SECTION 5 COMMISSIONING

NETWORK PILOT COMMISSIONING

Before the Network Pilot can be used, it is necessary to set and calibrate various parameters. This procedure is called Commissioning. This manual covers both ACP 1 and ACP 2 Pilot systems.

PILOT INSTALLATION CHECK LIST

The check list below should be used prior to the commissioning of the autopilot to ensure that the entire system is correct before applying power.

DRIVE UNIT & STEERING SYSTEM

1. Drive unit securely fixed to a rigid part of the boat structure...❒
2. Gauge of power cable is appropriate..... ..... ❒

HYDRAULIC RAMS:

1. Boat end stops must limit the rudder movement, not the stroke of the Hydraulic ram .....❒
2. Split pin that holds the pivot pin in the mounting foot must be secure .....❒
3. Absence of oil leaks .....❒
4. Correct diameter bolt in universal ball joint, correct size hole in tiller.....❒
5. Ram free to move side to side & up and down.....❒
6. Additional reservoir fitted if black ram mounted on its side .❒
7. Reservoir at highest point if ram split .....❒

BLUE SIZE 3 RAM INSTALLATION CHECK LIST

1. The base foot of the ram and pump have been firmly bolted into position
2. The Reservoir has been fixed to a bulkhead ABOVE the Ram and Pump.
3. The sealed reservoir transit cap has been replaced by the Breather cap supplied.
4. The Reservoir has been switched to the ON position allowing oil to flow between the reservoir and the pipe.
5. TAP ON POSITION IS IN LINE WITH THE PIPE. The piston rod can now be extended or retracted and the pump run.

HYDRAULIC PUMPS:

1. Absence of oil leaks .....❒
2. Absence of air in the hydraulic steering .....❒

ROTARY DRIVES:

1. No backlash or excessive slackness in chain .....❒

RUDDER REFERENCE INSTALLATION

1. Base securely fixed to boat structure .....❒
2. Arm securely fixed to boss .....❒
3. Ball joint securely fixed to arm .....❒
4. Linkage has not been over extended .....❒
5. No slack or backlash in the linkage .....❒
6. Linkage does not foul when rudder moved hardover to hardover .....❒
7. Arm moves through at least 90° when rudder moved hardover to hardover (there must be at least 1 volt difference between the end stops) .....❒
8. Ball joint securely fixed to quadrant/tiller .....❒

LINEAR FEEDBACK UNIT INSTALLATION

1. Ensure that the Linear Feed back unit is firmly clamped to the side of the Linear actuator using the bracket kit supplied.
2. Check to see the shaft of the Linear Drive Unit has sufficient lubrication, use only high quality grease.
3. Ensure that the Ram stroke does not exceed the stroke of the Linear Feedback Unit.

COMPASS INSTALLATION

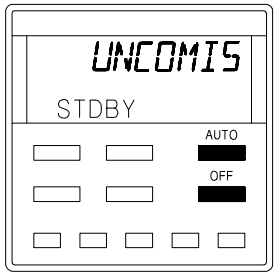
1. Clear of sources of magnetic interference, including power cables to other equipment, if in doubt check 1 metre around with small hand compass. Look on the other side of the bulkhead!.....❒
2. Fitted as near to centre of motion of boat as other factors allow, aft of centre preferred because usually less motion than fore of centre .....❒

ELECTRONICS INSTALLATION

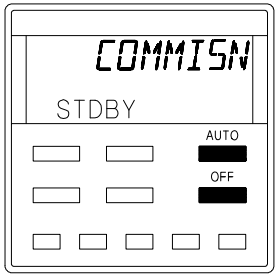
1. Cables secure .....❒
2. Cables undamaged .....❒
3. No loose bits of wire .....❒
4. Screens connected in accordance with wiring instructions and sleeved where appropriate .....❒

TO ENTER COMMISSIONING MODE

With the autopilot in Standby, press **AUTO** and **OFF** key at the same time. The display will change to the following display.

