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ST-7000 Operation

Autohelm™

Contents

1. Introduction

This Handbook describes how to operate your ST7000 and is intended for use after the autopilot has been set up. Full details of setting up and initial sea trials procedures are described in the Installation Handbook.

Basic Principles

When switched on, the ST7000 will be in Standby mode. To select automatic steering simply steady the vessel on the required heading and push Auto. At any time to return to manual steering push Standby.

Autopilot control has been simplified to a set of pushbutton operations, all of which are confirmed with a beep tone. In addition to the main 6 button course control keypad, the secondary 4 button keypad provides the following functions:-

- Track
  - — selects the built in track control to allow the autopilot to steer under the supervision of Radio Navigation System.
- Response
  - — selects 3 levels of course keeping response.
- Display
  - — selects
    1) waypoint information for display (when available).
    2) the watch alarm.
    3) illumination level.

Warning

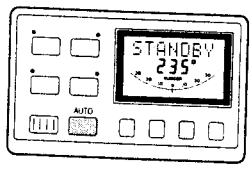
Hand steering is not possible when 'Auto' is selected. The 'Standby' button must be pressed to disengage the Autopilot drive.

It is the skippers responsibility to brief all crew members on this procedure.

When used with a Sterndrive Actuator a special emergency manual override facility is provided. For details see page 13.

2. Operator Controls

Auto

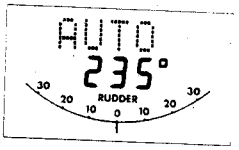


Push to engage automatic steering and maintain current heading

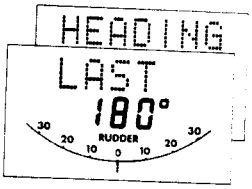
OR

Push and hold down for 1 second to return to previous automatic heading (Display returns to Auto after 10 seconds).

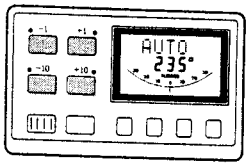
Automatic Heading



Previous Automatic Heading

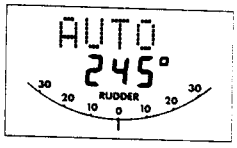


Course Changes (-1, +1, -10, +10)

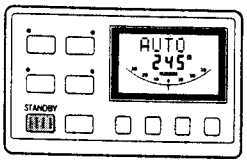


Push to alter course to port (-) and starboard (+) in increments of 1 and 10 degrees.

New Automatic Heading

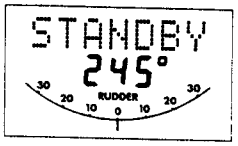


Standby

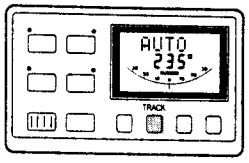


Push to disengage the autopilot for manual steering. (The previous automatic heading is memorised).

Current Heading



Track (see operating hints)



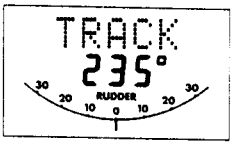
Push to select track control from Auto.
Push again to return to automatic steering.

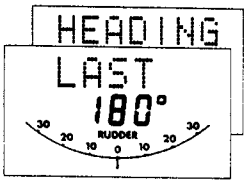
OR

Push and hold down for 1 second to select previous track control heading from Auto or Track.

(Display returns to Track after 10 seconds).

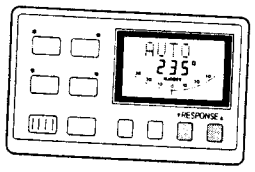
Automatic Heading





Response

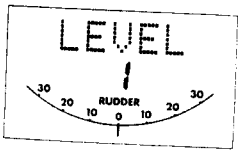
- **Response Level Adjustment** (see Operating Hints)



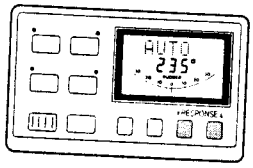
Push to increase (▲) or decrease (▼) response level

To display response level without changing it push both **Response** keys together briefly.

Response Level

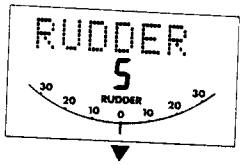


- **Rudder Gain Adjustment** (see Operating Hints)



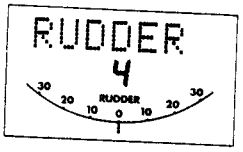
Push and hold down for 1 second both **Response** keys together to display rudder gain level.

Rudder Gain Level



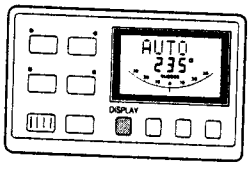
Within 10 seconds push once to increase (▲) or decrease (▼) rudder gain.

Rudder Gain Level



(Response and Rudder levels are displayed for 10 seconds only)

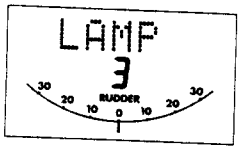
Illumination



Push and hold down **Display** for 1 second to switch on illumination.

Within 10 seconds push **Display** to select illumination level.

Illumination Level



3 = High
2 = Medium
1 = Low
OFF = OFF

(Illumination level is displayed for 10 seconds only)

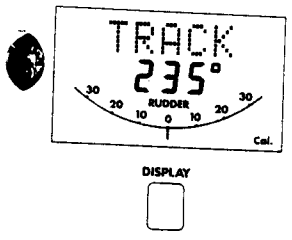
3. Additional Displays

Display

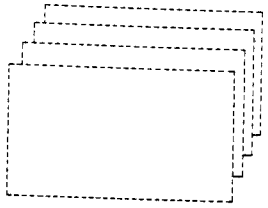
The **Display** pushbutton is used to cycle through additional information menus. These menus depend on the autopilot mode and if navigation information is available.

Standby Mode

- **Main Display**



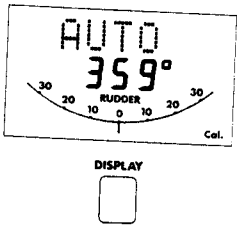
- **Navigation Displays**



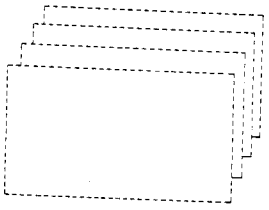
See section on Navigation Displays

Auto Mode

- **Main Display**



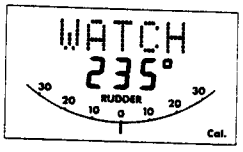
- **Navigation Displays**



See section on Navigation Displays.

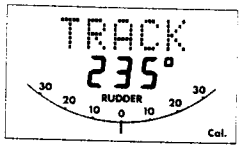
DISPLAY

- **Watch Alarm**



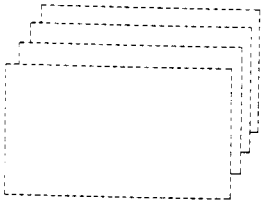
Track Mode

- **Main Display**



DISPLAY

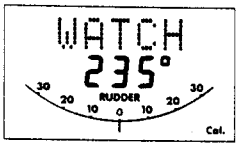
- **Navigation Displays**



See section on Navigation Displays.

DISPLAY

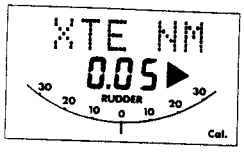
- **Watch Alarm**



Navigation Displays

With the Navigation Receiver operating in waypoint made, the following information can be displayed (provided that the Navigation Receiver transmits the appropriate information - see Installation Handbook).

