

SCP 110 Course Computer Installation Guide

531913-2_B



Accessory Manual

Thank You!

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Contact Humminbird Customer Service at **1-800-633-1468** or visit our Web site at **humminbird.com**.

WARNING! *It is the operator's responsibility to make prudent decisions regarding personal safety and the operation of the vessel. Do NOT leave the autopilot unattended while it is steering the vessel. Watch for obstacles and potential hazards at all times. Be prepared to respond to changing conditions and take manual control of the vessel as required.*

WARNING! *The autopilot system should be installed by a Certified Marine Electronics Technician (CMET) or an authorized Marine Electronics Installer (MEI). See NMEA.org for details. Incorrect installation affects the system's performance, which affects the safety of the vessel and its passengers. If you have questions about the installation, please contact Humminbird Customer Service.*

WARNING! *Do NOT use the autopilot where there may be shallow water, obstacles, or when manual navigation is required, especially in the following situations:*

- while navigating or maneuvering in shallow waters or dangerous seabeds,
- while entering or exiting harbor, mooring, or setting sail,
- while traveling at high speed,
- in heavy traffic areas, near breakwaters, canals,
- or while encountering any potential obstacles.

WARNING! *While you are learning to use the autopilot, it is important to practice in calm, open sea, far from shallow water, vessels, or other obstacles.*

WARNING! *This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.*

NOTE: *Disassembly and repair of this electronic unit should only be performed by Humminbird authorized service personnel. Any modification of the serial number or attempt to repair the original equipment or accessories by unauthorized individuals will void the warranty.*

NOTE: *We recommend that you read this manual completely so you understand the installation and operation requirements before you proceed. Keep this manual with you on the vessel for your reference.*

NOTE: *Product specifications, features, and printed materials are subject to change without notice. Humminbird is not responsible for any direct or indirect damage that may occur to people, animals, or things due to the use of its products.*

NOTE: *To purchase accessories or additional equipment, visit our Web site at **humminbird.com** or contact Humminbird Customer Service at **1-800-633-1468**.*

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WEEE compliance may not be required in your location for electrical & electronic equipment (EEE), nor may it be required for EEE designed and intended as fixed or temporary installation in transportation vehicles such as automobiles, aircraft, and boats. In some European Union member states, these vehicles are considered outside of the scope of the Directive, and EEE for those applications can be considered excluded from the WEEE Directive requirement.



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Table of Contents

Installation Overview	1
SCP110 Course Computer	3
Main Power	6
SC110 Control Head	7
FXC110 Fluxgate Compass	8
FB30 Rudder Feedback	9
Linear Rudder Feedback	10
Optional Electro-Hydraulic Unit	11
Optional Linear Drive	13
Optional Second SC110 Control Head	14
Optional TC110 Tiller Control	15
Optional Second TC110 Tiller Control	16
Optional AR32, AR33, AR34 Rudder Indicator	17
Optional Second AR32, AR33, AR34 Rudder Indicator	18
Optional Chartplotter	19
Optional Second Chartplotter / Wind Sensor	20
Heading Output	21
Commissioning Tests	22
FB30 Rudder Feedback	22
Linear Rudder Feedback	22
No Feedback Configuration	22
AR32, AR33, AR34 Rudder Indicator	22
FXC110 Fluxgate Compass	23
Automatic Compensation of the FXC110 Fluxgate Compass	23
Electro-Hydraulic and/or Linear Drive Unit	24
GPS and/or Chartplotter	24
Wind Direction Sensor	24
Specifications	25
SCP110 Course Computer	25
NMEA0183 Ports	25
Supported Sentences	25
Sentences Handling	26
Contact Humminbird	28

Installation Overview

The autopilot is powerful and sophisticated but its reliability strictly depends on the meticulous installation and proper software configuration of all connected devices and optional accessories.

For safety reasons, the best way is to section the power supply of the Course Computer (and so of the whole autopilot) with a switch installed in the electric panel of the vessel, only for this purpose.

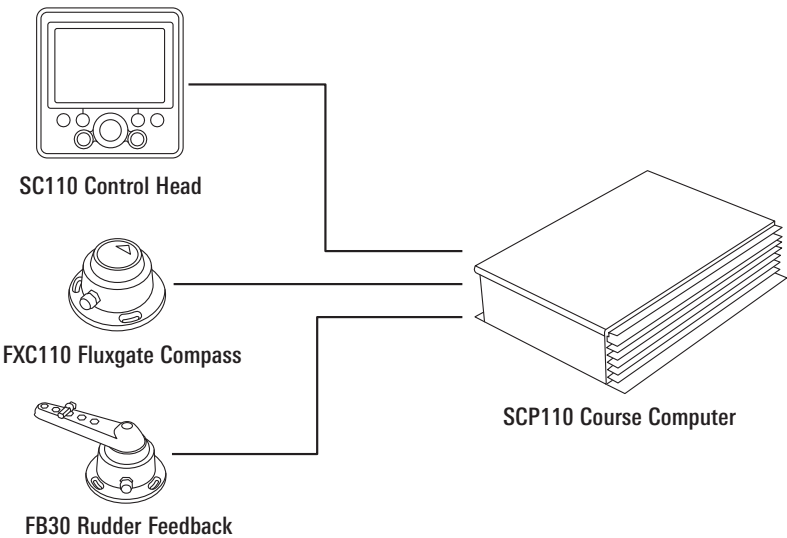
WARNING! When you switch off the Control Head of the autopilot, remember that the rest of the system is still powered. If you want to switch the autopilot completely off, you should use the external switch mentioned above.

WARNING! Before making any electrical connections, be sure that the power supply is switched off.

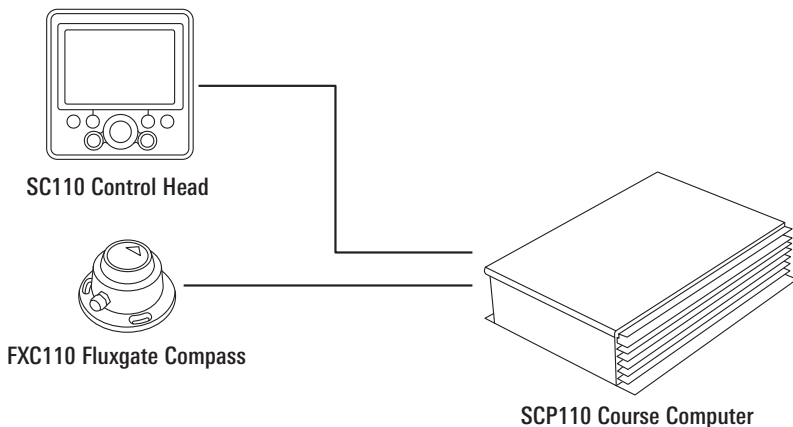
Autopilot Composition

This manual covers three different Autopilot System Configurations:

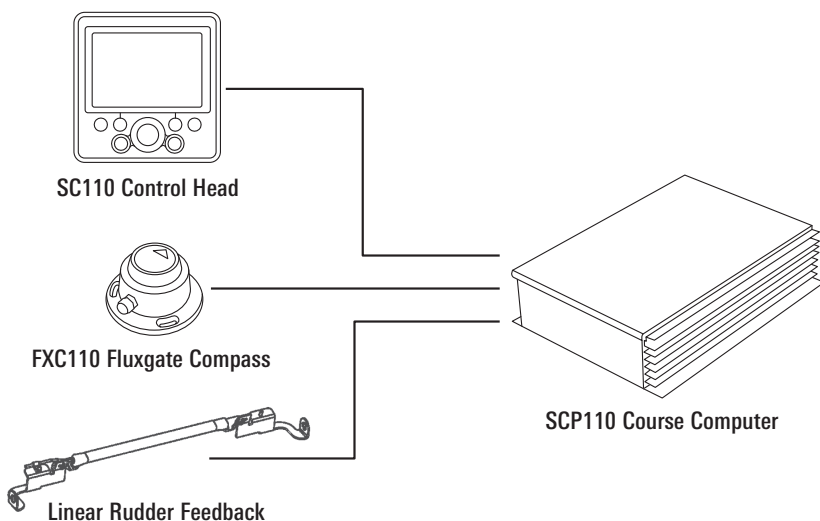
700047-1 SC110 Autopilot System Configuration



700048-1 SC110 Autopilot without Feedback System Configuration



700049-1 SC110 Autopilot for Outboard System Configuration



Mechanical Installation

A mechanical installation should be performed before starting the electrical installation. These are the main steps:

