NOTE!

Simrad Robertson AS makes every effort to ensure that the information contained within this document is correct. However, our equipment is continuously being improved and updated, so we cannot assume liability for any errors which may occur.

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Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment or injury to personnel. The user must be familiar with the contents of the appropriate manuals before attempting to operate or work on the equipment.

Simrad Robertson AS disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.
Instruction Manual

This manual is intended as a reference guide for operating and correctly installing the AP300X autopilot.

Great care has been paid to simplify operation and set-up of the Robertson AP300X, however, an autopilot is a complex electronic system. It is affected by sea conditions, speed of the vessel, hull shape and size.

Please take time to read this manual to get a thorough understanding of the operation and system components and their relationship to a complete AP300X autopilot system.

Other documentation materials that is included in this manual is a warranty card. This must be filled out by the authorized dealer that performed the installation and mailed in to activate the warranty.
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–   | Original issue.
A   | Change of cable clamp in junction units page 71 Minor corrections in text and displays.
B   | Minor corrections in text and displays. Section 1 and 3 extended. Section 4-6 added.
C   | Minor corrections in text page 72 and in text and diagram page 88. Table with NMEA input-/output messages included.
D   | Updated spare parts list section 7.
E   | Page 112 Moved arrow on J3000X/J300X/J300X-40 Main PC-board to correct EPROM. Minor corrections in text.
F   | Operational instructions for MSD50 installations included. Operational instructions for dodging in NAV mode added. Minor changes in explanatory text to NAV mode displays. Interface setup table modified. Wiring of CD100 if mounted upside down.
H   | Page 89 New cable for LF3000 included.
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1 GENERAL INFORMATION

1.1 Introduction

Congratulations on the purchase of your new Robertson AP300X autopilot system and thank you for selecting what we feel is the most advanced autopilot system available on the market today.

Simrad Robertson AS is located in Egersund on the south/west coast of Norway. The company’s involvement in autopilots began in 1953 with equipment for the North Sea fishing fleet. Today Simrad Robertson AS manufactures a complete range of autopilots for all types of vessels, from pleasure boats up to advanced steering systems for merchant marine vessels. Professional mariners around the world acknowledge that the Robertson name is synonymous with the absolute best in autopilot technology.

The AP300X series from Robertson represents yet another step forward in autopilot technology with the intent to provide power and sailing boats from 30 to 80 feet with a host of new features. The system can be expanded and enhanced with a selection of options and accessories.

The brain in the AP300X autopilot series is the single "intelligent" junction unit that communicates with all other system modules on the ROBNET network. The ROBNET has been developed to establish a reliable digital communication and power distribution network between the units in the system. The ROBNET simplifies installation and enables the AP300X system to be easily expanded at any time.

Three different models of control units are available. All of them may be used as part of a stand alone autopilot system or as a full function control unit in a multiple station installation. Any combination of control units up to a total of 7 may be used in one installation.

All AP300X systems include Nav. interface as standard with NMEA0183 input and output. The NMEA interface allows a navigation receiver or position sensor to provide input to the AP300X system. All equipment connected to the ROBNET network can access the input data. In addition the NMEA output provides heading, rudder angle and other data depending on the autopilot configuration and the equipment that may be connected to the NMEA input. The optional NI300X Interface (expansion) Unit can expand the number of NMEA input/output ports, which allows a multiple number of peripheral navigation equipment to be interfaced.

The time proven experience of the Robertson engineers and the computer power in the AP300X system has made it possible to automate and simplify the setup and installation procedures. One important feature is the capability to set up automatically the steering parameters and select the scaling factor for speed and hull type; power (planing or displacement) or sail. Proportional rate output commands and an adaptive sea state filter contribute to enhanced steering performance in any sea condition.
1.2 How to use this manual

This manual is intended as a reference guide for operating, installing and maintaining the AP300X series of autopilots. Great care has been paid to simplify operation and set-up of the Robertson AP300X, however, an autopilot is a complex electronic system. It is affected by sea conditions, speed of the vessel, hull shape and size.

Please take time to read this manual to get a thorough understanding of the operation and system components and their relationship to a complete AP300X autopilot system.

Other documentation materials that is provided with your system include a warranty card. This must be filled out by the authorized dealer that performed the installation and mailed in to activate the warranty.

1.3 System components

A basic AP300X autopilot system consists of: Control Unit(s), Junction Unit, Rudder Feedback Unit, Electronic Fluxgate Compass and Drive Unit.
**AP300CX Control unit**

A compact autopilot control for panel, bulkhead or bracket mounting. Large LCD display for readout of autopilot data and rotary course selector. It has three Robnet connectors for system inter-connection and expansion.

Weight: 0.4 kg (0.9 lbs)

**AP300PX Control Unit**

Portable control unit with 7 m (20 ft.) of cable. It has all the same autopilot functions as AP300CX, and can be used as a hand held autopilot or be mounted in a fixed, bracket mount.

Weight: 0.4 kg (0.9 lbs)

**AP300DLX Control Unit**

Control unit with all autopilot function controls and ROBNET connectors arranged as on AP300CX. It has an additional graphic display and a built in navigation computer capable of storing waypoints and route planning.

Weight: 0.6 kg (1.3 lbs.)

Other features of the AP300DLX:
- 7 different instrument displays with calibration capabilities
- Interface to "black-box" GPS
• Plot function
• Full feature demo and training software
• 100 waypoints and 20 routes memory capacity

**J300X, J300X-40 and J3000X Junction Units**

---

**J300X**
Weight: 1.3 kg (2.9 lbs.)

**J3000X**

**J300X-40**
Weight: 2.8 kg (6.2 lbs.)

The junction unit is the central unit in the AP300X autopilot system. It contains the steering computer, interface circuits to all system components and drive circuits for the drive unit motor and clutch. Three models, J300X, J300X-40 and J3000X are available.

**Junction unit comparison chart:**

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<th>J300X</th>
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<td>CX, PX, DLX</td>
<td>CX, PX, DLX</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>10-28 V</td>
<td>10-40 V</td>
</tr>
<tr>
<td>Motor current (continuous/peak)</td>
<td>6/10 A</td>
<td>10/20A (20/40A)</td>
</tr>
<tr>
<td>Number of control units</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>NMEA ports</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Solenoid output</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Input for NFU control</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>External alarm</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Radar clock/data interface</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
RF300 Rudder Feedback unit

Weight: 0.5 kg (1.1 lbs)

Rudder feedback unit with transmission link and 10 m (30 feet) of cable. Transforms the angular travel of the rudder to a digital signal read by the autopilot steering computer.
RFC35 Electronic fluxgate compass

A new compact heading sensor from Robertson with 15 m (45 feet) of cable. The direction of the earth’s magnetic field is sensed by a floating ring core in a fluxgate coil and transformed to a digital signal read by the autopilot steering computer.

1.4 Optional components

NI300X NMEA Interface Unit

This unit has 4 NMEA I/O ports for communication to other systems, and a selectable heading output for radars (Anritzu or Furuno). Includes two ROBNET connectors for connection to the AP300X system.

