

PROPILOT 700

User's Guide

Issue 02





Welcome . . .

All of us at Cetrek would like to welcome you to the world of Cetrek ProPilot Systems.

Your ProPilot 700 is easy to operate. It will effortlessly steer your boat on a straight course moving the rudders with the minimum of fuss to ensure the absolute minimum wear and tear on the steering system. When properly set up it will also help to give optimum fuel economy and minimise power consumption.

Your Safety

THE USE OF AN AUTOPILOT DOES NOT AVOID THE NEED FOR NORMAL WATCHKEEPING.

Your System

The system consists of the following basic units:

- ProPilot Control
- Pilot Computer
- Compass Sensor
- Rudder Feedback Unit
- Drive Unit

It may also include any of these optional enhancements:

- a second ProPilot 700
- a ProJog or ProSteer remote steer lever
- a Rudder position indicator

Most of these options can be added to the system at any time. Your Cetrek Dealer will be glad to give you the latest information on any of them.

Document
Reference:
807000
Issue 03
December 1997



EMC Directive 89/336/EEC

This product has been designed to be compliant with the above Directive.

Maximum performance and compliance with the EMC Directive can only be ensured by correct installation. It is strongly recommended that the installation conforms with the following Standards:

SMALL CRAFT - ELECTRICAL SYSTEMS:

- a) ISO 10133 - Extra Low-Voltage DC Installations
- b) ISO 13297 - Alternating Current Installations

ISO - International Standards Organisation

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1. Using Your ProPilot 700

1.1 The Autopilot Control

This is the unit where you, the Helmsman, tell your ProPilot 700 what you require it to do for you.

It communicates to you using a 4 digit illuminated Liquid Crystal Display (LCD) and you communicate with it by using the 6 backlit keys and the Course Control knob.

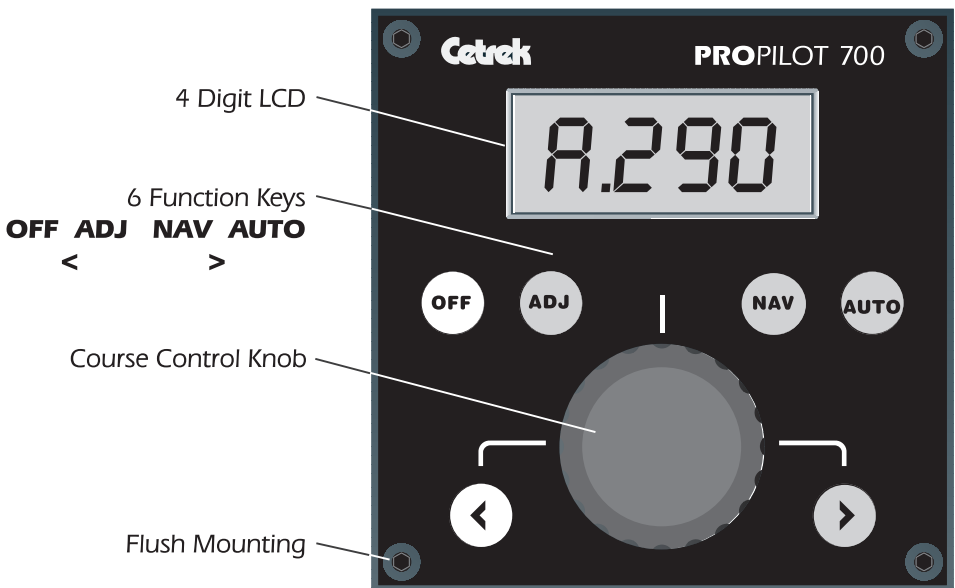


Figure 1 - The ProPilot 700 Autopilot Control



In an EMERGENCY press the OFF key to regain manual control.

The style of LCD means that displayed messages will be a mixture of upper and lower case characters. The alphabet used is as follows:

"AbCcdeFGHIiJLnnOoPrStUu1234567890"

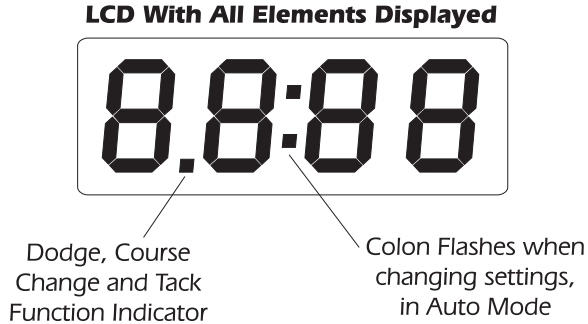


Figure 2 - LCD Display

1.2 The Keyboard

OFF Key

- With the system powered up, this key selects Standby Mode.

AUTO key

- With the system powered up, this key selects Auto Mode.

⊖ and ⊕ keys

- To dodge, Course Change or Tack in Auto Mode, depending on selection.
- Jog Steer in Standby Mode.
- They change values in the menus.

ADJ Key

- This key selects; Response, Rudder Ratio and Rudder Position.
- A three second press of the ADJ key will display the Pilot Configuration Menu

NAV Key

- This key selects NMEA Input and displays Waypoint Sequence and Cross Track Error.
- This key engages Navigator Control.

Course Select Knob

- To Course Change in Auto Mode
- Changes value in some menus.

1.3 Getting Started

Before the ProPilot 700 can be operated, the Dockside Settings must be carried out, see section 5.

The ProPilot 700 has 2 basic modes of operation.

1. Standby Mode where the ProPilot 700 is switched on but not in control of the vessel.
2. Auto Mode where the ProPilot 700 is in control of the vessel.

As soon as the ProPilot 700 is supplied with power it will turn on in Standby Mode.



There will be a delay of about 10 seconds while the ProPilot 700 carries out a self test routine:



8 8 8 8	Displays all the segments of the LCD,
S n * *	Software Version Number,
P 7 0 0	Pilot Control Type,
t E S t	then Self test completed successfully.
H * * *	The vessel's heading is now displayed.



1.4 Standby Mode (Manual Control of the steering)

H 0 3 5	"H" is displayed to show that the ProPilot 700 is in Standby Mode and is displaying the vessel's heading (035° in this example). The Heading will change as you manually steer, just like a conventional compass. The ProPilot 700 is not in control of the vessel.
----------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

1.5 Jog Steer

When in Standby Mode the Jog Steer function can be used by first pressing either the  or  key, which will turn the vessel onto a new heading.

J O G -	To Jog Steer to Port (left), press the  key.
- J O G	To Jog Steer to Starboard (right), press the  key.

The Jog Steer function will not operate in Auto Mode or when Menu settings are being altered, using the  and  keys.

1.6 Auto Mode (with the Control Option Compass)

Press the AUTO key to switch the ProPilot 700 from Standby to Auto Mode, which engages the pilot in control of the vessel's course.



Press the OFF key at any time to revert to Standby Mode and resume Manual Control.

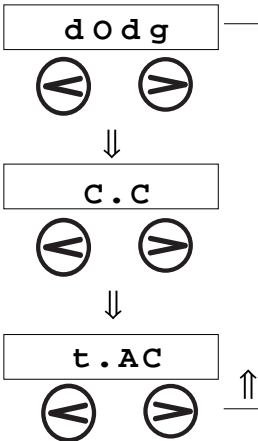
A 0 8 1

"A" is displayed to show that the ProPilot 700 is in Auto Mode, steering under Compass Control and Course to Steer is displayed (081° in this example).

If you are in Auto Mode but adjusting settings, a colon between the second and third characters will flash to remind you that the vessel is still under ProPilot 700 control.

1.7 Selecting Arrow Key Functions

In Auto Mode, each time the  and  keys are pressed together, the ProPilot 700 cycles through the arrow key functions.



The display in Auto Mode shows "A 234" when the Dodge function is selected,



"A.234" when the Course Change function is selected (note dot),

and "t.234" when the Tack function is selected.




The Tack function is only available when "SAIL" is selected as the Vessel Type Configuration.


1.8 Dodge



When you are in Auto Mode the Dodge function can be used by pressing either the  or  key, which will turn the vessel and continue to turn until the key is released. The ProPilot 700 will then return to its preset heading. This function is used to "Dodge" small obstacles in the vessel's path and return to a parallel track from your original.

d 0 - -

Press the  key and the display will indicate a Dodge to Port (left) and the vessel will turn to Port.



- - d 0

Press the  key and the display will indicate a Dodge to Starboard (right) and the vessel will turn to Starboard.

The dodge function not operate in Standby Mode or when Menu settings are being altered, using the  and  keys.

1.9 Changing Course



A . 0 9 1

To change course, in Auto Mode, rotate the course Select Knob until the new course is displayed (alternatively if the arrow key function is set to Course Change, press the  or  keys, one press represents 1°). The ProPilot 700 will immediately bring the vessel on to the new course.


You could switch your ProPilot 700 back to Standby Mode, steer to the new course manually then switch back to Auto Mode.

1.10 Tack (with the Control Option Compass)

The Tack function is only available when "SAIL" is selected as the Vessel Type Configuration.



When the pilot is in Auto Mode and with the Tack function selected, pressing either the  or  key will tack through a preset angle, and will then hold course on this new heading. The Tack Angle setting may be adjusted in the Pilot Configuration.

t . 1 5 6

Press the  key for a Port Tack, left of your course.

t . 2 2 6

Press the  key for a Starboard Tack, right of your course.

The Tack function not operate in Standby Mode or when Menu settings are being altered, using the  and  keys.

1.11 Off Course Warning

If the vessel remains Off Course by more than 15° for 20 seconds, or instantly if it reaches 30°, the display will flash to warn the Helmsman that there is a problem.