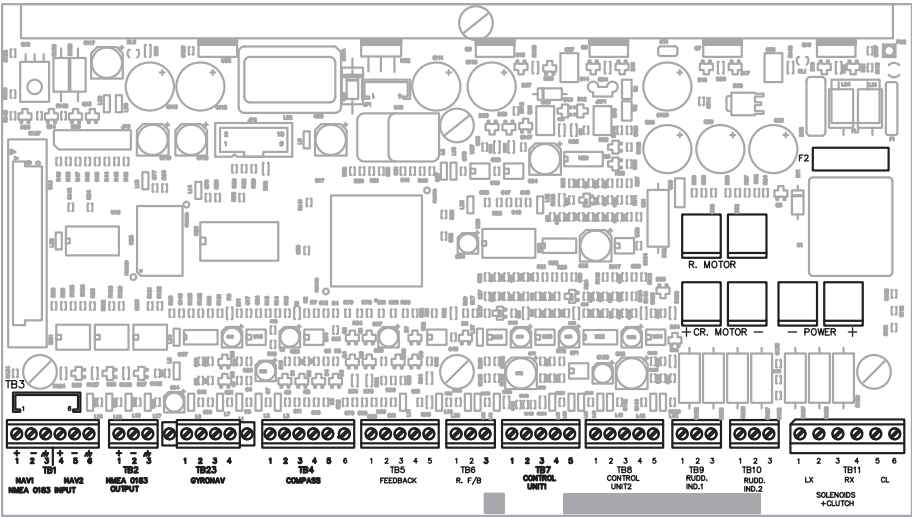
1. Mount SCP110 Course Computer
2. Mount SC110 Control Head
3. Mount FXC110 Fluxgate Compass
4. Mount FB30 Rudder Feedback if present
5. Mount Linear Feedback if present
6. Mount Drive Unit
7. Mount any accessories, if present
8. Route Cables

SCP110 Course Computer

Review the following information to choose a mounting location for the Course Computer:

- Fasten the SCP110 Course Computer to a vertical or a horizontal surface, far away from direct heating, vibrations, and shocks. See the following pages for vertical and horizontal mounting requirements.
- Do NOT mount the Course Computer in the engine-room, bilge area, or other similar locations.
- Do NOT mount the Course Computer in a wet, high humidity, or splash-prone location. It must be mounted in a dry, protected area.
- The mounting location must be a well-ventilated area. If the vessel is provided with a reversing electro-hydraulic actuator, it is necessary to position the Course Computer in a well-ventilated room. In fact, according to the power required by the actuator, it is normal that the Course Computer overheats considerably.
- Install the Course Computer far from radio aerials (a few meters are enough) to avoid interference.
- We also recommend installing it in a place that is easily accessible for technician service or future installation of optional devices.

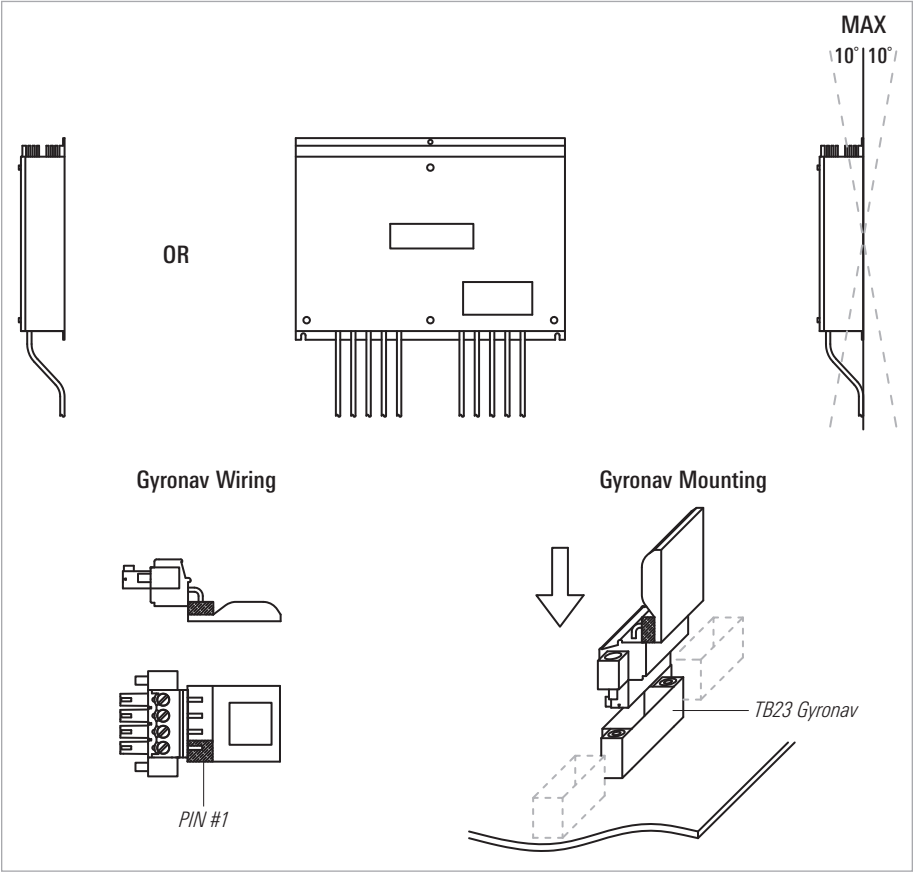
SCP110 Course Computer Electronic Card



This Course Computer has a built-in rate gyro (Gyronav). This sensor is wired to a connector to allow the Course Computer to be mounted on a vertical or horizontal surface. See the following pages in this section for details.

Vertical Mount: The default configuration is for a vertical Course Computer mount as shown below:

SCP110 Vertical Mounting



In a vertical mounting, the Course Computer is oriented horizontally on a vertical surface such as the bulkhead.

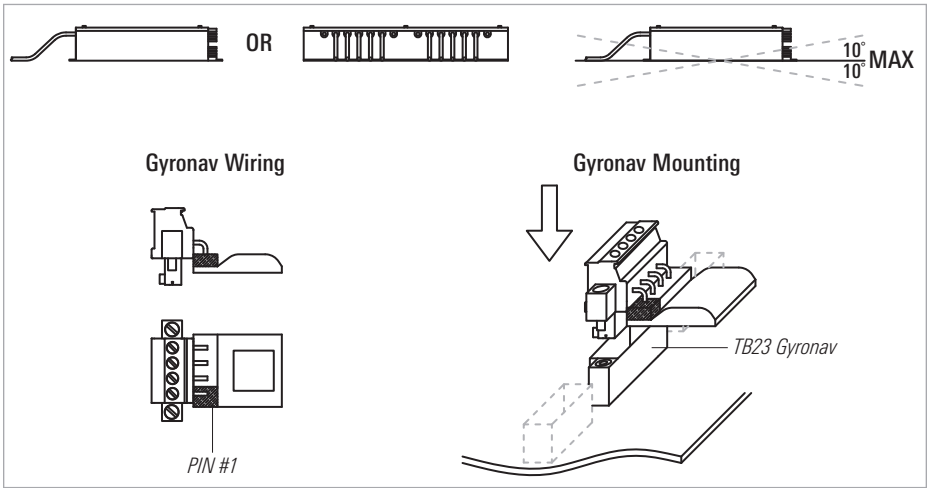
Mount the Course Computer on a stable, flat surface. The removable cover must be secured and face out. The cables must hang down. Confirm that the box is level horizontally.

NOTE: Do NOT mount the Course Computer so that the cables protrude from the right, left, or top. The cables must hang straight down for accurate installation and operation. See the above illustrations for more information.

NOTE: The Gyronav chip must face the sky. See the above illustrations for proper installation.

Horizontal Mount: If you need to install the SCP110 Course Computer horizontally, you must change the connector and the mounting as shown below:

SCP110 Horizontal Mounting



In a horizontal mounting, the Course Computer is mounted on a flat, horizontal surface such as the deck.

Mount the Course Computer on a stable, flat surface. The removable cover must be secured and face up. The Course Computer will not work if it is mounted hanging overhead. Also, confirm that the box is level. See the above illustrations for more information.

