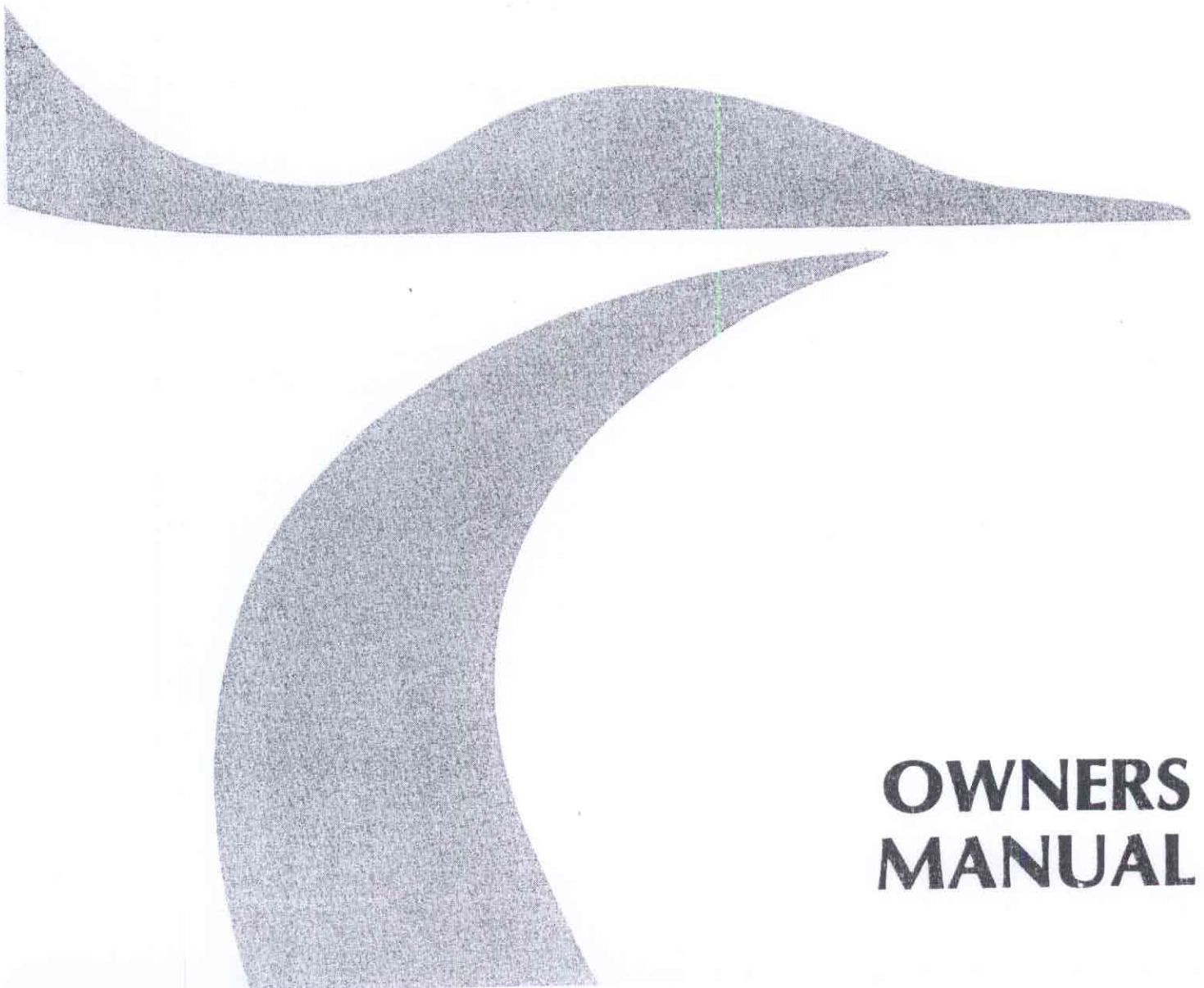


TILLERPILOT TP1800



**OWNERS
MANUAL**

TILLERPILOT® TP1800

ADVANCED MICROPROCESSOR CONTROLLED PILOT FOR TILLER STEERED YACHTS

Contents	Page
1 Installation	2
1.1. Mounting the Tillerpilot	2
1.2. Electrical Connection	3
1.3. Mounting Accessories	4
2 Operation	5
2.1. Engaging Autopilot Operation	6
2.2. Keypad Operation	7
3 Hints on Sailing	9
4 How the Pilot Works	10
4.1. Tiller Movement	10
4.2. Seastate	11
4.3. Autotrim	11
5 Porthand Mounting	12
6 Gain	13
7 Diagnostic Checks	14
8 Spare Parts	15
9 Service and Warranty	16

The Navico Tillerpilot **TP1800** is a self-contained automatic pilot suitable for a wide variety of tiller steered sailing yachts. It contains highly sophisticated electronics with advanced software capable of optimising the steering performance under differing conditions.

