Manual

Navico TP20 & TP30 Tillerpilots

SIMRAD
A KONGSBERG Company

For service and advice please contact the main Simrad dealer in your country of residence.

MDL 2/12/98

CONTENTS

1 General

1.1 Introduction

The TP20 & TP30 Tillerpilots from Simrad are suitable for a wide variety of tiller steered sailing yachts up to 12.8M (42 Ft) in length.

Combining highly sophisticated electronics with advanced software and a powerful mechanical drive, it is capable of providing reliable and accurate steering performance under a variety of different conditions with minimal current consumption.

The Tillerpilots have been designed so that, while they represent the state of the art in marine autopilots with many advanced features, they remain very simple to operate, using only five keys to access all functions.

Sophisticated functions available include Sail To Wind Mode and Navlock Mode (Steer To GPS) using external equipment linked directly to the Tillerpilot through the inbuilt NMEA0183 interface.

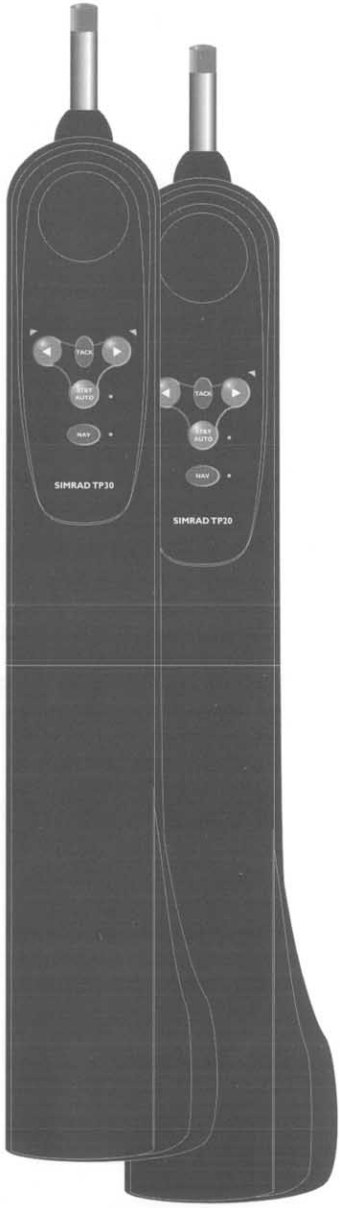
There is also the option to operate the Tillerpilot remotely, either using the simple HR20 Hand Remotee. For more details, refer to the separate instruction card supplied with this unit.

To ensure the best results from your Tillerpilot it is essential that the unit is installed correctly. Please read this manual thoroughly before installation.

Thank you for choosing Simrad

If you are pleased with your Tillerpilot we hope you will be interested in our range of marine electronic equipment, which is manufactured to the same high standards as the Tillerpilot. Please contact your nearest Simrad Agent for a catalogue showing our increasing range of high tech navigational instruments, GPS, CHart Plotters, autopilots, Radar, Fishfinders and VHF radio sets.

Simrad operate a policy of continual development and reserve the right to alter and improve the specification of their products without notice.



Tillerpilots TP20 & TP30

1.2 Technical Summary

TILLERPILOT SPECIFICATIONS

	TP20	TP30
Drive System	*Screw Thread*	*Recirculating Ballscrew*
Hardover time 0kg	*6.9 secs*	*4.0 secs*
20kg	*8.0 secs*	*4.7 secs*
40kg	*12.0 secs*	*6.0 secs*
50kg		*8.0 secs*
Peak Thrust	*65kg (143lbs)*	*85kg (187lbs)*
Operating Stroke	*250mm (10in)*	
Supply Voltage	*12v DC (10v-16v)*	
Power Consumption (Typical)	*0.06A (Stby)* *0.5A (Auto)*	
Mounting	*Starboard as default (Can be reversed)*	

Fig 1.1 - Tillerpilot dimensions

1.3 The Complete Navigation System

The TP20 and TP30 are fully compatible with the Navico Corus instrument system, so not only do they operate as a stand alone autopilot, but by connecting it to a Corus instrument network, they can form part of a complete navigation system, offering additonal functions such as connection to an external compass, wind sensor or navigational receiver, as well as additional remote control options. For more details, contact Simrad Navico at the address on page 2.

The new range of IS15 instruments from Simrad will interface with the T20 & TP30 to provide wind information and (when connected to a GPS) crosstrack error and bearing to waypoint information. Please refer to the relevant IS15 manual for further information

2 Operation

2.1 General

The keypad of the Tillerpilot has been designed to be as simple and intuitive to operate as possible. Using only five keys (Fig 2.1) it is possible to perform precise course adjustments and navigational functions.

Fig 2.1 - Tillerpilot keypad

The unit powers up in Standby Mode, indicated by a flashing LED next to the **STBY AUTO** key (Fig 2.2). The two direction LEDs above the Port and Starboard keys are always dimly lit, which provides night illumination for the keypad. All functions are confirmed audibly by a "beep" and visually by the LEDs, so the status of the unit can always be confirmed at a glance.

2.2 Autopilot Mode

While in Standby Mode, the pushrod can be manually driven in and out by pressing the arrowed **Port** and **Starboard** keys, which allows "power steering" of the vessel.

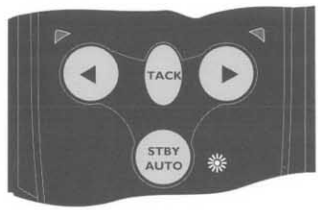


Fig 2.2 - Standby Mode

To engage Autopilot Mode, simply press the **STBY AUTO** key, and the Tillerpilot will lock onto the current course. The LED next to this key will stop flashing and remain permanently lit as long as the pilot is in Autopilot Mode (Fig 2.3). To lock the pilot onto the desired course, either steer the correct course and then engage the autopilot, or engage the autopilot and then adjust the heading until the correct course is being sailed (see section 2.3). If the **STBY AUTO** key is pressed and held, the pilot will beep a second time and lock onto the previously used heading (this feature will not be available if the unit has just been switched on).

