

Troubleshooting Autopilot

Read this document before do any calibration or making any changes

Normal calibration and setup

- 1- Perform Calibration and Dockside Checks per [Autopilot Commissioning Guide, ST70 Autopilot Control Head Installation Guide, or p70/p7R Autopilot Control Head Installation Guide](#)
 - a. Verify that the autopilot maintains approximate rudder position when configured to AUTO mode.
 - b. If rudder or engines go hard over,
 - i. If there is a rudder reference unit (RFU) - The RFU should be check for proper movement from right to left on the autopilot display in standby, if reversed then swap the RFU wires (red and green) at the course computer
 - ii. If the RFU wires are not reversed then drive motor A and B leads are reversed ... swap these leads (i.e. connect the lead which is presently in the B port to the A port and vice versa).
 - iii. Note: With SPX autopilots, it is recommended that A and B motor leads be swapped to address hard over rather than use the Reverse Polarity feature within the autopilot's Setup Wizard.
 - c. Auto, press +10 (or rotating the knob to the right) does the rudder scale and the engines or rudder goes to the right?
 - d. Auto, press – 10 (or rotating the knob to the left) does the rudder scale and the engines or rudder goes to the left?
 - e. If the rudder or engines go hard over then the motor a and b leads at the course computer may be reversed, swap them
 - i. In the newer spx system it is best to move the wires instead of doing a reverse the polarity in the setup wizard
- 2- Get underway.

- 3- While in Standby mode, perform a slow 360 degree circle while monitoring the heading on the autopilot control head. You should observe a relatively constant rate of angular change (no more than 3-5 deg.) in the reported heading. Should you observe the heading stick or jump, then this would be indicative of a problem with the Fluxgate Compass or the installation (ex. field influence on the fluxgate compass or course computer).
- 4- Perform Sea Trial Calibration
 - a. Verify that a low (1-15 degrees) deviation is recorded, by swinging the boat in Sea Trial Calibration on older units, or Sea Trial Wizard on p70/p7R autopilot control heads.
 - b. Adjust heading to match the magnetic compass of the boats compass (assumes that boats compass has been properly calibrated and autopilot has been configured to display magnetic bearings).
 - c. If the autopilot features a gyro, then command the autopilot to Auto Learn. This process is designed to permit the vessel to learn the vessels handling characteristics by steering the vessel through a sequence of maneuvers. See the [Autopilot Commissioning Guide, ST70 Autopilot Control Head Installation Guide, or p70/p7R Autopilot Control Head Installation Guide](#) for more information on this subject.

Troubleshooting and testing

If a rudder reference unit has been interfaced to the autopilot course computer:

1-Command the autopilot into STANDBY MODE:

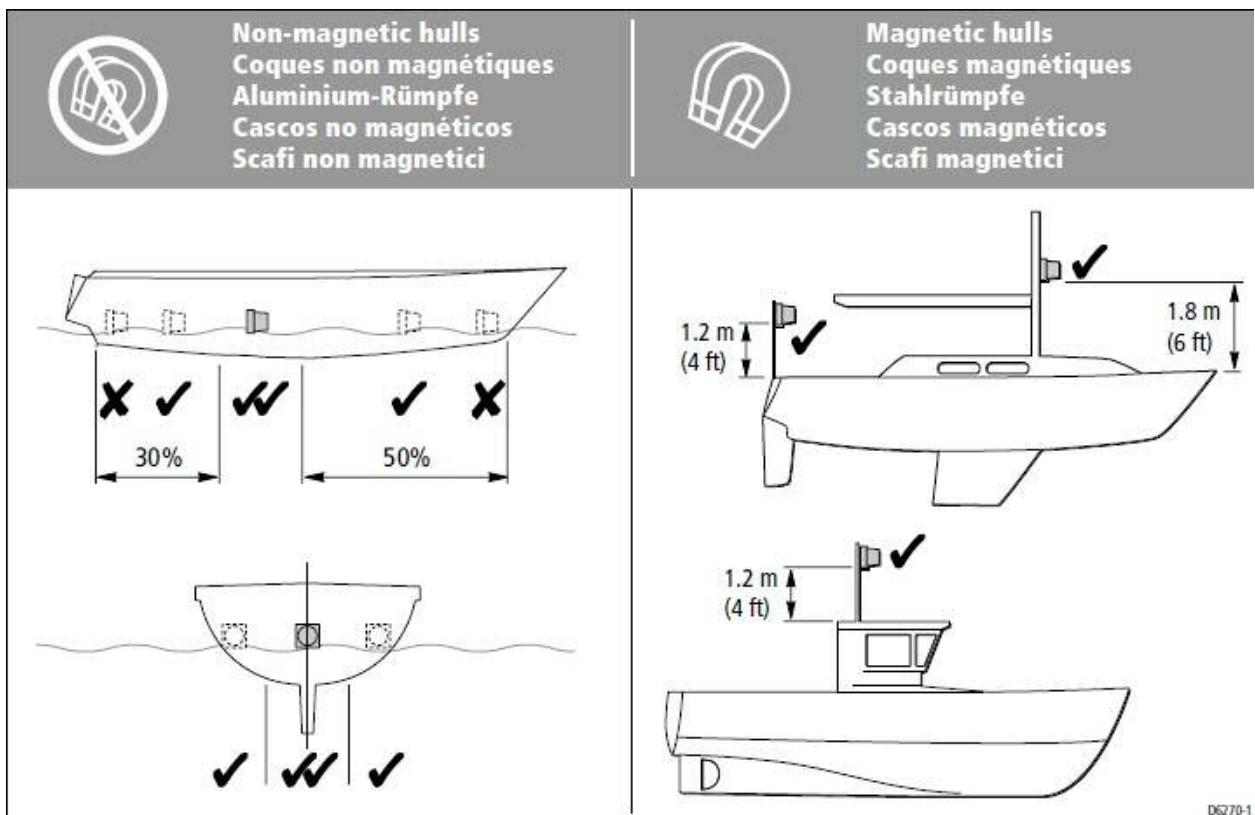
2-Ensure that good rudder angle deflection is observed on the rudder angle indicator/rudder bar as the helm is shifted from hard over left to hard over right. If not, then disconnect the rudder reference unit from the course computer and test per the Rotary Rudder Feedback Unit Test Procedure. Should the rudder reference unit pass the test procedure, then reconnect the rudder reference unit to the autopilot course computer. Should the rudder reference unit not pass the test procedure, then replace the rudder reference unit