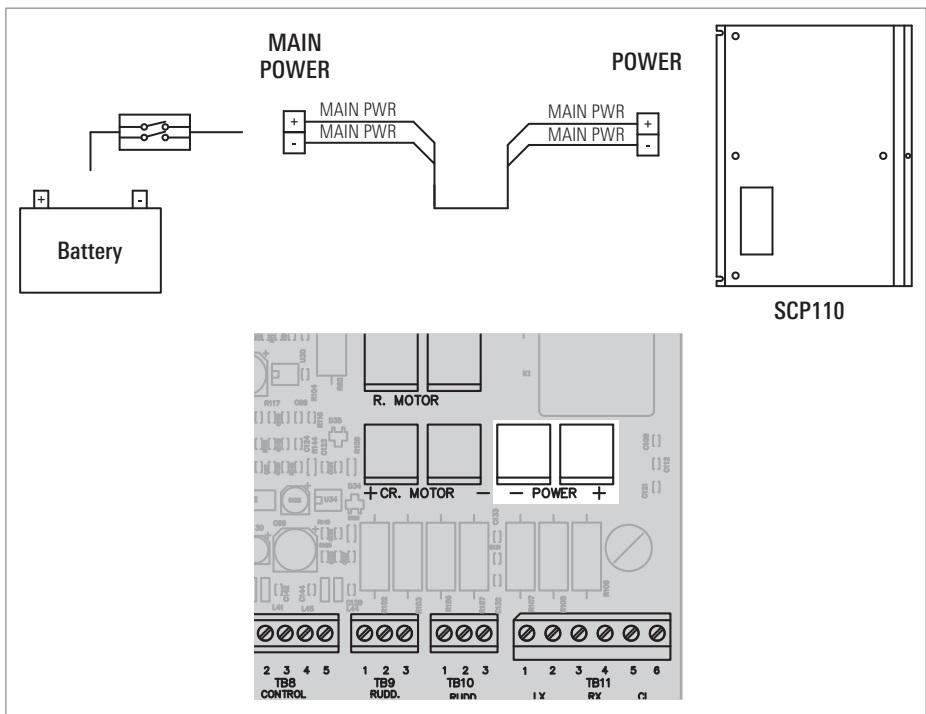
- NOTE:** Do NOT mount the Course Computer upside down.
- NOTE:** The Gyronav chip must face the sky. See the above illustrations for proper installation. A spare connector is included in the Course Computer box.

Main Power

Power should be taken from the vessel’s electrical distribution panel through an external switch. The gauge of the cables should be chosen depending on the power of the drive unit, the voltage, and the length of these connections.

Use the following guidelines:

Drive Power	Copper Area	AWG specs
Up to 100Watts	2.5mm2	13 AWG
From 100 to 200Watts	4.0mm2	11 AWG
From 200 to 350Watts	6.0mm2	9 AWG



SC110 Control Head

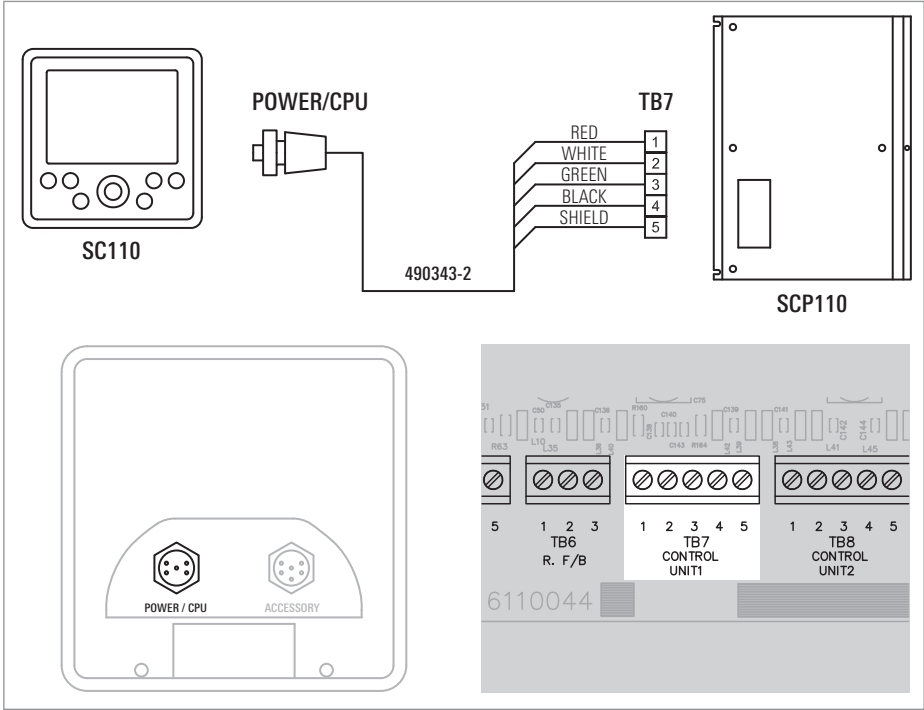
This is the “cockpit” of the autopilot, and it is through this unit that the user instructs the system about the operations that should be executed.

See the SC110 Installation and Operations Manual for instructions and guidelines for mounting the control head. Install the Control Head on the main deck, in a position where it will be easily reached and controlled: carefully chose the proper location and orientation so that the display will be perfectly readable from the operating position. If the Control Head is flush-mounted in the cockpit, special attention should be given to the placing angle in order to ensure a perfect reading of the display. Even if the display has the back-light, if badly oriented the reading of all information data will be difficult.

The Control Head can be installed also using an optional bracket. In this case, the visual angle can be easily changed by the user himself when necessary. Visit our Web site at humminbird.com or contact Humminbird Customer Service at **1-800-633-1468** for more information.

The Control Head is splash-proof, but it is not supposed to operate UNDERWATER! Thus, if externally installed, take care to position it in a shielded area with its protective cover.

The SC110 Control Head should be connected to the Course Computer using the supplied cable (490343-2) in the **TB7 CONTROL UNIT 1** connector.



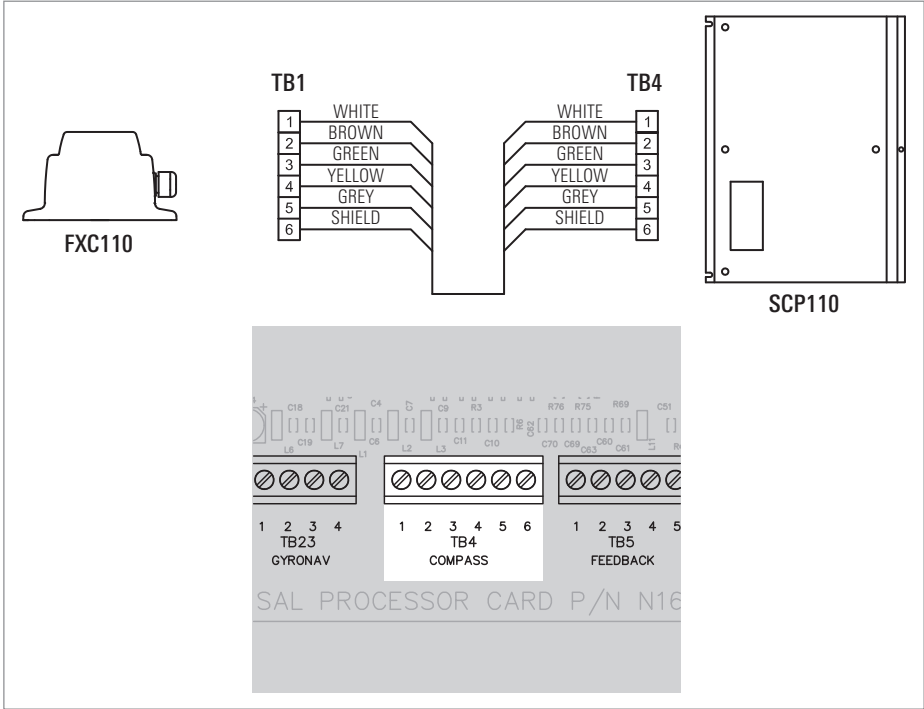
FXC110 Fluxgate Compass

This sensor is a key device of the autopilot. In fact, it is based on the electronic compass bearing that the autopilot keeps the vessel on the planned course, applying any needed correction, bringing you to the expected destination. An improper installation of this device will negatively affect the performance of the whole navigation system.

The **FXC110 Fluxgate Compass** can be used with wood, fiberglass, and aluminum vessels. We suggest that you use the FGX60 Pick-Up Coils Compass for all the iron or steel vessels provided with a planar magnetic compass, externally gimballed, correctly functioning and compensated. It should be placed horizontally, with the arrow aligned parallel to the bow. See the compass installation guide for details.