Fig 2.3 - Engaging Autopilot Mode

2.3 Adjusting Course

While in Autopilot Mode, precise course adjustments can be easily made. By pressing either the **Port** or **Starboard** key once, a 1º course adjustment will be made in the specified direction. This is confirmed by a single beep, and the relevant Port or Starboard LED will flash once. By pressing and holding the key, 10º course adjustments will be made, confirmed by a double beep and a double flash of the Port or Starboard LED (Fig 2.4).

Fig 2.4 - Course adjustment to Port

N.B - When in NavLock Mode (see section 3.1), the Tillerpilot will gradually return to the original track.

2.4 Autotack

The Tillerpilot has a built-in autotack facility, allowing easy tacking of the vessel when single or short handed. An autotack is only possible when in Autopilot Mode

To initiate autotack, press and hold the **Tack** key, followed by either the **Port** or **Starboard** key, depending on which direction you wish to tack (Fig 2.5).

The operation of the Tillerpilot will differ during an autotack depending on whether the pilot is in Sail To Compass or Sail To Wind Mode:

2.5.1 Autotacking In Compass Mode

If in Sail To Compass Mode (default), the Tillerpilot will then tack the vessel in the selected direction. The WP30 has a factory preset autotack angle of 100°, how ever this can be adjusted to any value between 40 and 140° using either a C600AD Active Display (configured to PILOT) or a CP600 Corus Programmer. Please refer to the relevant unit's instruction manual for more details.

2.5.2 Autotacking In Wind Mode (Section 3.2)

The Tillerpilot will only allow an autotack if the apparent wind is less than 90° i.e autotack is disabled if sailing downwind. The Tillerpilot will tack the vessel through to the same apparent wind angle, but on the opposite tack.

NB - In this mode, the Tillerpilot automatically pre vents tacking in the wrong direction eg, If on Port tack, only an autotack onto Starboard tack will be possible.

In all cases, the autotack is confirmed by a long beep, with the relevant Port or Starboard LED flashing during the course change.

2.5.3 NavLock (Section 3.1)

The autotack facility is disabled while in NavLock mode.

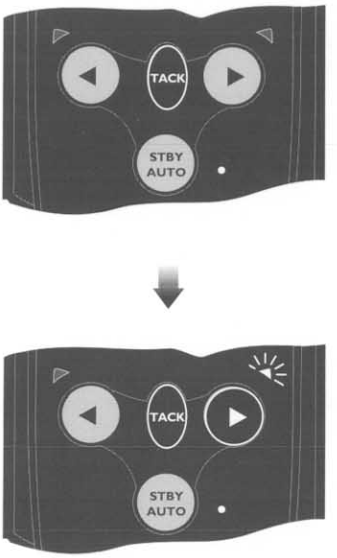


Fig 2.5 - Initiating Starboard autotack

2.5 Tiller Movement (Gain)

The Tillerpilot will apply adjustments to the tiller in order to compensate for heading variations, the amount of movement being proportional to the heading error detected by the compass unit. The amount of movement is set by the **Gain** (sometimes referred to as the rudder ratio).

The Gain setting can be likened to driving a car - at high speeds, very little wheel movement is necessary to steer the car (LOW gain). When driving at slow speeds, more wheel movement is necessary (HIGH gain).

Fig 2.6A shows the effect of setting the Gain too low: the vessel takes a long time to return to the correct heading. Fig 2.6B shows the ideal setting, where errors are quickly corrected. Fig 2.6C illustrates the effects of setting the Gain too high, which causes the vessel to oscillate around the correct heading. Excessive Gain (Fig 2.6D) creates a tendency to instability of course, leading to increasing error.

The Gain setting can be adjusted manually - see section 4.2. Additionally, if Speed data is available (through Corus or NMEA), the Tillerpilot will automatically optimise the Gain within the manually set value.

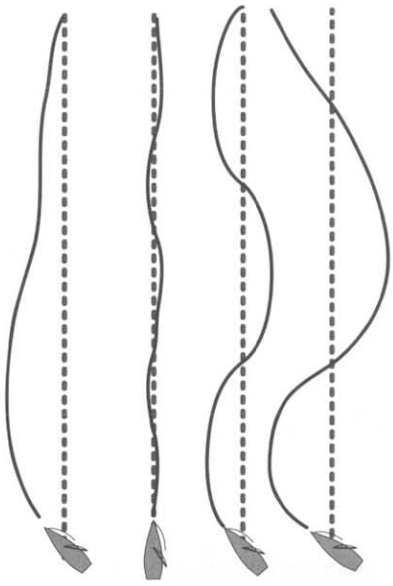


Fig 2.6 - Effects of Gain setting

2.6 Seastate

In rough weather, more variations in heading will be detected by the Tillerpilot due to the heavy seas yawing the vessel. If no account of this was taken, then the Tillerpilot would be overworked, causing unnecessary strain on the unit and excessive drain on the batteries. The Tillerpilot will continuously monitor corrections applied to the tiller over the course of a voyage, and allow a "dead band" within which the boat can go off course without corrections being made. The dead band is automatically set and updated by the Tillerpilot to give the best compromise between course holding and battery consumption. However, this can be manually set if so desired. To manually adjust the Seastate, please refer to section 4.4.