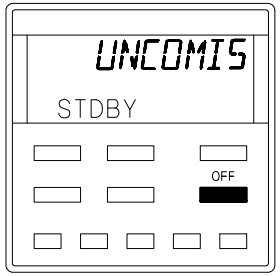


READY TO BEGIN COMMISSIONING



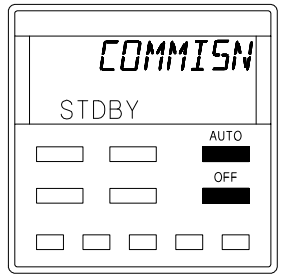
TO EXIT COMMISSIONING MODE

Press the RED **OFF** key.



RE-ENTERING COMMISSIONING MODE

When the autopilot has been commissioned it is possible to change the values that have been set by pressing the **AUTO** and **OFF** keys together. The display will now show **COMMISN**. Use the **SETUP** key to select the parameter to be changed.



COMMISSIONING PARAMETERS

The following is a list of the parameters that have to be set, they are selected by pressing the **SETUP** key while in Commissioning mode.

BT TYPE	-Select boat type: Sail, Power P, Power D
SET RDP	-Rudder end stop Port
SET RDS	-Rudder end stop Starboard
SET RDM	-Rudder Mid position
DRIVE A	-Rudder drive type selection
ST RDT	-Rudder Hard-over time
BLN10.0M	-Boat waterline length in Metres
BLN 32F	-Boat waterline length in Feet
BLG 0.3	-Boat lag value
DIP 0	-Magnetic Dip Angle compensation
SWING	-Compass Deviation Correction
CMP 000º	-Compass alignment correction
RGN 0.50	-Rudder gain value
SC 6.25	-Speed sensor calibration
POWER	-Power steer mode

The procedures for commissioning can be divided into two sections. The first to be carried out alongside and the second to be carried out or checked during the course of a sea trial. The order in which the commissioning procedures are carried out is not necessarily the

order in which they appear when the **SETUP** key is pressed, continue pressing the key until the one that is required is displayed.

COMMISSIONING ALONGSIDE

Set the following parameters prior to a sea trial.

BT TYPE	Select type of boat
SET RDP	Rudder end stop Port
SET RDS	Rudder end stop Starboard
SET RDM	Rudder Mid position
DRIVE A	Select the rudder drive type
ST RDT	Rudder Hard-over time
BLN10.0M	Boat waterline length in Metres (or Feet)
BLN 32F	Boat waterline length in Feet
DIP 0	Magnetic Dip Angle correction
CMP 000º	Compass alignment correction
POWER	Power steer mode to verify that the autopilot can drive the rudder

COMMISSIONING DURING A SEA TRIAL

The following parameters should be set and checked during the initial sea trial.

SET RDM	Rudder Mid position (reset)
SWING	Internal Compass Deviation Correction
BLG 0.3	Boat Lag value
RGN 0.50	Rudder Gain value
SC 6.25	Speed sensor calibration Hz/Knot (availability is software version dependant)
POWER	Power steer mode

The following commissioning parameters will be set in this section of commissioning:

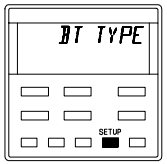
1.	BT TYPE	Select type of boat
2.	SET RDP	Rudder end stop Port
3.	SET RDS	Rudder end stop Starboard
4.	SET RDM	Rudder mid position
5.	DRIVE A	Select the rudder drive type
6.	ST RDT	Rudder Hard-over time
7.	BLN10.0M	Boat waterline length in Metres
8.	BLN 32F	Boat waterline length in Feet
9.	DIP 0	Magnetic Dip Angle correction
10.	CMP 000º	Compass alignment correction
11.	POWER	Power steer mode to verify that the autopilot can drive the rudder

SELECTING THE BOAT TYPE

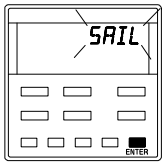
There are three selections available:

SAIL For all sail boats.