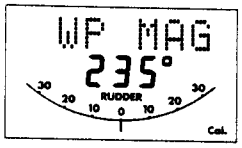
- **Cross Track Error**



DISPLAY

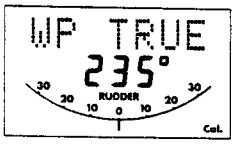
The arrows show the direction to steer to rejoin the desired Track:
▶ Starboard
◀ Port

- **Bearing to Waypoint**



- **Magnetic**

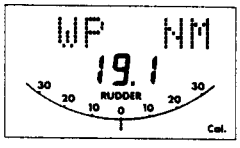
or



- **True**

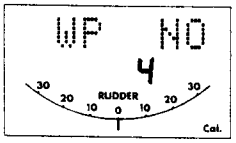
DISPLAY

- **Distance to Waypoint**



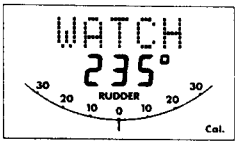
DISPLAY

- **Waypoint Number**



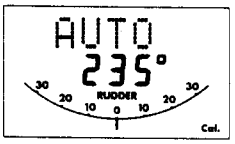
Watch Alarm (not available in Standby)

- Engage the Autopilot in Auto/Track/Windvane mode.
- To select Watch alarm push **Display** repeatedly until Watch appears.



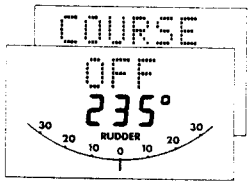
The 4 minute timer is now running:-
— After 3 minutes 'Watch' flashes on all control units.
— After 4 minutes the alarm sounds on all control units.

- Push **Auto** at any time to reset the timer to 4 minutes and silence the alarm.
- To cancel the Watch alarm at any time push **Display.**



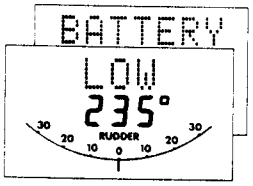
Warning Messages

- **Off Course Alarm**



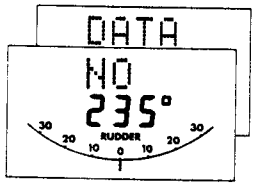
— Sounds if the vessel deviates from the automatic heading by more than the selected amount for over 20 seconds.

- **Low Battery Alarm**

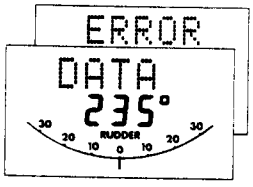


— Sounds if the course computer supply voltage falls below 11 volts for over 20 seconds.

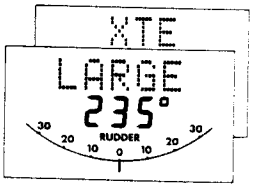
- **Track Mode Alarms**



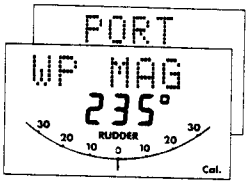
— Sounds if no waypoint data is received from the Radio Navigation System for over 20 seconds.



— Sounds if the data has the incorrect format or if an invalid flag is set.



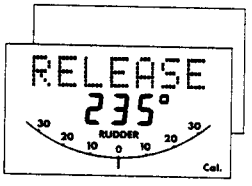
— Sounds if the cross track error exceeds 0.30nm



— Sounds when the target waypoint number changes. The displayed bearing is to the new waypoint. PORT or STBD indicates in which direction the autopilot will turn onto the new waypoint bearing.

Push **Track** to silence the alarm and automatically steer onto the new bearing to waypoint.

- **Manual Override Alarm**
(Installations with stern drive actuators only).



— Sounds for 10 seconds when the autopilot is manually overridden at the steering wheel. After 10 seconds the autopilot will return to **Standby** automatically.

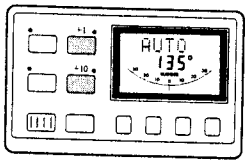
Note: Push **Standby** to silence an alarm and select **Standby** mode (unless indicated otherwise).

4. Additional Information for Sailing Vessels

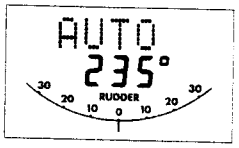
Autotack

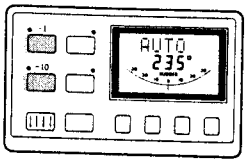
The ST7000 has a built in Autotack function which will turn the vessel through 100 deg. This operates in both compass and vane modes as follows:-

Vane

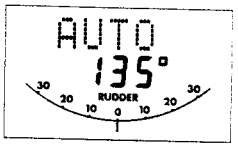


Push **+1** and **+10** keys together to initiate a tack turning to Starboard.





Push **-1** and **-10** keys together to initiate a tack turning to Port.

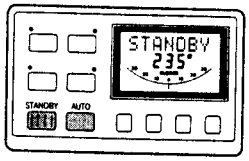


Note: It is important that the rudder angle transducer is accurately aligned as the Autotack function mirrors standing helm and any offset will change the initial tack angle.

Wind Trim

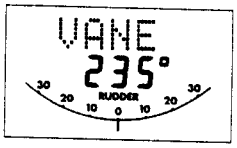
Wind Trim allows the autopilot to be supervised by apparent wind direction. The wind direction is read either:-

— From the SeaTalk bus (requires Autohelm ST50 wind).
OR
— Directly from a Masthead Transducer (Z080)
OR
— From an NMEA 0183 input on the control unit.



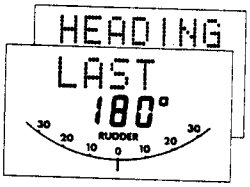
Push both **red keys** together to select Wind Trim and maintain the current apparent wind angle.

Automatic Heading



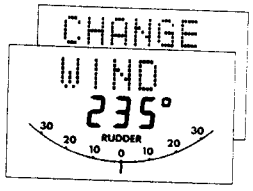
Push and hold down for 1 second both **red keys** together to return to the previous apparent wind angle.

Previous Automatic Heading



Wind Change Alarm

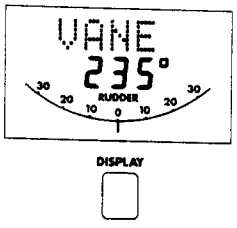
Wind Trim uses the fluxgate compass as the primary heading reference and automatically adjusts the compass heading to maintain the original apparent wind angle. If changes in apparent wind angle adjust the original automatic heading by more than 15 deg. the wind change alarm will sound.



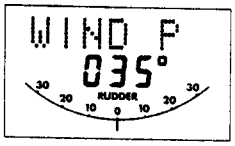
— The alarm is silenced by pushing both red keys together briefly.

Display of Wind Angle

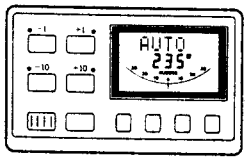
If the wind angle information is supplied using the NMEA 0183 input or SeaTalk bus, the apparent wind angle and tack sense (P & S) is added to the display menu and accessed via the Display button.



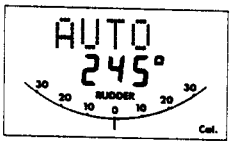
- **Apparent Wind Angle**



- **Adjust Apparent Wind Angle**



Use the **±1** or **±10** degree buttons to change heading and hence adjust the apparent wind angle.



Using Wind Trim

It is important to understand that "Wind Trim" prevents over-reaction to gusts or sudden wind shifts. One minute is required to change the heading in response to a permanent change in apparent wind angle. Do not attempt to override the automatic sequence with the course change buttons.

In gusty conditions sail a few degrees off the wind and pay frequent attention to sail trim and helm balance using the rudder angle indication.

Performance will normally be improved by reefing headsail and mainsail a little early rather than too late.