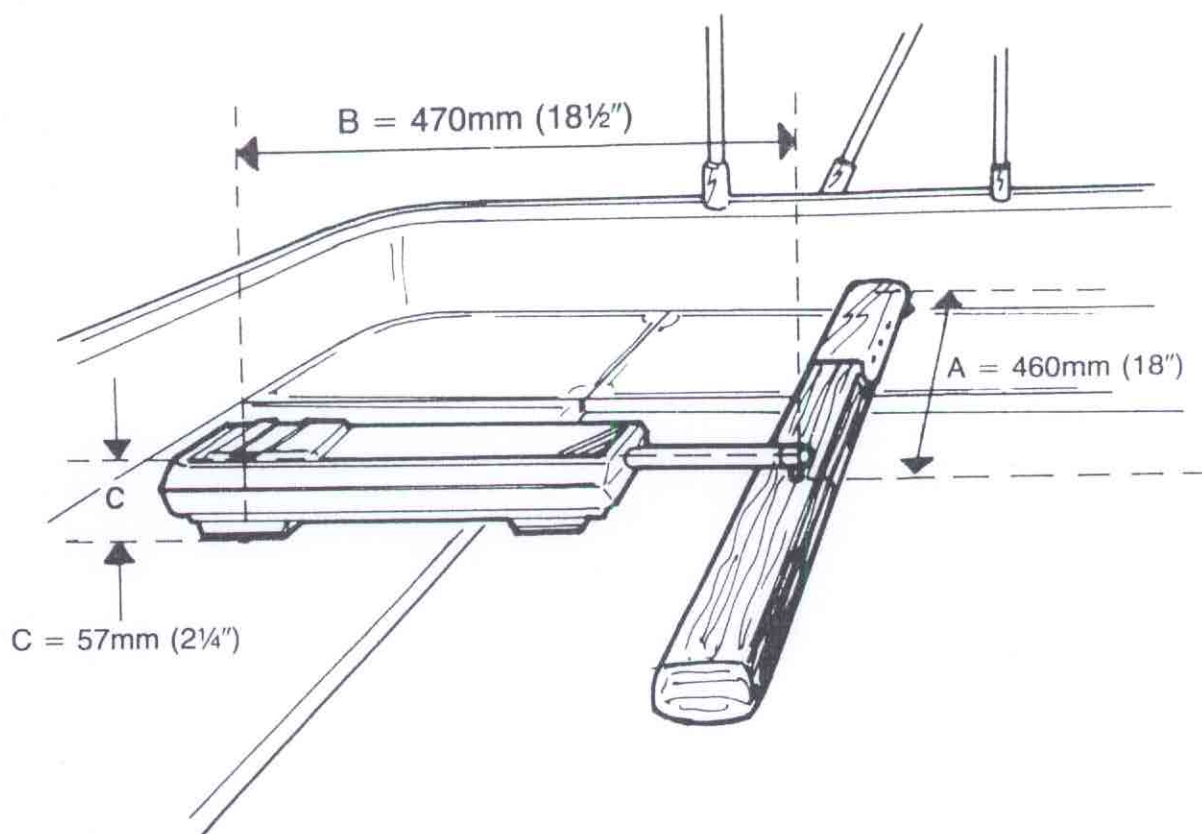
The control format of both units is simple to follow and gives precise control via three keys and two indicators.

To ensure best results the unit should be installed correctly. You are advised to read the complete manual before commencing installation and use.

® **Tillerpilot is a Registered Trade Mark of Navico Limited**

1 INSTALLATION

1.1 MOUNTING THE TILLERPILOT



The Tillerpilot should be installed to be horizontal and to the dimensions indicated above (note: tiller set amidships).

The Tillerpilot is factory preset to mount on the starboard side, but can be configured for porthand mounting if required - see section 5.

If the above dimensions "B" or "C" are not practical on your boat then a full range of mounting accessories are available - see section 1.3.

Some tolerance on dimension "A" can be allowed but the unit may require a change of gain to compensate - see Section 6.

The Tillerpilot houses an internal fluxgate compass and should therefore be mounted away from sources of magnetic interference. Ensure that steering compass is at least 1 metre (3 feet) away.

Tillerpin. Drill a 6.3mm (0.25") diameter hole in the tiller - ensure this is on the centre line and vertical. Drill to a depth that allows only the top 12.7mm (0.5") of the Tillerpin to protrude. Fix with an epoxy adhesive.