Weight: 0.9 kg (2.0 lbs)

CI300X Compass Interface

Optional unit for interface to foreign fluxgate compasses, windvane systems with analog output and NFU levers. Input for Robertson gyro compass type RGC50, RGC10 and RGC11. Same dimensions and weight as NI300X.
**Rudder" indicator**

A Robertson Dataline instrument that can be connected directly to one of the AP300X NMEA outputs. Analogue display of boat's rudder angle.

**Compass" Indicator**

A 12 V Dataline instrument that displays the boat's heading on both digital and analogue format. Can be connected directly to NMEA output on the junction unit.

Dimensions and weight as for "Rudder" Indicator.

**CDI35 Course Detector Interface**

Interface unit to connect autopilot to a magnetic compass with CD100 Course Detector. Provides exitation current for CD100 and converts the analogue sin/cos signal to digital format for the autopilot steering computer.
**LF3000 Linear Feedback**

Linear feedback unit for boats with outboard engine. Transforms the linear movement to an analogue signal. Supplied with 8.5 m cable and mounting clamps.

**LFI3000 Linear Feedback Interface**

Interface unit for LF3000 Linear Feedback. Converts the analogue LF3000 signal to the standard digital feedback signal for the autopilot steering computer.

**Robnet cables**

Standard Robnet cable (15 m) with one male plug.

Standard Robnet cable (7 m) with two male connectors.

Standard Robnet cable (15 m) with two male connectors.

Robnet extension cable (10 m) with male and female connector.
R3000X Remote Control

A small handheld remote control with two push buttons for power steering or course selection (port and starboard) and one push button with built-in lighted indicator for mode selection.

Weight: 0.4 kg (0.9 lbs.)

S100 NFU steering lever

Designed for in-door console mount. The lever has spring loaded return to mid-position.

Weight: 0.2 kg (0.4 lbs.)

S3 NFU steering lever

Designed for in-door bulkhead mount and made of shock resistant polyxymethylene. The lever has spring loaded return to mid-position.

Weight: 0.5 kg (0.9 lbs.)
**JP300 Jack Point**

Jack point for remote connection of AP300PX. Robnet male connector and 0.5 m cable with female connector for daisy chain connection.

**Mounting brackets**

Optional mounting bracket for AP300CX and AP300DLX.

**Top mount bezel**

Optional bezel for panel top mount of AP300CX

Optional bezel for panel top mount of AP300DLX.

**Flush mount bezel**

Optional bezel for panel flush mount of AP300CX

Optional bezel for panel flush mount of AP300DLX.
2 AP300X AUTOPILLOT OPERATION

Caution! An autopilot is a very useful navigational aid, but DOES NOT under any circumstance replace a human navigator.

Do not use automatic steering when:

- In heavy traffic areas or in narrow waters
- In poor visibility or extreme sea conditions
- When in areas where use of autopilot is prohibited by law

When using an autopilot:

- Do not leave the helm unattended
- Do not place any magnetic material or equipment near magnetic or fluxgate compass used in the autopilot system
- Verify at regular intervals course and position of the vessel
- Always switch to Standby mode in due time to avoid hazardous situations

2.1 Overview

Each of the three different control units shown on the opposite page can operate as a stand alone unit in an autopilot system or combined in a multistation system. In a multistation system the command can easily be transferred from one unit to another. Units not in control will display "Inactive".

The AP300X system is capable of the following primary steering modes: STBY (manual steering), AUTO, NAV (power boats) or WIND (sailboats) and DODGE, each mode having a dedicated push button.

Each of the operation mode push buttons is clearly identified with the primary function in large text, and a secondary function listed in smaller text. Each button provides you with the ability to access a primary display, a secondary display and/or multiple function displays.

A group of user adjustable settings are provided in the AP300X USER SETUP MENU (page 34). The settings allows adjustment of display visibility, selection of heading sensors, navigation and position sources and the ability to select between automatic or manual adjustable sea state filter.

Alarms are presented in plain text to alert you of system and external data failure conditions. Alarms include both audible and visual presentations. The alarm listing is on page 114.
Audible alarm reset: Press any button. Refer to page 114 for further information about alarms.
2.2 AP300X with MSD50 Stern Drive unit

Note ! The information on this page applies if your autopilot is driving a Robertson MSD50 Stern Drive.

The MSD50 Stern Drive unit has a relative feedback signal which needs a zero point setting after the autopilot has been turned on. Refer to page 1-1 of the MSD50 manual for further information.

Zero point setting

Note ! If you do not need a rudder angle display when leaving the dock, just steering the boat manually on a straight course and press the AUTO button. The zero point is then set automatically.

If you prefer to use the rudder angle display when leaving the dock, proceed as follows:

After turn on press the STBY button once more to display the rudder angle.

STBY

Display is alternating between port and starboard rudder to indicate that the “rudder” zero point need be set.

Use the wheel to bring the “rudder” to midship position: Turn the wheel from lock to lock (H.O. to H.O.) and count the exact number of turns. Then start from one lock position and turn the half number of turns.

Press AUTO and then STBY two times with an interval of approx. 2 seconds between the two. The zero point is now set and the display will read:

STBY

00

Operation

Use the operation instructions on the following pages. There is no need for further zero point setting until next time you turn the autopilot on.
2.3 ON/OFF / Standby mode

A single press on the STBY button switches the system ON and the following status displays are shown

After approx. 5 seconds the system is operative and the unit that was turned on will show the STBY mode Primary Display. Other units in a multistation system will display "Inactive". Control can be available at any unit by pressing the STBY button.

A long press (3-5 sec.) on the STBY button switches the system OFF.

Note !

In an emergency it is possible on a multistation system to turn OFF the system at any control unit by pressing down the STBY button for 3-5 seconds.

STBY mode is also the mode that is used when steering the boat manually.

Follow-Up steering

When both the PORT and STBD push buttons are pressed simultaneously the AP300X is set to Follow-Up steering mode and rudder commands can be set by the course dial. The commanded rudder angle is shown on the secondary display and the rudder will move to the commanded angle and stop.

Non-Follow-Up steering

When the PORT or STBD push button is pressed separately, the actual rudder angle is shown on the secondary display and the rudder will move as long as the button is pressed.

NFU Steering lever

The rudder will move when the lever is offset to Port or Starboard

Note !

When the NFU steering lever is operated, the control units become "Inactive".
Standby Mode Operation

First Press

Primary Display

STBY
STBY off

Current heading

S265

Secondary Display

STBY
OFF

Rudder angle (PORT 7 degrees)

Follow Up Steering

Press both buttons simultaneously to activate Follow-Up

Commanded rudder angle

FU
07

Use course dial to command rudder angle

WARNING:
While in Follow-Up mode, you cannot take manual control of the wheel.

Return to manual control in STBY by pressing:

STBY off

Non Follow Up Steering

Activates PORT Rudder command

Actual rudder angle

NFU
03

Activates STBD Rudder command

Actual rudder angle

NFU
05
2.4 Automatic Steering

The AUTO mode is used when the AP300X shall steer the boat automatically on a set course. AUTO is always available from any mode or function within the AP300X by a single push on the AUTO button. When the AUTO mode is selected, the AP300X automatically selects the current boat heading as the set course.

In AUTO, the AP300X is continually issuing rudder commands to the steering gear to keep the boat on the set course. Determination of the boat heading is provided only by the RFC35 Fluxgate Compass (or optional heading sensor) for course keeping in AUTO mode.