5. Operating Hints

Response Level Adjustment

The ST7000 has three response levels which enable tighter course keeping to be achieved in certain cases:-

Level 1 — Automatic Sea State Control
Level 2 — Automatic Sea State Inhibit
Level 3 — Automatic Sea State Inhibit and counter rudder.

When the autopilot is switched on, the response level is set to 1. This provides the best compromise between power consumption and course keeping accuracy and is suitable for nearly all situations.

Increasing Response level provides tighter course keeping at the expense of increased power consumption and general wear and tear. It is advisable to use the minimum response level necessary to achieve the desired course keeping accuracy. On larger power vessels level 3 can improve slow speed steering where the natural yaw damping of the vessel is reduced.

Note: Level 3 is not recommended for use at planing speeds or in rough seas.

Track

To make full use of Track control the following simple points should be observed:-

- Always steer the vessel to within 0.1 nm of track and bring the heading to within 5 deg. of the bearing to the next waypoint before selecting Track.
- Always check that there are no navigational hazards either side of the intended track.
- Always maintain an accurate log with regular plots to verify the computed position read from the Radio Navigation Receiver. Maintain a proper lookout at all times.

Waypoint Advance

If the navigation receiver is transmitting the waypoint number to the ST7000 the waypoint alarm will sound whenever a new target waypoint is selected (see Page 8). When the alarm is sounding the ST7000 will maintain the current heading and automatic track control is suspended. Check the displayed new bearing to waypoint and when it is safe to turn onto it, resume automatic track control by simply pushing **Track**. This accepts the new target waypoint and will steer the vessel onto the new bearing to waypoint.

The tidal offset may be very different on the new bearing, and it is good practise to check the cross track error after a couple of minutes. If the cross track error continues to increase make a course adjustment of say 10 degrees in the direction of the arrow. This will help the Track control correct more quickly for the new tidal vector.

Automatic Trim

If Automatic Trim has been selected during calibration the ST7000 will correct for trim changes. This correction can take up to one minute to apply the rudder offset necessary to restore the set automatic heading. Large course changes which change the apparent wind direction can produce large trim changes. In these cases the autopilot will not immediately assume the new automatic heading, and only settle onto course when the Automatic Trim has been fully established.

To minimise the inherent time delay the following procedure may be adopted for large course changes.

- Note required new heading.
- Select **Standby** and steer manually.
- Bring vessel onto new heading.
- Select **Auto** and let vessel settle onto course.
- Bring to final course with 1 deg. increments.

It is sound seamanship to make major course changes only whilst steering manually. In this way any obstructions or other vessels may be cleared properly and due account taken of the changed wind and sea conditions on the new heading prior to engaging the autopilot.

Rudder Gain

The rudder gain level selected during initial sea trials will normally provide excellent steering performance over a wide range of conditions. However, it may be noticed that the autopilot tends to be a little less stable on northerly headings in the higher latitudes of the Northern hemisphere (and conversely southerly headings in the Southern hemisphere). This is caused by the increasing angle of dip of the earth's

magnetic field at higher latitudes which has the effect of amplifying rudder response on northerly (southerly) headings.

Rudder Gain Adjustment (Sail)
It is not normally necessary to adjust the autopilot gain setting once the correct level has been established during initial sea trials.

Depending on the yacht's individual steering characteristics a change of one level may improve course keeping accuracy when going from northerly to southerly (increase) or southerly to northerly ,(decrease) headings.

The effect may be judged by carrying out a sea trial in smooth water conditions and observing the results.

Note: The effect is reversed for the Southern hemisphere.

Rudder Gain Adjustment (Powercraft)
The tendency towards northerly (southerly) heading instability is more obvious in high speed craft and can be corrected by a reduction in the rudder gain setting. At speeds in excess of 30 knots a reduction of two levels can be required on headings between 315 deg. and 045 deg (Northern hemisphere) or 135 deg. and 230 deg. (Southern hemisphere).

Two options are available to control this:-

- **Manual** (Low speed and displacement craft).
  The rudder gain control may change by one level when going from northerly to southerly (increase) or southerly to northerly (decrease) headings.

  The effect may be judged by carrying out a sea trial in smooth water conditions and observing the results.

  Note: The effect is reversed for the Southern hemisphere.
- **Autoadapt** (High speed planing craft)
  The ST7000 can be set automatically to reduce the effects of northerly heading instability. This feature is selected in calibration mode by entering the latitude (see Installation Handbook, Calibration, section on 'Auto Adapt'). When selected the ST7000 automatically adjusts the Rudder Gain depending on the compass heading, removing the need for manual adjustment.

Rudder Gain/Speed Adjustment (Powercraft)
High speed planing craft exhibit very different steering characteristics when on and off the plane. As a result it is generally necessary to adjust the Rudder Gain setting when going from displacement speed to planing speed or vice versa.

Two options are available to achieve this:-

- **Automatic**
  When the ST7000 is used with an Autohelm ST50 Speed Instrument or Tridata, Rudder Gain is adjusted automatically with boat speed. There should be no need for any manual adjustment.
- **Manual**
  (No ST50 Speed/Tridata)
  The Rudder Gain setting may be increased by one or two levels when dropping from planing speed to cruise speed and decreased by the same amount when returning to planing speeds.

Note: It is important to make the gain adjustment **after** dropping to displacement speed and **before** returning to planing speed.

Note: The adjustment of Gain with boat speed is normally only required for high speed planing powercraft.

Unsatisfactory Steering Performance
If the ST7000 has been installed and set up in accordance with the instructions in the Installation Manual it will provide excellent steering performance over a wide range of conditions.

If performance drops but the autopilot is still working correctly, the following simple checks should find the fault:-

- Has a magnetic influence been introduced near the fluxgate compass? i.e. anchor, chain, radio equipment, loudspeaker, tools, generator etc. Check that the autopilot compass heading still corresponds with the steering compass.
- Are all fuses intact, circuit breakers engaged?
- Are all screw connections tight and free of corrosion?

- If the autopilot fails to hold course check the Rudder Gain level. Has it been changed from the initial sea trials level (check in Installation Manual)?
- If the vessel wanders check that the Rudder Reference Transducer linkage is secure with no free play.

Hydraulic Drive Units only:-

- Check that all unions are tight and bleed system to remove air.

Failure of Drive Unit to Disengage

The mechanical drive actuators of the ST7000 are designed to 'Fail Safe' - When power is disconnected the drive unit will disengage leaving the steering system free for manual control.

When Standby is selected the actuator will disengage leaving the steering free.

It is remotely possible that a fault could develop which could cause the actuator to remain engaged even when Standby is selected. If this happens:-

- DISCONNECT THE MAIN CIRCUIT BREAKER TO THE AUTOPILOT - THE STEERING WILL IMMEDIATELY BE FREE.

  or

- IN AN EMERGENCY THE ACTUATOR CLUTCH CAN NORMALLY BE OVERRIDDEN BY TURNING THE STEERING WHEEL **HARD.**

It is emphasised that this fault is extremely unlikely and can be immediately corrected as described.

If preferred a separate **Override** switch can be fitted close to the steering position which will break the actuator clutch drive for **Emergency Use**.

Stern Drive Actuator

Manual Override Option

When used with a stern drive actuator, the ST7000 can be set up automatically to release the drive if the steering wheel is turned in an emergency situation. After releasing the drive unit the ST7000 will return to Standby and sound the manual override alarm for 10 seconds.

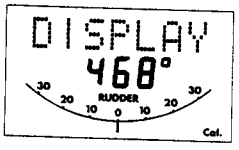
This feature is selected during autopilot calibration (see Installation Handbook).

