Any reference to Raytheon or RTN in this manual should be interpreted as Raymarine. The names Raytheon and RTN are owned by the Raytheon Company.
Introduction

The ST5000 can be configured to suit each installation's unique requirements without a need for reference to any specific guidance manuals. The software and hardware used in each installation is tailored to meet the specific needs of each installation. The ST5000 is supplied with a reference speed pump, which is dropped from the installation's control panel. The ST5000 is configured to operate with a position transducer (GPS, DCC, etc.) and is compatible with the installation's requirements for use with a position transducer. The control panel also includes a built-in navigation interface for use with a position transducer. The control panel is easy to connect to secondary systems and compatible with the installation's requirements for use with a position transducer. The control panel is compatible with the installation's requirements for use with a position transducer. The ST5000 is permanently installed and can be configured to suit the specific needs of each installation.

Specifications

ST5000 Hydraulic Actuator Operation and Installation Handbook

- Power Supply
- -10V to +12V
- Operating temperature
- -4°C to +70°C
- Ambient conditions
- 0°C to 70°C
Safety

The vessel's safety is a critical concern. All crew members must be aware of their responsibilities to ensure the vessel's safety.

When entering the cockpit,:
- Ensure that all crew members are familiar with the controls.
- Understand the vessel's navigation system and emergency procedures.
- Enforce strict safety measures to minimize risks.
- Keep a continuous watch on the vessel's position and all equipment.
- Report any unusual occurrences immediately.
- Maintain a vigilant watch on the vessel's position at all times.
- Take necessary precautions to prevent accidents.
- Ensure all equipment is functioning properly.

In the event of an emergency:
- Immediate action must be taken to ensure the vessel's safety.
-Activate the emergency procedures and follow the established guidelines.
- Keep a clear line of communication with all crew members.
- Evacuate the vessel safely and efficiently.

In case of a fire:
- Use the vessel's fire extinguishers immediately.
- Call for help and report the incident immediately.
- Keep a clear path to the helipad for rescue operations.
- Ensure all crew members are accounted for.

In the event of a collision:
- Immediately report the incident to all relevant authorities.
- Take necessary actions to prevent further damage.
- Keep a record of all events for future reference.
- Follow established protocols to ensure the vessel's safety.

In the event of a medical emergency:
- Call for medical assistance immediately.
- Keep a clear line of communication with medical professionals.
- Ensure all crew members are accounted for.
- Keep a record of all events for future reference.

In the event of a loss of power:
- Use the vessel's emergency generator immediately.
- Keep a clear line of communication with all crew members.
- Ensure all equipment is functioning properly.
- Take necessary actions to prevent further damage.

In the event of a loss of communication:
- Use all available means of communication to establish contact.
- Keep a clear line of communication with all crew members.
- Take necessary actions to prevent further damage.
- Keep a record of all events for future reference.

In the event of a loss of propulsion:
- Use the vessel's emergency propulsion system immediately.
- Keep a clear line of communication with all crew members.
- Ensure all equipment is functioning properly.
- Take necessary actions to prevent further damage.
- Keep a record of all events for future reference.
Chapter 1: Operation

1.1 Basic Principles

Also see 'Auto'.

If by any reason the vessel is steered away from the selected heading

- Push to select and manually steer and maintain current heading

1.2 Operator controls

ST5000 Navigating Operator Operation and Installation Handbook
Automatic Deadband Control (Auto Seabase)

Press the +1 and -1 degree course change keys together to toggle between auto deadband and fixed minimum deadband. The difference shaded box will light when the fixed minimum deadband is selected.

| Cross Track Error | | |
|-------------------|-----------------|
|                   | Distance to Ward | Lead Ahead |
|                   |                   |            |
|                   |                   | 050.0      |

For more details, see Advanced Operation.

Dodge

In order to avoid an obstacle under autopilot control select a course change in the appropriate direction (say starboard 30° = 3 x 10°).
1.3 Operating hints

This can only be done with the switch in Standby mode.

Press the +1 and -1 keys for 1 second to display under angle.

Rudder angle display

Chapter 1: Operation

ST5000 Hydrane Autopilot Operation and Installation Handbook
Advanced Operation
Cross Track Error

Display: The current navigation information will now be continuously displayed on the screen.

The cross track error is the vessel's distance from a planned route. This is displayed in nautical miles and is read directly from your position lines.

Press the +10 and -10 degree keys together to enter Track Control.

Press Alt.

Bring the vessel to within 0.1 mile of track.

To enter the cross track error distance, the vessel is now positioned within 0.1 mile of track.

The icon will change to display the distance to waypoint.