The AP300X will keep the boat on the set course until a new mode is selected (STBY, NAV, DODGE) or a new course is set with either the course dial or the PORT or STBD buttons.

Once the course is changed to a new set course, the boat will automatically turn to the new heading and continue to steer the new set course.

Dodging

The AP300X provides the capability for dodging. The Dodging function allows the user to temporarily take manual control of the boat's steering, when steering automatically on a set course, and then automatically return to the previous set course.

Dodging is extremely useful in situations where you need to quickly take control of the helm to steer around an obstruction, and then wish to return on the previous set heading after performing the evasive maneuver. Dodging is activated by a single press on the DODGE button.
Autopilot Operation

Automatic Mode Operation
(Automatic steering by compass input only)

First Press
- **AUTO SPEED**
- Set course
- Course adjust
  - 1 degree/push
- Decrease
- Increase
- **STBY OFF**
- Course change
  - CW: Increase
  - CCW: Decrease
- Regain manual steering by pressing:
- **AUTO SPEED**
- Current heading
  - A265

Second Press
- **AUTO SPEED**
- HI speed parameters selected
- Speed input source
- **STBY OFF**
- HI speed parameters selected
- Speed input source

Dodging
- **DODGE TURN**
- Selects AUTO mode at the previous set course
- Selects AUTO mode with current heading as set course
- **DODGE TURN**
- Current heading
- Wheel
- Non Follow Up
- or both
- Follow Up
- Perform dodge using:
- or both

U-turn
- **DODGE TURN**
- Quick double press
- **U-TURN**
- Present course
  - A265
- U-turn prompt
  - **U-TURN**
- New course
  - A085
- Press to select STBD U-turn
- Boat makes STBD U-turn
When in DODGE mode the course displayed is the current boat’s heading, however the previous set course is remembered by the AP300X. When DODGE is displayed, the AP300X is no longer in control of the steering, and you must either manually steer the boat or take control using either Non Follow Up steering or Follow Up steering. On manual steering the clutch (or bypass valve) in the drive unit will be disengaged when dodging. The AP300X will remain in the DODGE mode until you exit DODGE by a second press on the DODGE button or select another mode.

**U-Turn**

The AP300X also provides a special U-turn feature that is available on power boats when the AP300X is in the AUTO mode.

U-Turn changes the current set course to be 180 degrees in the opposite direction. The user may decide if the U-Turn should be made to Port or Starboard to bring the boat on the new course. U-Turn is activated by a quick double press on the DODGE button, and can only be activated when the AP300X is in AUTO or NAV modes. After the quick double press, the AP300X will continue on the set course until you press either the PORT or STBD button to select the direction to make the U-Turn. If you do not press PORT or STBD within 1 minute, the AP300X will return to the AUTO mode and stay on course.

**Tacking in Auto mode**

When the AP300X is installed on a sailboat, a tacking aid function with a fixed tack of 100 degrees is available in AUTO mode.

The use of this function should be carefully considered based on the boat’s characteristics and the weather conditions. The tack function may only be used when the boat is reaching and must be tried out in good weather conditions with light wind to find out how it works on your boat. Due to wide range in boat characteristics (from cruising to racing boats) the performance of the tack function may vary from boat to boat. Except for the course change of 100° and the difference in displays, the procedure is similar to that of the U-Turn described on the previous page.
2.5 Navigating with the AP300X

The AP300X has the capability to use steering information from an external navigator (GPS, LORAN, Decca) or the NAV computer in AP300DLX to direct the boat to a specific waypoint location, or through a route of waypoints. In the NAV mode, the AP300X uses the heading sensor as it's primary source of heading for course keeping. The steering information received from the external navigator alters the set course to direct the AP300X to the destination waypoint.

Note! Navigational steering must only be used in open waters. The process of having an external navigation receiver direct an autopilot can be a slow acting process. By selecting the NAV mode, the AP300X is set for automatic steering on the current set course and then waits for the user to accept the course change to the destination waypoint.

To obtain satisfactory navigation steering, the following points must be fulfilled prior to entering the NAV mode:

- The AP300X autosteering must be tested and found satisfactory.
- The navigation receiver must be operating and the navigation system (GPS, LORAN, Decca) must be in full operating mode with adequate signal characteristics for valid position and steering data.
- At least one waypoint must be entered and selected as the current waypoint in the navigation receiver.
- The navigation source in the AP300X USER SETUP menu must be set for the navigator that contains the current waypoint.

The AP300X is designed to steer in mixed mode operation. This combines the straight steering capability of cross track error (XTE) steering in conjunction with the turning capability of bearing mode steering (CTS).

When operating the AP300DLX in NAV mode to automatically steer through a route of waypoints, the AP300X will steer to the first waypoint in the route after you accept the first waypoint as the location to steer to. When you arrive at the waypoint, the AP300X will display an alert screen with the proposed new course information displayed. You will need to verify that the upcoming course change is acceptable. Verification is performed by pressing the NAV button after the alert screen is displayed. If no verification is received, the AP300X will continue on the current set course in AUTO mode.

Note! Steering through a route of waypoints with the AP300X allows you the total flexibility for automatic waypoint sequencing, but combines the safety feature of requiring operator acknowledge for course changes in excess of 10 degrees.
Navigation Mode Operation
(Automatic steering by compass and Nav source input)

First Press

Second press

Third press

At the arrival of each new waypoint in a route:

Prompt displayed to advise required course change

New heading accepted automatically after NAV/SETUP button is pressed

Selecting a different Navigator

If you have more than one Navigation source connected to the AP300X, you will be able to choose any for Navigation. Refer to the User Set-up menu for details on selecting a different Navigator.
Note ! If the AP300X is connected to a Nav. receiver that does not transmit a message with bearing to next waypoint, it will pick a XTE message and steer on Cross Track Error only. In that case you have to revert to AUTO mode at each waypoint and manually change set course to equal bearing to next waypoint and then select NAV mode again.

**Dodging in Nav. mode**

First Press
- Selects NAV mode at the current track
- Selects AUTO mode with current heading as set course

Next Press
- Selects NAV mode at present position
- Selects NAV mode at the current track

Perform dodge using:
- Wheel [DODGE TURN]
- Non Follow Up [DODGE]
- Follow Up [DODGE TURN]

2.6 Wind vane steering

In order to enter WIND mode the AP300X system must be operating in AUTO, with valid input from the selected wind sensor. The WIND function is an alternative function to the NAV function and it is only available if the system has been set up for SAIL-boat in the Installation Setup Menu, and NAV source is set to WIND under USER SETUP menu. (Refer to page 34).

WIND function can only operate when reaching as it is necessary to have a stable apparent wind. The sails should be trimmed so that the autopilot easily can steer the boat in AUTO mode and the signal from the masthead must give a stable signal.

Enter the WIND mode by pressing the NAV/SETUP button.

The pilot will take the apparent wind at the moment the WIND function is selected and enter it as the set apparent wind. From that point the pilot will change the course to maintain this apparent wind as the wind direction may change.

Note ! If the course change to maintain the apparent wind exceeds 15° from the value at the time the WIND mode was selected, a WIND SHIFT alarm will sound.

The primary display will show the set apparent wind angle. Adjustments to this set angle can be done by using PORT or STBD button, or by the rotary course selector.