Note: This feature is for use with a stern drive actuator only.

Control Unit Display Adjustment

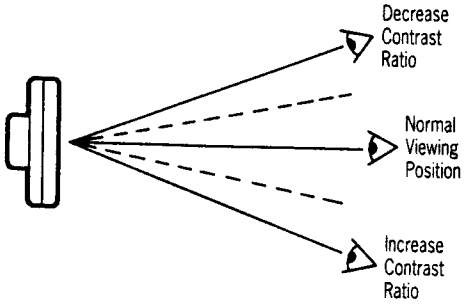
The control unit display is designed to provide good legibility over a wide range of viewing angles. However, it is recommended that wherever possible the control unit is mounted so that the viewing angle is normal to the lcd display when the helmsman is in the usual steering position. If the control unit is mounted so that the usual viewing position is at an angle to the lcd display, the lcd contrast can be adjusted to improve legibility.

- Push **Display** and **Track** together momentarily.



- Push ▲ to increase, ▼ to decrease contrast level. Continue until the display has optimum legibility when viewed from the usual helming 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.



6. Maintenance

The autopilot is one of the most used and hardest working items of equipment on board, and therefore must receive its fair share of attention and routine maintenance. The working parts of the drive system are sealed and lubricated for life during manufacture and therefore do not require servicing.

Regular inspection of the installation is recommended in the following areas where applicable.

1. Check tension and alignment of the drive chain (Rotary Drive) and lubricate with good quality waterproof light grease.
2. Check that Hydraulic Steering systems are free from leaks and trapped air. Bleed when necessary to remove air from the system.
3. Check that all inter-connecting cable terminals are fully tightened and corrosion free.
4. Check that external waterproof sockets are capped when not in use and periodically spray with WD40 (or similar) to protect from corrosion.
5. Check that the heavy power supply cable connections are tight and free from corrosion.

7. Safety

Passage making under autopilot can greatly increase the pleasure of the voyage and ensure the crew can relax. However, this can lead to a dangerous lack of attention to basic seamanship. The following rules should always be observed:-

- **Maintain a permanent watch and check regularly all round for other vessels and obstacles to navigations. No matter how clear the sea may appear a dangerous situation can develop rapidly.**
- **Maintain an accurate record of the vessel's position either by use of a radio navigation receiver or visual bearings.**
- **Maintain a continuous plot of position on a current chart. Ensure the locked autopilot heading steers you clear of all obstacles. Make proper allowance for Tidal Set - the autopilot cannot!**
- **Even when your autopilot is locked to the desired Track using a radio navigation receiver maintain a log and a regular positional plot. Radio navigation signals can produce significant errors under some circumstances and the autopilot cannot detect this situation.**
- **Ensure that all members of crew are familiar with the procedures required to engage and disengage the autopilot.**
- **When searoom is restricted a crew member must be close to a control unit at all times if under autopilot control.**
- **On Powercraft permanent watch should be maintained at the steering station when at speed with the autopilot engaged.**

Your Autohelm ST7000 will add a new dimension to your boating enjoyment. However, it is the responsibility of the skipper to ensure the safety of the vessel at all times by careful observance of these basic rules.

8. Fault Location Procedure

The ST7000 has been designed to achieve very high standards of reliability combined with ease of servicing.

If a fault should appear, please double check that all connections in the connector unit are sound and that the heavy duty power connections are tight and free from corrosion. If you are satisfied that all connections are sound,the simple check procedure tabulated below will assist you to locate the most likely fault area.

If the autopilot switches on but does not [illegible]erate correctly, check the rudder angle and [illegible]ding displays on the control unit. If these appear incorrect, double check all connections from the course computer to the compass and rudder reference transducers.

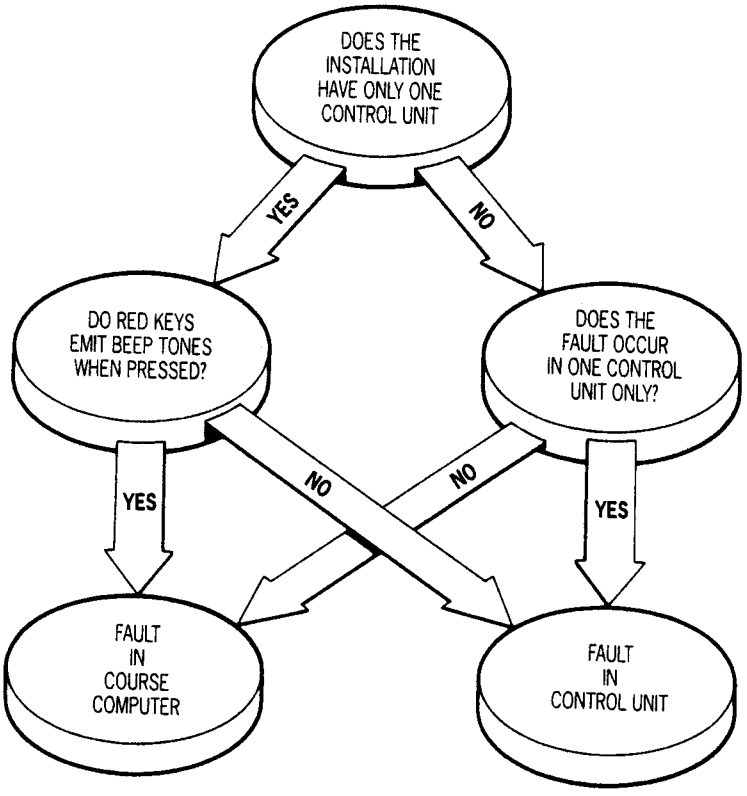
In the case of a sailing yacht fitted with a windvane system, if a fault occurs only in vane mode then it is likely that fault has developed in the vane head or the interconnection system.

Since the course computer houses the majority of the electronic control system there is a high probability that if an electronic fault has occurred it will be located in this area. The course computer unplugs easily from the connector unit for servicing. (See Installation Manual).

Control Units are removed by undoing the two thumb nuts (accessed from behind). Disconnect the cables by rotating the locking rings anti-clockwise before separating the connectors.

The faulty unit should be removed and returned to your nearest service agent.

If any difficulties arise, please consult Nautech's Product Support Department in the UK or your own national distributor who will also be able to provide expert assistance.



9. Warranty, After Sales Service

Limited Warranty

Nautech or its appointed Distributors or Service Centres will, subject to the conditions below, rectify any failures in this product due to faulty manufacture which become apparent within twelve months of its purchase date.

Equipment used in the country of purchase should be sent directly to the authorised Distributor for that country or its appointed Service Centres. The product will then be serviced free of charge and returned promptly direct to the sender.

Equipment used outside the country of purchase can be either:-

a. Returned to the Distributor or Dealer in whose country the equipment was originally purchased - it will then be serviced free of charge and promptly returned direct to the sender, or

b. The product can be returned freight pre-paid to the authorised Distributor or its appointed Service Centres in the country in which the product is being used. It will then be serviced and returned direct to the sender on the basis that the Distributor or Service Centre will supply any parts used free of charge but the sender will be invoiced for the necessary labour and return shipment at the local rate.

Conditions

The warranty is invalid if:-

a. The product has been misused, installed or operated not in accordance with the standards defined in this manual.

b. Repairs have been attempted by persons other than Nautech approved Service personnel.

Full International Warranty

Nautech or its appointed Distributors or Service Centres will, subject to the conditions below, rectify any failures in this product due to faulty manufacture which become apparent within twelve months of its purchase date wherever the vessel and the product may be operated.