1.12 Rudder Position Indicator

The LCD can display a readout of the position of the rudder.

P r 0 0

or

S r 0 3

Press the ADJ key until the LCD displays the rudder position indication. "**Pr**" indicates Port rudder applied, "**Sr**" indicates Starboard rudder applied. The figure is the rudder's angle in degrees from amidships. "**Pr00**" is displayed when the rudder is amidships.

S t O P

When the rudder reaches its set limit of travel, the LCD will display the message "**STOP**".

Press the OFF key to return to Standby Mode.

In Auto Mode, press the AUTO key to return to Auto Mode.

While viewing the rudder position, the ⏪ and ⏩ keys are still active. In Auto Mode, this means that pressing the ⏪ or ⏩ key will cause the vessel to Dodge, Change Course or Tack.

2. Navigator Control

The ProPilot 700 can be interfaced to a navigation device such as a GPS, Loran or Plotter using the Industry Standard NMEA 0183 Format.

Once a waypoint or a waypoint within a route has been selected as your target and the navigation device is providing Navigator Data to the target the ProPilot 700 may be engaged under Navigator Control. It is advisable to steer the boat on to the desired heading to minimise any Cross Track Error before engaging navigator control, to avoid an immediate course change.

As soon as Navigator Control is selected the ProPilot 700 will read the magnetic bearing to the target from the navigator (if magnetic bearings are not available, the Pilot Computer will automatically use true bearings) and turn the vessel onto that course. The ProPilot 700 constantly monitors the Cross Track Error and applies Navigator Gain to maintain a direct Course Over Ground to the target. Note the vessel may establish a "crab" angle to compensate for wind and tide as it steers to the waypoint.

If a route or a new waypoint is selected, in the navigator, the ProPilot 700 will be triggered by a change of waypoint identifier to automatically turn the vessel onto the next course to the new waypoint if Automatic Waypoint Sequence is selected. The system may be programmed for Manual Waypoint Sequence, if preferred, this is described later, see section 7.5.

While under Navigator Control, both the arrow keys and Course Select Knob still operate.

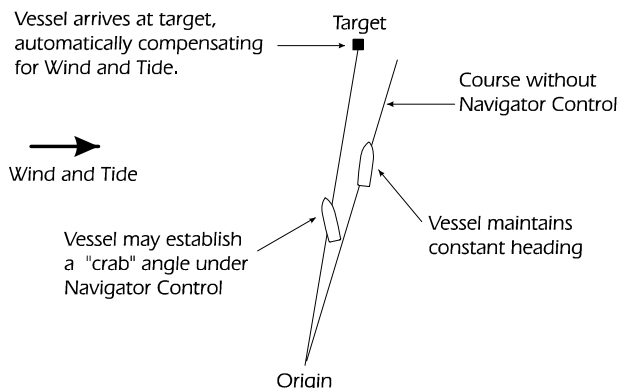


Figure 3 - Navigator Control

2.1 NMEA 0183 Messages

The ProPilot 700 is capable of processing the following NMEA 0183 messages for navigation. Cross Track Error, Bearing to Waypoint and Waypoint identifier are required as a minimum, Velocity can be used to control the Rudder Ratio setting.

MESSAGE	CROSS TRACK ERROR	BEARING TO WAYPOINT	WAYPOINT IDENTIFIER	VELOCITY
APB/APA	✓	✓	✓	-
BOD	-	✓	✓	-
BWC	-	✓	✓	-
XTE	✓	-	-	-
RMA	-	-	-	✓
RMB	✓	✓	✓	-
RMC	-	-	-	✓
VTG	-	-	-	✓
VHW	-	-	-	✓

✓ indicates that the data should be present in the given message according to the NMEA 0183 specification, however please note that not all manufacturers provide all the data required by a given message.

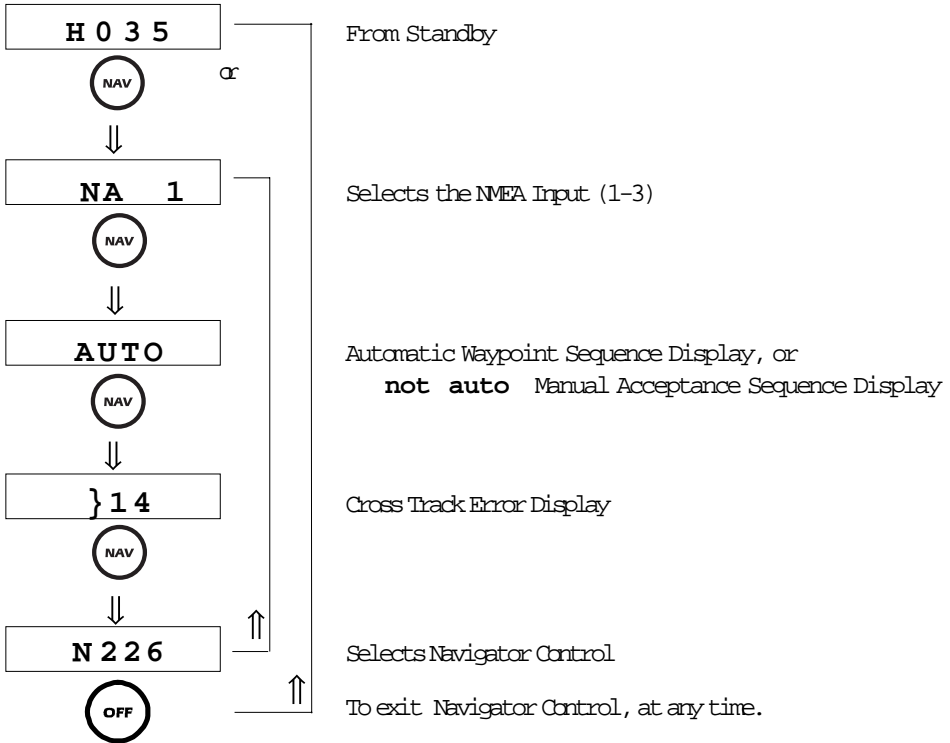
Providing the navigator outputs the minimum information, your craft will turn automatically on to the next track without any action on your part. You have the option to change the configuration of the ProPilot 700, so that it requires a key press before it changes to the new bearing.

2.2 Using Navigator Control

If the navigator is to output the required information, it first has to be programmed with your a waypoint or route selected as your target. The basic information used for ProPilot 700 control is:-

- Bearing to Next Waypoint.
- Cross Track Error: Whether you are port or starboard of the course and by how much, expressed in units of one hundredth of a nautical mile (60ft).
- Alarm condition: This indicates if information received from the navigator is not valid, check the navigator.
- Next Waypoint Identifier

The NAV key cycle is as follows:



2.3 Selecting NMEA Input

On the first press of the NAV key, the NMEA Input is displayed.

N A 1 NMEA Input PL11 in the 930609 Pilot Computer

Additional NMEA Inputs are only available with a 930619 Pilot Computer, to change the NMEA Input press the ADJ key.

N A 2 NMEA Input PL17 in the 930619 Pilot Computer

N A 3 NMEA Input PL16 in the 930619 Pilot Computer

C 7 7 5 Only when a ChartPilot 775 is connected to a 930619 Pilot Computer is "**C775**" displayed.

2.4 Waypoint Sequence

On the second press of the NAV key the LCD will display the Waypoint sequence message that has been set in the Configuration Routine.

A U T O

This message is given to show that the Automatic sequence is selected, whereby on reaching a waypoint the ProPilot 700 will flash the bearing to next waypoint for 7 seconds, but turn onto it automatically after the first 2 seconds.

not Auto

This scrolling message shows that manual acceptance sequence is selected, whereby on reaching a waypoint the ProPilot 700 will flash the bearing to next waypoint for 7 seconds, but the vessel will not turn onto it unless the NAV key is pressed.

If the NAV key has NOT been pressed, after 7 seconds the ProPilot 700 will switch to Auto Mode and continue on its last heading until new instructions are received.

2.5 Cross Track Error Display

The third press of the NAV key displays the Cross Track Error.

} 1 4

The number displayed is the cross track error in one hundredth's of a mile. The left hand character indicates if the error is to Port or Starboard. This example shows 0.14 miles Port (left) of the track.

{ 0 2

This example shows 0.02 miles Starboard (right) of the track.

} { 0 0

This example shows that the pilot is on track.

N O } {

No Cross Track Error information has been received from the Navigator.



Before engaging the Pilot. CHECK the Cross Track Error. The larger the error, the sharper the turn that will be made when the Pilot is engaged. This could be dangerous. The display cannot show errors greater than 99. Reduce the error by steering manually to bring the vessel closer to the track.

2.6 To Engage Navigator Control

If the Cross Track Error is at an acceptable value then press the NAV key a fourth time to engage Navigator Control. The left character will be "N" to inform you that the ProPilot 700 is controlling the vessel with information from the Navigator.

N 2 6 6

The other three characters are the course that is being followed.

N O N A

The ProPilot 700 has received No Navigator Data. Check the cable, connections and message format.

Pressing the NAV key now will step through and allow viewing of the four displays, NMEA Input, Waypoint Sequence, Cross Track Error and Course being followed.

The ⏪ and ⏩ keys will still function under Navigator Control and the Dodge function will work normally if it has been selected.

In the event of a navigator error or fault condition, the ProPilot 700 will display a fault message, hold the vessel on its present heading and will not accept any further course changes from the Navigator until the error clears.

If the alarm clears, the ProPilot 700 will accept data and navigator control can resume. If the fault condition remains, turn the ProPilot 700 back to Auto Mode or manually steer the vessel.

2.7 Cancelling Navigator Control

Exit from Navigator Control, at any time, by pressing the OFF key to regain Manual Control.