When NAV button is pressed again the display will change to a secondary display showing WIND (mode) and rudder angle.
Dodging while in the WIND mode is very similar to dodging while in the AUTO or NAV modes. Refer to DODGE mode operation in the AUTO mode section on page 24.

**Wind Vane Steering Operation**  
(Automatic steering by compass and wind vane)

**First Press**
- NAV SETUP
- Apparent wind angle set

**Second Press**
- NAV SETUP
- Wind angle adjust
  - CW: Increase
  - CCW: Decrease

- Selects WIND mode
- Selects AUTO mode with current heading as set course

**Dodging**
- DODGE TURN
- Current heading
- Wheel
- Non Follow Up
- Follow Up

- Selects WIND mode at the previous set course
- Selects WIND mode at the current set wind angle
- Selects AUTO mode with current heading as set course

**Tacking**
- Quick double press
- Press to select STBD Tack

- W 042°
- Boat makes STBD Tack

- W 042°
- Tacking prompt

- AUTO SPEED

- W 042°
- NAV SETUP

- W 042°
- NAV SETUP

- W 042°
- NAV SETUP
**Tacking in Wind mode**

In WIND mode on sailboats there is also a tacking aid function. This function may only be used when the boat is reaching and will when activated take the boat from the course you are steering to the computed course that gives you the same apparent wind on the other side.

This tacking function as compared to tacking in AUTO mode can only be used when you are sailing with the apparent wind as the reference (WIND mode), and with apparent wind angle less than 80-90 deg.

A quick double press on DODGE will activate the tack function which will prompt you for which way the tack should be performed. Press PORT or STBD to select the tack.

2.7 Automatic Speed selection

The AP300X provides two different sets of steering parameters for controlling the response of the boat at different speeds (HI or LO) while in AUTO and NAV modes.

The AP300X always selects the HI speed steering parameters when first switched on. This is a safety feature. After initial turn on, selection of the steering parameters is done automatically, based on the availability of input data from either an external speed log or an external navigator, or manually.

The AP300X automatically selects the HI or LO parameter set. The speed at which the AP300X changes from HI to LO (or opposite) is determined by the "Transition Speed" set in the Installation Setup Menu.
Manual speed selection

Select AUTO mode. Press the AUTO button a second time to display the secondary AUTO display. To toggle between HI and LO speed parameters, press the "AUTO" button two times quickly.

If you change boat speed it is recommended that you select HI or LO parameters correspondingly.

Quick double press

The manually selected steering parameter set (HI or LO) will remain in effect until you re-enter AUTO mode.

2.8 Multiple station system

In normal operation of multiple control units, control is accessible from every control unit connected to the AP300X system. One control unit is "active" and provides the user with access to all functions and enables the user to change modes and set the course for automatic course keeping. All remaining control units are "inactive" and have no effect on mode changes or course selection. A single push of either the STBY (or AUTO) buttons on an "inactive" control unit will allow transfer of command and make it "active".

2.9 Lock function

The "LOCK" function is a safety feature included in the AP300X system to disable all control units except for a single, user selected control unit location.

When the "lock" function is in use, no transfer of command may take place; only the "active" control unit stays in command.

To enable the "lock" function, select STBY mode, and make a quick double press on the STBY button.

Quick double press

The display on the "active" control unit will first show a single key icon followed by the primary display on which the key icon will alternate with the mode index.

The "locked" control units in the system will show:
The “Lock” function is disengaged by the following actions:

- The “active” control unit unlocks by a double press on the STBY button.
- The system is switched OFF by any control unit (press STBY for 3-5 seconds).

After having “unlocked” the other control stations, the “active” control unit will show the above symbol before the display returns to normal. All other control units will return to the “inactive” state.
2.10 The User Set-up Menu

Quick double press
Enter User Setup Menu
Displays User Set-up Menu

- SETUP -
Backlight
03
Adjusts backlight of display and pushbuttons in 10 steps. (0 - dim, 10 - brightest). Setting is stored when system is turned off, and resets to stored level at turn on.
Adjustment is local to the control head you adjust.

- SETUP -
Contrast
05
Adjusts contrast of displays in 10 steps. Setting is stored when system is turned off, and resets to stored level at turn on. Adjustment is local.
All steps not available at high temperature due to automatic temperature compensation.

- SETUP -
Select Comp.: RFC300 COMP.
Selects the heading sensor used for AUTO steering.

- SETUP -
Seastate
Filt.: OFF
Selects the Sea State filter.
OFF: Provides precise steering but increases rudder activity.
AUTO: Reduces rudder activity and reduces sensitivity of autopilot in rough weather automatically.
MANUAL: Sets yawband manually.

- SETUP -
NAV/WIND func
Navigation
Selects whether NAV mode pushbutton will activate NAVigation mode steering or WIND mode steering.

- SETUP -
NAV. source: GPS 1
Selects the source for NAV mode steering as configured in the INSTALLATION SETUP. (AP300DLX always appears even if AP300DLX is not connected in the system).

- SETUP -
POS. Source:
GPS 1
Selects the source of position data used by the AP300DLX.
This option will appear whenever there is more than one navigation receiver or position sensor connected to the system. Selection of POS source is required only when an AP300DLX is installed in the system, or if automatic speed selection (HI/LO) is taken from a position source.

NMEA TEST?
SYSTEM DATA?
TOP

The menu will disappear after 60 seconds if no key is pressed, or immediately if any mode key (STBY, AUTO, NAV) is pressed.
2.11 AP300DLX Main features

The AP300DLX autopilot control unit includes a variety of features in addition to the autopilot control functions.

- BAR graph presentation and digital readout of rudder angle
- Digital and graphic readout of ship’s heading
- Digital and graphic readout of apparent and true wind
- Digital readout of water depth and temperature, shallow water alarm
- Digital readout of speed log data, UTC, local time, engine hours and water temperature
- A full function navigation computer that provides the following:
  - Display of ship’s present position
  - Display of course over ground (COG) and speed over ground (SOG)
  - Position source accepted from external equipment: Loran C, GPS, Decca.
  - Instantaneous calculation and display of cross track error (XTE), bearing and distance to any stored waypoint
  - Automatic calculation or manual input of Mag. variation (for WPT calculations)
  - Save your present position as a waypoint
  - Storage of up to 100 waypoints in Lat/Lon (1 MOB, 1 Temporary, 98 user input).
  - Storage of up to 20 routes using any stored waypoints
  - Waypoints and route names with up to 8 alphanumeric characters
- Navigate directly to any previously stored waypoint or to a temporary waypoint
- Navigate through any route of waypoints stored in memory (forward or reverse)
- A unique "skip" feature to enable changing the next waypoint when following a route
- Display of waypoint bearing in either Magnetic or True
- Man over board (MOB) mode to automatically display position, distance and bearing to MOB saved location.

- An X-Y PLOT mode that displays ships' position, waypoint position and plot line of the ship's movement.

Availability of data sources

In order to fully utilize the features of the AP300DLX, necessary sensor data (position, speed, depth, temperature, wind) must be available at the system NMEA input port(s).

Use of external position sources

The AP300DLX navigator uses position information supplied by an external position source such as a Loran C or GPS as the basis for it's navigation calculations. This is normally referred to as POS source and is the source where AP300DLX determines and displays Latitude, Longitude, Speed Over Ground (SOG) and Course Over Ground (COG). The accuracy of the calculations performed by the AP300DLX navigator can only be as good as the position accuracy supplied by the external navigator.