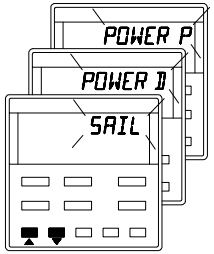
POWER D For power boats with displacement.
POWER P For power boats with planing hulls.



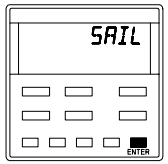
Press **SETUP** key, select **BT TYPE**.



Press **ENTER** key. Display flashes.



Use ▲ or ▼ to select the boat type.

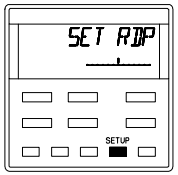


Press the **ENTER** key to memorise the setting.

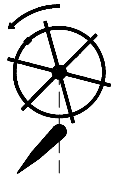
SETTING THE RUDDER END STOPS

Before the Network PILOT can be used it must know the position of the rudder end stops.

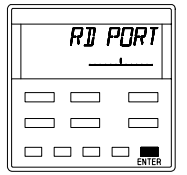
SETTING THE PORT END STOP



Press **SETUP** key, select **SET RDP**

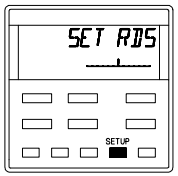


Move the rudder to hard over port position.

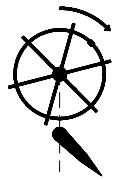


Press **ENTER** to set ***PORT*** end stop, the display confirms setting is successful.

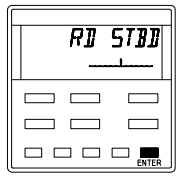
SETTING THE STARBOARD END STOP



Press **SETUP** key, select **SET RDS**.

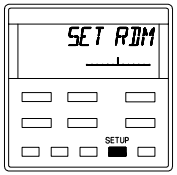


Move the rudder to hard-over starboard position.

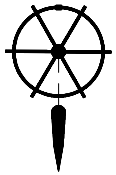


Press **ENTER** to set ***STBD*** end stop, the display confirms setting is successful.

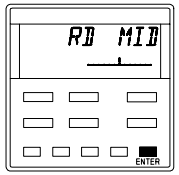
SETTING THE MIDSHIPS POSITION



Press **SETUP** key, select **SET RDM**.



Move the rudder to the amidships position.



Press **ENTER** to set the ***MID*** position, the display confirms setting is successful.

SELECTING THE RUDDER DRIVE TYPE

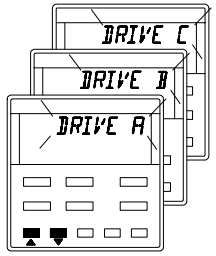
Depending upon the type of rudder drive unit fitted the PILOT controls the rudder drive motor in different ways, this optimises the autopilot steering response.

There are three selections available:

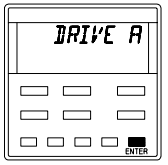
1. **DRIVE A** Ram drives, Hydraulic pumps, Rotary drives, all sizes and voltages.
2. **DRIVE B** Pedestal drive motors fitted by some steering gear manufactures.
3. **DRIVE C** Outdrive drive units and Continuous drive units.

Press **SETUP** key, select **DRIVE A**.

Press **ENTER** key. The display flashes.



Use ▲ or ▼ to select the drive type.



Press **ENTER** key to memorise the setting.

RUDDER HARD-OVER TIME

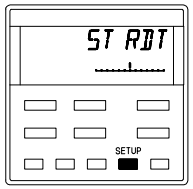
To finish the rudder end stop commissioning procedure the autopilot must calculate the rudder hard-over port to hard-over starboard time.

The following points must observed before carrying out the procedure:

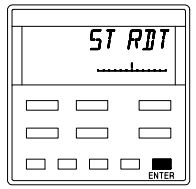
1. If the boat is equipped with hydraulic power assisted steering the engines must be running during setting the rudder end stops.
2. The rudder hard-over to hard-over time can only be calculated with the boat stationary.