As it is a magnetic compass, the first care will be the choice of location. It differs from the other electronic devices because it should be placed far from iron masses, magnetic fields, and any device originating magnetic noises. The minimum distance to be taken from this possible interference is proportional to the intensity of noise and should be found at any time by way of experiment (e.g. by using a magnetic compass).

The FXC110 Fluxgate Compass should be connected to the Course Computer using the supplied standard cable, **TB4 COMPASS** connector.



FB30 Rudder Feedback

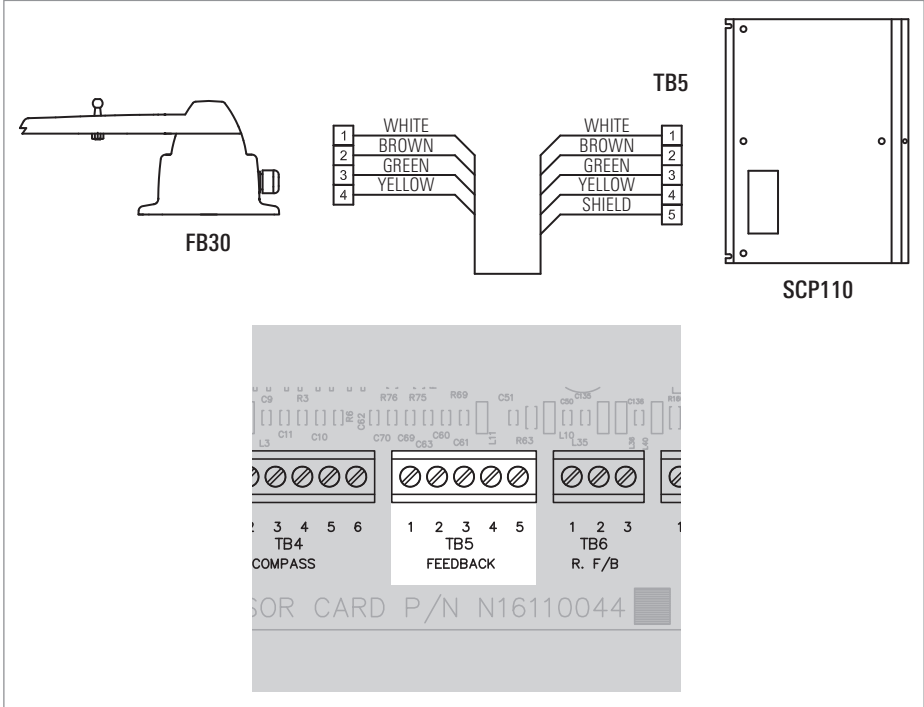
The **FB30 Rudder Feedback** could be present or not, depending on the product.

This is another key element of the autopilot. It is mechanically linked to the section of the rudder, and it informs the system on its real position.

It is important that it is installed on a firm, rigid support respecting precisely the suggested mounting scheme.

Any slack both on the coupling bar and the rudder sector should be eliminated or the measured rudder angle will be incorrect and the whole system will become inaccurate and critical.

The FB30 Rudder Feedback should be connected to the Course Computer using the supplied standard cable, **TB5 FEEDBACK** connector.



Linear Rudder Feedback

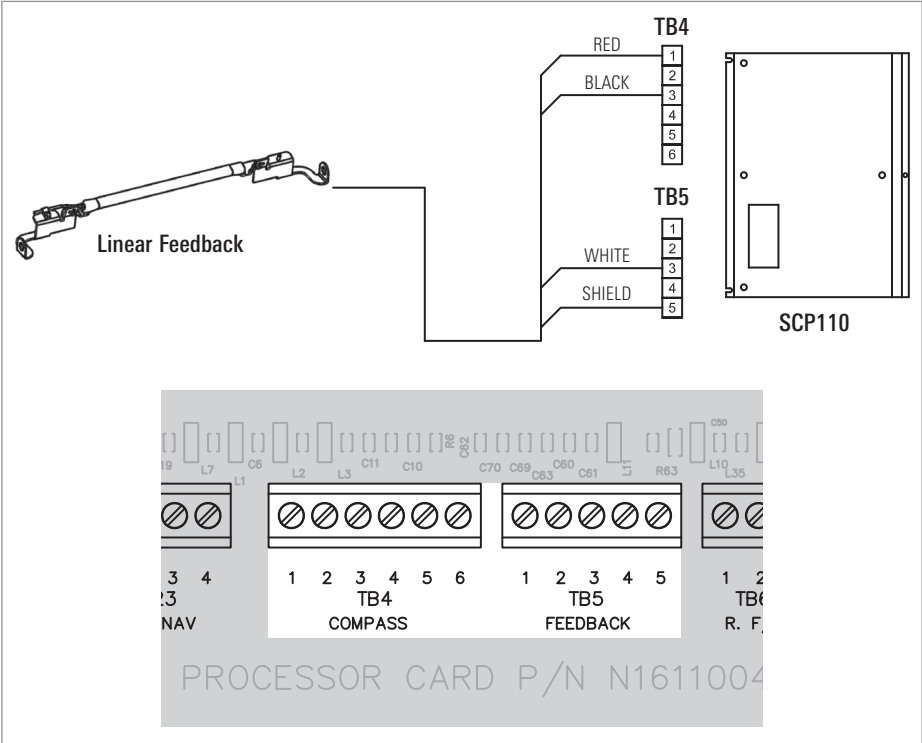
The **Linear Rudder Feedback** could be present or not, depending on the product.

This is another key element of the autopilot. It is mechanically linked to the outboard engine and it informs the system on its real position.

It is important that it is installed following the detailed instructions supplied in the box.

Since the Linear Rudder Feedback is not the default setting, you should enter the **INSTALLATION MENU** and set the **FEEDBACK TYPE** to **LF n**.

The Linear Rudder Feedback should be connected to the Course Computer using its own cable, **TB4 COMPASS** and **TB5 FEEDBACK** connectors.



Optional Electro-Hydraulic Unit

For a correct use of our autopilot and for best performance, use hydraulic units suitable to the vessel steering system.

The flow-rate is the most important parameter when you choose a pump: it should be calculated to obtain a hard-over to hard-over time of about 12 seconds ($\pm 10/20\%$).

This is the formula to be used:

FLOW-RATE (liters/min.) = RAM-VOLUME (liters) x 5

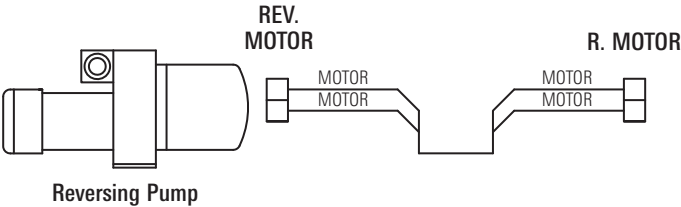
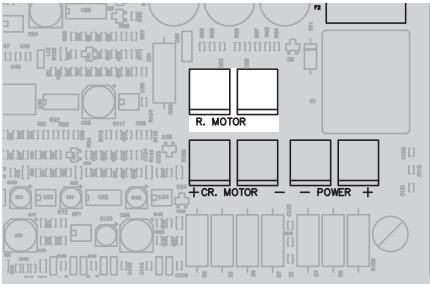
FLOW-RATE (cc/min.) = RAM-VOLUME (cc.) x 5

The Continuous Running pumps can be installed on every kind of boat and are mandatory for heavy or working vessels.

The Reversing pumps can be installed only on small pleasure vessels and, in any case, no bigger than 15mt. (50 feet) length over all.