3. Sea State Adjustments

Adaptive Setting

The ProPilot 700's "Adaptive" software has been designed to optimise Response, Rudder Ratio, Counter Rudder and Trim in order to maintain the best performance, as conditions change.

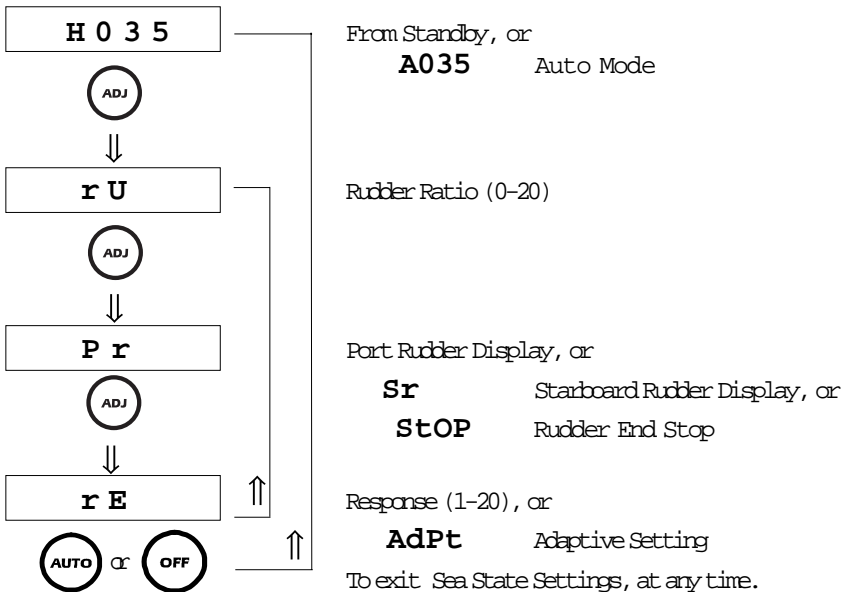
With Response set to Adaptive (see section 3.1 below) the ProPilot 700 automatically fine tunes the controlled helm movements to roughly the same frequency and magnitude as those performed by hand when steering manually.

When sea states or conditions obviously change, ie after turning to a new course from a following wind / tide to an oncoming wind / tide, the Adaptive Software adjusts the Rudder Ratio, Trim and Counter Rudder settings to suit the change in conditions. It is possible to assist the Adaptive Software by changing these three settings manually, without exiting the Adaptive setting.

These settings are explained in the following pages.

Proper setting of these controls has a marked effect on steering system wear and tear, as well as battery life in sailing craft.

The ADJ key Sea State Adjustment cycle is as follows:



3.1 Response

The Response setting is primarily the autopilot's "weather" control. It sets the amount that the vessel is permitted to move off course before rudder is applied to bring it back onto its set heading.

You may need to open the Response (i.e. increase the setting value) in heavy seas and close it (i.e. decrease the setting value) in calm seas.

If the response setting is too high the vessel moves a long way from the course before it is corrected. You will need to decrease the Response setting to correct this.

If the response setting is too low the vessel will hold its course but the helm will be constantly and rapidly moving, making small unnecessary corrections. You will need to increase the Response setting to correct this. This is the condition that can cause unnecessary wear in the steering gear and is wasteful of battery power.

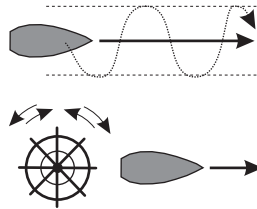




Figure 4 - Response

Your ProPilot 700 can be set to Adaptive setting and in this state will automatically vary the Response, Rudder Ratio, Counter Rudder and trim settings to suit prevailing sea conditions.

To Adjust the Response Setting

A d P t

Sea State Adjustment menu system, press the ADJ key repeatedly until "AdPt" or "rE" is displayed. Change the setting by using the  or  keys.

The range is Adaptive, then manual values from 1 (No Response) to 20 (Maximum Response).

To select Adaptive, press the  key until "AdPt" is displayed.

3.2 Rudder Ratio

The Rudder Ratio setting is used primarily to match rudder movement to boat speed. Generally the higher the speed, the lower the setting needs to be.

If the setting is too low the vessel will understeer and tend to drift off course to one side.

If the setting is too high the vessel will oversteer and build up oscillations from side to side.

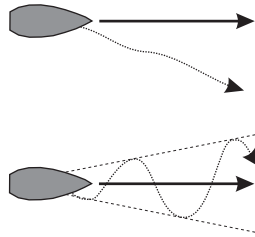


Figure 5 - Rudder Ratio

If NMEA Speed information is connected to the Pilot Computer, the ProPilot 700 can be configured to automatically adjust the Rudder Ratio setting in relation to the vessel's speed, see section 7.7.

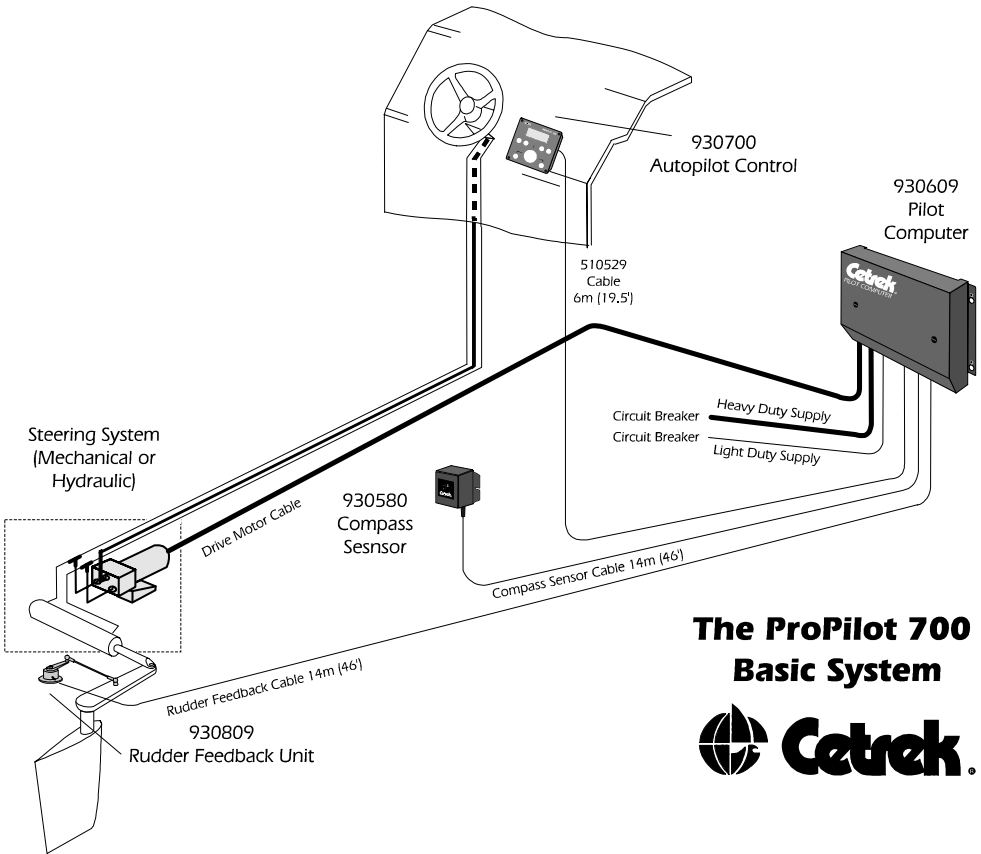
To Adjust the Rudder Ratio Setting

rU 5

Sea State Adjustment menu system, press the ADJ key repeatedly until "rU" is displayed. Change the setting by using the ⏪ or ⏩ keys.

The range is from 0 (No Rudder) to 20 (Maximum Rudder).

4. Installing Your ProPilot 700



The ProPilot 700 Basic System



Figure 6 - The Basic System

Basic Equipment

- 930 700 ProPilot 700, inc Cable
- 930 609 Pilot Computer
- 930 580 Compass Sensor
- 930 809 Rudder Feedback Unit
- Drive Unit
- Heavy Duty Power Supply, fused to sit drive unit
- Light Duty Power Supply, fused at 5 Amps

4.1 Installation Procedure

It is important to read the documentation for each unit prior to commencing installation.

1. Refer to the 930 609/619 Pilot Computer Manual for:
 - A step by step installation procedure for connecting the ProPilot 700 system into the Pilot Computer.
 - Connecting Cetrek peripheral equipment.
 - Setting the Jumpers and Links.

The 700 does not have an On/Off switch, therefore:

- Systems with only 700s (and/or 770s), must move J7 to the 'Auto Power On' position.
- If the 700(770) is used as a second station with a control head that has an on/off switch, J7 must not be moved, the other control head must be used to turn the autopilot on or off.

2. To install the ProPilot 700, refer to sections 4.3 to 4.5.
3. Once the ProPilot 700 system's mechanical installation is complete, carry out:
 - Dockside Settings (section 5, steps 1 - 5), and
 - Sea Trials (section 6, steps 6 - 9) to configure the pilot to your vessel, then
 - Pilot Configuration (section 7) to configure the pilot with the peripheral equipment connected to your system.