2.7 Autotrim

Under differing conditions a tiller bias (sometimes known as standing helm or rudder trim) is applied in order to steer a straight course. An example is when sailing close hauled where the vessel will normally pull into the wind, and the helmsman applies a standing helm to leeward in order to maintain course. The amount of this standing helm varies according to factors such as strength of wind, boat speed, sail trim and amount of sail set. If no account of these were taken, then the vessel would tend to veer off course, or pull round head to wind if sailing close hauled.

The Tillerpilot continuously monitors the average course error and applies a bias to the tiller to compensate until the optimum condition is reached. This bias or standing helm is applied gradually, so as not to upset the normal performance of the Tillerpilot. Thus, it may take up to a minute or so to fully compensate after changing tack. Once optimum trim is reached, the pilot will still monitor for changes in the prevailing conditions and update the trim accordingly.

3 Advanced Features

The TP20 and TP30 Tillerpilots contain many advanced features, one of which is the ability to accept course data from a variety of sources apart from the internal fluxgate compass, including NMEA compatible navigational receivers (GPS etc) and windvanes. An external compass option is also available via the inbuilt Corus network connection, which can also accept wind and navigational data from the relevant Corus active transducers.

Section 3 describes in detail the advanced facilities available with the Tillerpilots when interfaced with other equipment.

3.1 NavLock™

The TP20 and TP30 has a built in NMEA interface which allows direct connection with NMEA0183 compatible equipment such as GPS and Plotters.

Once interfaced with navigation equipment via NMEA, the Tillerpilot can steer using data from this source in addition to the internal compass, allowing a highly accurate course to waypoint.

To access NavLock the unit must be in Autopilot Mode. Simply activate a waypoint or route programmed into the navigational receiver, and press the **NAV** key. The LED next to the **NAV** key will light and the Tillerpilot will steer to the first waypoint, using Cross Track Error and Bearing To Waypoint information from the navigational receiver to maintain an accurate course.

On arrival at the target waypoint an intermittent alarm will sound. As a safety feature to avoid an unexpected course change, the next waypoint will not be automatically loaded until the **NAV** key is pressed. When the vessel reaches the final waypoint, the Tillerpilot will continue its current course under Compass Mode.

Note that some of the standard key stroke functions may have a different effect in NavLock than when in Compass Mode. Please refer to sections 2.5.2 and 2.5.3

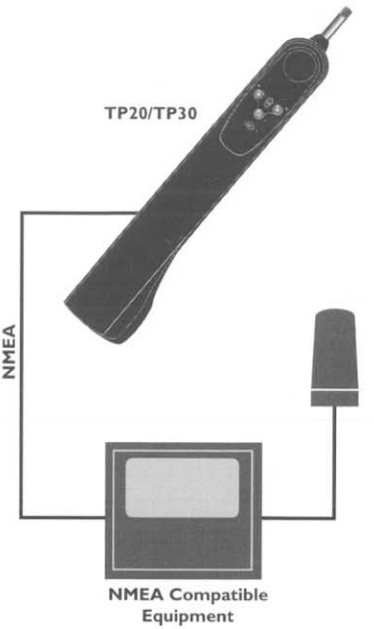


Fig 3.1 - Interfacing via NMEA

Fig 3.2 - Initiating NavLock

3.2 Sail To Wind

The TP20 and TP30 are able to sail to the apparent wind angle rather than a compass course, using wind data via the NMEA interface. The use of a Simrad IS15 wind instrument is recommended.

If no wind information is present, the Tillerpilot will not enter Sail To Wind Mode.

To select Sail To Wind Mode, the unit must be in Autopilot Mode. To enter Sail To Wind Mode, press and hold both the **Port** and **Starboard** keys together until a double beep is heard (Fig 3.3). Both the Port and Starboard LEDs will flash simultaneously while the pilot is in Sail To Wind Mode.

Fig 3.3 - Selecting Sail To Wind Mode

To switch back to Compass Mode, simply press and hold the **Port** and **Starboard** key together again until a double beep is heard.

While in Sail To Wind Mode, engaging the autopilot will lock the Tillerpilot onto the current apparent wind angle being sailed. Any course adjustments made will be relative to the apparent wind angle, rather than the compass heading as when in Compass Mode. Please note that some of the standard key stroke functions may have a different effect in Sail To Wind Mode than when in Compass or NavLock Mode. Refer to section 2.5.3 for more details.

Note that NavLock cannot be selected while in Sail To Wind Mode - to initiate, first return to Compass Mode.

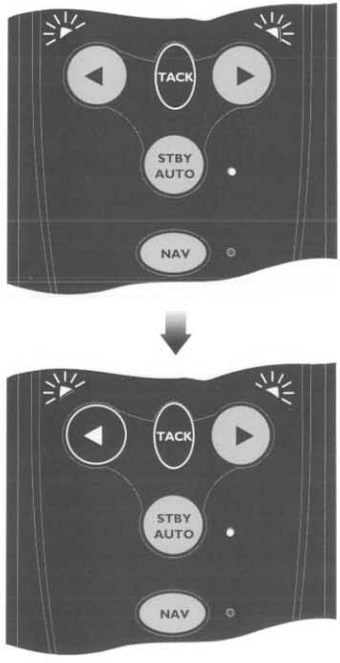


Fig 3.4 - Initiating Port Autotack in Sail To Wind Mode

3.3 Using External Compass

Normally, the accurate operation of a self-contained autopilot is very difficult on a ferrous hulled boat (steel, ferro cement etc) as the hull will affect the bearing read by the internal fluxgate compass.

Although the TP20 and TP30 Tillerpilots operates using a built-in fluxgate compass, they have the facility to accept data from an external source - the Navico Corus ATC600 active compass.