Mounting Cup. Drill a 12.7mm (0.5") diameter hole in the cockpit seat and mount so that only the flange protrudes. Ensure that the mounting cup is a tight fit (using epoxy adhesive), and is supported over its entire depth. If necessary reinforce underside of cockpit seat with hardwood or marine plywood.

NOTE: Tillerpilots are powerful devices and high loads can be exerted. Do not fit the Tillerpilot to the mounting cup and tillerpin until the adhesive has completely set.

1.2 ELECTRICAL CONNECTION

For 12 Volt DC Supplies Only

Connect to the battery or power distribution panel by a cable of suitable gauge for the length of cable run (refer to table below). It may be advantageous to fit a weatherproof plug and socket to allow easy disconnection and removal of equipment. Refer to Section 1.3 for relevant accessory.

- Do not fit other electronic or electrical equipment to this cable.
- Do not tap into the supply from a nearby cable for other electrical equipment - especially motor starting circuitry.
- Ensure all connections are well made. Poor contact will result in loss of thrust from the Tillerpilot and slower speed of response.
- Ensure that a 5amp fuse is fitted at either the boat's distribution panel or fitted in-line with direct connection to batteries.

Length of cable run	Size of Conductor.		
	X-section area	Conductor Type	A W G
Under 4 metres (13 feet)	1 mm ²	32/0.2	18
4 - 7 metres (23 feet)	1.5mm ²	30/0.25	15
7 - 12 metres (39 feet)	2.5mm ²	50/0.25	13

Trim surplus cable from the Tillerpilot

Ensure correct polarity connection:-

Brown	+ ve
Blue	- ve

Inadvertent reverse polarity connection will not cause damage to the Tillerpilot but the unit will not function.

1.3 MOUNTING ACCESSORIES

The following accessories are available from Navico dealers.

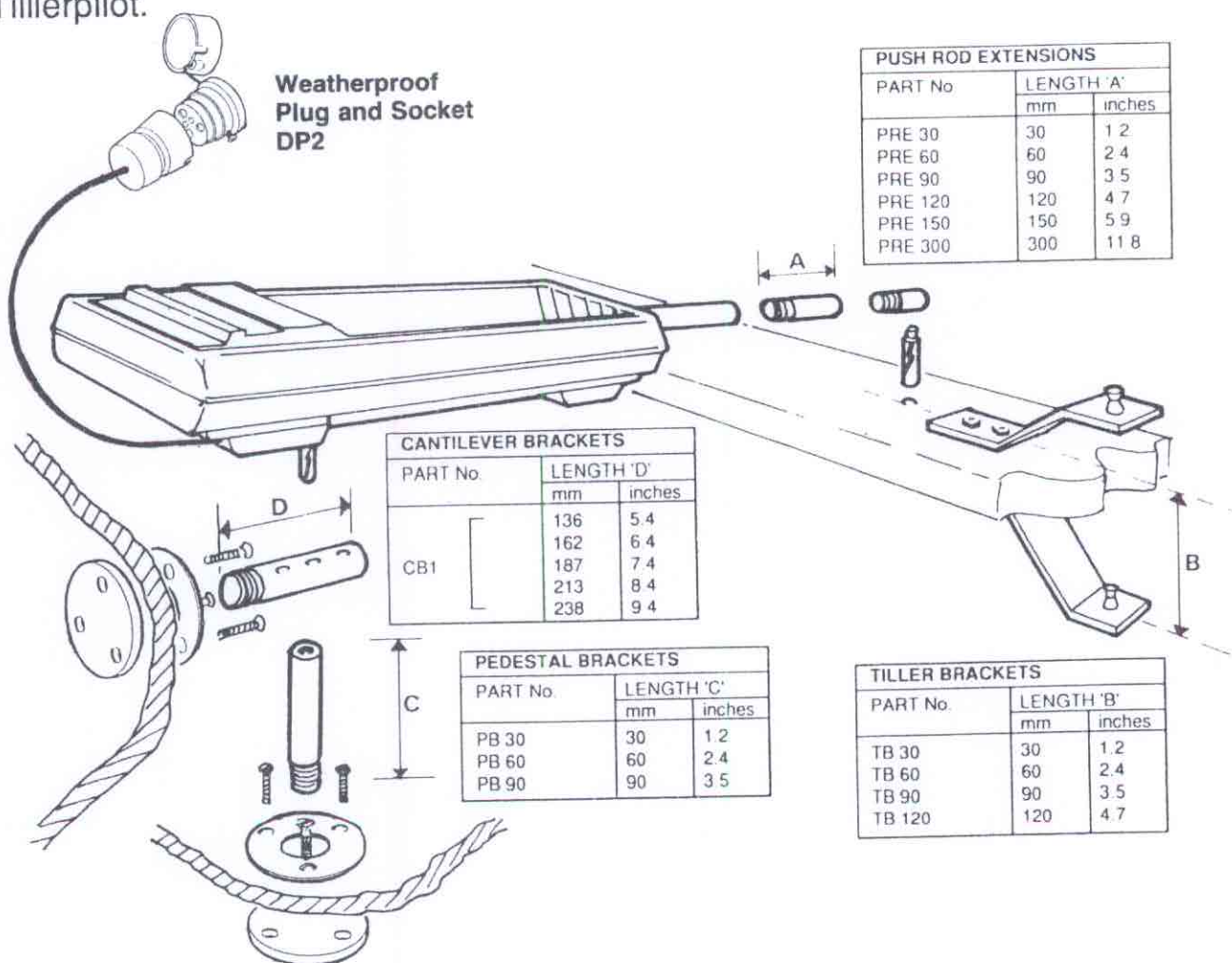
Pushrod extensions - to increase the distance between Tillerpilot mounting and tiller pin.