Conditions

1. The product must be installed aboard the vessel in the country of purchase.
2. The product must be installed in accordance with the recommendations issued by Nautech Ltd.
3. The installation must be carried out by an installer approved by Nautech: alternatively, the installation must have been inspected and approved by Nautech or its approved installer.
4. The Warranty Registration Card must be completed by:-
   — The owner or user.
   — The dealer supplying the product.
   — The installer.
5. The Full International Warranty is invalid if:-
   (a) The product has been misused, or installed or operated not in accordance with standards defined in this handbook.
   (b) Repairs have been attempted by persons other than Nautech approved Service personnel.
   (c) The warranty card has not been completed correctly or is not accompanied by proof of purchase.

Claim Procedure

1. The product should be sent direct to Nautech or its appointed Distributor or Service Centre nearest to the vessel. The completed Warranty Card and proof of purchase must accompany the claim. The product will then be serviced free of charge and returned promptly direct to the sender.
2. Nautech, its Distributors and Service Centres, are not liable for any charges arising from visits to the vessel not to attend to the product, whether under warranty or not, nor for sea trials or any other work associated with the installation. The right is reserved to charge for any such services at the local rate.

After Sales Service

Your ST7000 is designed to give you long service and reliable performance wherever you sail. To ensure that you can always receive prompt and expert attention in case of any difficulty, Nautech has established a worldwide network of Autohelm Service Centres.

Please contact your nearest Service Centre for assistance. Always have ready:-

— Your warranty card.
— Proof of purchase.

Nautech Limited, Anchorage Park, Portsmouth
Hampshire, PO3 5TD, England.
Telephone (0705) 693611. Telex 86384 NAUTEC G.

ST-7000 Operation

Autohelm™

Contents

1. Introduction

This Handbook describes how to operate your ST7000 and is intended for use after the autopilot has been set up. Full details of setting up and initial sea trials procedures are described in the Installation Handbook.

Basic Principles

When switched on, the ST7000 will be in Standby mode. To select automatic steering simply steady the vessel on the required heading and push Auto. At any time to return to manual steering push Standby.

Autopilot control has been simplified to a set of pushbutton operations, all of which are confirmed with a beep tone. In addition to the main 6 button course control keypad, the secondary 4 button keypad provides the following functions:-

- Track
  - — selects the built in track control to allow the autopilot to steer under the supervision of Radio Navigation System.
- Response
  - — selects 3 levels of course keeping response.
- Display
  - — selects
    1) waypoint information for display (when available).
    2) the watch alarm.
    3) illumination level.

Warning

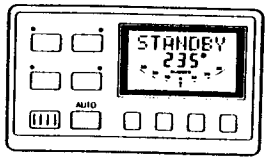
Hand steering is not possible when 'Auto' is selected. The 'Standby' button must be pressed to disengage the Autopilot drive.

It is the skippers responsibility to brief all crew members on this procedure.

When used with a Sterndrive Actuator a special emergency manual override facility is provided. For details see page 13.

2. Operator Controls

Auto

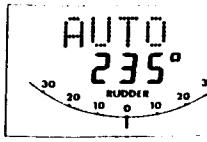


Push to engage automatic steering and maintain current heading

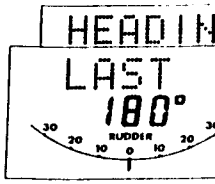
OR

Push and hold down for 1 second to return to previous automatic heading (Display returns to Auto after 10 seconds).

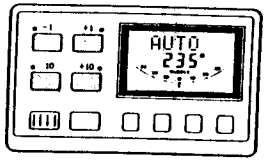
Automatic Heading



Previous Automatic

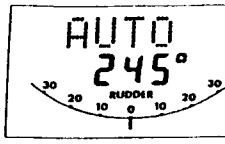


Course Changes (-1, +1, -10, +10)

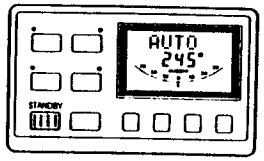


Push to alter course to port (-) and starboard (+) in increments of 1 and 10 degrees.

New Automatic Hea

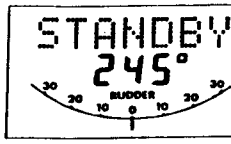


Standby

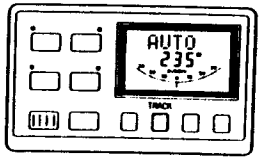


Push to disengage the autopilot for manual steering. (The previous automatic heading is memorised).

Current Heading



Track (see operating hints)



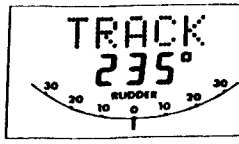
Push to select track control from Auto.
Push again to return to automatic steering.

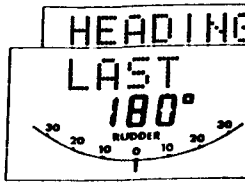
OR

Push and hold down for 1 second to select previous track control heading from Auto or Track.

(Display returns to Track after 10 seconds).

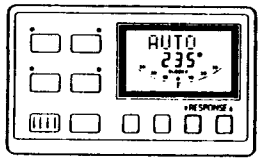
Automatic Heading





Response

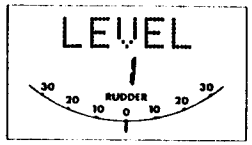
- **Response Level Adjustment** (see Operating Hints)



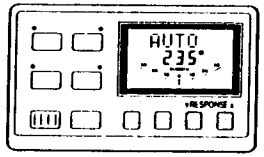
Push to increase (▲) or decrease (▼) response level

To display response level without changing it push both **Response** keys together briefly.

Response Level

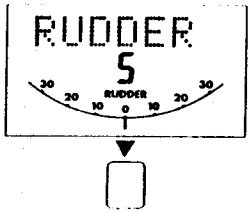


- **Rudder Gain Adjustment** (see Operating Hints)



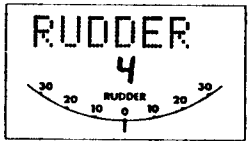
Push and hold down for 1 second both **Response** keys together to display rudder gain level.

Rudder Gain Level



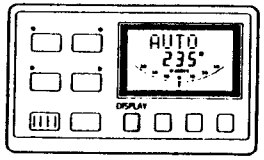
Within 10 seconds push once to increase (▲) or decrease (▼) rudder gain.

Rudder Gain Level



(Response and Rudder levels are displayed for 10 seconds only)

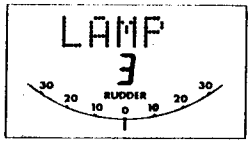
Illumination



Push and hold down **Display** for 1 second to switch on illumination.

Within 10 seconds push **Display** to select illumination level.

Illumination Level



3 = High
2 = Medium
1 = Low
OFF = OFF

(Illumination level is displayed for 10 seconds only)

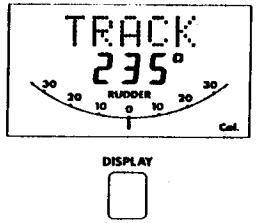
3. Additional Displays

Display

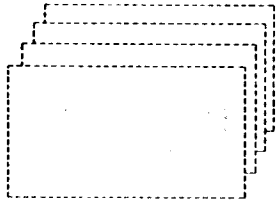
The **Display** pushbutton is used to cycle through additional information menus. These menus depend on the autopilot mode and if navigation information is available.