On a steel or ferro hulled boat, the correct location for the ATC600 would be on the mast, between 1 and 2 metres above the deck (Fig 3.5). On a non-ferrous hulled boat, the ATC600 should be situated low down ,as near the centre point of the boat as possible, but away from any sources of magnetic interference such as speakers etc.

The ATC600 is connected to the Tillerpilot via the Navico Corus Network connection. Note that in order to operate, the ATC600 will require a separate 12v power supply through a CPC02 or CPC05 power cable.

Once connected, the Tillerpilot will automatically accept bearing data from the ATC600 active compass transducer in preference to the internal fluxgate compass.

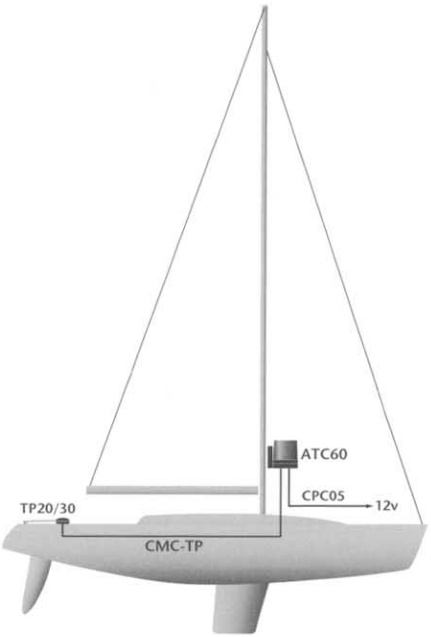


Fig 3.5 - Using TP20 / TP30 with external compass

4 Configuration

4.1 Porthand Mounting

Although the Tillerpilot is factory preset for Starboard side mounting, it is possible to reconfigure it for mounting on the Port side of the cockpit, to facilitate easy installation on most types of yacht.

With the power off, hold down the **NAV** and **TACK** keys and switch on the power. Either the Port or Starboard LED will illuminate, depending on the current mounting configuration. Press the **PORT** key to select Port side mounting. The Port LED only will remain illuminated to indicate selection. Confirm selection and exit to Standby Mode by pressing **NAV**. (Fig 4.2)

To select Starboard mounting, repeat the above procedure, but press the **Starboard** key instead of **Port**.

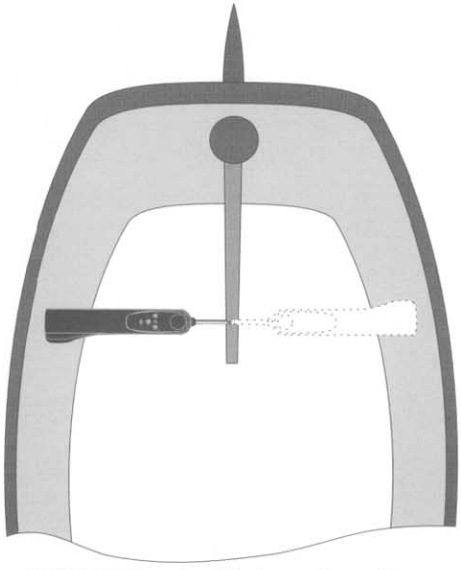


Fig 4.1 - Starboard and Port mounting options

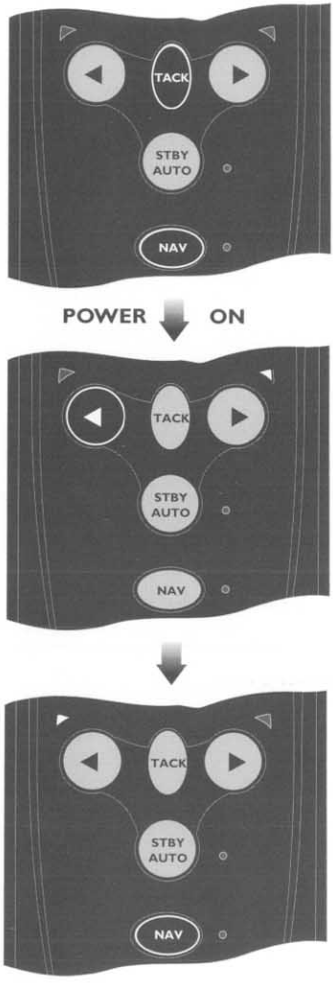


Fig 4.2 - Configuring for Port mounting

4.2 Calibration Mode

To adjust the Gain and Seastate settings of the Tillerpilot (refer to sections 2.5 & 2.6), it is necessary to enter Calibration Mode, which can be done whilst the Tillerpilot is in either Standby or Autopilot Mode.

Press and hold the **TACK** key, followed by the **NAV** key (Fig 4.3). The Starboard green LED will illuminate to indicate that the pilot is in Gain Mode. To toggle between Gain and Seastate Mode, press the **TACK** key (Fig 4.4). The Port red LED will illuminate to indicate Seastate Mode.

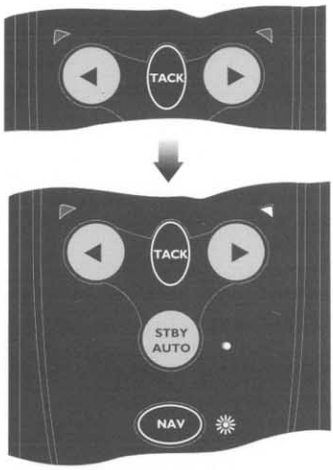


Fig 4.3 - Entering Calibration Mode

4.3 Adjusting Gain

When Gain Mode is selected (indicated by the Starboard green LED illuminated), the Nav LED will flash and a repeated sequence of beeps will be heard. The number of flashes and beeps in the sequence indicates the level of the Gain setting.

To increase the Gain press the **Starboard** key the required number of times, to a maximum level of 9 (Fig 4.5). To decrease the Gain press the **Port** key the required number of times, to a minimum level of 1.