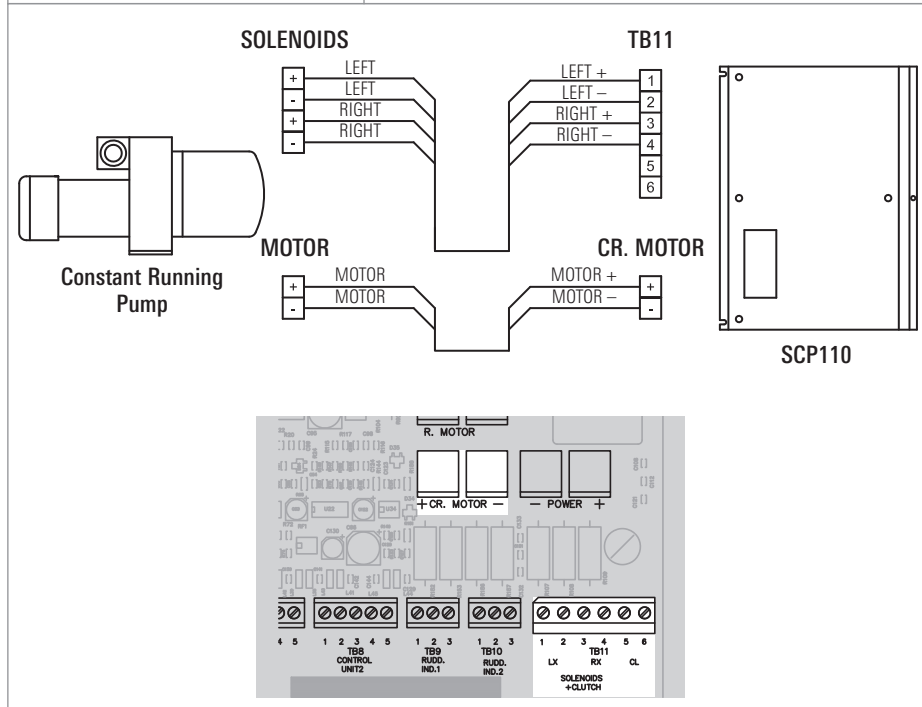
The electronics and the software provided with the autopilot are suitable to drive these two popular types of rudder drives.

Reversing (R model)

Wiring	MOTOR: R. MOTOR faston connectors.
Software Settings (SC110 Installation Mode)	POWER STEERING TYPE function should be set to REV1 (this is the default setting). Use the REV2 or REV3 values with over-dimensioned power units (too fast).
<div><div><p>Reversing Pump</p></div><div><p>SCP110</p></div></div>	

Continuous Running (CR model with solenoid valves)

Wiring	<p>MOTOR: CR. MOTOR faston connectors.</p> <p>SOLENOIDS: TB11 connector.</p>
Software Settings (SC110 Installation Mode)	<p>POWER STEERING TYPE function should be set to SOL.</p>



The gauge of the cables should be chosen depending on the power of the pack driven, the voltage, and the length of these connections. Use the following guidelines:

Motor	Copper Area	AWG specs
Up to 100Watts	2.5mm2	13 AWG
From 100 to 200Watts	4.0mm2	11 AWG
From 200 to 350Watts	6.0mm2	9 AWG

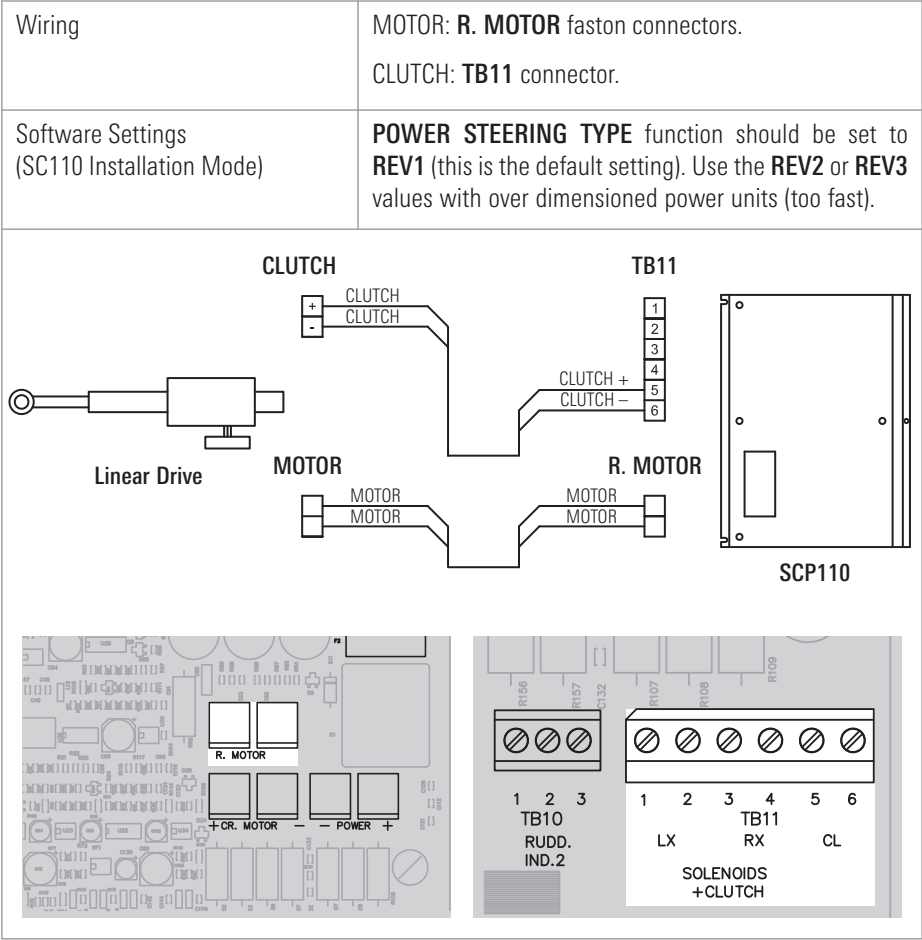
Solenoids and/or Clutch	Copper Area	AWG specs
Any	1.5mm2	15 AWG

Optional Linear Drive

In some boats, the rudder could be moved using a **linear drive**. Normally, this is the case of the boats equipped with a mechanical steering system.

A correct linear drive should move the rudder with an hard-over to hard-over time of about 12 seconds ($\pm 10/20\%$).

Linear Drive (equipped with reversing motor)



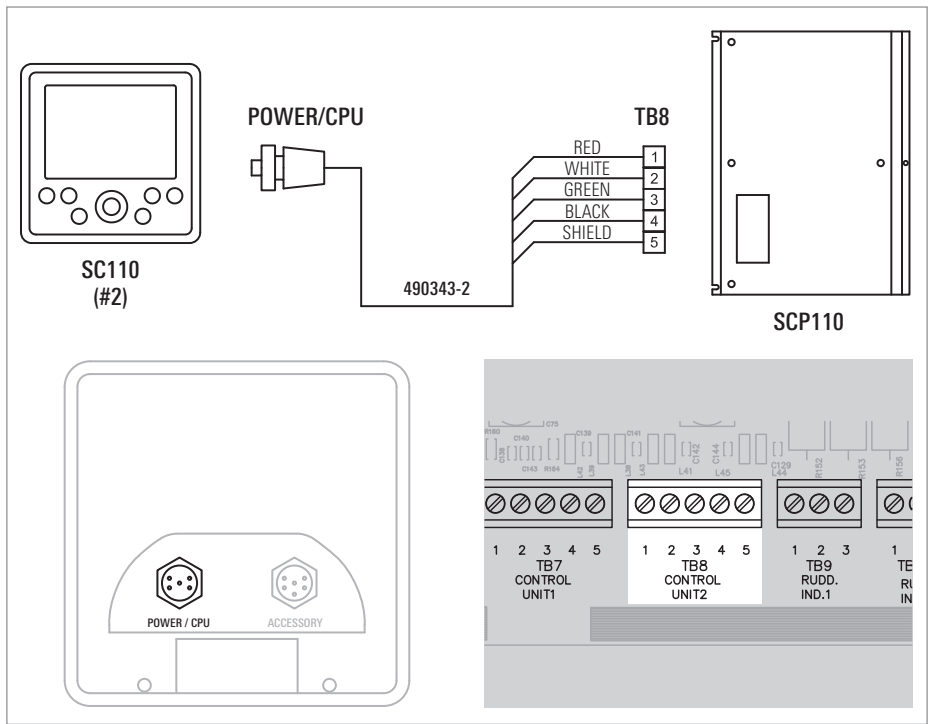
The gauge of the cables should be chosen using the same guidelines specified in the previous section (ELECTRO-HYDRAULIC UNIT).

Optional Second SC110 Control Head

An optional **extra Control Head** should be installed with the same cares adopted for the first one.

Even if it is named Second Control head, it is identical to the main Control Head both physically and functionally.