Pedestal brackets - to increase the height of the Tillerpilot mounting.

Tiller brackets - to raise or lower the attachment point on the tiller.

Cantilever bracket - to mount the unit from the side of the cockpit.

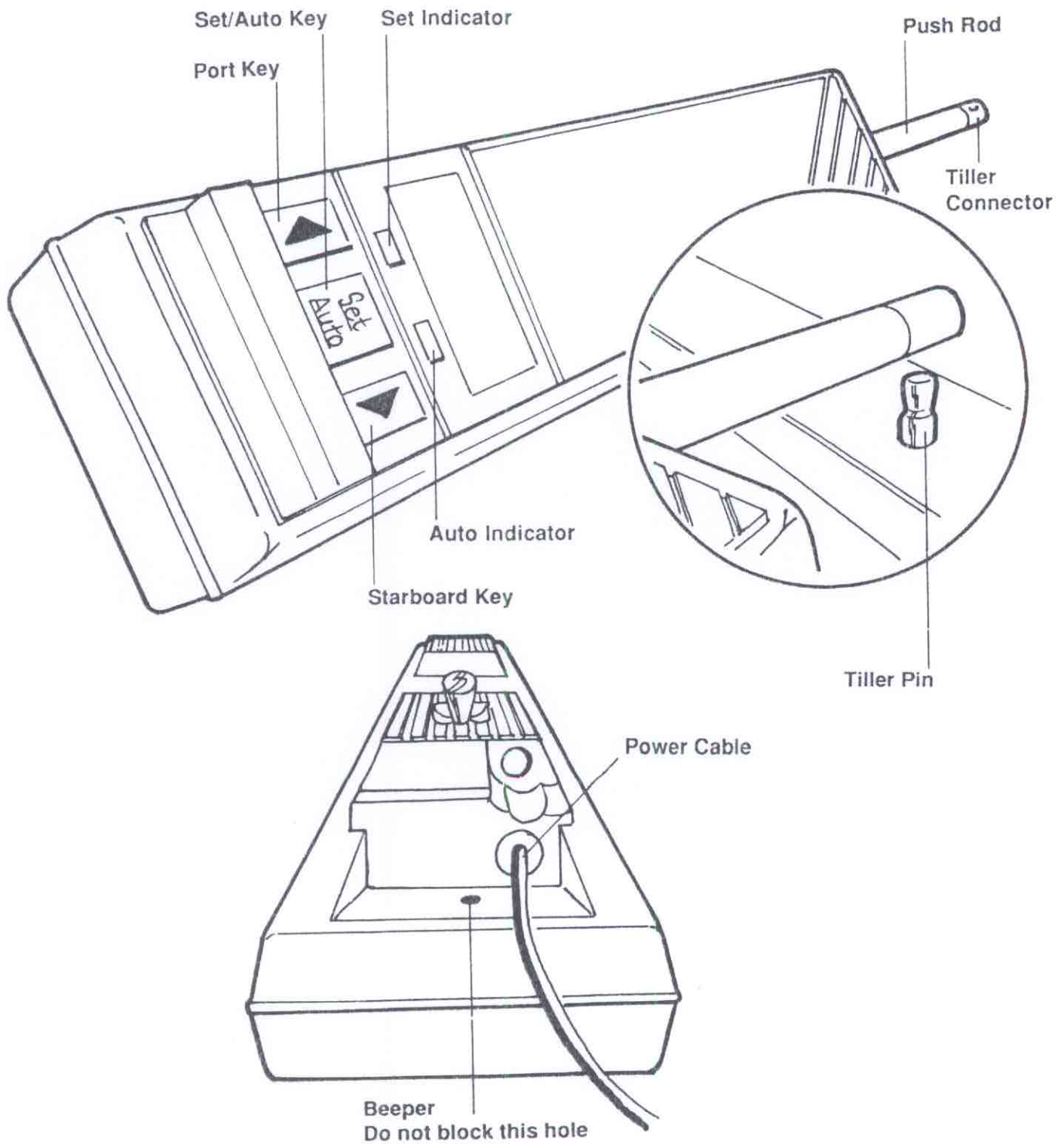
Power Plug/Socket - to provide a weatherproof power connection to the Tillerpilot.