For example, if the Gain was set at 4 (indicated by a sequence of four flashes of the Nav LED and four beeps), and the Gain needed to be increased to 7, pressing the **Starboard** key three times would adjust the Gain accordingly. The Nav LED would then flash seven times and seven beeps would be heard.

Fig 4.4 - Toggling between Adjust Gain and Seastate

4.4 Adjusting Seastate

When adjusting Seastate (indicated by the Port red LED illuminated), the Seastate level is indicated by the number of audible beeps and flashes of the Nav LED. No beeps or flashes of the Nav LED indicates that the Tillerpilot is set to automatic seastate (see section 2.6).

To switch from Manual to Auto Seastate and increase the Seastate level, press the **Starboard** key the required number of times to a maximum level of 9. To decrease the Seastate press the **Port** key the required number of times, to a minimum level of **0** - which will switch the Tillerpilot back to Auto Seastate.

To confirm Gain/Seastate settings and return to Standby Mode, press the NAV key.

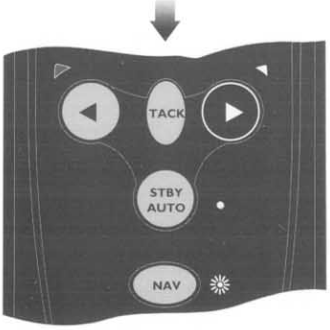


Fig 4.5 - Increasing Gain level

5 Installation

5.1 Fitting Tillerpilot

The Tillerpilot is a very sophisticated piece of equipment, and therefore in order for it to function to its full capabilities, it is essential that it is installed correctly. Please read this section thoroughly before attempting installation and use.

The Tillerpilot should be installed so that it is level (horizontal - Fig 5.2), and 90º to the tiller when it is amidships and the pushrod is in the midstroke position (Fig 5.3). The pilot is factory preset to be mounted on the Starboard side as shown, but this can be reconfigured for Port side mounting (see section 4.1).

The dimensions given in Figs 5.2 & 5.3 should be adhered to as far as possible, especially Fig 5.2. Some tolerance on the distance from tiller stock (Fig 5.3 dimension) is permissible, but the Tillerpilot may require a Gain adjustment to compensate (see section 4.3). If the dimension given in Fig 5.2 is not practical for the vessel to which it is to be fitted, a range of fitting accessories are available to facilitate correct installation. Please refer to section 6.4.

The Tillerpilot houses an internal fluxgate compass, and should therefore be mounted away from sources of magnetic interference, such as the vessel's steering compass. The minimum safe distance is 1M (3Ft).

The Tillerpilot is mounted using a supplied tiller pin and mounting cup, which allows the unit to be fitted and stowed easily.

To fit the tillerpin, drill a 6.3mm ($^1/4$ in) hole in the tiller (ensure that this is on the centreline of the tiller and is vertical). Drill to a depth that allows only the top 18.0mm ($^3/4$ in) to protrude. Fix in place using an epoxy adhesive.

To fit the mounting cup, drill a 12.7mm ($^1/2$ in) hole into the cockpit seat and mount so that only the flange protrudes. Ensure that the cup is a tight fit (use an epoxy adhesive), and is supported over its entire depth. If necessary, reinforce the underside of the cockpit seat with hardwood or marine plywood.

NOTE - Due to the high loads exerted, do not fit the Tillerpilot to the mounting cup and pin until the adhesive has completely set.