If during timing the display shows the error message ***ERR 18***, check:

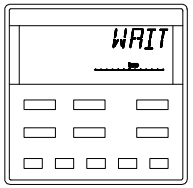
- The boat speed is less than 3 knots.
- The rudder reference unit must move through an angle of at least 90° when the wheel is turned from hardover to hardover.
- The output variation from the rudder reference unit is greater than 1 volt from hard-over port to hard-over starboard. Refer to Section 1 Rudder Reference Unit for installation details and check the installation.
- The separate power supply to the ACP control unit is switched on.



Press the **SETUP** key to display **ST RDT**.



Press **ENTER** key, the autopilot will drive the rudder to the port end stop position. Then it will measure the time taken from port to starboard and back, coming to rest in the midships position.



During the timing calculation, the autopilot display will show **WAIT**. The Rudder Angle Bar Display now indicates rudder angle, check that it indicates correctly.

BOAT LENGTH

Boat waterline length must be entered into the autopilot for it to steer accurately. This value can be entered in Metres or Feet.

SETTING IN METRES

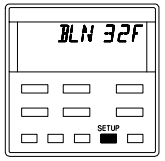
Press **SETUP** key to select **BLN10.0M**.

Press **ENTER** key. Display flashes.

Adjust the value,
▲= value up
▼= value down

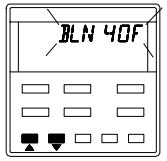
Press **ENTER** key, the new value is memorised.

SETTING IN FEET

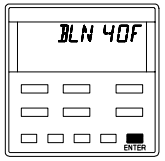


Press **SETUP** key to select **BLN 32F**.

Press **ENTER** key. Display flashes.



Adjust the value,
▲= value up
▼= value down



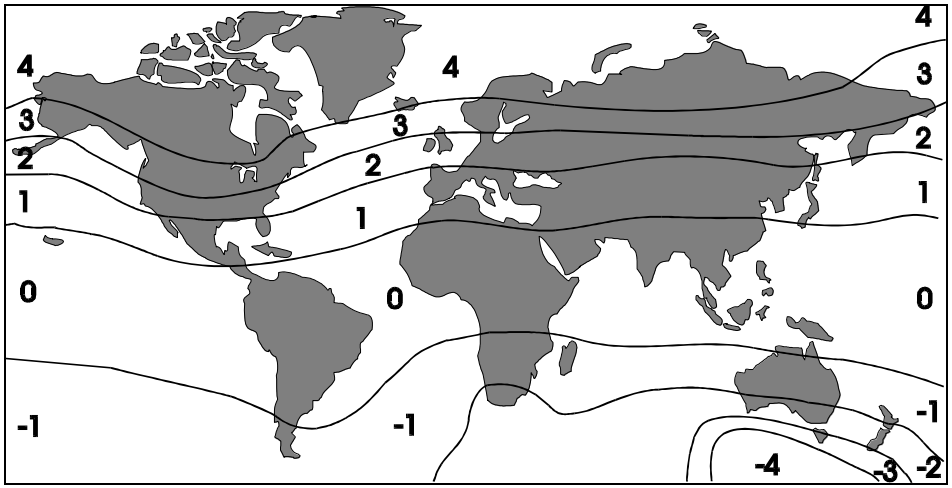
Press **ENTER** key, the new value is memorised.

MAGNETIC DIP ANGLE

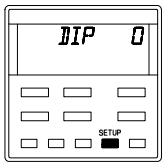
BOATS FASTER THAN 20 KNOTS ONLY

All magnetic compasses are effected by ‘Northerly turning errors’ in the Northern Hemisphere or ‘Southerly turning errors’ in the Southern Hemisphere, which increase with boat speed and magnetic dip angle in higher latitudes. These can cause heading instability at boat speeds greater than 20 knots when steering with an autopilot. By entering the dip value indicated on the compensation chart, the autopilot will be able to correct for these errors and improve the heading stability. Use the minimum value necessary to stabilise the heading.