In all cases the mounting points should be strongly fixed to withstand the considerable forces that can be applied.

Use only Navico accessories. Other manufacturers' accessories may look similar but vary in dimension, which could have a detrimental effect on the performance of the Tillerpilot **TP1800**.

Just 3 keys, which used in conjunction with the LED indicators carry out your commands in a simple and straightforward way. All key strokes are confirmed by one or more "beeps".



On connecting the Tillerpilot to a 12 Volt d.c. supply the unit will go into the set condition. This is confirmed by a flashing set indicator. In this mode no autopilot operation takes place, but movements of the Tillerpilot's pushrod can be made by pressing the port or starboard keys.

Course change and tacking are possible when under autopilot control. There is also a "lock-onto previously selected heading" facility.

2.1 **ENGAGING AUTOPILOT OPERATION**

Manually steer the required heading. Using the port and starboard keys move the Tillerpilot pushrod until it is over the tillerpin. Push the tiller connector onto the tillerpin - this should have a positive "click" action to prevent accidental disengagement.

Immediately lock the Tillerpilot onto your heading by pressing the set/auto key. The auto indicator will confirm.

Alternatively - connect the Tillerpilot to the tillerpin and use the port and starboard keys to steer the required heading. When the required heading is being steered press the set/auto key to lock onto autopilot operation.

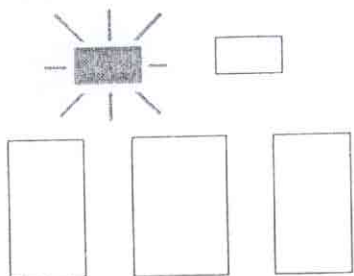
For either method it is desirable to ensure a straight course is being steered before the set/auto key is pressed. This will ensure the correct bias (rudder trim) to the helm for steering a straight course has been applied.

Emergency. In an emergency the pilot can be disconnected from the tiller by a sharp upwards force on the push rod. If the tiller can pivot upwards it is advisable to use one hand to hold the tiller, the other to lift the Tillerpilot off.

2.2

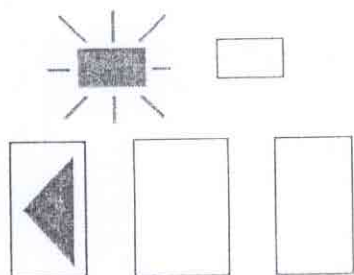
KEYPAD OPERATION

2.2.1 Initial power on condition.

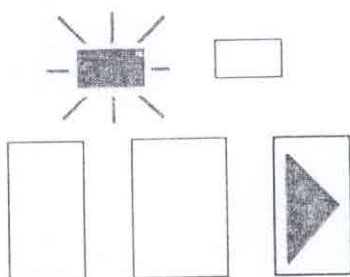


Set mode
Set indicator flashes.

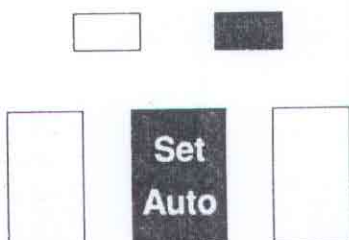
2.2.2 Operation of Keys in Set Mode



Vessel moves to port.
Pushrod retracts (for starboard mounted Tillerpilots).
Pushrod extends (for port mounted Tillerpilots)

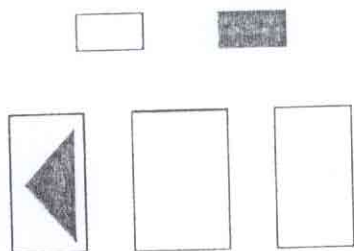


Vessel moves to starboard.
Pushrod extends (for starboard mounted Tillerpilots).
Pushrod retracts (for port mounted Tillerpilots)

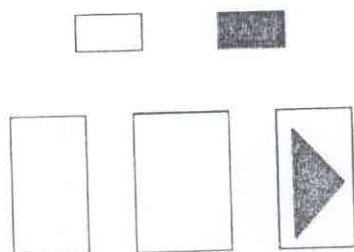


A single short press locks the Tillerpilot to the boat's current heading.
The auto indicator illuminates continuously to confirm.
Holding key depressed until second beep is heard - Tillerpilot locks onto previously used autopilot heading.