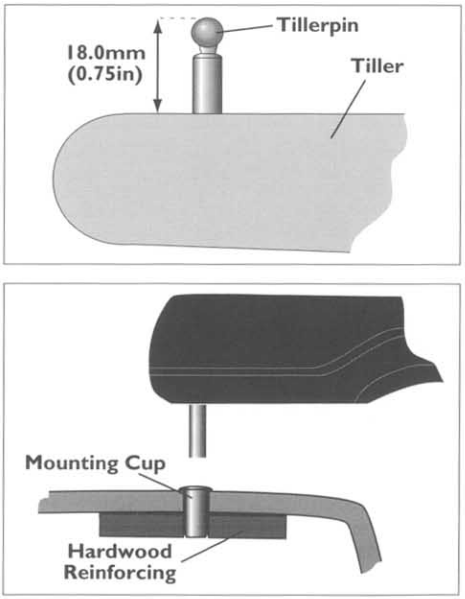


Fig 5.1 - Tillerpin & mounting cup

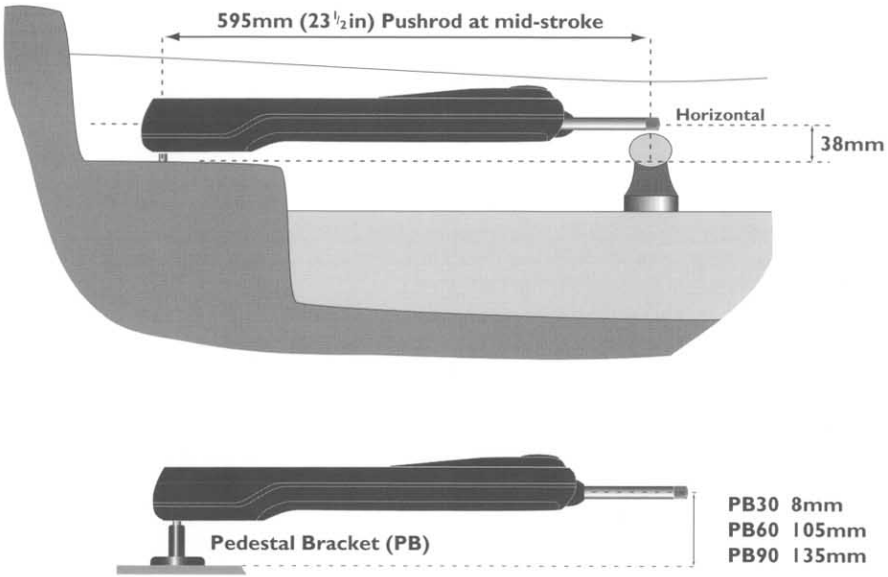


Fig 5.2 - Installation, cross section

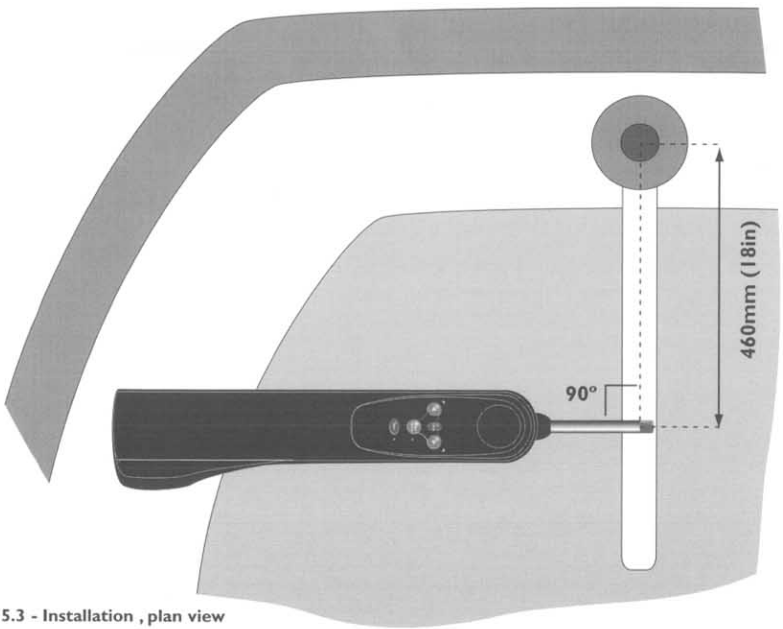


Fig 5.3 - Installation , plan view

5.2 Electrical Installation

The Tillerpilot operates from a 12v DC supply. It is supplied with a high quality six pin waterproof connector ready fitted, which is used to supply the power, NMEA and (where appropriate) Corus data. The mating 6-pin bulkhead socket is also supplied with the unit.

The six pin bulkhead socket should be mounted in a convenient position close to where the Tillerpilot is to be fitted, and wired in accordance with Fig 5.4.

Important - If the vessel has more than one separate battery bank, when connecting the Tillerpilot to the power supply always ensure that the pilot and all interfaced equipment - whether Corus or NMEA - are connected to the same battery bank, even though they each have independent connections to the switch panel. This is to avoid a possible voltage drop between the interfaced equipment which would render the equipment inoperative.

Pin No.	Wired To
1	+12v DC
2	0v
(3	*Corus Green)*
(4	*Corus White)*
5	NMEA0183 Com
6	NMEA0183 Data

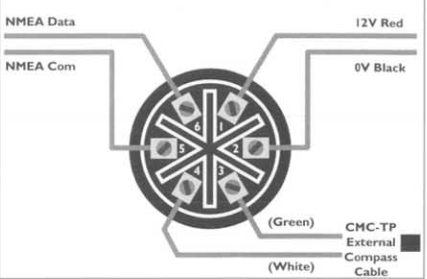


Fig 5.4 - Six pin socket connections - rear view

* Mount the bulkhead socket on a vertical surface to prevent standing water gathering around or in the socket. Always fit the protective cap when the pilot is not plugged in.

* Use a suitable gauge cable for the run from the socket to the supply (see Fig 5.5).

* Connect to the vessel's switch panel via a 10 Amp fuse or breaker.

* Do not fit other electronic or electrical equipment to this cable, or "tap into" the supply from a nearby cable - always wire each piece of equipment to its own breaker in the switch panel.

* Ensure all wire ends are tinned, and any connections are well made. Poor contact will result in loss of thrust from the Tillerpilot and slower speed of response.

* If in any doubt, employ a qualified engineer to install the equipment.

Length of Cable Run	Cross Section Area	Conductor Type	AWG
Under 4M (13Ft)	1.5mm^2	30/0.25	16
4-8M (27Ft)	2.5mm^2	50/0.25	14

Fig 5.5 - Cable selection table

The Tillerpilot is linked to the ATC600 external compass via a connecting lead CMC-TP (not supplied), which is wired to the Tillerpilot bulkhead socket's Corus input (terminals 3 & 4), and then plugged into the Compass.

The CMC-TP is used purely to supply Corus data to the Tillerpilot, and does not carry any power supply. The ATC600 must always have it's own 12v power supplied via a CPC02 or CPC05 Corus Power Cable.

5.3 Interfacing Via NMEA

The Tillerpilot's state-of-the-art electronics include a built-in NMEA processor, which means that NMEA0183 compatible equipment can be connected directly to the Wheelpilot, without any need for a separate interface unit (Fig 5.6).

Due to the vast number of different manufacturers and models of navigational equipment, Simrad cannot guarantee correct operation and installation of this equipment. Therefore, before connecting any equipment to the Tillerpilot it is important that the unit's manual is referred to with regard to interfacing via NMEA.

When connecting to the Tillerpilot's NMEA interface, two wires are used - a DATA wire and a COMMON (Com) wire. These should be connected to the six-pin bulkhead socket as follows:

Pin No.	Wired To
5	NMEA-Com (-)
6	NMEA-Data (+)

It should be noted that some manufacturer's equipment does not have a dedicated Common connection. In this case, the DATA connection will usually be labelled NMEA OUT, and the NMEA Common connection on the Tillerpilot (terminal 5) should be connected directly to 0v (terminal 2). If in any doubt, refer to the manufacturer, or Simrad's Product Support department for advice.