Chapter 2: Using Track Control

ST5000 Information Manual Operation and Installation Handbook

18
Low Speed Operation

The normal operation procedures are as follows:

1. The crew member should approach the target area at a low speed.
2. The crew member should establish communication with the target area.
3. Once communication is established, the crew member should proceed to the target area at a low speed.
4. Upon arrival, the crew member should turn on the safety lights.
5. The crew member should approach the target area at a low speed.
6. Once the target area is in sight, the crew member should establish communication with the target area.
7. Once communication is established, the crew member should proceed to the target area at a low speed.
8. Upon arrival, the crew member should turn on the safety lights.
9. The crew member should approach the target area at a low speed.
10. Once the target area is in sight, the crew member should establish communication with the target area.
11. Once communication is established, the crew member should proceed to the target area at a low speed.
12. Upon arrival, the crew member should turn on the safety lights.
13. The crew member should approach the target area at a low speed.
14. Once the target area is in sight, the crew member should establish communication with the target area.
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88. Upon arrival, the crew member should turn on the safety lights.
89. The crew member should approach the target area at a low speed.
90. Once the target area is in sight, the crew member should establish communication with the target area.
91. Once communication is established, the crew member should proceed to the target area at a low speed.
92. Upon arrival, the crew member should turn on the safety lights.
93. The crew member should approach the target area at a low speed.
94. Once the target area is in sight, the crew member should establish communication with the target area.
95. Once communication is established, the crew member should proceed to the target area at a low speed.
96. Upon arrival, the crew member should turn on the safety lights.
97. The crew member should approach the target area at a low speed.
98. Once the target area is in sight, the crew member should establish communication with the target area.
99. Once communication is established, the crew member should proceed to the target area at a low speed.
100. Upon arrival, the crew member should turn on the safety lights.

Limitations

1. The crew member should ensure that the target area is clear of obstacles.
2. The crew member should ensure that the target area is clear of personnel.
3. The crew member should ensure that the target area is clear of equipment.
4. The crew member should ensure that the target area is clear of hazardous materials.
5. The crew member should ensure that the target area is clear of electrical hazards.
6. The crew member should ensure that the target area is clear of chemical hazards.
7. The crew member should ensure that the target area is clear of biological hazards.
8. The crew member should ensure that the target area is clear of radiological hazards.
9. The crew member should ensure that the target area is clear of environmental hazards.
10. The crew member should ensure that the target area is clear of natural hazards.

Tidal Stream Computation

Chapter 2: Using Tidal Currents

ST5000 Hydraulics and Navigation Operating and Inspection Handbook

Note: While the workshop is under way the current boat heading.

Wave: While the workshop is under way the current boat heading.

Wave: While the workshop is under way the current boat heading.

Wave: While the workshop is under way the current boat heading.

Wave: While the workshop is under way the current boat heading.

Wave: While the workshop is under way the current boat heading.
The waypoint advance alarm sounds whenever the radio receives a waypoint advance message.

Safety

Start back towards the head. Follow the red vessel on the HH screen. The red vessel is the vessel under the boat. Warning messages are received from the control panel when the vessel is not proper.
Chapter 3: Adjusting autopilot performance

Stabilized by reducing the rudder gain setting.

An excessive high rudder setting results in oversteering.

The rudder gain is correctly adjusted.

Cruise airspeed by an observed airspeed change of 4000 feet.

Typically, an overshoot speeds a course change of 4000 feet.

Press Auto to engage the autopilot on the course.

Hold the course steadily for 10-15 seconds.

Steer onto a steady course.
Chapter 3: Adjusting Aircraft Performance

It is particularly important that the rudder can is correctly set on each side.

Adjuster movements and force reduce power consumption and wear and tear. The rudder can is set on the ground and should be set to the correct height and position. The rudder can is set to wing are 90° to 5° of angle to the wing. Adjust the rudder can to the correct height and position. Refer to chapter 4, "Flight Operations," for instructions on how to adjust the rudder can.

Some actions are most easily performed in calm sea conditions. If the aircraft does not match basic flying performance, these actions are most easily performed in calm sea conditions. Simultaneously, an unusual rudder can setting will result in undesirable flight behavior.

The need for manual adjustments can be determined based on the aircraft, removing the need for manual adjustments. By examining the aircraft's operating instructions and guidelines, the need for manual adjustments can be confirmed. The aircraft's operating instructions may also be found in chapter 4, "Flight Operations."
4.1. Entering Calibration Mode

Press the Standby button for 5 seconds until the display shows:

Chapter 4: Autopilot re-calibration
Chapter 4: Adjustment & Calibration

4.3 Suggested Calibration Settings

This will only calibrate with the current machine and adjusted values in memory. Monitor calibrations are not saved. To save:

Press and hold "STAND BY" for one second.