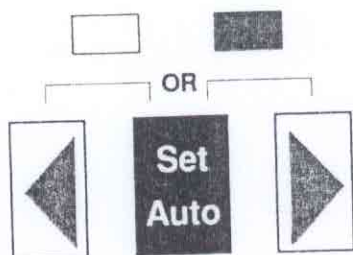
2.2.3 Operation of Keys in Auto Mode.



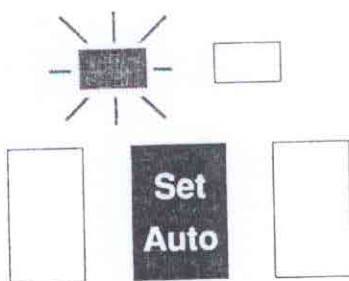
A single press alters the course by 1° to port. Holding key down will change the course by 10° to port for every double beep heard. (note: On pressing the key an initial beep is heard, if key held down then only the double beep will give a course change).



A single press alters the course by 1° to starboard. Holding key down will change the course by 10° to starboard for every double beep heard.



Both keys pressed together (set/auto with port or starboard). A 100° (compass heading) tack will result in direction of outer key used.



Tillerpilot reverts to the set mode.

Navico Tillerpilots when used properly can maintain as good a course, on most points of sailing, as a skilled helmsman. They also have the advantage of never losing concentration whereas the human may begin to show temporary lapses of concentration after as little as ten minutes. There are, however, certain circumstances in which the human has an advantage, in being able to anticipate events which no autopilot can sense, typically in a heavy following sea.

- When sailing close to the wind it is easy to forget to trim the mainsail and consequently allow excessively heavy weather helm to build up. A helmsman would complain, whereas a pilot will struggle on and the boat will not be sailing efficiently. The human likes to feel some weather helm, but for the pilot this is not essential and it will help (in drag reduction, wear and power consumption) to free or reef the mainsail a little sooner than you normally would when steering by hand.

- When sailing close to the wind it is wise to set a course a few degrees free of that normally sailed under manual tiller control.

- When running downwind near the gybe, a helmsman has the advantage of extra visual signals. When under autopilot operation do not sail as close to the gybe as you would when under manual tiller control.

- When broad reaching or running fast, particularly with quartering waves, a helmsman will naturally begin to apply periodic larger angles of helm than when beating or sailing slowly. This is the equivalent of increasing "rudder gain" and it may help to adjust the gain on the pilot. Many people find a compromise setting and use this for all sailing, but with practise it can be optimized for different conditions, eg: low for motoring in a calm and high for running fast. If gain is too low, the boat will understeer, ie: yaw because insufficient rudder is applied in time: if gain is too high, the boat will oversteer, ie: be overcorrected on each deviation from course.

Keeping Watch. The Tillerpilot is an invaluable aid to sailing. However, do not become complacent. Always keep a good look out - the Tillerpilot cannot see obstacles and danger!

Automatic pilots for sailboats have evolved considerably since their introduction some years ago. With advances in technology greater sophistication has been incorporated which allows more precise steering yet with much simpler control formats. This operating simplicity masks the hidden tasks which the pilot carries out. A knowledge of this will help you to understand what is going on, and why. It will also assist in knowing what to expect in certain conditions and how to set the sails to help operation and obtain optimum performance rather than hinder it.

The following explanation, whilst by no means complete, is a simple overview of the essential parameters.

4.1 TILLER MOVEMENT

Movements of the tiller are applied to compensate for heading variations, the amount of movement being proportional to the heading error detected by the internal compass. The amount of movement is set by the **Gain**. (sometimes known as the rudder ratio).

The following sketch shows the effect of gain setting.



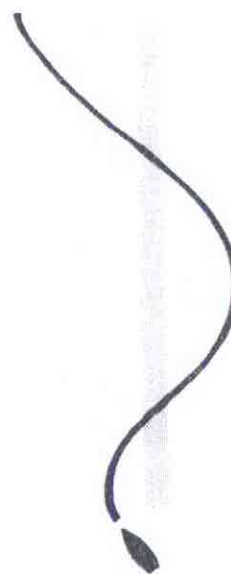
Gain too low.
Boat takes
a long time
to come back on
to heading



Ideal.
Errors from
heading are
quickly
corrected



Gain high.
Boat continually
oscillates through
required
heading



Gain Excessive.
Tendency to
instability of
course, with
increasing error

It is important not to confuse too high a gain with the natural yawing of the boat allowed in heavy seas. Always allow a minute under autopilot operation before making any assessment of gain as the correct bias (rudder trim) of the helm for steering a straight course may not have been fully applied, and could lead to the false conclusion of too low a gain.