If a navigational receiver (GPS etc) is connected to the Tillerpilot, it can extract the NMEA sentences necessary for the NavLock function to operate. Other functions such as Sail To Wind may also be available if NMEA0183 compatible equipment transmitting the correct NMEA sentences is interfaced.

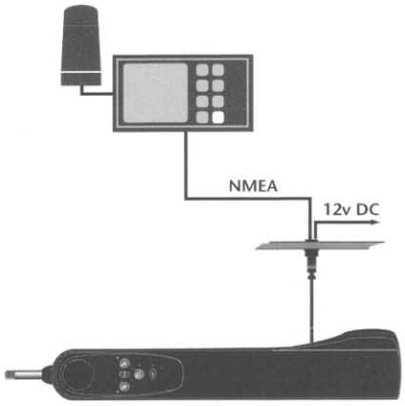


Fig 5.6 - Interfacing to Tillerpilot via NMEA

5.4 NMEA Sentences Received

The NMEA0183 information required for full functionality whilst in NavLock is as follows -

Cross track error

Bearing to destination waypoint

Arrival at waypoint indication

Magnetic Variation

This information is extracted from the following NMEA0183 sentences -

XTE	Cross Track Error and Arrival At Waypoint
BWC	Bearing To Destination Waypoint and Arrival At Waypoint (Great Circle)
BWR	Bearing To Destination Waypoint and Arrival At Waypoint (Rhumb Line)
APA	Cross Track Error, Bearing To Destination Waypoint and Arrival At Waypoint
APB	Cross Track Error, Bearing To Destination Waypoint and Arrival At Waypoint
RMA	Speed Over Ground (SOG) & Magnetic Variation
RMB	Cross Track Error, Bearing To Destination Waypoint and Arrival At Waypoint
RMC	Speed Over Ground (SOG) & Magnetic Variation

NOTE - The Cross Track Error (XTE) information has a maximum value of 1.21 Nautical Miles. If the XTE exceeds this while using NavLock, the Wheelpilot will sound an alarm, exit NavLock Mode and return to Compass Auto Mode.

The TP20 & TP30 also extracts the apparent wind angle from the following NMEA0183 sentences -

VWR	Apparent Wind Speed & Angle
MWV	Wind Speed & Angle

6 Appendix

6.1 Advice On Operation

The Simrad Tillerpilot when used correctly can maintain as good a course, on most points of sail as a skilled helmsman, with the advantage that they never lose concentration where a human may begin to show lapses of concentration after as little as ten minutes.

There are certain circumstances however, where a human pilot has the advantage in being able to anticipate events which no autopilot can sense, typically in a heavy following sea. The following advice should improve efficiency when sailing using Tillerpilot:

1. When sailing close to the wind, it is easy to forget to trim the mainsail, allowing excessive weather helm to build up. Where a human helmsman would quickly complain, the autopilot will struggle on, and the boat will be sailed less efficiently. Whereas a human normally likes to feel some weather helm, this is not necessary for the functioning of the Tillerpilot. Power consumption, wear and drag will be greatly reduced if the mainsail is freed or reefed a little sooner than normal when sailing manually.

2. It is also advisable when sailing close hauled to set a course a few degrees free of that normally sailed under manual control, to avoid luffing into the wind.

3. When running dead downwind, a human pilot can see visual signs warning him if the boat is about to gybe, which the Tillerpilot cannot sense. Therefore, when under autopilot it is advisable not to sail as close to the gybe as you may do when sailing manually.

4. When broad reaching or running fast, particularly with quartering waves, a helmsman will naturally apply periodic larger angles of helm than when beating or sailing slowly. This is the equivalent of increasing rudder Gain, and it may be a good idea to adjust the Gain on the Tillerpilot. Many people prefer to find a compromise setting which is used for all sailing, but with practice it can be optimised for different conditions e.g. low for motoring in a calm sea or high for running fast. If the Gain is set too low, the boat will yaw because insufficient rudder is applied in time; if the gain is too high, the boat will continually overcorrect on each deviation, increasing power consumption.

5. The Tillerpilot is a highly advanced piece of equipment - as such, it is a valuable aid to enjoyable sailing. However, it would be a mistake to become complacent. As with all electronic navigational equipment, it is an **aid** to navigation and should not be used as a substitute for conventional navigational practice. **Remember - Maritime Law* requires that you keep a good look out at all times.**

*IMO International Regulations for Preventing Collisions at Sea, Part B Rule 5 (1972)

6.2 Fault Finding

Symptom	Probable Cause	Remedy
When engaged, the pilot immediately applies a large helm angle and increases course error.	Tillerpilot is configured for Porthand setting but installed on Starboard side (or vice versa).	* Refer to section 4.1.
After functioning normally course is suddenly lost and the Tillerpilot goes into Standby Mode.	* Power interrupted briefly, or low voltage. * Cable used to socket too small. * Intermittent connection.	* Increase size of cable. * Check all connections. * Charge batteries. * Uprate 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 tiller is at full travel.	* Reset the vessel on course and re-engage pilot
Power socket is live, but pilot is not on.	* Socket is wired incorrectly.	* Check wiring of socket (see section 5.2).
Loss of course under Sail To Wind Mode.	* Apparent wind has become too light to give a consistent direction.	* Change to Compass Mode.
Cannot select Sail To Wind Mode.	* Masthead unit is not connected. * Corus system is not switched on. * Required NMEA sentence not being transmitted.	* Fit ATM601 Masthead Unit. * Check Corus Monocable connections. * See section 5.5.
Cannot select NavLock Mode.	* Navigational receiver not connected. * No waypoints have been programmed. * Wrong NMEA format is being used.	* Check NMEA interface connections. * Check NMEA0183 format is being transmitted by navigational receiver.
Autotack function not working.	* Pilot is in NavLock Mode. * Pilot is in Steer To Wind Mode and a) apparent wind is >90... b) autotack being attempted is in the wrong direction.	* Exit NavLock. * Luff up until apparent wind is less than 90....
Pilot exits NavLock before waypoint is reached.	* Cross Track Error has exceeded 1.21 Nm.	* Reset the vessel on course and re-engage NavLock.