You can exit calibration at any time in one of two ways:

4.2 Execute calibration mode

How to adjust:

Please refer to the Calibration Access - Section A.5 for details on how to calibrate the machine.
Chapter 4: Autopilot - Calibration

To set up the rudder limit, refer to the section on rudder limits and set the limit accordingly.

Calibration Level 1 (Rudder Gain)

Calibrate the rudder gain as described in section 4.1

Calibration Level 2 (Rudder Offset)

Set the rudder offset, which is the turning point at which the rudder begins to move under automatic control. This sets the control head to read a specific value.

Calibration Level 3 (Rudder Limit)

The display will show: [Display Image]

1. Enter calibration by pressing the start-up key for 1 second until the display reads: [Display Image]
2. Enter the calibration mode as described in section 4.1.
3. Set the calibration mode as described in section 4.1.
4. Display the right hand side of the screen.
5. Press the Auto key
6. Display to zero.
7. Zero difference means the rudder is positioned as desired. This sets the control head to read [Display Image].

Calibration Level 4

Press the Start-up key to exit calibration mode. This sets the control head to read [Display Image].
Chapter 6: Analogic to Calibration

1. Press the Auto Key.
2. Adjust the trim level using the +1 and -1 degree buttons.
3. Press the Auto Key.
4. Level 3: Trim the trim level.
5. Level 2: Show the trim level.
6. Level 1: Turn off the trim level.
7. Trim can be set to any one of these ranges or switched off completely.

8. Press the Auto Key.
9. Calibration level 7 (Trim Level)

10. Calibration level 5 (Course Speed)

11. Calibration level 5 (Course speed)

12. Calibration level 6 (Trim Course Angle)

13. Calibration level 4 (Trim Rate Limit)

14. ST5000 Hydronic Automatic Operation and Instruction Handbook
Chapter 4: Autopilot / Calibration

ST5000 Hydraulically Acting Autopilot and Installation Handbook
The calibration should now be saved by pressing the standby key for 1 second. This is an important step not to be omitted.

Press the digit 1 and calibration key for 1 second until the display shows 00.

If the display fails to show 00, please check if the calibration setting is set to levels 0.
5.1 Control head

Chapter 5: Installation
The panel can be extended if required. The following table shows the minimum cable sizes acceptable:

<table>
<thead>
<tr>
<th>Cable Length</th>
<th>AWG</th>
<th>Copper Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>16</td>
<td>1.5 sqmm</td>
</tr>
<tr>
<td>14</td>
<td>18</td>
<td>1.0 sqmm</td>
</tr>
<tr>
<td>16</td>
<td>20</td>
<td>0.75 sqmm</td>
</tr>
</tbody>
</table>

Power supply connection

Head

A screw (item 7) is already attached to the back cover of the control panel.

1. Screw the control head with the thumb nuts provided (3).
2. Align the recess projection on the control head to the control head recess on the ST5000.
3. Press the control head into the control head recess until it is seated.
4. Screw the two locking screws (4) into the back cover.
Mounting position

5.2 Fusegate Compass

Use a Dural landa extension cable (see Chapter 5, Accessories). Other Sealark instruments can now be connected to the control head.

For safety reasons the ST5000 should not supply power to the Sealark.

Control head as shown below:

The ST5000 is supplied with one Sealark cable for the control head. No additional cables are required for installation.

Important:

Connection to the Sealark bus.

Will reduce the power on the ignition pump.

No supply will drop voltage between the supply and the control head. This can cause the required current specification but it will reduce the power on the ignition system.
Control head

Green means the transducer must be reversed on the rear of the

counter head. These should be connected together for correct to the transducer. The cable runs on the face of the transducer.

Mounting position

A rudder reference transducer must be used on all installations with a

5.3 Rudder Reference Transducer

Cabling

Correct positioning of the transducer is crucial for accurate performance from

ST5000 Lyric Furling Operation and Installation Handbook

Page 49
The rudder control is at the rear of the control head as shown below.

Cable Routing

- The conduit connections at the rear of the control head as shown below.
- These should be connected to the conduit to which is attached the rear of the control head. The conduit runs along the side of which is attached the conduit.
- The conduit running along the side of which is attached the conduit.

Steering System

- In order to ensure the rudder is free from any obstruction at all.
- The cables can then be passed onto the other, move the inner side.
- The inner side is secured to the inner side.
- Turn the steering to begin and screw on the locknuts and ball nut side.
- The inner side is secured to the inner side.