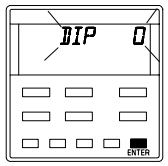
MAGNETIC DIP ANGLE COMPENSATION CHART



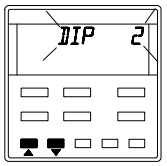
SETTING THE MAGNETIC DIP VALUE



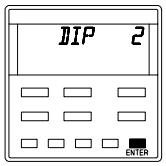
Press **SETUP** key, select **DIP 0**.



Press **ENTER** key, Display flashes.



Adjust the value,
▲= value up
▼= value down



Press **ENTER** key,
the value is memorised.

COMPASS ALIGNMENT

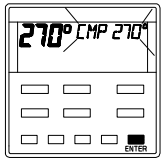
The Compass Alignment electronically compensates for the misalignment between the autopilot's fluxgate compass and the Earth's magnetic field. Use the following procedure:

1. The boats actual heading must be known, use a compensated bowl compass or hand-held compass for reference.
2. Enter the actual heading to correct the misalignment.

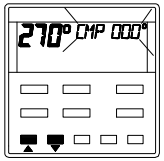
For Example:
- The boats actual heading is Due North, 000.
- The autopilot display is indicating West, 270.
- Enter the Compass Alignment value of 000.

Compass Offset should be checked during a sea trial to ensure that it has been entered accurately.

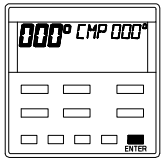
Press **SETUP** key, select **CMP**.



Press **ENTER** key, Display flashes.



Adjust the value,
▲= value up
▼= value down

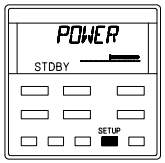


Press **ENTER** key, the value is memorised.

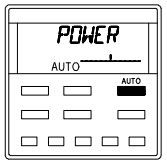
VERIFY OPERATION OF RUDDER DRIVE

- Power Steer mode can be used to verify that the Rudder Drive is operating correctly.
- Turn the wheel so the rudder is in the midships position (if possible).

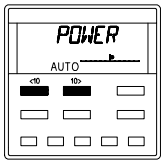
NOTE: When the **AUTO** key is pressed the rudder will return to the position it was in when **POWER** steer was engaged. If the rudder was set at the midships position then **AUTO** key will return it to that position.



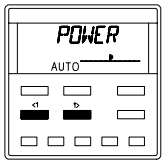
Press **SETUP** key, select **POWER**.



With the rudder amidships. Press **AUTO** key to engage power steer.



Use the **<10** or **10>** keys to move the rudder **3°** to port or starboard for each press.



Use the **<1** or **1>** keys to move the rudder **0.6°** to port or starboard for each press.

It is now necessary to carry out a Sea Trial to finish the autopilot Commissioning.

IMPORTANT NOTE: Until all parameters have been set or checked the autopilot should not be used to steer the boat.

COMMISSIONING SEA TRIAL

The commissioning sea trial should be carried out in open water on a calm day. The procedures for the remainder of the commissioning involve continual course and speed changes. It is very important to

maintain a constant lookout at all times. Use proper seamanship when clearing turns to ensure the commissioning is carried out safely.
The autopilot will be initially operating from the factory default values for Boat Lag (***B LAG***) and Rudder Gain (***R GAN***), these are different for sail or power boats. During the sea trial the Pilot learning algorithm will automatically set and adjust the value for Rudder Gain. The values for boat lag and rudder gain will be checked and adjusted to finely tune the autopilot steering performance when necessary. The default values are automatically set depending upon the type of vessel by the setting ***BTYPE***.

IMPORTANT NOTE

- On the initial sea trial ***DO NOT EXCEED 15 KNOTS***.
- Always maintain a proper lookout.
- If in doubt, disengage the autopilot with the red OFF key on any Pilot Display or Hand-held Controller, and return to manual steering.

The following parameters should be set and checked during the initial sea trial.