4.2 ProPilot 700 Specifications

Voltage:	Nominal 12V / 24V DC
Operating Temperature:	0° to +55° C
Cable (510529):	6 way x 6 metres (Screened)
Dimensions:	125 mm x 125 mm x 36 mm
Weatherproof	



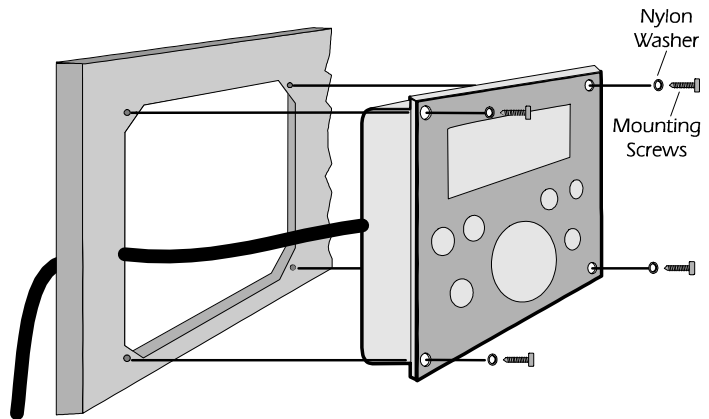
4.3 The Autopilot Control

In the interest of safety there must be an autopilot control within reach of the helmsman **AT ALL TIMES**.

This should be installed in a convenient position for operation by the Helmsman.

4.4 Mounting the ProPilot 700

Use the template to cut out the aperture and make four pilot holes for the screws. Connect the 930529 cable to the rear of the ProPilot 700. Place the pilot into the aperture, then secure with the four self taper screws supplied.



Not to Scale

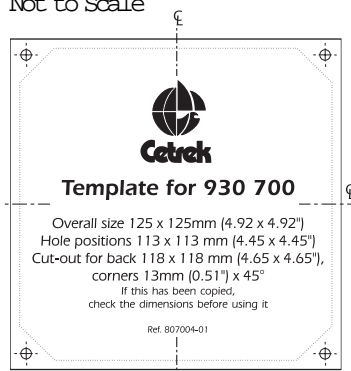


Figure 7 – Flush Mounting and Template



Allow adequate clearance for cable connections to ensure cables are not unduly stressed and that there is sufficient length of cable to remove the unit for service purposes.

A Trunnion Mounting kit is available, part number 930291.

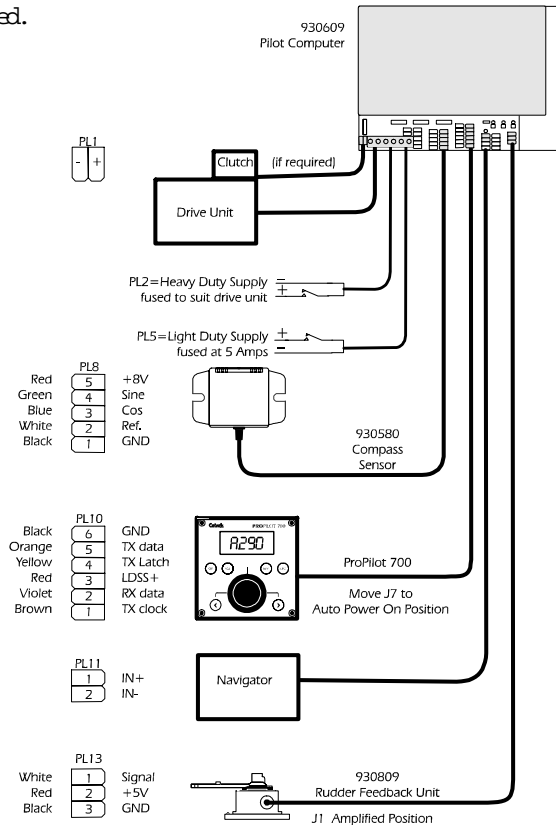
4.5 Connecting The ProPilot 700

Route the cable to the Pilot Computer. Remove the plug if the cable needs to pass through a bulkhead, note the wire colours in the white connector, then remove to aid fitting.



Incorrect wiring (e.g. reverse polarity) can cause irreparable damage to some equipment and is not covered by the Cetrek warranty agreement.

Insert the connector into the Pilot Computer (PL10). Connect the cable screen securely to the fixing 'tongue' using the two cable ties provided.



5. Dockside Settings

Having completed the mechanical installation of the system, the next step is to configure the ProPilot 700 for the characteristics of your boat, because no two vessels are quite the same.

In order to use the pilot successfully, it is MANDATORY that you carry out the Vessel Type and the Rudder Settings Routine.

Press and hold the ADJ key for three seconds until "CONF" is displayed. Press the ADJ key to display the next option in the menu. If you press the ADJ key after "RSET" you will return to the beginning of the menu cycle "CONF".

To return to the heading display, press the OFF key, and to return to the same Pilot Configuration option press the ADJ key.

To exit the Pilot Configuration Menu press and hold the ADJ key for three seconds, until a Sea State Adjustment option is displayed.

Installation Steps

- 1 Powering Up for the First Time
- 2 Vessel Type
- 3 Rudder Settings Routine
- 4 Align Compass
- 5 Checking the settings

Step 1

5.1 Powering up for the First Time

Ensure that all units are installed correctly, that the correct size fuses or circuit breakers are fitted and that the ship's batteries are adequately charged. Finally check that all the system connections are correctly made before switching the power on.

Return the rudder to the midships position.

Switch the ProPilot 700 supply ON, if the steering operates, switch off at once and re-check the connections.

If all is correct the ProPilot 700 displays a start-up sequence:

8 8 8 8

Displays all the segments of the LCD,

S n * *

Software Version Number,

PROPILOT 700

P 7 0 0

Pilot Control Type,

t E S t

then Self test completed successfully.

H * * *

The vessel's heading is now displayed.

Check the Rudder Position Display

Press the ADJ key repeatedly until the Rudder Position display reads "**Pr00**" or "**Sr03**" (the figure is the rudder's angle in degrees from midships).


With the rudder at midships, if the figure shown is 5 degrees or less, it will be corrected during the Rudder Settings Routine. If over 5 degrees, mechanically readjust the Rudder Feedback Unit (refer to the Installation Instructions).



Depending on how the Rudder Feedback Unit is mounted, the direction of the pilot's rudder information may be reversed, this will be corrected during the Rudder Settings Routine.

Step 2

C O N F

5.2 Vessel Type Configuration

Press and hold the ADJ Key until "**CONF**" is displayed. Press the  key to display the current Vessel Type.

In the Autopilot's memory there are 4 pre-set vessel type configuration settings. Press the  or  key to scroll through the vessel types, the setting displayed will be the one used.

P L A N

PLANING hull

S A i L

SAILING vessel

d i S P

DISPLACEMENT hull

S d I S

SEMI-DISPLACEMENT hull

The "**SAIL**" setting enables the Tack function, in Auto Mode.

Step 3

**r u d d e r
S E T T I N G S**

5.3 Rudder Settings Routine


Press the ADJ key, the ProPilot 700 will display "**r u d d e r S E T T I N G S**"



During the Rudder Settings Routine the rudder will be moved under Autopilot Control, it is therefore important to ensure the rudder and steering gear, can move safely from hardover to hardover without hitting anything. Check that the steering moves freely from lock to lock without undue stiffness and that it can move to its full travel without the Rudder Feedback Arm fouling the steering.

The Rudder Settings Routine will set:-

- Rudder Phasing this selects which signal from the Rudder Feedback Unit indicates Port and Starboard movement of the rudder.
- Motor Phasing this selects which direction the motor drives so that the rudder moves to Port and Starboard correctly.
- Rudder Limits this sets the maximum rudder movement, either side of amidships, obtainable under autopilot control.
- Centre Rudder.

Press the  key to start the Rudder Settings Routine.



**CENTRE
RUDDER**

First the ProPilot 700 scrolls the message "**CENTRE RUDDER**". Position the rudder at midships, then press the ADJ key to enter this information.

**STARBOARD
END STOP**

The display now scrolls "Starboard END STOP". Turn the helm to starboard, to a position just before the mechanical end stop and with it held in this position press the ADJ key again.

r 3 0

A default value of 30° appears. Using the Rudder Angle Template (see section 11) estimate the current angle of the vessel's rudder just before the mechanical end stop. Use the  or  keys to alter the default value to the estimated angle. Press the ADJ key to enter this information.

**PORT
END
STOP**

The display scrolls "PORT END STOP". Turn the helm to port, to a position just before the mechanical end stop and with it held in this position, again press the ADJ key.



To prevent possible damage to your steering gear; if the Port and Starboard positions that you select were different angles the ProPilot 700 will set both Rudder Limits to the smaller angle.

**CENTRE
rUdder**

Now the display scrolls "CENTRE RUDDER", centre the rudder, with it held in this position, press the ADJ key.

PrESS AUTO

The display scrolls "press auto". Ensure the rudder is free to move, press the AUTO key, which engages the motor and will drive the rudder four times:

H O 1

from the centre rudder position to a Rudder Limit

H O 2

then across to the other Rudder Limit

H O 3

the rudder is returned to first Rudder Limit

H O 4

and finally the rudder is centred again.

r S E t

Rudder Set is displayed to confirm that the Rudder Phasing, Motor Phasing, Rudder Limits and Centre Rudder settings have all been completed successfully.

Step 4

5.4 Align Compass

A L N C

Press the ADJ key, the LCD displays "ALNC".

The ProPilot 700 now displays "C***" which is the vessel's offset heading. Using the Course Select Knob, set the display to the vessel's approximate heading (this is set more accurately during the SeaTrials).

Press and hold the ADJ key to return to the Sea State Adjustments, then press the OFF key.

The Dockside settings are now complete.

Step 5

5.5 Checking the Settings

Pr 0 0

Press the ADJ key until the display shows "Pr" or "sr". Check that the rudder position indicator reads "Pr00" when the rudder is in the position normally required to steer the vessel in a straight line.