Control dimensions

> Chapter 5: Installation

ST5000 Hydraulics: Operation and Installation Handbook
The diagram below shows the minimum size of cable gland needed to connect the hydraulic pump to the steering system. The cable gland must be adequate to ensure proper sealing and prevent leakage. The hydraulic pump connections to the steering system combination must be made in accordance with the manufacturer's instructions. The manifold pressure and the steering pump must be checked before the system is pressure-tested with the pressure relief valve closed.

**Types of Steering Systems**

- **Two-Stage Systems**
- **Three-Phase Systems**
- **Two-Stage Systems**

There are three basic types of hydraulic steering systems:

5.4 Hydraulic Pump Installation

ST50000 Hydraulic Pump Operation and Installation Handbook
Two Line Pressurized System

The diagram shows a two-line pressurized system with a pump, valve, and pressure gauge. The pump is connected to the system as shown below. The valve is in the open position, allowing fluid to flow in the direction indicated.

A two-line pressurized system has an external pressurized reservoir.

Chapter 5: Installation

ST5000 Hydraulic Actuator Operation and Installation Handbook
Chapter 6: Interfaces to GPS, Decca, Loran

6.2 NMEA Data Transmission to Other Equipment

The NMEA data port is the rear of the ST5000 and should be connected to a NMEA data port on the rear of the ST5000. The NMEA data port is shown in Section 6.3.

6.1 Cabling

The NMEA data port is shown in Section 6.3. The NMEA data port is shown in Section 6.3. The NMEA data port is shown in Section 6.3.
Seal the control head and the instrument.

If the instrument does not switch on then a circuit fault exists in the

instrument.

The ST5000 should immediately respond by switching on its display.

---

**Navigation Interface (GPS, Deca, Loran)**

- Ensure all buttons and switches are in the correct position.
- Press the MENU button to access the menu.
- Use the arrow keys to select the required function.
- Press the SELECT button to confirm the selection.

**Rudder Reference Phase**

- Ensure the rudder reference is set correctly.
- Check the rudder reference display.
- Press the SELECT button to confirm the selection.

---

**Seal the bus**

- Ensure the bus is properly sealed.
- Check the bus display.
- Press the SELECT button to confirm the selection.
Chapter 7: Functional Test and Initial Sea Trial

Operating Sense Reversal

After 5 seconds, the Control Head will automatically revert back to its normal operation.

To press the +1 and -1 keys together for 5 seconds.

The Operating Sense of the Autopilot can be reversed as follows:

Auto pilot operation

- After course is to stop or selected in multiples of 1° and 0°
- When it needs to be activated
- Press and hold the Control Head
- Steer using compass heading and hold the course steadily
- To return to normal operation, press the appropriate procedure as recommended.
The control units are available for permanent mounting at different positions where a control panel is desired.

These control units are compatible with ST7000, ST16000 (Z174).

- Fixed control units - ST7000 (2082), ST16000 (Z174).

- Change buttons.

The digital control is supplied with 200 ft (61m) of cable and a waterproof terminal.

The keypad remote is supplied with 61m of cable and a waterproof terminal.

Various accessories are available for your ST5000 autopilot. These accessories are compatible with the ST5000 and ST7000 systems.

Chapter 8: Accessories

ST5000 Autopilot Operation and Installation Manual
Chapter 9: Maintenance

ST5000 Hydraulics, Alternative Operation and Maintenance Handbook

Chapter 10: Fault Finding

Fault 1: No Flow

Action

- Check all hydraulic connections.
- Check all hydraulic valves.
- Check all hydraulic lines.
- Check all hydraulic pumps.
- Check all hydraulic motors.
- Check all hydraulic cylinders.

Cause

- Air in the hydraulic system.
- Leaks in the hydraulic system.
- Malfunctioning hydraulic valves.
- Malfunctioning hydraulic pumps.
- Malfunctioning hydraulic motors.
- Malfunctioning hydraulic cylinders.

The following check list should help to identify the problem:

1. Check all hydraulic connections.
2. Check all hydraulic valves.
3. Check all hydraulic lines.
4. Check all hydraulic pumps.
5. Check all hydraulic motors.
6. Check all hydraulic cylinders.

All hydraulic products are subject to a comprehensive test procedure.

Always consult the serial number, which is printed on the label on the back of the control head.

Always consult your nearest authorized dealer or service center for technical assistance.

Before proceeding, please ensure that all hydraulic connections are tight and that all hydraulic valves are closed.

Always consult your nearest authorized dealer or service center for technical assistance.

The warranty period of the hydraulic parts are stated and limited for the specified period.

Drive unit

- The control head becomes slippery and may drop off the trailer.
- Please use any chemicals or other materials to clean your ST5000. If not harm the rail, and can be cleaned by washing with the指定 chemicals.