SET RDM	Rudder mid position (reset)
SWING	Internal Compass Deviation Correction
BLG 0.3	Boat Lag value
RGN 0.50	Rudder Gain value
SC 6.25	Speed sensor calibration
POWER	Power steer mode

ENGAGING THE AUTOPILOT

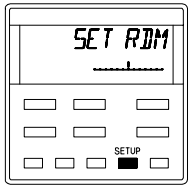
1. Steer the boat onto a suitable heading, allow time for the boat to settle on this course.
2. Select autopilot mode **COMP** (compass) with the **MODE** key.

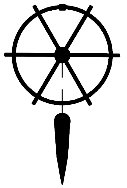
3. Press **AUTO** key on any Network Pilot Display or Hand-held Controller.
4. The autopilot will now be steering the boat on the selected heading.
5. Alter course in multiple increments using the 10^{o} and 1^{o} course change buttons on any Network Pilot Display or Hand-held Controller.
6. Press the red **OFF** key to disengage the autopilot and return to manual steering.

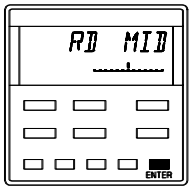
RESETTING THE RUDDER MIDSHIPS POSITION

Due to hull design and steering characteristics the best rudder midships position can only be set when underway at normal cruising speed. Adjust the midships position as follows.

- Steer the boat into the wind.
- Boats with twin engines must have the engine revs balanced.
- Boats with trim tabs must have them in the normal cruising position.
- Enter commissioning mode by pressing **AUTO** and **OFF** keys.





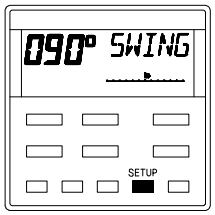


Press **SETUP** key, select **SET RDM**.	Move the wheel to the midships position. Check that the boat settles onto a steady, straight course.	Press **ENTER** to reset the midships position, the display confirms the setting is successful.

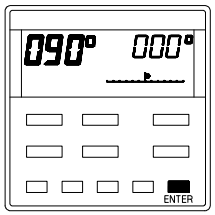
CALIBRATION OF THE PILOT COMPASS

This procedure will automatically correct the autopilot's compass for any deviation errors. It should be carried out in open water, preferably on a calm day, with minimal wind and waves.

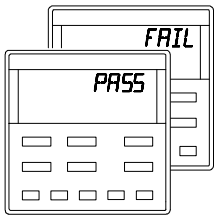
1. Press **SETUP** key, until the display shows **SWING**.



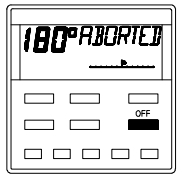
2. Press **ENTER** to start the swing. With the speed below 5 knots, turn the boat through 360° at a rate of turn not greater than 2° per second i.e. the turn should take about 3 minutes to complete. The display will show the amount of turn completed so far in degrees.



3. Keep turning until **PASS** or **FAIL** is displayed. If **FAIL** shows the swing was unsuccessful, the display will return to 000° and the procedure will have to be repeated.



4. The **SWING** can be stopped at any time by pressing the **OFF** key. The display will show **ABORTED** and return to **SWING**.



CHECKING THE COMPASS OFFSET

The compass offset was originally set while the boat was alongside. It would be advisable to check that the offset value is correct now that the internal compass has been swung. Refer to the Compass Offset procedure.

AUTOMATIC RUDDER GAIN

When the Network Pilot is part of an integrated Network system, boat speed data will be supplied via the system network cables from a Network Speed or Network Quad unit. This will allow the autopilot to automatically 'learn' the correct value for Rudder Gain by monitoring boat speed and rate of turn, the rate of turn will be approximately 7.5^{o} per second.
If there is no direct speed input or the speed is being set by the Network Pilot Display Manual Speed Band selections, then the Rudder Gain value must be entered manually, please refer to Manual Rudder Gain, section 5-26.

CHECKING THE AUTOMATIC RUDDER GAIN LEARNING

1. Steer the boat onto a suitable heading, allow time for the boat to settle on this course.
2. Select autopilot mode **COMP** (compass) with the **MODE** key.
3. Press **AUTO** key on any Network Pilot Display or Hand-held Controller.
4. The autopilot will now be steering the boat on the selected heading.