4.2 SEASTATE

The rougher the weather the more variations in heading will be detected. If no account of this were made then overworking of the pilot would result, causing unnecessary drain on the batteries. The Navico Tillerpilot continuously monitors corrections applied to the tiller and allows a "dead band" within which the boat can go off course without corrections being applied. The "dead band" is selected automatically by the built in microcomputer to give the best compromise between course steered and battery consumption.

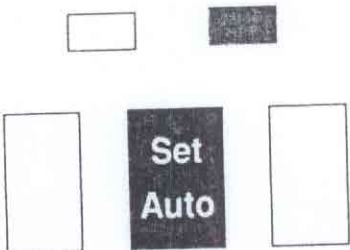
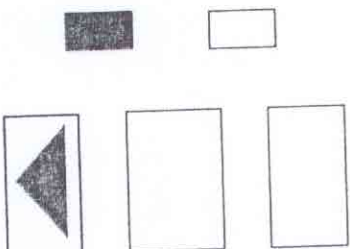
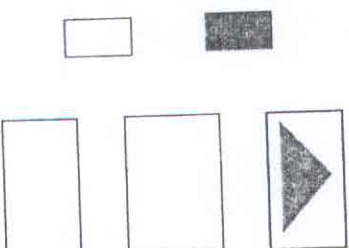
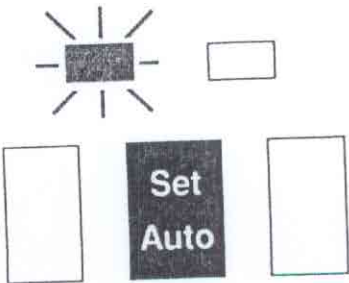
4.3 AUTOTRIM

Under differing conditions a bias of the tiller (sometimes known as standing helm, or rudder trim) to port or starboard will be required to steer a straight course. The amount of bias depends on many factors such as strength of wind, speed of boat and amount of sail set. If no account were made of this then the boat would tend to veer off to one side or the other eventually oscillating about a heading offset by a number of degrees to that required.

The internal computer of the Navico Tillerpilot continuously monitors the average course error and applies a bias to the tiller to compensate until the ideal condition is reached. It applies the bias gradually so as not to upset the normal automatic pilot performance, and may take up to a minute or so to fully compensate for changing tack. Once the compensation is applied the computer will continue to monitor even small changes in condition that take place and continue to apply trim automatically.

The Tillerpilot is factory set for mounting on the starboard side. If you require port hand mounting then the unit can be reconfigured by following the procedure below. You will only need to do this once as the setting will be memorised by the unit and retained even after disconnection from the power supply.

5.1 CHANGING MOUNTING CONFIGURATION OF TILLERPILOT.

 <p>The diagram shows a control panel with a 'Set Auto' button in the center. Above it are two small indicator lights, one on the left and one on the right. Below the button are three larger rectangular buttons: one on the left, the 'Set Auto' button in the center, and one on the right.</p>	<p>Hold down the set/auto key and connect Tillerpilot to 12 Volts (ensure key is held down before and during power connection). Auto indicator confirms Tillerpilot set for starboard mounting (note: if port hand mounting had previously been set, then set indicator would confirm).</p>
 <p>The diagram shows the control panel with the 'Set Auto' button in the center. Above it are two small indicator lights, one on the left and one on the right. Below the button are three larger rectangular buttons: one on the left with a left-pointing arrow, the 'Set Auto' button in the center, and one on the right.</p>	<p>Press the port key if port hand mounting required. Set indicator confirms Tillerpilot now set for port hand mounting.</p>
 <p>The diagram shows the control panel with the 'Set Auto' button in the center. Above it are two small indicator lights, one on the left and one on the right. Below the button are three larger rectangular buttons: one on the left, the 'Set Auto' button in the center, and one on the right with a right-pointing arrow.</p>	<p>Press the starboard key only if starboard mounting is to be reselected. Auto indicator will confirm.</p>
 <p>The diagram shows the control panel with the 'Set Auto' button in the center. Above it are two small indicator lights, one on the left and one on the right. Below the button are three larger rectangular buttons: one on the left, the 'Set Auto' button in the center, and one on the right.</p>	<p>When correct mounting has been selected press set/auto to revert the Tillerpilot to normal operation in the Set mode.</p>