Turn the helm to Starboard and check that "STOP" is displayed, indicating that it has reached the Rudder Limit, before it reaches the mechanical limit of the rudder movement. Repeat for Port helm.

Re-centre the rudder. Switch the autopilot into Auto Mode, by pressing the AUTO key. Very little or no rudder movement should occur.



If the rudder drives continuously to one side, switch off the powering at the breaker at once. Check the mechanical and electrical installation. There is a Troubleshooting Guide in the 930 609/619 Installation Guide which may help.

If the rudder continuously 'hunts' about amidships, remove as much freeplay as possible from the steering and Rudder Feedback Unit linkage. This also occurs on Power Steering systems particularly if the steering pump is plumbed with flexible hose. If that does not stop it, increase the Rudder Deadband setting, see section 7.1.

Check that when you press the  key, the motor drives the rudder to Starboard and when you press the  key, the rudder drives to Port.

Press the OFF key to return to Standby Mode. You are now ready to start the Sea Trials Installation.



It is advisable to record the optimised settings, in case they are accidentally changed at any time.

6. Sea Trials

The next step of the installation is to set up the ProPilot 700 at sea, to determine the best settings for optimum autopilot performance for your boat.



It is dangerous to carry out these trials in restricted or busy waters.

It is essential that you carry out the Automatic Deviation Correction Routine. This must be performed in a calm sea.

Before continuing ensure you have an accurate known method of obtaining a heading, ie GPS transits or a corrected magnetic compass.

Press and hold the ADJ key for three seconds until "CONF" is displayed. Press the ADJ key to display the next option in the menu. If you press the ADJ key after "RSET" you will return to the beginning of the menu cycle "CONF".

To return to the heading display, press the OFF key, and to return to the same Pilot Configuration option press the ADJ key.

To exit the Pilot Configuration Menu press and hold the ADJ key for three seconds, until a Sea State Adjustment option is displayed.

Installation Steps

- 6 Automatic Deviation Correction
- 7 Align Compass
- 8 Centre Rudder
- 9 Optional Auto Tune: Rudder Ratio, Counter Rudder and Trim
- 10 Final Sea Trials and Fine Tuning

Step 6

6.1 Automatic Compass Deviation Correction (Calm Sea)

The compass has a facility to automatically measure and compensate for the majority of compass deviation found on board a vessel. The compass sensor must be mounted clear of strong magnetic fields, caused by heavy duty cables, motors, speakers etc.

Turn the vessel through a full 360° with the ProPilot 700 in Standby Mode and note the amount of error at the eight Cardinal and Inter-cardinal points.

The compass sensor requires the vessel to turn approximately 2½ times in a CLOCKWISE direction to complete the deviation correction. Steer your vessel, in a calm sea, to a location well away from any large iron structures.

With the system powered up in Standby Mode "H035", press and hold the ADJ key for three seconds, until "CONF" is displayed.

Press the ADJ key a further 3 times, the pilot will now display "CLR" or "COrr" is displayed.

CLr

If "COrr" is displayed it means that the autopilot already has correction values stored. Press the ⬅️ and ➡️ keys simultaneously so that previous information is erased and "CLr" is displayed. "ERR*" is displayed if the compass is located too close to a strong magnetic field. Move the compass to a more suitable location.

Turn your vessel slowly, in a clockwise direction, aiming to complete a full turn in 1 to 3 minutes.

INIT

Press the ⬅️ and ➡️ keys simultaneously to start the sequence running. The ProPilot 700 displays "INIT".

rUN

The display then shows "rUN".

COrr

After 2½ turns the display shows "COrr", the Auto deviation correction routine has been completed.

If the compass cannot complete the routine for some reason (it will continue to display "rUN") or if you wish to abort the routine, press the ⬅️ and ➡️ keys together. The display returns to "CLr".

Step 7

6.2 Align Compass

Having completed the Auto Compass Deviation Correction procedure you should now check that the compass heading is still the same as the vessel's heading, in which case alignment will not be necessary. If there is a standing error, the compass must be 'electronically' aligned with the vessel's bow.

A L N C

Press the ADJ key repeatedly until "**ALNC**" is displayed. Hold the vessel on a steady heading, then press the ⏪ or ⏩ key to display the present value from the Deviation Correction just performed. The lower case "C" indicates that this is the compass offset reading. Using the ⏪ and ⏩ keys or the Course Select Knob, change the value until it is the same as the vessel's heading. When correct press the ADJ key.

6.3 Centre Rudder (Calm Sea)

C E N r

Press the ADJ key, the Pilot 700 will now display "**CENr**".

This routine will set the electronic centre rudder position more accurately than that set in the dockside settings.

Steer the vessel on a straight heading at normal cruising speed, ensure that there is very little or no Standing Helm. Press the ⏩ key to set the current rudder angle as the centre position.

6.4 Auto Sea Tune (Calm Sea)

There are two methods to set up the Rudder Ratio, Counter Rudder and Trim settings:

- The Auto Sea Trial method, as described in this section, or
- Adjusting the default settings individually, see section 2.3, 7.2 and 7.3.

Auto Sea Trial is a routine to help set up some of the Pilot Computer's sea state parameters. This is an optional procedure if control is proving difficult to set up.

t U N E

Press the ADJ key twice to select Auto Sea Tune. The ProPilot 700 provides a set of default values for the Rudder Ratio, Counter Rudder and Trim settings for your vessel.

Auto Sea Tune will help to set these values automatically for you, taking into account the boat's steering and handling characteristics. The routine will apply 20° course change and will time the vessel's oscillations (oversteer) and amount of overshoot. Using these values it will calculate the optimum settings. Choose a calm sea to carry out this routine.

Drive your vessel at a normal operational speed. With the vessel travelling, press the ⏪ or ⏩ key to initiate the Auto Sea Tune routine.

PrESS AUTO

The ProPilot 700 will prompt you to “**PrESS AUTO**”. Press the AUTO key, the pilot will perform a 20° turn to Starboard.

LO1

Then will initially oscillate (oversteer), and then settle down.

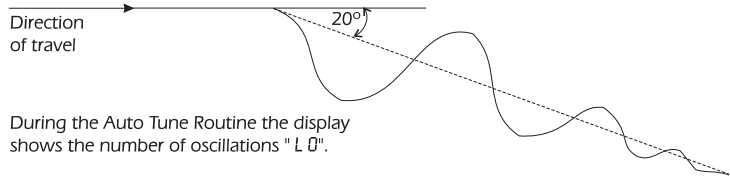


Figure 8 – Auto Sea Trial

PSET

To confirm that the Rudder Ratio, Counter Rudder and Trim settings have been completed “**PSET**” is displayed.

If the oscillations become greater than 20° the routine will return to Standby Mode. The ProPilot 700 will ask you to press the AUTO key, to restart the Auto Sea Tune routine again with reduced settings.

Press the OFF key to return to Standby Mode.

Step 10

6.5 Final Sea Trials and Fine Tuning

Checking the Compass Settings

Comparison checks against known headings should be carried out to verify the accuracy of the compass.

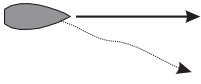
Turn the vessel again through a full 360° with the ProPilot 700 in Standby Mode and note the amount of error at the eight Cardinal and Intercardinal points. The error should now have reduced to less than +/- 3° at each point.

Auto Sea Trial Fine Tuning (Calm Sea)

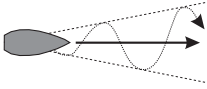
Steer the vessel in a straight line at normal cruising speed and press the AUTO key. The vessel should now hold a steady course.

If the vessel does not hold a steady course, change the Sea State Adjustment Rudder Ratio to set the pilot for optimum performance, as you would on any voyage (see section 3).

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If the vessel drifts off course to one side, increase the rudder ratio by one.



If the vessel oscillates from side to side, decrease the rudder ratio by one.

Figure 13 - Rudder Ratio

Do not make major adjustments.

Press the ADJ key repeatedly until "RU" is displayed for Rudder Ratio and change the setting by using the  or  keys.

Press the OFF key to regain Manual Control. The ProPilot 700 installation is now complete.



It is advisable to record the optimised settings, in case they are accidentally changed at any time.

7. Pilot Configuration

The Pilot Configuration settings contained in this section are to configure your ProPilot 700 for your vessel, and for the peripheral equipment, connected to your system.

Press and hold the ADJ key for three seconds until "CONF" is displayed. Press the ADJ key to display the next option in the menu. If you press the ADJ key after "RSET" you will return to the beginning of the menu cycle "CONF".

To return to the heading display, press the OFF key, and to return to the same Pilot Configuration option press the ADJ key.

To exit the Pilot Configuration Menu press and hold the ADJ key for three seconds, until a Sea State Adjustment option is displayed.



7.1 Rudder Deadband

rd 3

Some steering systems have slack in them owing to wear or system design which gives a few uncontrolled degrees of rudder movement. Hydraulic Drive and Power Steering systems often have some overshoot.

To stop the ProPilot 700 trying to correct these small movements, the rudder deadband setting allows a small course error movement without the pilot applying rudder.

Press and hold the ADJ key for three seconds until "CONF" is displayed. Press the ADJ key repeatedly until "rd" is displayed.

Set this to the minimum value that avoids hunting of the rudder, using the  or  keys. The range is from 0 (0°) to 20 (2°).

Too much slack in the steering system will affect Pilot performance.

7.2 Counter Rudder

Cr 3

To prevent the vessel from overshooting at the end of a large course change, the amount of rudder is reduced if the vessel approaches the new heading too fast, and may result in opposite helm being applied for a short time. The rate at which the reduction in the amount of rudder occurs is known as Counter Rudder.