5. ***At A Speed Not Exceeding 15 Knots***, make at least 6 large course changes of at least 100°, by multiple presses of the 10° course change buttons on any Network Pilot Display or Hand-held Controller. This enables the autopilot to learn the rudder gain value.
6. When the autopilot has learnt the rudder gain value the rate of turn will be approximately 7.5° per second. (To estimate the rate of turn the display is updated every 1 second, therefore the heading display should jump in 7.5° steps.)
7. Press the red **OFF** key to disengage the autopilot and return to manual steering.
8. Now proceed with checking and adjusting the Boat Lag value.

MANUAL RUDDER GAIN

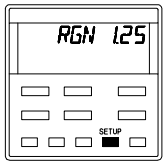
1. Steer the boat onto a suitable heading, allow time for the boat to settle on this course.
2. Select autopilot mode **COMP** (compass) with the **MODE** key.
3. Press **AUTO** key on any Network Pilot Display or Hand-held Controller.
4. The autopilot will now be steering the boat on the selected heading.
5. ***At A Speed Not Exceeding 15 Knots***, make course changes of at least 100°, by multiple presses of the 10° course change buttons on any Network Pilot Display or Hand-held Controller.
6. Observe and estimate the rate of turn. It should be approximately 7° to 8° per second. (To estimate the rate of turn the display is updated every 1 second, therefore the heading display should jump in 7° to 8° steps).
7. Observe the performance of the Pilot when changing course.
8. If the rudder gain value is too low, the autopilot will understeer, causing sluggish steering. If the rudder gain value is too high, the autopilot will oversteer, causing erratic steering and

excessive rudder movements. In high speed boats this could cause a jerky response and dangerous rates of turn.

9. Adjust the Rudder Gain value for best steering performance. Use the minimum value necessary to maintain a good response to course changes and course keeping without excessive rudder movement.

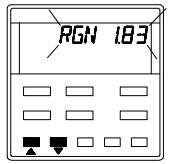
SETTING THE RUDDER GAIN MANUALLY

The autopilot must be disengaged and commissioning mode selected to adjust the Rudder Gain value.

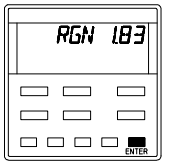


Press **SETUP** key, select **RGN 1.25**.

Press **ENTER** key, Display flashes.



Adjust the value,
▲= value up
▼= value down



Press **ENTER** key, the new value is memorised.

RUDDER GAIN VALUE TABLE

BOAT TYPE	DEFAULT VALUE	TYPICAL VALUES
SAIL BOATS	0.50	0.3 to 1.0
POWER BOATS	1.25	1.0 to 3.0

NOTE: The factory set value is selected by setting Boat Type and Rudder Drive Type during commissioning.

BOAT LAG

Boat Lag is the time taken for the boat to respond to changes in helm. For example, heavy displacement hulls require a larger value for boat lag.

1. Engage the autopilot as previously explained in Initial Pilot Sea Trial.

2. At a speed not exceeding 15 knots, change course by 90° in each direction.

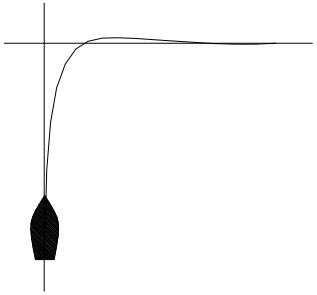
3. Observe the autopilot steering performance. The boat should turn onto the new heading with minimal overshoot (a slight overshoot is acceptable).

4. If the overshoot is consistently more than 5° for course changes in both directions increase the Boat Lag value in steps of 0.1 until the overshoot is corrected.

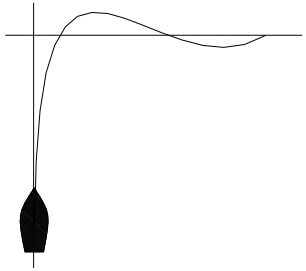
5. It is easier to observe overshoot than undershoot, hence if no overshoot is observed decrease the boat lag in steps of 0.1 until a small overshoot is seen.