Standby Mode

- **Main Display**



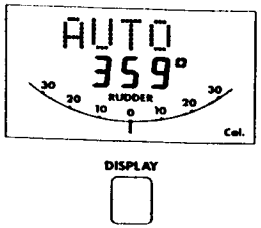
- **Navigation Displays**



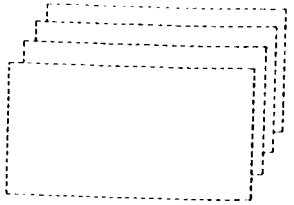
See section on Navigation Displays

Auto Mode

- **Main Display**



- **Navigation Displays**

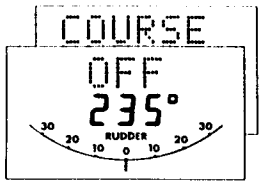


See section on Navigation Display

- **Watch Alarm**

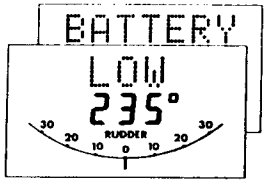
Warning Messages

- **Off Course Alarm**



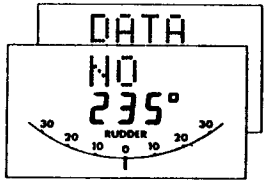
— Sounds if the vessel deviates from the automatic heading by more than the selected amount for over 20 seconds.

- **Low Battery Alarm**

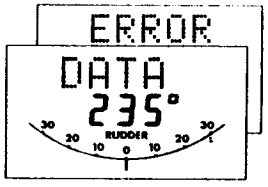


— Sounds if the course computer supply voltage falls below 11 volts for over 20 seconds.

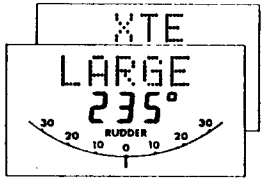
- **Track Mode Alarms**



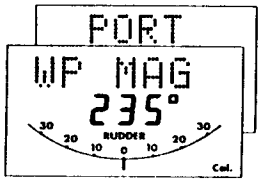
— Sounds if no waypoint data is received from the Radio Navigation System for over 20 seconds.



— Sounds if the data has the incorrect format or if an invalid flag is set.



— Sounds if the cross track error exceeds 0.30nm

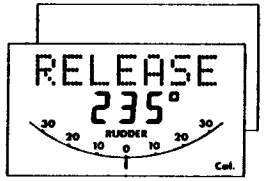


— Sounds when the target waypoint number changes. The displayed bearing is to the new waypoint. PORT or STBD indicates in which direction the autopilot will turn onto the new waypoint bearing.

Push **Track** to silence the alarm and automatically steer onto the new bearing to waypoint.

- **Manual Override Alarm**

(Installations with stern drive actuators only).



— Sounds for 10 seconds when the autopilot is manually overridden at the steering wheel. After 10 seconds the autopilot will return to **Standby** automatically.

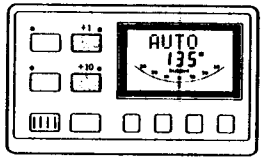
Note: Push **Standby** to silence an alarm and select **Standby** mode (unless indicated otherwise).

4. Additional Information for Sailing Vessels

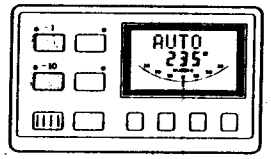
Autotack

The ST7000 has a built in Autotack function which will turn the vessel through 100 deg. This operates in both compass and vane modes as follows:-

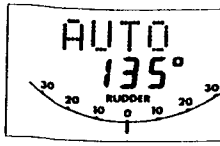
Vane



Push **+1** and **+10** keys together to initiate a tack turning to Starboard.



Push **–1** and **–10** keys together to initiate a tack turning to Port.



Note: It is important that the rudder angle transducer is accurately aligned as the Autotack function mirrors standing helm and any offset will change the initial tack angle.

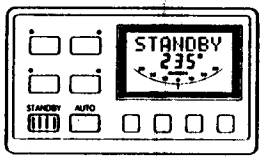
Wind Trim

Wind Trim allows the autopilot to be supervised by apparent wind direction. The wind direction is read either:-

— From the SeaTalk bus (requires Autohelm ST50 wind).
OR

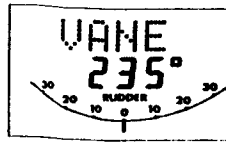
— Directly from a Masthead Trans (Z080)
OR

— From an NMEA 0183 input on t unit.



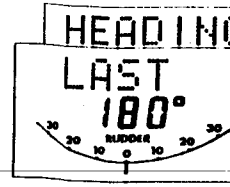
Push both **red keys** together to select Wind Trim and maintain the current apparent wind angle.

Automatic Heading



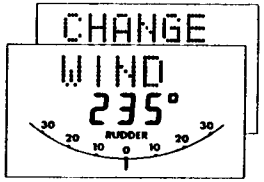
Previous Automatic

Push and hold down for 1 second both **red keys** together to return to the previous apparent wind angle.



Wind Change Alarm

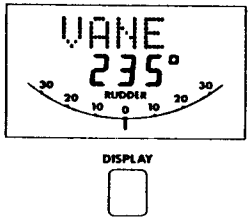
Wind Trim uses the fluxgate compass as the primary heading reference and automatically adjusts the compass heading to maintain the original apparent wind angle. If changes in apparent wind angle adjust the original automatic heading by more than 15 deg. the wind change alarm will sound.



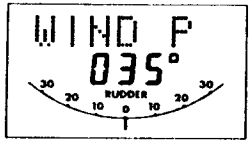
— The alarm is silenced by pushing both red keys together briefly.

Display of Wind Angle

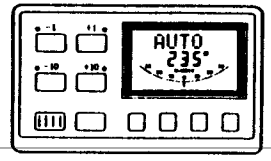
If the wind angle information is supplied using the NMEA 0183 input or SeaTalk bus, the apparent wind angle and tack sense (P & S) is added to the display menu and accessed via the Display button.



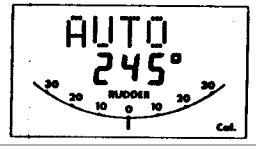
- **Apparent Wind Angle**



- **Adjust Apparent Wind Angle**



Use the **±1** or **±10** degree buttons to change heading and hence adjust the apparent wind angle.



Using Wind Trim

It is important to understand that "Wind Trim" prevents over-reaction to gusts or sudden wind shifts. One minute is required to change the heading in response to a permanent change in apparent wind angle. Do not attempt to override the automatic sequence with the course change buttons.

In gusty conditions sail a few degrees off the wind and pay frequent attention to sail trim and helm balance using the rudder angle indication.

Performance will normally be improved by reefing headsail and mainsail a little early rather than too late.

5. Operating Hints

Response Level Adjustment

The ST7000 has three response levels which enable tighter course keeping to be achieved in certain cases:-

Level 1 — Automatic Sea State Control
Level 2 — Automatic Sea State Inhibit
Level 3 — Automatic Sea State Inhibit and counter rudder.

When the autopilot is switched on, the response level is set to 1. This provides the best compromise between power consumption and course keeping accuracy and is suitable for nearly all situations.

Increasing Response level provides tighter course keeping at the expense of increased power consumption and general wear and tear. It is advisable to use the minimum response level necessary to achieve the desired course keeping accuracy. On larger power vessels level 3 can improve slow speed steering where the natural yaw damping of the vessel is reduced.

Note: Level 3 is not recommended for use at planing speeds or in rough seas.

Track

To make full use of Track control the following simple points should be observed:-

- Always steer the vessel to within 0.1 nm of track and bring the heading to within 5 deg. of the bearing to the next waypoint before selecting Track.
- Always check that there are no navigational hazards either side of the intended track.
- Always maintain an accurate log with regular plots to verify the computed position read from the Radio Navigation Receiver. Maintain a proper lookout at all times.