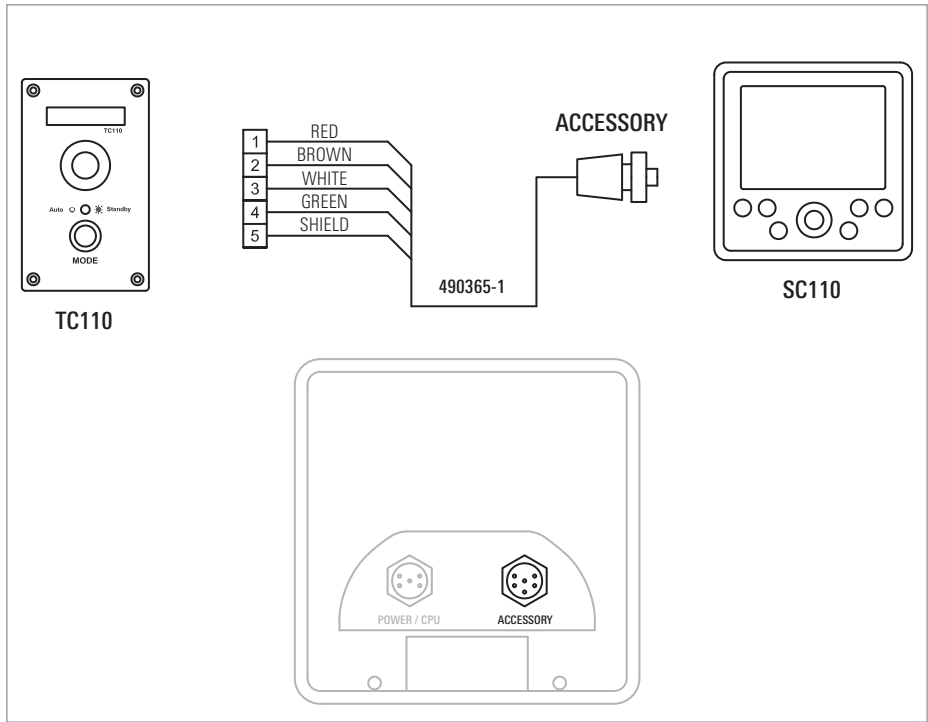
The optional second SC110 Control Head should be connected to the Course Computer using the supplied cable (490343-2) in the **TB8 CONTROL UNIT 2** connector.



Optional TC110 Tiller Control

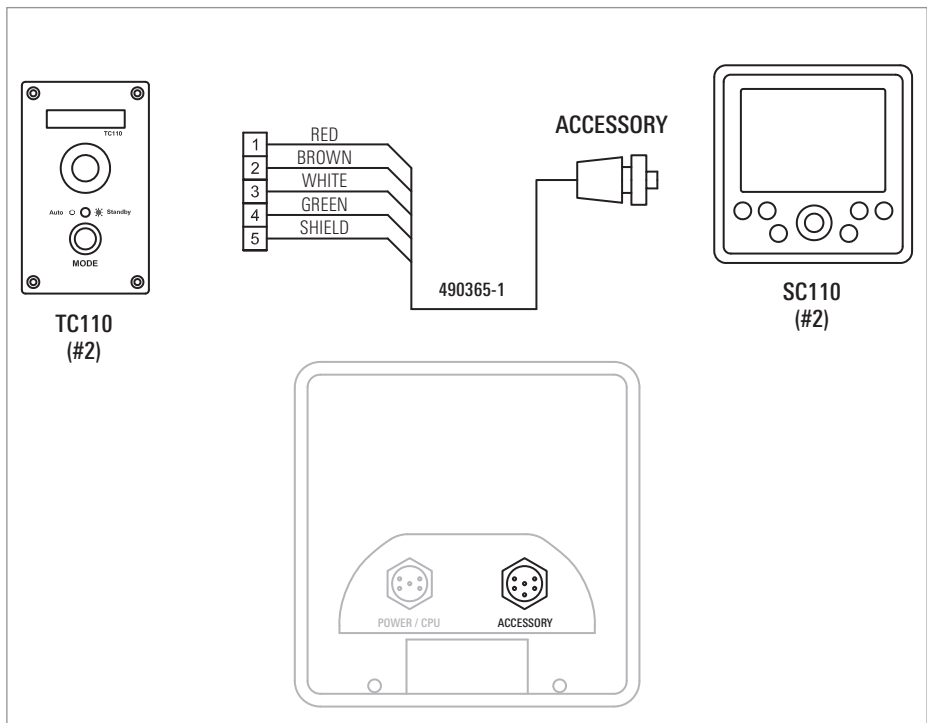
An optional **Tiller Control** can be installed on the main deck, in a position where it will be easily reached and controlled. It must be flush mounted.

The optional TC110 Tiller Control should be connected to the Control Head using the supplied cable (490365-1), **ACCESSORY** connector.



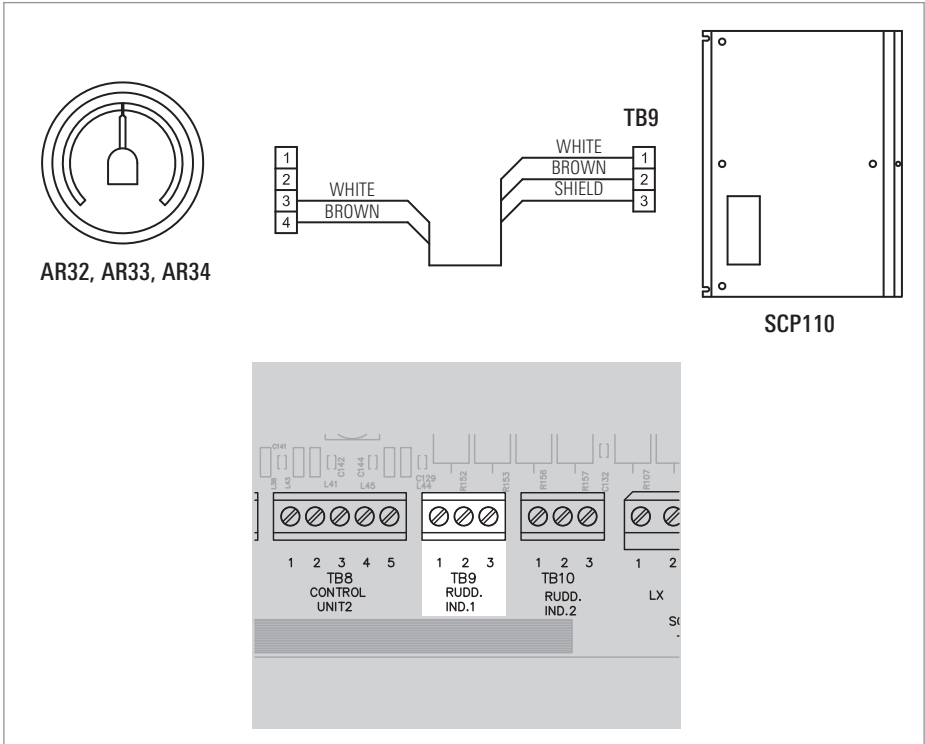
Optional Second TC110 Tiller Control

The optional **second TC110 Tiller Control** should be connected to the Control Head number 2 using the supplied cable (490365-1), **ACCESSORY** connector.



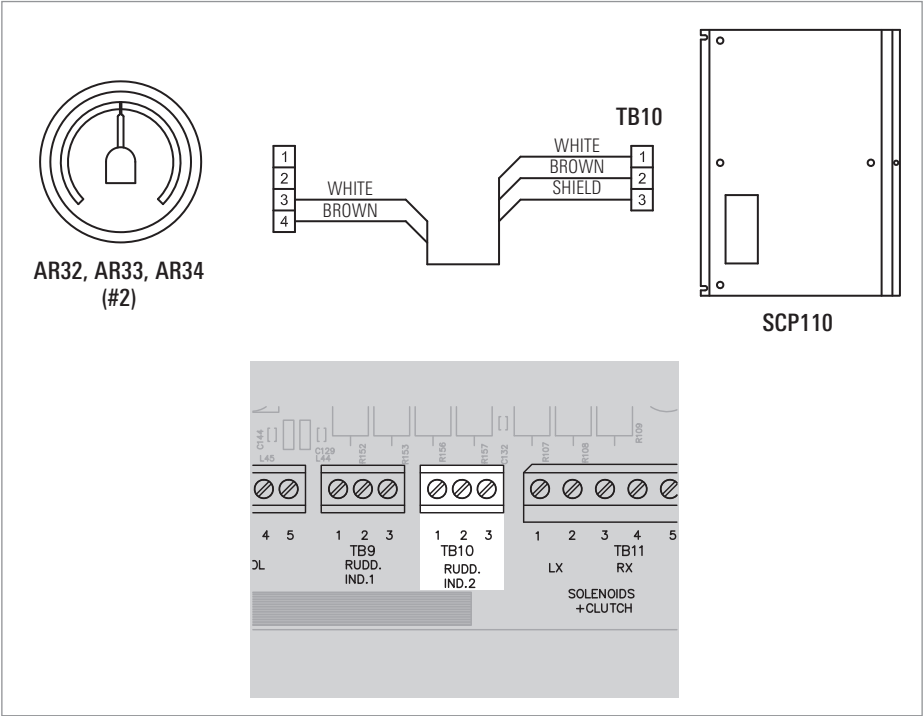
Optional AR32, AR33, AR34 Rudder Indicator

The **optional AR32, AR33, AR34 Rudder Indicator** should be connected to the Course Computer using the supplied standard cable, **TB9 RUDDER INDICATOR 1** connector.