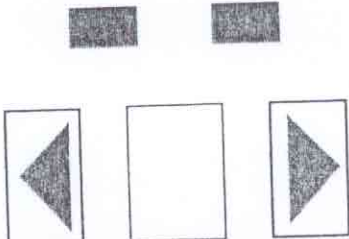
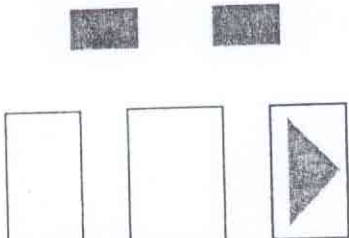
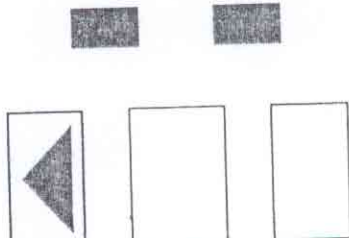
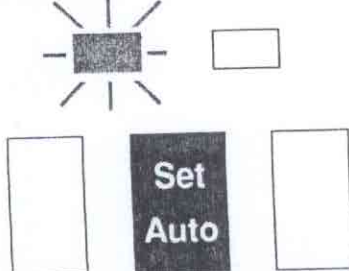
The Tillerpilot gain has been factory pre-set to give the best compromise for steering a large range of yachts provided that the unit has been mounted at the recommended distance from the rudder pivot point. However, there may be occasions where a particular installation may benefit from a change of gain. Unless the function is fully understood it is advisable to leave as factory set (refer to Section 4.1 for detailed explanation of gain).

The Tillerpilot **TP1800** have 9 settings of gain.

1 = lowest ie: smallest movements of actuator

9 = highest ie: largest movements of actuator

The Tillerpilot is factory pre-set to gain = 5.

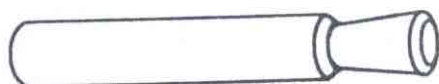
6.1	CHANGING GAIN OF TILLERPILOT
	<p>Hold down port and starboard keys and connect Tillerpilot to 12 Volts (ensure keys held down before and during power connection). A repeated sequence of beeps is emitted. The number of beeps in the sequence indicates the gain. Both indicators will illuminate continuously to confirm this mode has been selected.</p>
	<p>Increases gain by one for every press of the key.</p>
	<p>Decreases gain by one for every press of key.</p>
	<p>When correct gain has been selected press set/auto to revert pilot to normal operation - standby-mode, compass selected. The setting of gain will now be memorised by the Tillerpilot, even after disconnection from power supply.</p>

SYMPTOM	PROBABLE CAUSE	REMEDY
When engaged, pilot immediately applies large tiller angle and increases course error.	Wrong (port or starboard side) installation setting	Read Section 5.
After working normally course suddenly lost and Tillerpilot goes into set-mode.	Power interrupted and restored or low voltage Cable to batteries too small a size. Intermittent connection.	Increase size of cable. Check all connections. Charge batteries.
Helm is hard over and alarm is continuously on.	Steerage way insufficient to control course, or sails are aback. Pulsing is a correct safety feature when rod is at full travel.	Reset the vessel on course
Power socket live but no indicator light.	Incorrect polarity connection.	Check polarity.

TILLERPILOT - SPARE PARTS

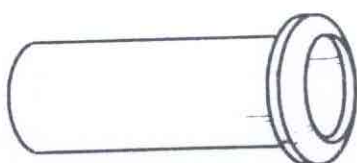
Description

Navico Part Number



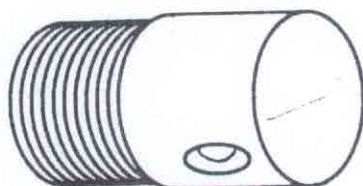
Tiller pin

E00098



Mounting cup

E00099



Push rod end

E00111

SERVICE AND WARRANTY

Your Tillerpilot should seldom need servicing, but will benefit from a seasonal smear of silicone grease on the pushrod.

The instrument is guaranteed for 12 months from date of retail sale. If it is necessary to have the unit repaired, return it, carriage prepaid to the agent in the country of purchase with a copy of the receipted invoice showing date of purchase. Where possible return all the components unless you are certain that you have located the fault. If the original packing is not available, cushion well; the shock loading of freight handling can be very different from the marine environment for which the instrument is designed.

If a fault occurs outside the country of purchase, return the unit to the official NAVICO agent in the country of use. The appointed agent will rectify the fault and make a charge for labour, return carriage and packing. Any component that has failed under the terms of the warranty may be replaced free of charge.

A list of official NAVICO distributors and service centres is available upon request.

Navico Limited

Star Lane, Margate, Kent CT9 4NP, UK
telephone: (0843) 290290
facsimile: (0843) 290471

Navico INC

11701 Belcher Road, Suite 128, Largo, FL 34643, USA
telephone: (813) 524 1555
facsimile: (813) 524 1355

Navico France SARL

Urba Parc 3, 75 Rue Rateau, 93210 La Courneuve
telephone: (1) 48.35.48.05
facsimile: (1) 48.35.38.83