If this is set too high the vessel will not settle on to the new heading quickly enough. If the Counter Rudder is set too low the vessel will overshoot and the pilot will have to correct accordingly, possibly causing the vessel to oscillate from side to side, before settling to the new heading.

If your vessel is suddenly pushed off course, an increased amount of rudder will be applied to counteract the action returning you onto course.

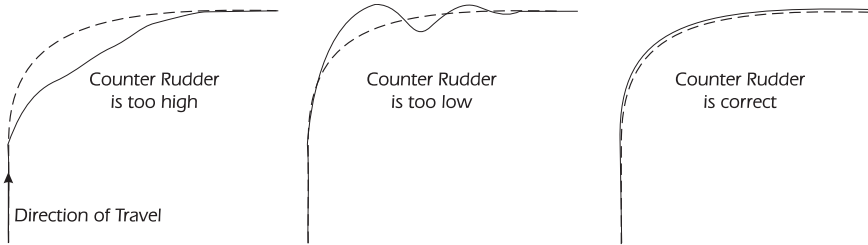


Figure 9 - Counter Rudder

This setting will have a greater effect on heavier displacement vessel's. Adjust to give approximately 10° of overshoot for a 90° change of course.

Press the ADJ key twice, "Cr" is displayed. Change the setting by using the ⬅ or ➡ keys.

The range is from 0 (No Counter Rudder) to 20 (Maximum Counter Rudder).

7.3 Trim

t r 4

Normally, if the rudder is amidships the vessel will travel in a straight line. Often something will cause the vessel to drag to one side, for example the wind, towing something or current. To counteract this, a few degrees of rudder will be applied, this is termed Trim or Standing Helm.

This setting adjusts the rate at which that standing helm is applied.

The higher the setting, the faster the standing helm is applied. This should be set so that the ProPilot 700 will trim the vessel within 60 seconds.

On single screwed vessels or sailing yachts it is only possible to check the Trim setting while using the craft when, for example, the prevailing conditions cause the vessel to steer with offset rudder.

The correct Trim adjustment setting for these types of vessel is therefore best found by experience.

To check the Trim adjustment with twin engine vessels, run the boat under ProPilot 700 command with both engines running, then close down one engine. The vessel will initially go off course but should return to course in less than 60 seconds. If the vessel takes a longer period of time to return to course then increase the value set for Trim.

Press the ADJ key, "tr" is displayed.

Change the setting by using the ⬅ or ➡ keys.

The range is from 0 (No Trim) to 20 (Maximum Trim).

7.4 Navigator Gain

NG

If your ProPilot 700 is working with a Navigator, adjustment of Navigator Gain will be available, which is the trim setting which the navigator will use. The speed of the vessel affects the Navigator Gain, high speed requires less Navigator Gain and slow speed requires higher Navigator Gain.

Set the navigator's output data to minimum damping (1 second intervals) and set the Navigator Gain to 5 (this is suitable for most applications).

If this is set too high the pilot will trim the vessel's course too much causing the vessel to oversteer either side of the desired track. If the Navigator Gain is set too low the vessel is pushed off track, the pilot will not bring the vessel to the desired track " }{00".

Press the ADJ key, "NG" is displayed.

Change the setting by using the ⬅ or ➡ keys.

The range is from 0 (No Gain) to 9 (Maximum Gain).

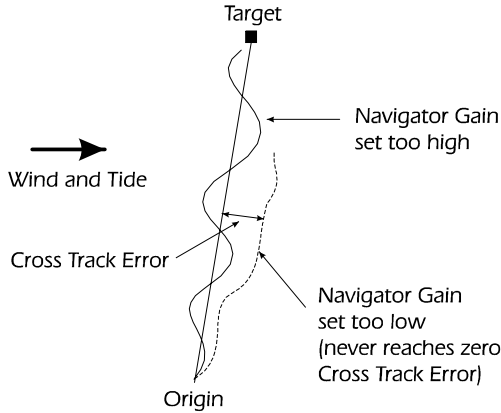


Figure 10 - Navigator Gain

7.5 Waypoint Sequence

When following a route, prepared on a navigator or plotter, there are two options: follow the whole route automatically or to manually advance to the next waypoint.

Press the ADJ key, "**AUTO**" or "**not auto**" is displayed. Change the setting by using the \ominus or \oplus keys.

A U T O

Automatic Waypoint Following.

not Auto

Manual Acceptance Sequence.

7.6 Compass Damping

A u c d

The ProPilot 700 will automatically calculate a suitable damping setting for the compass display to correspond with sea conditions, using the Automatic Compass Damping routine.

The normal setting is Automatic Compass Damping, this may only need to be changed if the compass has been mounted high above the waterline.

Press the ADJ key, "**AuCd**" or "**Cd**" is displayed. Change the setting by using the \ominus or \oplus keys.

C d

If the display is slow in updating, decrease the damping, using the \ominus key.

The range of settings is: Automatic Compass Damping; then manual values from 0 minimum to 9 maximum damping.

7.7 Transition Speed (Rudder Ratio)

S t

The Transition Speed setting indicates to the ProPilot 700 when to increase rudder ratio, to give you more steering control for manoeuvring at slower speeds. As your speed changes the software creates a gradual adjustment of Rudder Ratio, compared with the fixed Rudder Ratio values for the Pilot A, B and C settings.

This setting is most beneficial for planing vessels which need extra control when not on the plane.

Using the Speed Display find out at what point, in knots, your vessel is comfortably on the plane. Increase the Transition Speed setting to this value.

Above this value the ProPilot 700 will use the Rudder Ratio setting. Below, it will increase the amount of Rudder Ratio up to double, giving you more control at slower speeds, where more rudder is required to steer the vessel. The actual value of the rudder ratio used by the pilot at these slower speeds is not displayed.

Press the ADJ key, "St" is displayed.
Change the setting by using the  or  keys.

The range is from 0 (no speed data) to 50 knots in increments of 1 knot.

If there is no speed data, set the Transition Speed to 0.

The Pilot ProPilot 700 uses speed data received from a NMEA speed message from a GPS or velocity data from an NMEA 0183 interface, refer to the 930609/619 Pilot Computer Installation Guide).

7.8 Speed Display

S P

The ProPilot 700 will display the vessel's speed in knots, if it is receiving NMEA speed message from a GPS or velocity data from an NMEA 0183 interface.

If the ProPilot 700 is not receiving velocity data it will display "SP00" on the LCD.


7.9 Motor Speed Control

PWM (Pulse Width Modulation) is a method of controlling the speed of the steering motor of the vessel's drive unit so that rudder operation is smooth. This is especially useful if the vessel has a high steering inertia.

Motor Speed Control and the Motor Speed Reduction Angle are used to assist PWM, to achieve smooth rudder operation.

d 1 0 0

Motor Speed Control is the amount of power, output from the Drive Unit, needed to move the rudder between its limits in a time suitable for the vessel.


The Motor Speed Control setting starts at 100%, which is the maximum rudder speed the selected drive unit can provide, press the  key to reduce the power (increasing the Hardover time), to achieve the Hardover to Hardover time calculated for your system (Hardover time is double at 50% power).

As a guide, the Hardover to Hardover time will be approximately:

Planing vessels	8 - 12 seconds
Semi-Displacement vessels	11 - 16 seconds
Displacement and Sailing vessels	15 - 18 seconds

The range is from 100% to 50% in increments of 5%.

P O f f

There are a few conditions when PWM is a disadvantage, such as running down wind with a large following sea. To switch PWM off, press the  key until "POFF" is displayed.

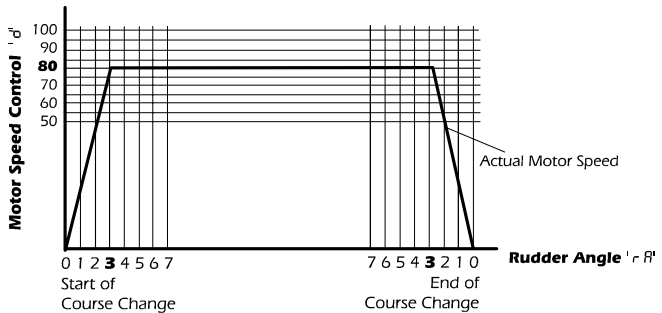


Figure 11 - Motor Speed Control / Rudder Angle

7.10 Spool Valve

P O F F

If using Spool Valve Control for the steering system, the Jumper J3 in the Pilot Computer will need to be set to "Spool Valve", this automatically sets Motor Speed Control to PWM Off.

J3 
Spool Valve Position

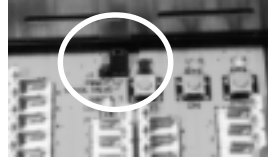


Figure 12 - Spool Valve Jumper

7.11 Motor Speed Reduction Angle

r A

The ideal setting will achieve a smooth reduction in motor speed as the rudder nears the desired position.

Planing vessel's are sensitive to sea conditions and can easily be moved off course. Decrease the Reduction Angle so that the corrective rudder movement, performed by the Pilot will quickly return the vessel onto its course.

Mechanical drive systems with high inertia, need to operate the rudder more slowly when small adjustments are needed, increasing the Reduction Angle will provide this effect.

Press the ADJ key, "rA" is displayed.

Change the setting by using the ⬅ or ➡ keys.



The range is from 0° to 7°, in increments of 1°.

7.12 Tack Angle (Only used for sailing vessels)

Tack Angle is only available when "sail" is selected as the Boat Type.

The ProPilot 700 has a Tack Angle setting, for sailing vessel's. This is the angle through which the vessel will tack when a Port or Starboard Tack is initiated in Compass Control.

The tack function uses the compass heading and subtracts or adds the tack angle to create the new course for Port or Starboard Tacks, respectively. Manually calculate the Tack Angle in the normal way and enter this value.