Rotary Rudder Feedback Unit Test Procedure

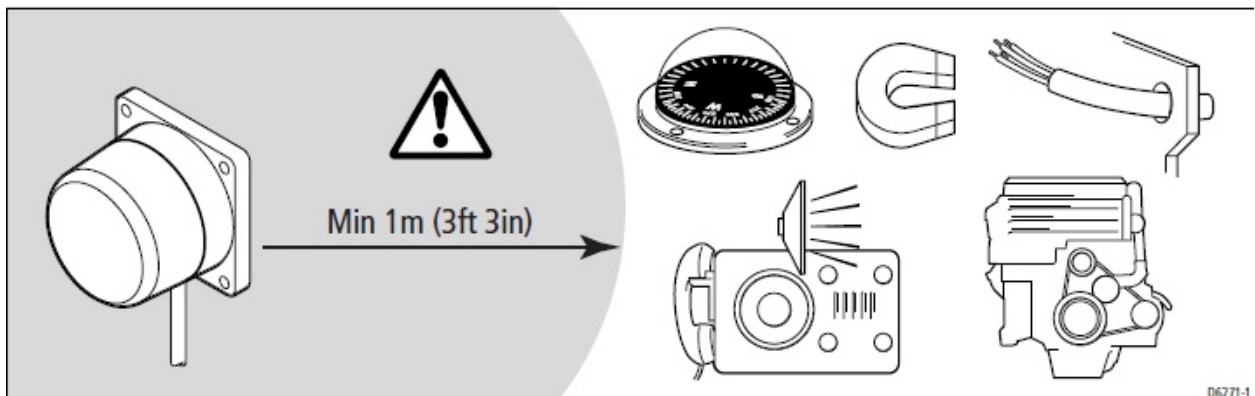
1. Remove the 4 wires (marked rudder) from the autopilot course computer
2. Test on the 20K ohm scale, between the following colors,
 - Red to green should see about 5K ohms.
 - Then between green and blue at mid ship position you should see about 2.5K ohms,
 - Slowly turn the wheel lock to lock; watching the meter and you should not see any jumping, skipping, and backwards movement in the meter as long as the unit is moving.
 - Verify that you see an approximately even amount of movement in each direction from the amidships position.
 - No opens or shorts also.
 - When the helm is rotated hard over to port, you should observe an increase or a decrease in resistance. If an increase in resistance is observed, the measured resistance should be no more than approx. 3.1k Ohms. If a decrease in resistance is observed, the measured resistance should be no less than approx. 1.9k Ohms.
- Failed rudder reference units should be replaced with part #M81105

Test the Fluxgate Compass per the Fluxgate Compass Test Procedure.

Check the compass installation area for ferrous metals (engine block, keel), high current carrying conductors, electric motor, tools, speakers, and any other items capable of producing a magnetic field.



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Fluxgate Compass Test Procedure

1. Disconnect the Fluxgate Compass wire from the autopilot course computer.
2. Configure the ohmmeter to the 20 Ohm scale
3. Resistance checks:
 - Red to Yellow - should see approx. 3.5 - 5 Ohms
 - Red to Green - should be approx. 3.5 - 5 Ohms
 - Shield to Blue - should be approx. 7 - 8.2 Ohms
 - Yellow to Green – should be approx. 7 - 8.2 Ohms
 - Red to Shield - should be open (infinite)
 - Green to Shield - should be open (infinite)
 - Yellow to Shield - should be open (infinite)
4. If the autopilot is equipped with a gyro (all SPX, S1G, S2G, and S3G feature gyros), ensure that the autopilot course computer is installed at least 3 feet from high current consuming devices (ex. DSM, VHF, electric motors, subwoofer, amplifiers, etc.)

Failed fluxgate compass should be replaced with part #M81190

HOW TO TEST THE COURSE COMPUTER FOR DRIVE OUTPUT

- 1- remove the wires from the motor A and B leads on the course computer
- 2- Place a voltage meter on motor A and B leads of the course computer
- 3- press the auto key, press + 10 (3 or 4 times)
- 4- you should see + or -, 6 to 12 vdc (this voltage will go away depending on how many times you press + 10)
- 5- now press - 10 and look for the opposite polarity 6 to 12vdc

HOW TO TEST THE DRIVE FOR PROPER OPERATION

If the drive has a clutch

- 1- remove the 4 drive leads from the course computer
- 2- apply 12vdc to the clutch leads observing polarity (+ and - leads)
- 3- apply 12vdc to drive leads these are the larger leads
- 4- the drive should go hard in or hard out
- 5- reverse the voltage to the drive leads (larger leads) and the drive should go in the opposite direction
- 6- if it does not there is a problem with the drive

If the drive does not have a clutch

- 1- remove the 2 drive leads from the course computer
- 2- apply 12vdc to drive leads
- 3- the drive should go hard in or hard out
- 4- reverse the voltage to the drive leads and the drive should go in the opposite direction
- 5- if it does not there is a problem with the drive

If both course computer and drive pass their tests then the problem is in the drive.