Waypoint Advance

If the navigation receiver is transmitting the waypoint number to the ST7000 the waypoint alarm will sound whenever a new target waypoint is selected (see Page 8). When the alarm is sounding the ST7000 will maintain the current heading and automatic track control is suspended. Check the displayed new bearing to waypoint and when it is safe to turn onto it, resume automatic track control by simply pushing **Track**. This accepts the new waypoint and will steer the vessel ont bearing to waypoint.

The tidal offset may be very differ new bearing, and it is good practise t the cross track error after a couple o If the cross track error continues to ir make a course adjustment of say 10 the direction of the arrow. This will he Track control correct more quickly fo tidal vector.

Automatic Trim

If Automatic Trim has been selected d calibration the ST7000 will correct fo changes. This correction can take up minute to apply the rudder offset nece restore the set automatic heading. La changes which change the apparent w direction can produce large trim chang these cases the autopilot will not imm assume the new automatic heading, a settle onto course when the Automatic been fully established.

To minimise the inherent time delay following procedure may be adopted f course changes.

- Note required new heading.
- Select **Standby** and steer manuall
- Bring vessel onto new heading.
- Select **Auto** and let vessel settle o
- Bring to final course with 1 deg. in

It is sound seamanship to make major changes only whilst steering manually. way any obstructions or other vessels cleared properly and due account take changed wind and sea conditions on th heading prior to engaging the autopilot

Rudder Gain

The rudder gain level selected during i trials will normally provide excellent ste performance over a wide range of con However, it may be noticed that the au tends to be a little less stable on north headings in the higher latitudes of the N hemisphere (and conversely southerly h in the Southern hemisphere). This is ca the increasing angle of dip of the earth'

magnetic field at higher latitudes which has the effect of amplifying rudder response on northerly (southerly) headings.

Rudder Gain Adjustment (Sail)
It is not normally necessary to adjust the autopilot gain setting once the correct level has been established during initial sea trials.

Depending on the yacht's individual steering characteristics a change of one level may improve course keeping accuracy when going from northerly to southerly (increase) or southerly to northerly ,(decrease) headings.

The effect may be judged by carrying out a sea trial in smooth water conditions and observing the results.

Note: The effect is reversed for the Southern hemisphere.

Rudder Gain Adjustment (Powercraft)
The tendency towards northerly (southerly) heading instability is more obvious in high speed craft and can be corrected by a reduction in the rudder gain setting. At speeds in excess of 30 knots a reduction of two levels can be required on headings between 315 deg. and 045 deg (Northern hemisphere) or 135 deg. and 230 deg. (Southern hemisphere).

Two options are available to control this:-

- **Manual** (Low speed and displacement craft).
  The rudder gain control may change by one level when going from northerly to southerly (increase) or southerly to northerly (decrease) headings.

  The effect may be judged by carrying out a sea trial in smooth water conditions and observing the results.

  Note: The effect is reversed for the Southern hemisphere.
- **Autoadapt** (High speed planing craft)
  The ST7000 can be set automatically to reduce the effects of northerly heading instability. This feature is selected in calibration mode by entering the latitude (see Installation Handbook, Calibration, section on 'Auto Adapt'). When selected the ST7000 automatically adjusts the Rudder Gain depending on the compass heading, removing the need for manual adjustment.

Rudder Gain/Speed Adjustment (Powercraft)
High speed planing craft exhibit very different steering characteristics when on and off the plane. As a result it is generally necessary to adjust the Rudder Gain setting when going from displacement speed to planing speed or vice versa.

Two options are available to achieve this:-

- **Automatic**
  When the ST7000 is used with an Autohelm ST50 Speed Instrument or Tridata, Rudder Gain is adjusted automatically with boat speed. There should be no need for any manual adjustment.
- **Manual**
  (No ST50 Speed/Tridata)
  The Rudder Gain setting may be increased by one or two levels when dropping from planing speed to cruise speed and decreased by the same amount when returning to planing speeds.

Note: It is important to make the gain adjustment **after** dropping to displacement speed and **before** returning to planing speed.

Note: The adjustment of Gain with boat speed is normally only required for high speed planing powercraft.

Unsatisfactory Steering Performance
If the ST7000 has been installed and set up in accordance with the instructions in the Installation Manual it will provide excellent steering performance over a wide range of conditions.

If performance drops but the autopilot is still working correctly, the following simple checks should find the fault:-

- Has a magnetic influence been introduced near the fluxgate compass? i.e. anchor, chain, radio equipment, loudspeaker, tools, generator etc. Check that the autopilot compass heading still corresponds with the steering compass.
- Are all fuses intact, circuit breakers engaged?
- Are all screw connections tight and free of corrosion?
- If the autopilot fails to hold course check the Rudder Gain level. Has it been changed from the initial sea trials level (check in Installation Manual)?
- If the vessel wanders check that the Rudder Reference Transducer linkage is secure with no free play.

Hydraulic Drive Units only:-

- Check that all unions are tight and bleed system to remove air.

Failure of Drive Unit to Disengage
The mechanical drive actuators of the ST7000 are designed to 'Fail Safe' - When power is disconnected the drive unit will disengage leaving the steering system free for manual control.

When Standby is selected the actuator will disengage leaving the steering free.

It is remotely possible that a fault could develop which could cause the actuator to remain engaged even when Standby is selected. If this happens:-

- DISCONNECT THE MAIN CIRCUIT BREAKER TO THE AUTOPILOT - THE STEERING WILL IMMEDIATELY BE FREE.
  or
- IN AN EMERGENCY THE ACTUATOR CLUTCH CAN NORMALLY BE OVERRIDDEN BY TURNING THE STEERING WHEEL **HARD.**

It is emphasised that this fault is extremely unlikely and can be immediately corrected as described.

If preferred a separate **Override** switch can be fitted close to the steering position which will break the actuator clutch drive for **Emergency Use.**

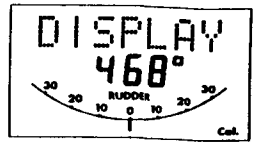
Stern Drive Actuator

Manual Override Option
When used with a stern drive actuator, the ST7000 can be set up automatically to release the drive if the steering wheel is turned in an emergency situation. After releasing the drive unit the ST7000 will return to Standby and sound the manual override alarm for 10 seconds.

This feature is selected during autopilot calibration (see Installation Handbook)
Note: This feature is for use with a st actuator only.

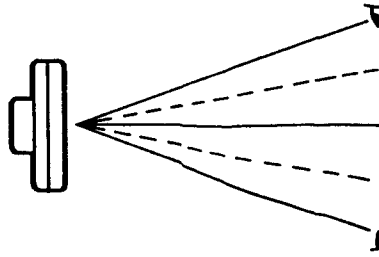
Control Unit Display Adjustment
The control unit display is designed to good legibility over a wide range of vi angles. However, it is recommended t wherever possible the control unit is n that the viewing angle is normal to the display when the helmsman is in the u steering position. If the control unit is so that the usual viewing position is a to the lcd display, the lcd contrast ca adjusted to improve legibility.

- Push **Display** and **Track** together momentarily.



- Push ▲ to increase, ▼ to decreas level. Continue until the display has legibility when viewed from the usu position.
- Push **Display** and **Track** together momentarily to store the selected level.

Note: Increasing the contrast level wil installations where the instrument is n viewed from below.



6. Maintenance

The autopilot is one of the most used and hardest working items of equipment on board, and therefore must receive its fair share of attention and routine maintenance. The working parts of the drive system are sealed and lubricated for life during manufacture and therefore do not require servicing.

Regular inspection of the installation is recommended in the following areas where applicable.