Press the ADJ key "**t**" is displayed.
Change the setting by using the  or  keys.

t 1 0 0

Manually calculate the Tack Angle in the normal way and enter this value into the Configuration Routine.

The range is from 60° to 110° in increments of 10°.

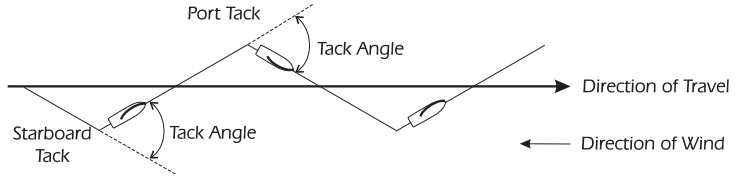




Figure 13 - Tack Angle

7.13 Power Steer Gain

P S

This adjusts the sensitivity of the steering when it is controlled by a remote device such as a 930788 ProSteer.



Press the ADJ key, "**PS**" is displayed.
Change the setting by using the  or  keys.

The range is from 01 (least sensitive) to 10 (most sensitive)

7.14 Rudder Limits

R L

This allows adjustments to the maximum rudder movement, either side of amidships, obtainable under autopilot control. The Dockside Settings automatically calculated this value, however Rudder Limits allows manual override.

Press the ADJ key, "**RL**" is displayed.
Change the setting by using the  or  keys.

The range is from 01 (4°) to 10 (40°).

Ensure the limit set does not allow the rudder to touch its end stops.

7.15 Rudder Gauge Type

The ProPilot 700 outputs rudder angle information to a Rudder Gauge connected to PL4 in the Pilot Computer.

r U d 1

VDO Rudder Gauge

r U d 2

Wagner Rudder Gauge

r U d 3



Tfx Marine / SeaStar / Teleflex Rudder Gauge

R U d 4

C-Power Rudder Gauge - Cetrek

7.16 Reset All

r E S A

When this message is displayed, pressing the  and  keys simultaneously will clear the Rudder Settings and Compass Alignment values.

Caution








The display will flash once when the values have been reset.

Note

It is advisable to record the optimised settings, in case they are accidentally changed at any time.

8. ProPilot 700 Key Summary

The functions below are dependent on the Mode of operation: Standby, Auto or changing settings in the ADJ key menus.

Key	Current Mode	Function	Display
	Standby Mode	Jog Steer to Starboard	- JOG
	Auto Mode	Dodge to Starboard	--dO
	Auto Mode	Starboard Tack	t . 2 2 6
	ADJ key Menus	Increases Settings	
	Standby Mode	Jog Steer to Port	JOG -
	Auto Mode	Dodge to Port	dO --
	Auto Mode	Port Tack	t . 1 5 6
	ADJ key Menus	Decreases Settings	
 	Auto Mode	Changes the function of the Arrow keys between Dodge, Course Change and Tack	
	Auto Mode	Course Change	A . 2 2 6
	Standby Mode	Select Auto Mode	A 2 2 6
	ADJ key Menus	To return to Auto Mode	
	Auto Mode	To return to Standby Mode	H 2 2 6
	Navigator Control	To return to Standby Mode	H 2 2 6
	(Only with a main Control Head fitted to a 930619)	Press and hold OFF Key to switch off	

Navigator Control

NAV	Key	Display	Function
	NA 1		Selects the NMEA Input (1-3)
	AUTO		Automatic Waypoint Sequence Display, or not auto Manual Acceptance Sequence Display
	} 1 4		Cross Track Error Display
	N 2 2 6		Selects Navigator Control

Sea State Settings Menu

ADJ	Key	Display	Function
	r U 0 4		Rudder Ratio (0-20)
	P r 2 5		Port Rudder Display, or S r 1 0 Starboard Rudder Display, or S t O P Rudder End Stop
	r E 0 1		Response (1-20), or AdPt Adaptive Setting

Configuration Routine Menu

Press and hold ADJ Key to select Configuration Routine.

ADJ	Key	Display	Function
	CONF		Vessel Type Configuration 5.2
		PLAN	Planing, or
		SAiL	Sailing vessel
		d i S P	Displacement, or
		SdIS	Semi-displacement, or
		rudd	Rudder Settings Routine 5.3
	ALnC		Align Compass 5.4 and 6.2

Continued \

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\ Continued

—	Clr	No Deviation Correction, or COrr Correction Value	6.1
—	CENr	Centre Rudder	6.3
—	rd03	Rudder Deadband (0-20)	7.1
—	tUNE	Auto Tune Routine	6.4
—	Cr01	Counter Rudder (0-20)	7.2
—	tr04	Trim (0-20)	7.3
—	NG05	Navigator Gain (0-9)	7.4
—	AUTO	Auto Waypoint Sequence, or not Auto Manual Acceptance Sequence	7.5
—	AuCd	Auto Compass Damping, or Cd Compass Damping (0-7)	7.6
—	noSt	No Transition Speed, or St14 Transition Speed (Rudder Ratio)	7.7
—	SP14.	Speed Display in Knots	7.8
—	d100	Motor Speed Control, or POFF PWM Off	7.9/ 7.10
—	rA	Reduction Angle (0-10)	7.11
—	t 60	Tack Angle (60-110)	7.12
—	PS05	Power Steer Gain (0-10)	7.13
—	r107	Rudder Limit (0-10)	7.14
—	rUd1	VDO Gauge, or	7.15
	—	rUd2 Wagner Gauge, or	
	—	rUd3 Tfx Marine/SeaStar/Teleflex Gauge, or	
	—	RUd4 C-power Rudder Gauge	
—	rESA	Resets: Compass Alignment and Rudder Settings	7.16

Press and hold ADJ key to return to Sea State Adjustments.

9. System Messages

If your autopilot detects a problem with the system it will display a warning on the LCD. For safety, a very serious problem will also turn the autopilot to Standby (manual steering) mode. Here are the messages that we hope you will never see, along with some explanations and some tips on what to do before you call your Cetrek dealer.

System Alarms

LOW BATTERY

The battery voltage is low.

- Clear the alarm by pressing any key except the OFF key. Once cleared the alarm will not trigger again until the autopilot has been turned off and back on again. If the voltage drops too low, autopilot operation may be impaired. Check the vessel's charging system.

NAVIGATOR ALARM

This will be shown if any of the following occur:

- The autopilot has received no Navigator Data
- The autopilot has received an error code from the Navigator
- The autopilot has received more Navigator Data than it expected or
- The autopilot has "timed out" because it has not received expected Navigator Data within a predetermined length of time.

Make the following checks:

- That the Navigator is turned on.
- That the Data output format from the Navigator is the same as the autopilot is set to receive (see Dockside Settings).
- That NAV is selected correctly.
- On the PCB inside the Pilot computer there are LED's beside each NAV port (PL11, 16 & 17). The LED for each port will flash if data is being received by that port.
- Check the Navigator for bad reception or faulty equipment.
- Check the data output from the Navigator.

WIND ALARM

The autopilot has "timed out" after not receiving expected Wind Instrument Data.

- Check the Data output from the Wind instrument.

10. System Faults

The System faults are identified by numbers as indicated below. For safety reasons, faults with a number greater than 128 will result in the autopilot automatically switching to Manual mode.

- 002 NOVRAM CHECKSUM ERROR
- This fault may indicate that the Autopilot's stored parameters are no longer valid, these should be checked before further use.
- 036 EXTERNAL COMPASS MESSAGE FAULT
- The compass message has not been received correctly by the Pilot Computer.
- If this occurs repeatedly then the compass should be repaired.
- 065 PORT MESSAGE OVERRUN ERROR
- The messages received by the Pilot Computer for the Autopilot Control is longer than expected.
- It could be caused by excess electrical noise interfering with the data cables of the Autopilot Control or by a loose 619 interface PCB (100285).
- 066 PORT READ CHECKSUM ERROR
- The messages received by the Pilot computer for the Autopilot Control is longer than expected.
- It could be caused by excess electrical noise interfering with the data cables of the Autopilot Control.
- 070 PL14 TIMEOUT
- The alarm will occur if the Control head connected to PL14 in the Pilot computer is incorrectly selected or if a control unit fails to respond. Check the wiring to the plug.
- 071 PL15 TIMEOUT
- The alarm will occur if the Control head connected to PL15 in the Pilot computer is incorrectly selected or if a control unit fails to respond. Check the wiring to the plug.
- 081 PC COMMS ALARM
- Indicates that data from the PC is of the wrong format.



Warning messages 128 and above are accompanied by audible (if the unit has one) and visual alarms, and the autopilot will have switched to standby (manual) mode.

- 130 STACK OVERFLOW
- Indicates that the software has crashed. This may be due to excessive electrical noise near the pilot computer. Remove any sources of electrical noise then power OFF and back ON again to clear the fault. If the problem persists, consult your local Cetrek dealer or distributor.
- 131 700 CONTROL HEAD ALARM
- Indicates that data from the 700 control head is not present. Check the cable and connections.
- 134 715-730 CONTROL HEAD ALARM
- Indicates that data from the 715 or 730 control head is not present. Check the cable and connections.
- 165 COMPASS TIMEOUT
- The Pilot computer is not receiving heading information from the compass. Check the wiring. If a 580 sensor is connected, check PL8, pins 2, 3 and 4. Their voltage should be $2.5V \pm 1.5V$, if they are not, the 580 compass is faulty.
- 167 EXTERNAL DIGITAL COMPASS ALARM
- The repetition rate of the NMEA input to the 619 from the compass is too slow ($>200ms$).
- 176 RATE GYRO ALARM
- Indicates that the data signal from the optional Rate Gyro is no longer present (PL19 pin4 is at 5V). PL19 pin4 should be at a nominal 2.5V when data is present.
- 192 GYRO STEPPER ALARM
- Indicates that the data signals from the Gyro stepper are faulty, all 'high' or all 'low'.
- 198 RUDDER FEEDBACK FAULT
- This may be caused by a fault in the Rudder Feedback Unit, wiring, excessive travel on the Rudder Feedback Arm or the Link J1 is set incorrectly.
Check that the Rudder Feedback Unit has been correctly installed.
- 200 MOTOR PHASING CHECK
- This indicates that the rudder setting data is wrong. Repeat the rudder setting routine detailed in the control head User's Guide.