6. Use the smallest value of Boat Lag to stop overshoot.

BOAT LAG CORRECT

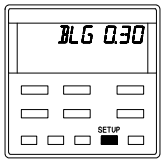


BOAT LAG INCORRECT

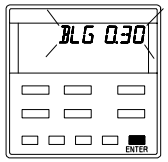


SETTING THE BOAT LAG VALUE

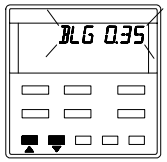
The autopilot must be disengaged and commissioning mode selected to adjust the Boat Lag value.



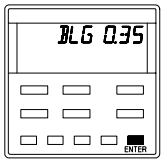
Press **SETUP** key, select **BLG 0.3**.



Press **ENTER** key, Display flashes.



Adjust the value,
▲= value up
▼= value down



Press **ENTER** key, the value is memorised.

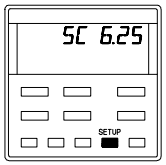
BOAT LAG VALUE TABLE

BOAT TYPE	DEFAULT VALUE	TYPICAL VALUE
SAIL BOATS	0.30	0.3 to 1.0
POWER BOATS	0.50	0.3 to 1.0

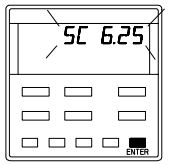
NOTE: The factory set value is selected by setting Boat Type and Rudder Drive Type during commissioning.

CALIBRATION OF DIRECT SPEED INPUT

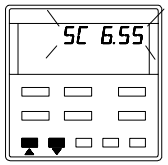
The ACP computer unit can take a direct speed input from a Paddle-Wheel with a hall effect output (also refer to sections 4-18 and 4-20). All B&G paddle-wheel type sensors are compatible. The Hertz/Knot value is entered into the system to ensure the autopilot steering response is controlled with reference to boat speed. The default Hertz/Knot value is 6.25, this is the setting for B&G speed sensors. To determine if the value is correct compare the boatspeed value displayed by the Network PILOT display (when the **SPEED** key is pressed) with the displayed value of speed on the log/speedo fitted.



Press **SETUP** key, select **SC 6.25**.



Press **ENTER** key, Display flashes.



Adjust the value,
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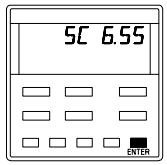
▼= value down



Press **ENTER** key, the value is memorised.

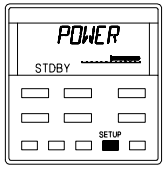
POWER STEER MODE

USE OF POWER STEER MODE

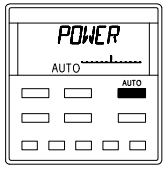
The power steer mode allows the user to directly control the boats rudder by using any Network Pilot Display or Hand-held controller course change keys. This could be used in an emergency if the normal manual steering system become defective, e.g. a broken steering quadrant cable or control rod. It can also enable faults in the ram drive unit or drive pump, the rudder reference unit and its' linkage to the steering system to be diagnosed because the autopilot normal course control software is by-passed.

SELECTING POWER STEER MODE

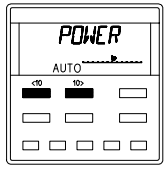
1. With the autopilot in standby, **STBDY**.
2. Select the commissioning mode by pressing **AUTO** and **OFF** keys together.
3. Turn the wheel so the rudder is in the midships position (if possible).



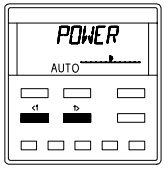
Press **SETUP** key, select **POWER**.



With the rudder amidships. Press **AUTO** key to engage power steer.



Use the **<10** or **10>** keys to move the rudder **3°** to port or starboard for each press.



Use the **<1** or **1>** keys to move the rudder **0.6°** to port or starboard for each press.

NOTE: When the **AUTO** key is pressed the rudder will return to the position it was in when **POWER** steer was engaged. If the rudder was set at the midships position then pressing the **AUTO** key will return it to that position.