Optional Second AR32, AR33, AR34 Rudder Indicator

The optional second AR32, AR33, AR34 Rudder Indicator should be connected to the Course Computer using the supplied standard cable, **TB10 RUDDER INDICATOR 2** connector.



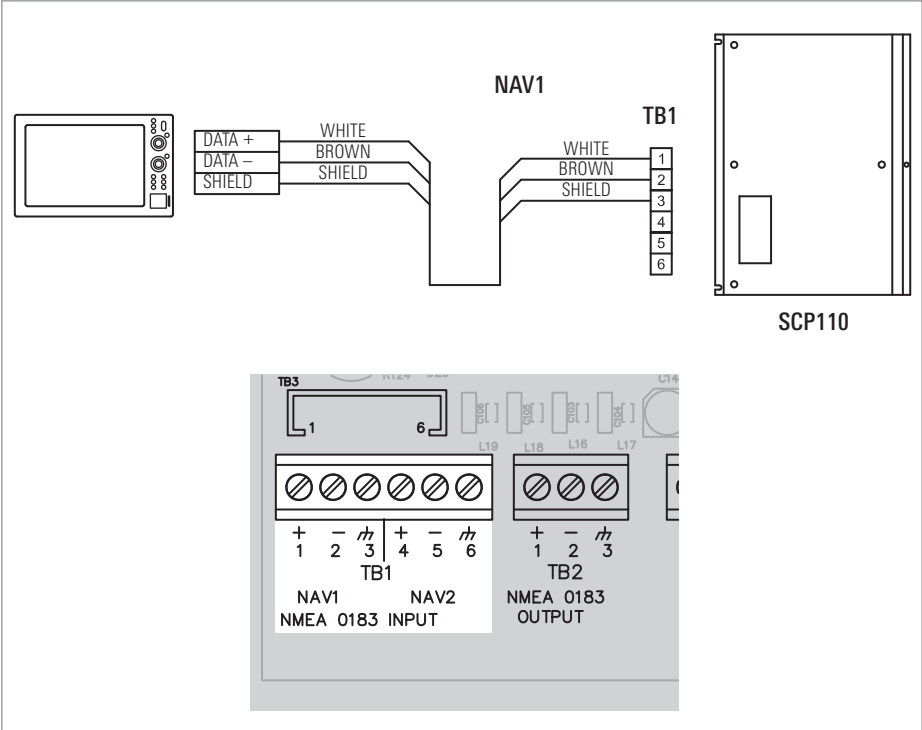
Optional Chartplotter

An **optional Chartplotter/Multi-Function Display** can be connected to the autopilot through the NAV1 input port.

This data line is a NMEA0183 input port. Be sure that the baud-rate is set to 4.800 and, at least, one of the following sentences is enabled: [APB] or [APA] or [BOD+RMB] or [BOD+XTE] or [BOD+XTR].

***NOTE:** APB is recommended. For more information, see the specification section of this manual and your ONIX and ION operations guide (or other chartplotter manual).*

This instrument should be connected to the Course Computer using the supplied standard cable, **TB1 NAV1 NMEA0183 INPUT** connector.



Optional Second Chartplotter/Wind Sensor

An **optional second Chartplotter / Multi-Function Display / Wind Sensor** can be connected to the autopilot through the NAV2 input port.

This data line is a NMEA0183 input port. Be sure that the baud-rate is set to 4.800 and, at least, one of the following sentences is enabled:

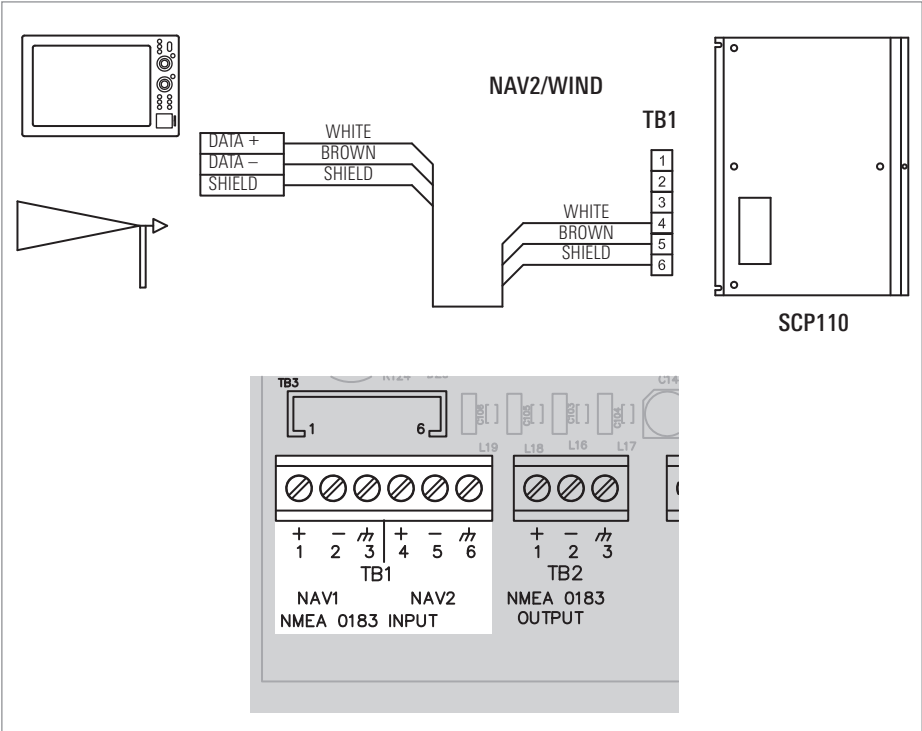
- Chartplotter: [APB] or [APA] or [BOD+RMB] or [BOD+XTE] or [BOD+XTR].

***NOTE:** APB is recommended. For more information, see the specification section of this manual and your ONIX and ION operations guide (or other chartplotter manual).*

- Wind Sensor: [MWV] or [VWR]

This input is normally set to receive data from a wind sensor. If you connect a second Chartplotter on the TB1 connector, NAV2 input, you should enter the **INSTALLATION MENU** and set the **NAV2 FUNCTION** to **NAV2**.

This instrument should be connected to the Course Computer using the supplied standard cable, **TB1 NAV2 NMEA0183 INPUT** connector.



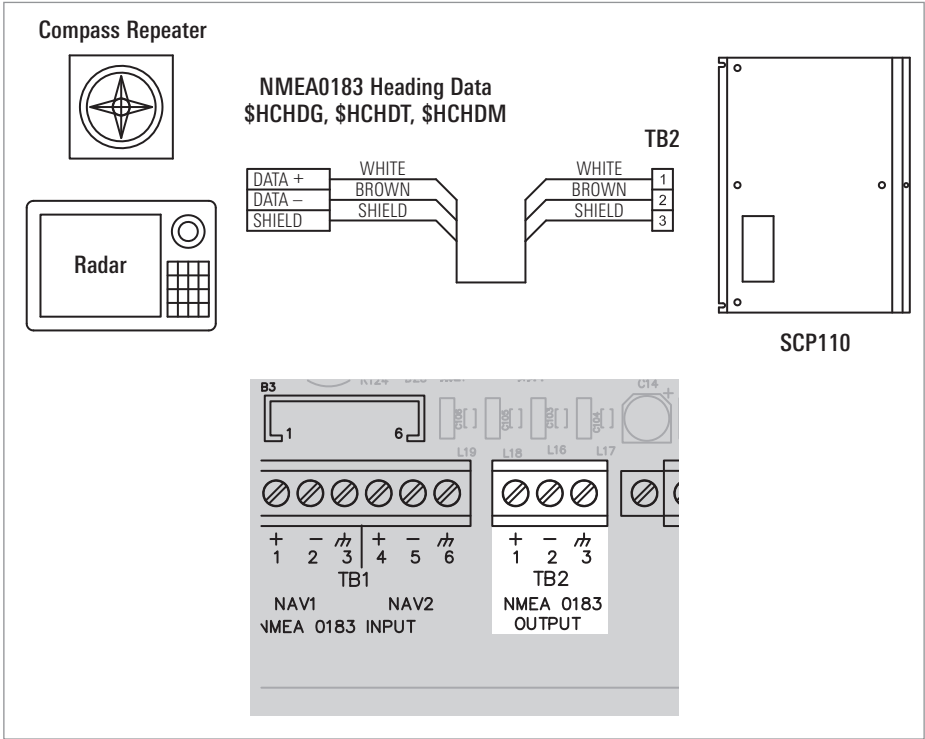
Heading Output

The **heading data** information can be shared with some external devices (radar, compass repeaters, satellite receivers and similar).