1. Check tension and alignment of the drive chain (Rotary Drive) and lubricate with good quality waterproof light grease.
2. Check that Hydraulic Steering systems are free from leaks and trapped air. Bleed when necessary to remove air from the system.
3. Check that all inter-connecting cable terminals are fully tightened and corrosion free.
4. Check that external waterproof sockets are capped when not in use and periodically spray with WD40 (or similar) to protect from corrosion.
5. Check that the heavy power supply cable connections are tight and free from corrosion.

7. Safety

Passage making under autopilot can greatly increase the pleasure of the voyage and ensure the crew can relax. However, this can lead to a dangerous lack of attention to basic seamanship. The following rules should always be observed:-

- **Maintain a permanent watch and check regularly all round for other vessels and obstacles to navigations. No matter how clear the sea may appear a dangerous situation can develop rapidly.**
- **Maintain an accurate record of the vessel's position either by use of a radio navigation receiver or visual bearings.**
- **Maintain a continuous plot of position on a current chart. Ensure the locked autopilot heading steers you clear of all obstacles. Make proper allowance for Tidal Set - the autopilot cannot!**
- **Even when your autopilot is locked to the desired Track using a radio navigation receiver maintain a log and a regular positional plot. Radio navigation signals can produce significant errors under some circumstances and the autopilot cannot detect this situation.**
- **Ensure that all members of crew are familiar with the procedures required to engage and disengage the autopilot.**
- **When searoom is restricted a crew member must be close to a control unit at all times if under autopilot control.**
- **On Powercraft permanent watch should be maintained at the steering station when at speed with the autopilot engaged.**

Your Autohelm ST7000 will add a new dimension to your boating enjoyment. However, it is the responsibility of the skipper to ensure the safety of the vessel at all times by careful observance of these basic rules.

8. Fault Location Procedure

The ST7000 has been designed to achieve very high standards of reliability combined with ease of servicing.

If a fault should appear, please double check that all connections in the connector unit are sound and that the heavy duty power connections are tight and free from corrosion. If you are satisfied that all connections are sound,the simple check procedure tabulated below will assist you to locate the most likely fault area.

If the autopilot switches on but does not operate correctly, check the rudder angle and heading displays on the control unit. If these appear incorrect, double check all connections from the course computer to the compass and rudder reference transducers.

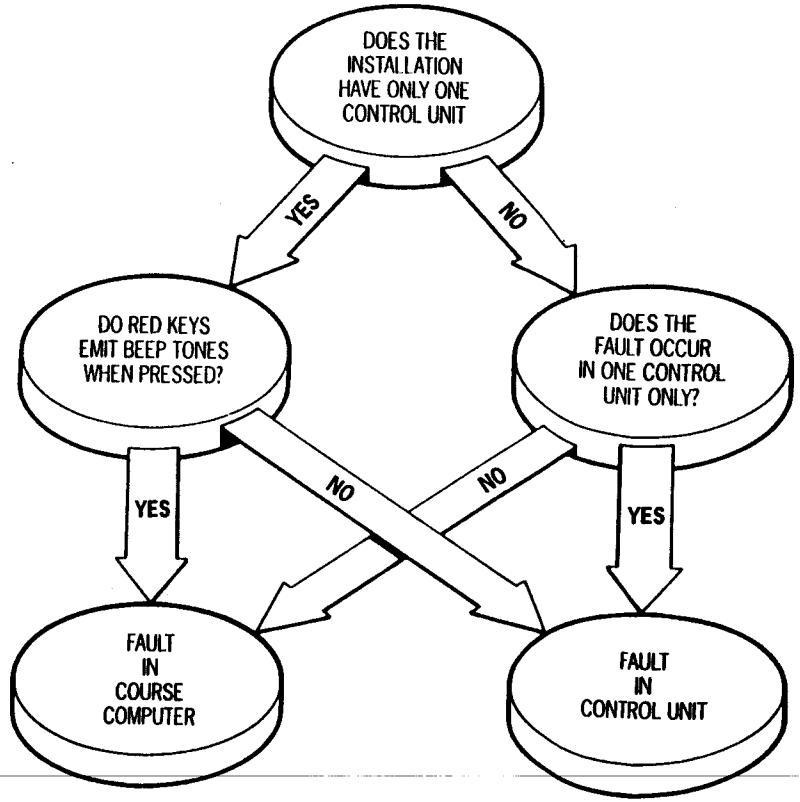
In the case of a sailing yacht fitted with a windvane system, if a fault occurs only in vane mode then it is likely that fault has developed in the vane head or the interconnection

Since the course computer house majority of the electronic control syst a high probability that if an electronic occurred it will be located in this area course computer unplugs easily from connector unit for servicing. (See Inst Manual).

Control Units are removed by und two thumb nuts (accessed from behir Disconnect the cables by rotating the rings anti-clockwise before separating connectors.

The faulty unit should be removed returned to your nearest service agen

If any difficulties arise, please con Nautech's Product Support Departme UK or your own national distributor wh be able to provide expert assistance.



9. Warranty, After Sales Service

Limited Warranty

Nautech or its appointed Distributors or Service Centres will, subject to the conditions below, rectify any failures in this product due to faulty manufacture which become apparent within twelve months of its purchase date.

Equipment used in the country of purchase should be sent directly to the authorised Distributor for that country or its appointed Service Centres. The product will then be serviced free of charge and returned promptly direct to the sender.

Equipment used outside the country of purchase can be either:-

a. Returned to the Distributor or Dealer in whose country the equipment was originally purchased - it will then be serviced free of charge and promptly returned direct to the sender, or
b. The product can be returned freight pre-paid to the authorised Distributor or its appointed Service Centres in the country in which the product is being used. It will then be serviced and returned direct to the sender on the basis that the Distributor or Service Centre will supply any parts used free of charge but the sender will be invoiced for the necessary labour and return shipment at the local rate.

Conditions

The warranty is invalid if:-

a. The product has been misused, installed or operated not in accordance with the standards defined in this manual.
b. Repairs have been attempted by persons other than Nautech approved Service personnel.

Full International Warranty

Nautech or its appointed Distributors or Service Centres will, subject to the conditions below, rectify any failures in this product due to faulty manufacture which become apparent within twelve months of its purchase date wherever the vessel and the product may be operated.

Conditions

1. The product must be installed aboard the vessel in the country of purchase.
2. The product must be installed in accordance with the recommendations issued by Nautech Ltd.
3. The installation must be carried out by an installer approved by Nautech: alternatively, the installation must have been inspected and approved by Nautech or its approved installer.
4. The Warranty Registration Card must be completed by:-
   — The owner or user.
   — The dealer supplying the product.
   — The installer.
5. The Full International Warranty is invalid if:-
   (a) The product has been misused, or installed or operated not in accordance with standards defined in this handbook.
   (b) Repairs have been attempted by persons other than Nautech approved Service personnel.
   (c) The warranty card has not been completed correctly or is not accompanied by proof of purchase.

Claim Procedure

1. The product should be sent direct to Nautech or its appointed Distributor or Service Centre nearest to the vessel. The completed Warranty Card and proof of purchase must accompany the claim. The product will then be serviced free of charge and returned promptly direct to the sender.
2. Nautech, its Distributors and Service Centres, are not liable for any charges arising from visits to the vessel not to attend to the product, whether under warranty or not, nor for sea trials or any other work associated with the installation. The right is reserved to charge for any such services at the local rate.

After Sales Service

Your ST7000 is designed to give you long service and reliable performance wherever you sail. To ensure that you can always receive prompt and expert attention in case of any difficulty, Nautech has established a worldwide network of Autohelm Service Centres.

Please contact your nearest Service Centre for assistance. Always have ready:-

— Your warranty card.
— Proof of purchase.