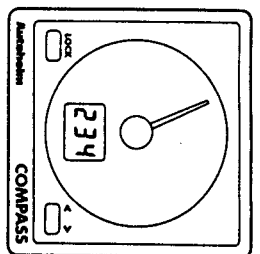


LCD displays locked heading (which flashes for 5 secs). Pointer shows off course error

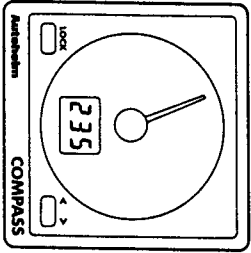
To Change Locked Heading



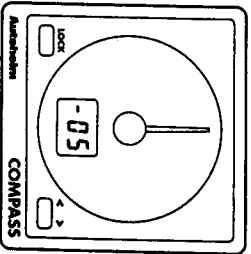
- Push \blacktriangleleft to decrease and \blacktriangleright to increase the locked heading by 1 degree.
- Push and hold down \blacktriangleleft or \blacktriangleright to change the locked heading at 10 degrees per second.



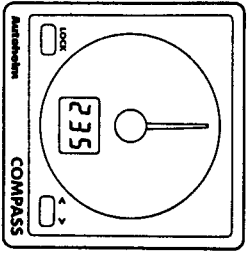
To Return to Standby



- Push Lock momentarily to return to Standby. The average course error is flashed for 5 seconds. The previous locked heading is memorized.



5 seconds

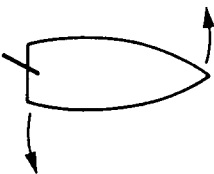
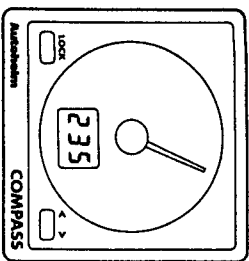


6.4 Operating Hints

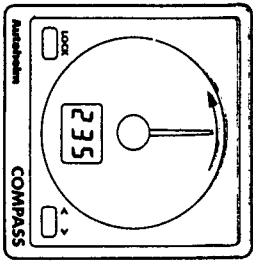
6.4.1 Steering Sense

When the pointer indicates an off course error simply steer the vessel in the direction you want the pointer to move i.e.

Off Course to Starboard



Steer Vessel to Port



6.4.2 Man Overboard/Reciprocal Course

When the Steering Compass is in Lock, turning the vessel through 180° will automatically lock onto the reciprocal course. The LCD will display the reciprocal course and the pointer will show the course error from that reciprocal.

The reciprocal course function is reversible so that a second turn through 180° would lock onto the original locked course.

6.4.3 Average Course

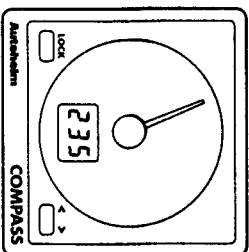
In Lock mode, the average course error from the locked heading is calculated continuously. This provides a useful navigation function to check the actual course steered.

Returning to Standby mode will always flash the average course error for 5 seconds. It is displayed as a difference from the locked heading. '-' indicates the average course steered has been to Port of the locked heading, (+) that it has been to Starboard.

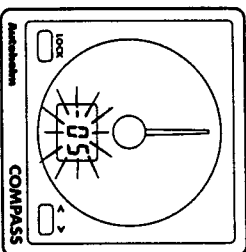
Pushing Lock twice within two seconds will lock onto the previous locked heading without resetting the average course error. This allows the helmsman to compensate and recheck the average course error later.

The average course error is only calculated when the Steering Compass is in Lock Mode. It is reset to zero whenever the locked heading is changed.

To display the average course error when in Lock mode.

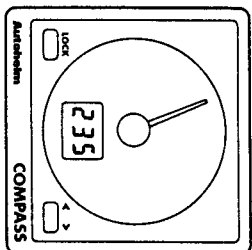


Push Lock momentarily to display average course error.



Average course error 5° to Port.

Push Lock twice within 2 seconds to lock onto the previous locked heading.



6.4.4 Operation with SeaTalk Compatible Autopilots

When the autopilot is in the Auto, Vane or Track mode, the Steering Compass is automatically set to 'Auto' mode. In Auto, the autopilot automatic heading is displayed on the LCD, and the autopilot course error on the pointer. All Steering Compass pushbutton functions are disabled apart from illumination.

In Auto mode, the pointer provides a useful indication of trim changes. A trim change will initially produce a course error which the autopilot corrects by progressively applying rudder offset until the autopilot automatic heading is restored. This can take up to three minutes.

Similarly locking the autopilot on a heading when there is a rudder offset will produce the same results.

If the pointer indicates a significant course error (more than 3°) which the autopilot does not correct for immediately, it will be caused by a rudder offset when locking on, or by a trim change.

7. N.M.E.A. Data Transmission

When available on the SeaTalk bus the following information will be transmitted to NMEA 0183 standard every 1 to 2 seconds.

Sentence	Content	Instrument Required on SeaTalk Bus
VWR	Apparent Wind Speed (knots and Direction)	ST50 Wind
DBT	Depth of Water below Transducer (feet)	ST50 Depth or Tridata
HDM	Magnetic Compass Heading	ST50 Steering Compass or SeaTalk Autopilot
HSC	Locked Magnetic Compass Heading	SeaTalk Autopilot (operating in Auto Mode)
VHW	Water Speed (knots) Magnetic Compass Heading	ST50 Speed or Tridata
MTW	Water Temperature (°C)	ST50 Speed or Tridata