This data is outputted through a NMEA0183 port at 4.800 baud, fixed. The sentences outputted are:

- HDG (@10Hz), Heading, Deviation & Variation*
- HDT (@10Hz), Heading, True*
- HDM (@1Hz), Heading, Magnetic

*HDG and HDT heading data incorporate the Magnetic Variation information from the GPS sensor (RMC sentence). If this data is not available, the heading outputted is MAGNETIC.



Commissioning Tests

After the installation of all mechanical and electrical components of the autopilot, a first testing session should be executed when the vessel is still moored.

In order to obtain the best performance of the system, it is necessary to carry out at least a trial at water.

The first testing to be executed refers to the correct installation of the sensors and should be carried out in the following sequence:

FB30 Rudder Feedback

When the autopilot is in **STANDBY** mode, the graphic bar of the Control Head shows the reading of the sensor. By turning manually the wheel of the rudder, verify that the angle shown is identical to the real position of the rudder.

If the indication is reversed (port instead of starboard), you should switch off the autopilot and invert the wiring connections which are connected to **TB5 FEEDBACK** connector, pin 3 and pin 4.

Linear Rudder Feedback

When the autopilot is in **STANDBY** mode, the graphic bar of the Control Head shows the reading of the sensor. By turning manually the wheel of the rudder, verify that the angle shown is identical to the real position of the rudder.

If the indication is reversed (port instead of starboard), you should enter the **INSTALLATION** mode and set the **FEEDBACK TYPE** to **LF r**.

No Feedback Configuration

If the autopilot is supplied without any kind of feedback (700048-1 SC110 AUTOPILOT W/O FEEDBACK), you should enter the **INSTALLATION** mode and set the **FEEDBACK TYPE** to **DISABLED**.

AR32, AR33, AR34 Rudder Indicator

When the autopilot is in **STANDBY** mode, turn manually the rudder from hard-over to hard-over and verify that the analog Rudder Indicator indicates exactly what is shown on the graphic bar of the Control Head.

WARNING! *If the autopilot is configured to work without the feedback, this indication is simulated and works only during the navigation.*

When the boat is moored, you always see center position (0°) regardless the real position of the rudder.

FXC110 Fluxgate Compass

When the autopilot is in **STANDBY** mode, the large display shows the reading of the electronic compass. Verify that there is no interference and the value indicated by the main compass of the vessel is almost the same.

In case of a significant difference, try to change the position of the compass (if interfered) or turn it on its axle until the difference is cancelled.

Automatic Compensation of the FXC110 Fluxgate Compass

The compass placing is always a challenge because of the magnetic interferences you may find aboard.

This autopilot allows the automatic compensation without the help of a technician. In fact, you only need to go out at calm sea with the vessel avoiding crowded areas and to carry out the following operations:

Switch on the autopilot in **STANDBY** mode and make the vessel turning slowly on circle. In order to obtain a good compensation, the maximum angular speed should not exceed 4 degrees per second (corresponding to a complete revolution taking 1.5 minutes at least).

Enter the **INSTALLATION** mode and press **AUTO/TRACK** key for at least 2 seconds and wait until the display visualizes "COMPASS AUTOMATIC COMPENSATION - WAIT." At this stage, release the **AUTO/TRACK** key. Wait until the vessel has carried out a complete revolution checking always that the angular speed is steady and under the maximum limit. If the vessel, during this turn should rock significantly (for instance a big wave, the passage of another vessel), repeat again the procedure.

Keep on turning in circle until the autopilot will display the maximum amount of the interference and the result of the compensation: "SUCCESS" if succeeded, "FAILED" if failed.

At this stage, the procedure is completed and you only need to press the **STANDBY** key in order to return to the normal functioning.

If the AutoCompensation failed, it means that the chosen location for the installation of the compass is too interfered and therefore the location should be changed.

The AutoCompensation procedure can be interrupted in any moment by pressing **STANDBY** key or by removing the power supply to the autopilot.

Electro-Hydraulic and/or Linear Drive Unit

When the vessel is still moored, turn manually the helm to the center. In **AUTO** mode, execute a course change of 10 / 20 degrees and check that the rudder moves in the correct direction and in an intermediate position (the movement should be proportioned to the change).

***NOTE:** If the autopilot is configured to work without the feedback, you will see the rudder moving to the hard-over position. A "NO RUDDER" alarm will also be displayed.*

In case the rudder moves in the opposite direction, invert the wires of the motor (reversing power unit) or invert the right and left solenoid connections (continuous running power unit).

GPS and/or Chartplotter

In these instruments, select the output data to the NMEA0183 standard (it usually is the default configuration and no manual operation is required).

Plan a route on this instrument and verify that the autopilot receives correctly the bearing from them by placing it on **NAV** mode.

Obviously, in NAV mode the autopilot will follow the course of the instrument connected to the TB1 connector of the Course Computer, NAV1 input.

You may also connect a second GPS / Chartplotter on the TB1 connector, NAV2 input. In this case, you should change the **NAV2 FUNCTION** to **NAV2**.

Wind Direction Sensor

Verify that the sensor is connected to the TB1 connector of the Course Computer, NAV2 input.

Select the output data to the NMEA0183 standard (this usually is the default configuration and no manual operation is required) and verify that the autopilot receives the correct bearing of the wind by pressing and releasing the **NAV/TURN** key until **WIND** mode is selected.

SCP110 Course Computer Specifications

Nominal Supply Voltage	12 to 24Vdc (-15% / +20%)
Power Consumption	4W to 8W, power pack excluded
Continuous Power Pack Drive	
Continuous Running Motor:	30A
Reversing Motor:	350W (30A@12Vdc, 15A@24Vdc)
Solenoid Drive	3A (each one)
Operating Temperature	-5°C to +55°C (23°F to 131°F)
Relative Humidity Limit	80%, non-condensing
Protections	Reverse Polarity, Overload, Overheating

NMEA0183 Ports

The Course Computer is able to receive and transmit data through the NMEA0183 protocol at 4.800Baud (fixed).

Supported Sentences

The following sentences are supported by the SCP110 Course Computer:

Input (TB1, TB3 connectors)

APA	Cross Track Error, Bearing Origin to Destination
APB	Cross Track Error, Bearing Origin to destination
BOD	Bearing Origin to Destination
GGA	Latitude and Longitude
GLL	Latitude and Longitude
HDG	Heading, Magnetic and True
MWV	Apparent Wind Angle
RMB	Cross Track Error
RMC	Latitude and Longitude, Speed Over Ground, Course Over Ground, Magnetic Variation
VTG	Course Over Ground, Speed Over Ground
VWR	Apparent Wind Angle
XTE	Cross Track Error
XTR	Cross Track Error

Output (TB2 connector)

HDG	Heading, Magnetic and True
HDM	Heading, Magnetic
HDT	Heading, True

Sentences Handling

This is a simple table that shows you how this information is handled depending on the operating mode of the autopilot:

Input (TB1 connector)	
Function	Needed Sentences
MULTISENSOR	RMC or VTG
STANDBY	None
AUTO	None
AUTOTRACK	GGA or GLL or RMC
NAV	APB (recommended) or APA or BOD+RMB or BOD+XTE or BOD+XTR
WIND	MWV or VWR
SOG visualization	RMC or VTG
COG visualization	RMC or VTG
Output (TB2 connector, Course Computer)	
Function	Outputted Sentences
Heading Output	HDG (@10Hz) + HDT (@10Hz) + HDM (@1Hz)

***NOTE:** Product specifications and features are subject to change without notice.*

Contact Humminbird

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