6.3 Auto Compass Calibration

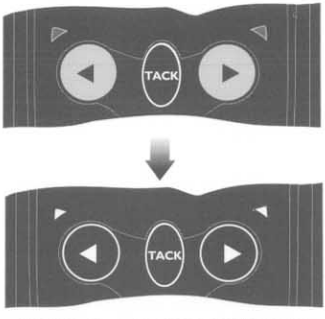


Fig 6.1 - Auto Compass Calibration

Although the Tillerpilot internal compass is extremely accurate, for long distance sailing it may be necessary to calibrate the compass, to compensate for any deviations caused by objects surrounding it on board the vessel.

With the vessel motoring along slowly (2-3 knots) in calm conditions and the Tillerpilot in Standby Mode, press the **Starboard** key a number of times to induce a slow clockwise rotation of the vessel. Press and hold the **TACK** key, followed by the **Port** and **Starboard** keys simultaneously to enter Auto Compass Calibration Mode (Fig 6.1). The Port and Starboard LEDs will both light. Allow the vessel to turn through a minimum of 1 1/4 turns (450°) in approximately two minutes, during which time the fluxgate compass will automatically calibrate itself.

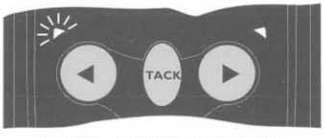


Fig 6.2 - Rate of turn too fast

If the rate of turn or the boat speed is too high, the Port LED will flash (FIg 6.2) indicating that it is necessary to either slow the boat or decrease the angle of turn. If the rate or turn or boat speed is too slow the Starboard LED will flash, indicating that it is necessary to either increase the boat speed or increase the angle of turn. A short beep will indicate that the calibration has been successful, and the Tillerpilot will return to Standby Mode. If the calibration has been unsuccessful after a period of four minutes, a long beep will sound. Try again carefully following the above directions.

Note that this function is only available for auto calibrating the internal fluxgate compass. If an ATC600 external compass is being used, this is calibrated using a separate display head. Please contact Simrad Product Support for more information.

6.4 Spares and Accessories

The following spare parts can be ordered from your local authorised Simrad Technical Dealer. Please quote the relevant part number when ordering.

E02648

Tiller Pin

E00111

Push Rod End

170090

Protective Cover for Bulkhead Socket

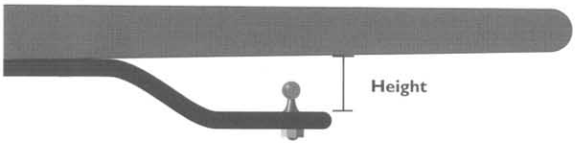
E00099

Mounting Cup

170153

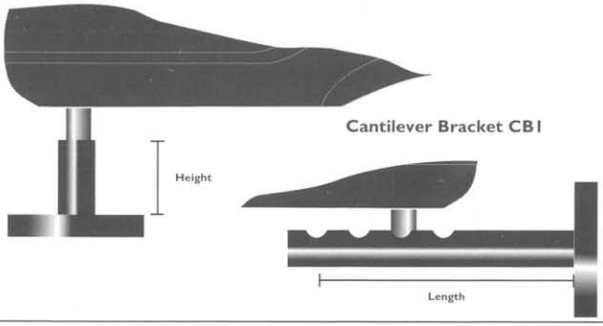
Bulkhead Socket

Tiller Brackets



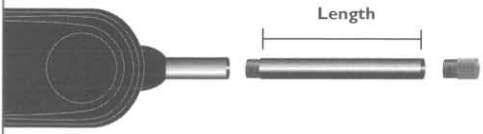
Part No.	Height
TB30	30mm (1.18")
TB60	60mm (2.36")
TB90	90mm (3.54")
TB120	120mm (4.72")

Pedestal & Cantilever Brackets



Part No	Height / Length
PB30	30mm (1.18")
PB60	60mm (2.36")
PB90	90mm (3.54")
CB1	135-240mm (5.31-9.44")

Push Rod Extensions



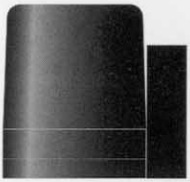
Part No.	Length
PRE30:GY	30mm (1.18")
PRE60:GY	60mm (2.36")
PRE90:GY	90mm (3.54")
PRE120:GY	120mm (4.72")
PRE150:GY	150mm (5.90")
PRE300:GY	300mm (11.81")

HR20

Hand Remote Unit.

ATC600

External
Compass



CMC-TP

Corus interface cable
(5M)

6.5 Service & Warranty

Your Tillerpilot should seldom need servicing, but will benefit from an application of silicone or Teflon grease to the pushrod and connectors each season, and by keeping the connector's protective cover in place when not in use.

The unit 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 the date of purchase. Where possible, return all the components unless you are certain that you have located the source of the fault. If the original packing is not available, ensure that it is well cushioned in packing; the rigours of freight handling can be very different from the loads encountered in the marine environment for which the unit is designed.

For Worldwide Warranty details, please refer to the Warranty Card supplied with this unit.

A list of official worldwide Simrad dealers is included in the Warranty Card.