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RUDDER DRIVE FAULT

- The Pilot computer has sent a drive command to the drive unit but the Rudder Feedback Unit has not detected a change in the rudder position.

Check that the Rudder Feedback has not become disconnected from the Rudder Arm, also check that the steering system, especially the motor, is operating the rudder gear correctly.

Ensure that the drive unit cables have not become disconnected or loose.

If You Need Assistance

If you do ever need to contact your Cetrek Dealer or Distributor, it would save time if you could make a note of the following details for them:

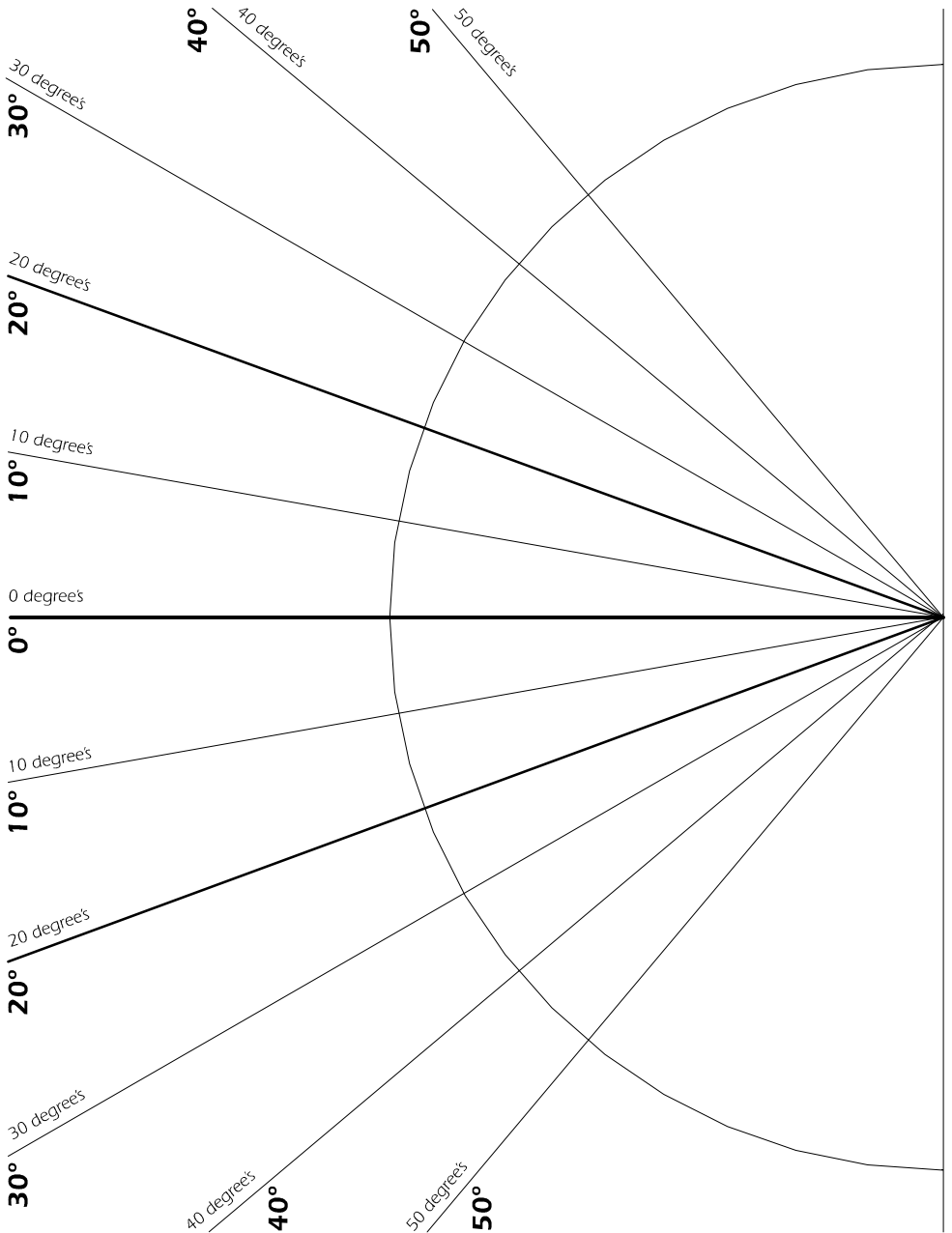
Model number:

Serial number:

Software version number:

A description of the failure.

11. Rudder Angle Template



LIMITED WARRANTY APPLYING TO ALL PRODUCTS OF Cetrek Ltd.

- I The Warrantor is: Cetrek Ltd.
- II This Warranty shall extend only to the original purchaser of the equipment.
- III The Warranty registration card must be completed in full and returned to Cetrek Ltd. before any warranty service may be authorised.
- IV This Warranty applies to all equipment manufactured by, or bearing the name plaque of, Cetrek Ltd., and the warrantor warrants all such equipment to be free from defects in workmanship or material under normal use and service.
- V This Warranty is in effect for a period of 12 months from date of invoice from a duly authorised Cetrek distributor, or 18 months after shipping date from Cetrek Ltd., whichever comes first.
- VI
 - i If any part of the equipment proves to be defective in workmanship or material, the warrantor will examine said equipment after it is returned to the warrantor as hereinafter stated: and
 - i If the returned equipment is found by the warrantor to be defective in workmanship or material, the equipment will be repaired or replaced at the above address of the warrantor's place of business without charge except for transportation charges as herein provided, and there will be no option for the purchaser to receive a refund of the purchase price until after a reasonable number of attempts to remedy the defect have been made by the warrantor.
 - iii Only persons expressly authorised by the warrantor shall be permitted to perform warranty service. The warrantor agrees to pay a duly authorised distributor or dealer up to a maximum of two hours labour at a predetermined and fixed rate for the repair on board the vessel. The warrantor will not assume the costs of any unauthorised labour, waiting time, travelling time, overtime or correction of faulty installation, unauthorised labour, travel accommodation and/or living expense, replacement or repair of units abused or subjected to water damage (other than units designated watertight).
- VII
 - i If the purchaser believes any part of the equipment is defective he should return the said part within 12 months of the date of purchase to Cetrek Ltd. at the address provided herein.
 - i The expense of transporting the defective equipment to the warrantor's place of service shall be paid in advance by the purchaser. The return of goods by normal transportation will normally be prepaid by the warrantor.
- VIII
 - i There are no warranties which extend beyond the description on the face hereof. This warranty is expressly in lieu of all other warranties, guarantees, obligations or liabilities expressed or implied by the warrantor or its representatives. All statutory or implied warranties other than title are hereby expressly excluded to the extent to which they may be excluded by law. This warranty will not apply where the purchaser, or others, have misused, abused or failed to normally service the equipment, and the warrantor will not be liable for any damage of any kind caused by such misuse, abuse, or lack of service.

- i There is no warranty coverage of any kind for defects of damage due to water immersion or salt spray except for equipment which is designated as watertight, and equipment so designated is warranted as set forth in paragraph VI herein.
 - iii There is no warranty and the warrantor shall not be held liable for any damages incurred as a result of a malfunction of any part of the warrantor's products, if said damages incur during or as a result of the autopilot being left unattended by the operator. The warranty shall not be liable for any damage arising from collisions with other vessels or objects. The autopilot product, including parts thereof, is designed to assist the operator or the man on watch to navigate accurately by maintaining an average course selected by the man on watch. The warrantor's products are not designed to, and do not, replace the man on watch. Due to the potential of a collision with an object in the vessel's path or of an electrical, mechanical, or hydraulic malfunction of the parts of the autopilot or the associated equipment of the vessel, the energised pilot should never be left unattended when the vessel is moving.
 - iv The sole remedy available to the purchaser if there is a defect in material or workmanship of the equipment is as set out in paragraph VI.
 - v Save in respect of loss of life and personal injury, which liability can not be excluded by law, the warrantor shall have no liability for incidental or consequential damages of any kind.
 - vi This warranty shall not cover defects or damage arising as a result of the faulty workmanship of any distributor, agent of the seller or dealer in the goods, or other person not being the seller or it's employee in respect of the installation of the goods.
 - vii The warrantor hereby notifies the purchaser purchasing as a consumer, that his statutory rights given under the Sale of Goods Act 1979 and Supply of Goods and Services Act 1982 are not affected by this warranty.
- X The purchaser's obligations in the event of defect are to:
- i Prepare a written detailed statement of the defect.
 - i Deliver the written statement to the warrantor's factory at the above indicated address.
 - iii Deliver or arrange for the delivery of the equipment to the warrantor's factory.
 - iv Arrange for the return of the equipment from the warrantor to the purchaser by either agreeing to pick up the equipment at the warrantor's factory or by depositing with the warrantor sufficient funds to pay to have the equipment delivered to the purchaser by means of commercial transportation other than standard freight services (UPS ground).
- X The purchaser hereby agrees that he has read and understands that the above warranty sets forth the exclusive warranty for this equipment.

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