With the AP300DLX system, the possibility exists for multiple position sources to be connected into the system. Having multiple position sources (for example: Loran C, Decca and GPS), presents the ability to quickly switch from one navigation system to another in the event of degraded signal quality or position accuracy. In an instant, the AP300DLX will accept the new position sensor input, and continue to update the navigation calculations, both to the AP300DLX display and out to the autopilot.
2.12 Operation of Graphic Display

The AP300DLX Control Unit has an extra graphic LCD display. Controlled by the five push buttons under the display and autopilot controls, it can be programmed to show various information or to do navigation calculations and store waypoints and routes.

Soft-keys below the LCD select the function as indicated on the display. The text labels for each soft-key change to represent the function available under each level in the menu. The course selector and PORT and STBD push buttons are also used for entering and selecting data in the nav computer.

Note!

When the Course Selector and PORT and STBD buttons are used to operate the graphic display an icon will alternate with the present screen on the autopilot display. The course selector command is transferred back to the autopilot if an autopilot mode-button is pressed, or after a 60 sec. timeout after last operation on the graphic display.

Heading and rudder information come from the autopilot system's own sensors. Position input to the nav computer must be provided by data from an external position source through the NMEA0183 ports in the system.

Other information that can be presented on the graphic display must be provided by data from external sources through the NMEA0183 ports in the system.
The AP300DLX can access up to six different NMEA inputs and has control for selecting which position source to use (one or two NMEA inputs are standard dependent on the type of junction unit installed, 4 additional with optional NI300X. Incoming data is checked for status and selected sentences of data from the selected position source are also retransmitted on all NMEA outputs.

**Graphic Display Setup**

When first initializing a system using an AP300DLX control unit, it is necessary to set up items in addition to the autopilot setup listed in the Installation Settings Menu.

At turn on of an AP300DLX the graphic display will show the following screen for about 5 seconds followed by the MAIN DISPLAY (see previous page):

```
AP300DLX
Software : V.R..
Position source : GPS1
Position offset : None
Magn. variation: None
```

Access to the Graphic Display Setup menu is by pressing the following softkeys:

```
PLOT  INSTR  MOB  INFO  NAV
SETUP  ROUTE  MAIN  WAYPT  GOTO
```

Use ↓ or ↑ to select menu item and press ENTER.
**Plot interval**

When using the Plot screen, you can determine how often you want to mark your position on the plot. In addition to no position marking, the following time intervals are available: 1 - 10 - 30 and 60 minutes.

Use \( \downarrow \) or \( \uparrow \) to select "Plot interval" and press ENTER.

### SETUP

<table>
<thead>
<tr>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plot interval: 1 min</td>
</tr>
</tbody>
</table>

Use \( \downarrow \) or \( \uparrow \) to select plot interval and press ENTER.

**Units and time setup**

You may select between traditional or metric units on the instrument displays. You may also select three decimals on your Pos. display if your position source is transmitting three decimals. The local time is offset from UTC on the separate UTC time display.

Use \( \downarrow \) to select menu item. Use \( \leftrightarrow \) to toggle between units. Press ENTER when you have completed the unit selection for the upper four menu items.
If you select the LOCAL TIME menu item and then press ENTER, the following display will appear provided a sentence containing the UTC message is available at the NMEA input(s):

![UTC TIME
06:24
LOCAL TIME
07:40
ESC - MAIN + ENTER]

Use – or + to set your local time and press ENTER.

**Position calibration**

**Note!**

*Entry of position calibration is optional and is not required unless your position source requires correction.*

The AP300DLX has the capability to add correction to Latitude/Longitude data received from each position source. The correction for each position source is entered individually and the corrections are stored when the unit is switched off. The correction can be made by adjusting the position to a known position, or by position offset specified in nautical charts.

If a position source input is corrected this will be indicated with a # when the position source is indicated.

Paper-charts very often use a different datum than the WGS84 commonly used by GPS navigators. Some of the GPS' receivers have the possibility to convert WGS84 position to the local datum used in your chart. In case you use a "black box" GPS without this possibility, the corrections must be done by AP300DLX.

Example:

GPS position N 58°27.00', E 005°58.30' [WGS 84 datum]

The chart is in European Datum ED50 with correction specified (relative to WGS84):

Latitude: N 0.03  Longitude: E 0.09

Added to the WGS84 it gives the ED50 position: N 58°27.03', E 005°58.39'

This will be the corrected position read on AP300DLX.
To input or change a position from the main menu:

```
To input or change a position from the main menu:

    PLOT  INSTR  MOB  INFO  NAV

    SETUP  ROUTE  MAIN  WAYPT  GOTO

Use   or   to select "Position Correction" and press ENTER.
```

```
<table>
<thead>
<tr>
<th>GPS 1 POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>N  58°27.00'</td>
</tr>
<tr>
<td>E  05°58.30'</td>
</tr>
<tr>
<td>S  0°00.00'</td>
</tr>
<tr>
<td>W  0°00.00'</td>
</tr>
</tbody>
</table>

Set Correct Position

Note!

To clear the position correction, press the “DEL” key and press “ENTER”. The # indication should be cleared when there is no correction.

Automatic MAGVAR calculation

Magnetic variation (MAGVAR) is used in the calculation of bearing to a waypoint selected from the AP300DLX. MAGVAR is used to correct the bearing calculation based on the type of heading sensor used in your autopilot system. When using the RFC35 fluxgate compass or a magnetic compass, you should leave the MAGVAR set to AUTO. The value is then calculated automatically, and is based on the position from the POS source.

The AP300DLX also allows for manual input of MAGVAR, or to turn the calculation of MAGVAR off. Manual input of MAGVAR may be required in an area of the world where there is an unusual value of magnetic variation.

When a value of MAGVAR is used, (either AUTO or manual input), the bearing to WP and Course over Ground (COG) values will be displayed as magnetic values and will be identified with the letter "M" next to the course or bearing value.
If the system includes a Robertson gyrocompass, the AP300DLX does not use the MAGVAR value when Gyro is selected as the current heading sensor. COG and bearings will then be displayed as TRUE values, designated by the letter ”T”.

To view the current MAGVAR calculation method and MAGVAR value:

```
PLOT  INSTR  MOB  INFO  NAV
SETUP  ROUTE  MAIN  WAYPT  GOTO
ESC  ↓  MAIN  ↑  ENTER
```

Use ↓ or ↑ to select ”Magnetic Variation” and press ENTER. Leave the menu by pressing ESC or MAIN.

### Manual input of MAGVAR

**Note !**

The manual input of MAGVAR is optional and only good for a limited navigation area. As you travel to a new area (greater than 50 miles), it may be necessary to reset the MAGVAR value. Refer to the nautical chart for your cruising area to determine the correct MAGVAR value. Failure to input correct MAGVAR will result in incorrect waypoint bearing calculations.

To input or change the MAGVAR from the main menu:

```
PLOT  INSTR  MOB  INFO  NAV
SETUP  ROUTE  MAIN  WAYPT  GOTO
ESC  ↓  MAIN  ↑  ENTER
ESC  MAN  MAIN  AUTO  OFF
```
To input 4° of westerly variation, press the WEST key 4 times, then press ENTER

Leave the menu by pressing ESC or MAIN.
Clearing Waypoint Database

Note!

Clearing the Waypoint Database memory will wipe out all waypoint names, waypoint positions, and routes. If a single waypoint or small number of waypoints need to be changed or deleted, it is better to use the EDIT WAYPOINTS feature. Clearing the Waypoint Database memory also deletes Position Offset and Depth Alarm limit!

Use ↓ or ↑ to select “Waypoint Database” and press ENTER.

Waypoint Database:

INIT : Clear All WP :

Press ESC to cancel the attempt to clear all waypoints

Press ENTER to clear all waypoints
Displays and menu structure

The following display is presented approximately 5 seconds after the AP300DLX is turned on:

Access to each of the submenus is indicated by prompt above each "softkey":

AP300DLX Submenu Structure

Pressing MAIN softkey on any menu always returns to the main menu and screen.
Pressing ESC softkey returns to the previous level menu and screen.
INFO and POS screens

The following display is accessed from the main menu by pressing the INFO softkey:

![Display Diagram]

The Latitude, Longitude, COG, SOG are values supplied from the selected external position source. The Course Over Ground is displayed as the Magnetic course over ground when the selected heading sensor is a fluxgate or magnetic sensor, or is shown as the True course when the heading sensor is selected as a gyro type. It may be different from the instantaneous ship’s heading.

By pressing the POS softkey on the WAYPOINT screen the following display is accessed:

![Display Diagram]

The Latitude and Longitude are values supplied from the external position source. The screen is very useful as a large digit position display.
Instrument displays and menu

The complete menu of instrument screens is shown below. The order of appearance of the displays below the Heading Screen may vary. Press NEXT, if necessary, to find the screen you are looking for.

Use \texttt{S/D} key to access Shallow Water Alarm setting.

Press ESC to return to Log Instrument Display

Press ESC to reset the Trip display

Use \textcircled{O} to set depth for Shallow Water Alarm, then press ENTER.

Alarm is disabled when no value is set.

Use \texttt{WIND} to toggle between Apparent and True wind direction and speed (True wind requires COG input).

Press ESC to return to Speed and Dept display

Analogue cursor

Heading source

Press \texttt{ESC} to return to Speed/Depth Instrument Display

Press to reset the Trip display
2.13 Waypoints

A waypoint is any position that you want to navigate to. It can be a buoy, the entrance to an inlet, a favorite wreck location, or an intermediate turning point 300 miles out in the ocean.

Three different types of waypoints are available in the AP300DLX navigator:

- Stored waypoints (98 are available), Temporary Waypoint (1 is available), and Man Over Board (MOB) waypoint.

To have the AP300DLX navigate to a waypoint, you must first store it into the memory, then you select the waypoint to go to. You can assign up to an 8 character name to each stored waypoint, or allow the AP300DLX to assign a number that represents the waypoint position in the waypoint list. You will find it much easier to remember what a waypoint location represents if you assign a descriptive name to each.

Waypoints are stored in Latitude and Longitude only! The Lat/Lon system is universal to both GPS and Loran systems, and in addition, virtually all electronic video chart/plotter systems are based on the Lat/Lon system.

Note! Waypoints are stored in Degrees, Minutes and Hundreds of minutes, (not seconds!) and position data is presented in the same manner.

Storing waypoints

When you enter the ADD screen, the AP300DLX has automatically selected the first available waypoint on the waypoint list, and input the ship’s current position as the waypoint position. You need to assign a name (up to 8 characters) and adjust the Latitude and Longitude to the values for the waypoint.

You will use the course dial to change the values or the characters, and use the PORT and STBD push buttons to change the flashing cursor position on the screen. Pressing the key advances the cursor to the next line.

The list of characters is shown below:

<table>
<thead>
<tr>
<th>0123456789_abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cursor start position</td>
</tr>
<tr>
<td>Rotate CW to select letters</td>
</tr>
<tr>
<td>Rotate CCW to select numbers and special characters</td>
</tr>
</tbody>
</table>
WARNING! The accuracy of current navigation systems make it possible to automatically navigate extremely close to positions that you will input the AP300DLX. When entering waypoints from a nautical chart or from a position listing, select a position that is a safe distance away from the actual location, to insure that you will not steer directly into a selected buoy.

If you do not press ENTER within 60 seconds after naming the waypoint, the new waypoint will not be saved.

As you continue moving, the AP300DLX will continuously calculate the distance and bearing from the ship's current location to the waypoint position that was retained at the instant the ADD button was pressed.
Saving Present Position to a Waypoint

The next available waypoint is automatically presented as the new waypoint with the ship’s position that was valid at the time “ADD” was pressed.

NAME the waypoint
Do not change Latitude or Longitude value
Press ENTER to save WP to memory

Note!
SAVED waypoints are exactly the same as other stored waypoints, except that the AP300DLX automatically sets the position, instead of having the user dial in the waypoint position.
Editing Waypoints

Editing allows you to change the Name, Latitude or Longitude value of a waypoint. Waypoints may be edited (changed) or deleted (erased).

To cancel editing and restore waypoint to previous name and position values before the ENTER softkey is pressed: Press "ESC" softkey.

To delete the waypoint and store a blank waypoint back to memory: Press "DEL" softkey.
2.14 Routes

A route is composed of a number of waypoints that are already stored in the AP300DLX waypoint memory. The route system provides flexibility with a simple approach to adding, inserting, deleting waypoints in any of the routes. The AP300DLX provides the ability to build up to 20 different routes and store the routes into memory.

You may swap the START and END points of the route, and also specify the NEXT point in the route. This allows you to specify the direction to follow the route (forward or reverse), and also to skip quickly to an intermediate starting point if you do not want to follow through the complete route.

Following are some guidelines about the routes used in the AP300DLX:

- Waypoints must be stored into the AP300DLX before a route can be created.
- Each route is identified with a name of up to 8 alphanumeric characters.
- Waypoints that are used as part of a route may be assembled in any order.

You may edit a route to do the following:

- Change the name of the route without affecting the route contents
- Add new waypoints to the end of the route.
- Insert new waypoints in between any waypoints in the route.
- Delete any waypoints from the route.
- Delete the entire route from memory.

Creating a route

Creation of a route involves the following steps:

- Assigning and entering a name for the route.
• Adding from the previously stored waypoints to the route list.
• Pressing "Enter" after creating the complete route.

Note! The MOB waypoint and TEMP-WP may not be used as part of a route.

You must press ENTER after creating a route to save it to memory.

Use the course selector to point at the first waypoint in the waypoint list that will be added to the route list. Then press the ADD key.

Each time you press the ADD key, the waypoint selected in the waypoint list will be added to the route list, and the WP insert pointer will be set below the last waypoint that was added to the new route.

If you make an ERROR, refer to the opposite page: "Correction of routes"
Continue adding waypoints to the new route until you have created the complete route. Then press ENTER to save the route.

**Correction of routes**

**Deleting** waypoints from the route list does not affect the listing of the waypoints in the waypoint memory. Use the PORT or STBD push buttons to move the pointer in the route list until you point at the waypoint. Then press the DEL softkey. The waypoint will be removed from the route list, and all other waypoints in the list will be shifted up one location.

**Inserting** waypoints in a route list will add the new waypoint at the pointer in the route list. Present waypoint and all waypoints below will shift down one position in the list to make room for the new entry.

**Replacing** a waypoint in a list with a different waypoint name, requires that you add the new point and delete the old point.

When you are finished correcting the route, press ENTER to save the changed route list.

**2.15 Navigating with the AP300DLX**

The AP300DLX has the ability to provide automatic navigation in the following different ways:

- To a temporary waypoint (TEMP-WP)
- To a stored waypoint
- Through a route of waypoints
- To a special man overboard waypoint (MOB)

**Note !** When navigating with the AP300DLX, a valid POS source must be selected. The AP300DLX will automatically be selected as NAV source when operating in NAV mode (ref. page 56 and 58).

**WARNING !** Loran C and Decca have inaccuracies introduced by changes in the signals when they travel overland. The corrections included in most Loran sets to account for variations in the Loran transmitted signals are called ASF (Additional Secondary phase Factor) corrections. It is recommended that you verify the position accuracy between the Loran and your actual position, and between the Loran and the GPS receiver(s) if you have more than one position sensor on board.
Navigating to a Temporary waypoint

The temporary waypoint feature in the AP300DLX is a simple method to navigate to a location without storing the location permanently. Each time you select the TEMP -WP function, the new position that you input will over-write the previous TEMP-WP position. After you turn the system off, the TEMP-WP location is not retained in the AP300DLX.

Press NAV button to enter the NAV mode

Use the or to move cursor to character field.

Use to move cursor to next line

Press ENTER after selecting the Latitude and Longitude for the temporary waypoint

Press NAV button to enter the NAV mode

Bearing to Temp -WP and heading change required to turn boat to steer to Temp-WP shown here.

Press NAV button again to accept the course change to steer the boat automatically to the Temp-WP.

AP300DLX is now set to steer automatically to the Temp-WP. When you arrive, the END of ROUTE message will appear.

Press STOP to stop navigating toward WP

Press RESET to zero the Cross Track Error value
Navigating to a stored waypoint

Press NAV button to enter the NAV mode

Press ENTER after the pointer is set to the correct waypoint.

Press NAV button to accept the course change to steer the boat automatically to the waypoint.

AP300DL is now set to actively steer automatically to the waypoint. When you arrive, the END of ROUTE message will appear.

Press RESET to zero the Cross Track Error value.
**Arriving at a waypoint**

The AP300DLX uses one of the following criteria to determine that you have arrived at a waypoint:

- When you are within 30 seconds of arriving at the waypoint. This is determined by the speed of the boat (provided by the speed over ground data), and the distance to the waypoint.

or

- Passing the arrival perpendicular line to the waypoint

When you arrive at a waypoint (or pass it), the AP300DLX graphic display will show the following:

```
            ESC   >   <   MAIN   <   >   SCALE

            PLOT       GPS 1 #

            N  40°52.60'  W  72°30.15'

            Arrived
            TEMP-WP
            XTE:  0.05
            BRG :  049°M
            DST :   0.8 Nm

            Scale

            32 Nm
```

Upon arrival or passage of the waypoint, if the AP300DLX is currently in the NAV mode, the autopilot display will indicate END OF ROUTE. The autopilot will then change back to the AUTO mode and accept the current heading as the AUTO steering heading.
Plotting with the AP300DLX

Plot mode presents a temporary track plot of the ship's movement. Each time you access the PLOT mode, the screen is re-drawn with the boat's current position in the center of the screen.

If a waypoint is active in the AP300DLX, the ship's position and the waypoint position will automatically be shown in the lowest scale possible to display both ship and WP positions. As your position changes, the correct scale is automatically set to display both the ship's position and the waypoint position each time the SCALE key is pressed.

**Note!** Each time the PLOT screen is re-drawn by changing scale, up to the last 10 position marks will be automatically re-entered on the plot. The number of re-entered position marks is dependent of the selected scale and the selected time interval between each position mark.
Navigating through a route

When you select the route screen, you are presented with a list of all of the available routes stored in the AP300DLX memory. The pointer (>) identifies the selected route. Turn the course dial clockwise to advance through the available routes, until you are pointing at the route name that you wish to steer to.

Each time you access the route screen, you are provided with the route in a forward direction, the first waypoint in the route is the START point, and the last waypoint in the route is the END point.

You may swap the START and END points of the route by pressing [Reverse direction].

The AP300DLX always selects the START point in the route as the NEXT point to steer to. When you change the direction of the route, the NEXT point to steer to will also change.

Press the ENTER key to begin navigating through the route.

The AP300DLX will begin calculation from the ship's current position to the NEXT point in the route.

When the AP300DLX is advancing through a route, the only point of interest is the NEXT waypoint in the route. This waypoint is displayed on the graphic screen of the AP300DLX, and is the only point that is used for calculation of distance, bearing and cross track error (XTE).

Each time you arrive at (or pass) a waypoint in a route, the AP300DLX will automatically step to the following waypoint as the NEXT waypoint in the route.

If the course change to the NEXT waypoint is more than 10 degrees from your present heading, the autopilot display will identify the new waypoint by name, show the intended new heading and heading change, and will wait for the user to press the NAV button to acknowledge the course change.
Robertson AP300X Autopilot

The process that the AP300DLX sequences through waypoints in a route is done automatically, but the autopilot commands require operator verification before a major course change is allowed. THIS IS A SAFETY FEATURE OF THE AP300DLX!

Press NAV button to set the AP300DL into the NAV.mode

AP300DLX is now set to steer automatically to the NEXT WP in the route.
When you arrive at each WP in the route, the previous screen will appear, on the autopilot display, again press NAV button to acknowledge the new heading.
When you arrive at last WP in the route, the END of ROUTE message will appear.

Press STOP to stop navigating toward WP
Press RESET to zero the Cross Track Error value
Navigating using the MOB function

The MOB function is a fast and easy method of temporarily saving present position. It is designed to be used in an emergency situation where it is critical to return to the exact location where an incident occurred.

Note !

_The MOB feature will only function when the position source is operating and sending the AP300DLX valid position data._

The use of MOB function is intended to supplement standard lifesaving measures.

In an emergency man overboard situation, the MOB function should only be used if:

- It can be activated without losing eye contact with the person in the water.
- Only if MOB can be activated without inhibiting the rescue maneuver to turn the boat.
- Only when the position source is the best reference for navigation.

When an MOB position is entered, it can easily be selected as the GOTO position. The MOB position is also temporarily stored in the waypoint list, and will be retained until the AP300DLX is turned OFF.

To access the MOB function from any screen or menu in the AP300DLX - Press and hold the main (MOB) push button until the following screen is presented:

```
MOB POSITION
N  40°52.60'
W  72°30.15'
BRG  170    M
DST  00.35 NM
```

To go to the MOB location - Press GOTO

Caution !

_To become familiar with the operation and capability of the MOB function, it is recommended to use MOB in other situations where you want to memorize present position temporarily and return to it immediately._
MOB (Man over Board)

Press and hold MOB softkey for 5 seconds to activate MOB function.

MOB screen shows the position and the bearing and distance to the MOB point.

Press GOTO to have AP300DLX set to navigate to the MOB point.

Press NAV button to enter the NAV mode

Bearing to MOB point and heading change required to turn boat to steer to MOB point.

Press NAV button again to accept the course change to steer the boat automatically to the MOB waypoint.

AP300DLX is now set to actively steer automatically to the MOB waypoint.
2.16 Glossary

ASF corrections, Loran - Additional secondary phase factor is the amount in microseconds, by which the time difference of an actual Loran signal that has traveled over varied terrain, differs from that of an ideal signal over an all-seaweather path. (ie. Loran signals travel slower over ground). The ASF correction is a value added (or subtracted) to a measured Loran position, to attempt to restore the position accuracy.

Chart Datum - A geographic reference system based on mathematical models of the earth's shape is the basis for mapping and charting positions in Latitude and Longitude. There are a number of local reference datums, each with its own mathematical model of the earth. Therefore, the position in one reference system does not coincide with that determined from another reference system. Each chart lists the Datum used.

COG - Course Over Ground - The actual direction of progress of a vessel, between two points, with respect to the surface of the earth, The vessels heading may differ from the course over ground due to the effects of wind, tide, currents.

GPS - Global Positioning System - This system consists of 18 satellites plus 3 spares in fixed orbits, circling the earth at an altitude of approximately 20,200 km. The system will provide the user with 24 hour a day all weather position coverage, with an accuracy of 15 to 100 meters.

Loran C - A complex radio navigation network developed by the US coast guard, to assist a navigator in determining his precise location. The acronym, Loran C, stands for Long Range Navigation. It is an all weather 24 hour a day electronic system of shore based radio transmitters.

Magnetic variation - A magnetic compass points to the magnetic north pole. The difference between this direction and true north is the magnetic variation. The amount and direction of this variation is dependent upon where on the earth you are located.

NMEA 0183 - A format (language) designed to permit communication between various types of marine electronic equipment. In essence this is a two-wire shielded, serial data link, permitting one device to talk while other devices listen. Numerous different sentences are available, permitting communication between various different devices.

Route - A stored sequence of waypoints. These waypoints will be listed in the order in which you desire to follow them. The AP300DLX permits the storage of up to 20 routes.

SOG - Speed over ground is the actual speed of the vessel relative to the ocean floor.
**Waypoint** - A discrete point, stored in a navigator, located on the surface of the earth. Normally this point will be identified by Lat/Lon coordinates although in some systems it may be shown by T.D.’s. The AP300DLX has the capability of storing 98 waypoints.

**XTE - Cross Track Error** - Used to identify a vessel’s position relative to a straight line drawn between two waypoints. The amount the vessel is off to the left or to the right of this line is known as the track. It is normally displayed in hundredths of a nautical mile, equal to 60 ft.

**UTC - Universal Time Coordinated** - Transmitted from satellites to GPS receivers as the universal time reference for the Global Positioning System.
3 INSTALLATION

3.1 General

This section provides detailed information required to successfully install AP300X Autopilot system.

The AP300X system includes several modules that need to be mounted in different locations on the boat, and also need to interface with at least three different systems on the boat:

- The boat’s steering system
- The boat’s electrical system (input power)
- Other equipment on board (NMEA interfacing)

In addition, the advanced capabilities of the AP300X require the installer to perform a series of settings and tests to verify proper operation of the system, refer to the checklist below.

Installation checklist

1. Determine system configuration you are installing (Page 66)
2. Perform the hardware installation (Page 69)
3. Connect external NMEA devices (inputs and outputs, page 84)
4. Set Language (Page 95)
5. Dockside settings (Page 95)
   a. Boat type selection
   b. Drive unit selection
   c. Rudder feedback calibration
   d. Automatic rudder test
   e. Transition Speed
6. Interface setup for Junction Unit, NI300X and CI300X if installed (Page 100)
7. Perform settings in User Setup Menu (Page 34 for NAV source and POS source)
8. Dockside Autopilot tests (refer to Operation Instructions, page 21)
   a. Test all stations (if applicable) - lock/unlock - active/inactive
   b. Test Non-Follow Up mode
   c. Test Follow-Up mode
   d. Test AUTO mode
   e. Test NAV mode and input interfaces (if connected) including optional heading sensors
   f. Test interface outputs to external equipment (if connected)
9. Seatrial settings (Page 103)
   a. Set rudder zero
   b. Compass calibration
   c. Compass Offset adjustment
   d. Automatic tuning (Optional: does not need to be done)
   e. Viewing parameters

10. Testing Autopilot Operation at Sea (refer to Sea Trial instructions, page 109)

11. Test the AP300DLX Navigation Computer

12. Provide the user with training (Page 109)

Unpacking and handling

Care should be taken when unpacking and handling the equipment. A visual inspection should be made to see that the equipment has not been damaged during shipment and that all components and parts are present according to the packing list.

A standard scope of supply for an AP300X system will include:

- Control unit (AP300CX, AP300DLX, AP300PX) with standard installation accessories.
- Junction unit (J300X, J300X-40, J3000X) and one 15 m (49’) Robnet cable.
- RFC35 Fluxgate Compass with 15 m (49’) cable attached.
- RF300 Feedback unit with 10 m (33’) cable attached and transmission rod.
- Appropriate drive unit for the installation (unless the AP300X is going to operate an existing drive unit)
- Optional equipment that may have been ordered for the installation.

Determine system configuration

It is important to become familiar with the configuration of the system prior to beginning the installation. The diagrams presented on page 67 to page 68 provide sample system configuration drawings. With the flexibility of the AP300X system, your specific installation may include all or part of one of the sample diagrams.

Pay particular attention to the junction unit/drive unit combinations on page 73 and the chart on page 12

As many of the units are communicating on a common network (ROBNET), with identical connectors, the installation is simplified. Try to mount the units within the standard cable length supplied with each unit, if possible. ROBNET Extension Cable (10m) is available from your distributor.
AP300X Basic system

AP300X multistation system with optional drive units
**AP300X system with compass interface options**

- AP300X CONTROL UNIT
- AP300DLX CONTROL UNIT
- C100X COMPASS INTERFACE
- BOAT'S MAGNETIC COMPASS
- RFC35 ELECTRONIC COMPASS
- JUNCTION UNIT
- RPU160 REVERSIBLE PUMP
- RF300 RUDDER FEEDBACK
- ROBNET Network Cable
- Other cable

**AP300X system with NAV interface options**

- AP300DLX CONTROL UNIT
- RFC35 ELECTRONIC COMPASS
- GPS 1
- GPS
- LORAN C
- N200X NMEA INTERFACE
- NMEA INSTRUMENT
- DATALINE SENSORS
- DATALINE DATABOX
- MAINS POWER SUPPLY

NOTE! 2 NMEA input/output ports on J300X and J300X-40 only.
3.2 RF300 Rudder feedback installation

The RF300 Rudder feedback unit mounts close to the rudders, and is mechanically linked to the rudder tiller arm or rudder quadrant.

Refer to Figure 3-1 for the recommended mounting arrangement. Note that the RF300 transmitter arm has two slots for the transmission link. The slots enable maximum flexibility to provide the 1:1 mechanical linkage relationship.

**Note!**
Do not try to remove the transmitter arm from the feedback unit. The unit is factory adjusted and need no further adjustment at installation than described below.

As a starting point, it is desirable to set the transmitter rod to the inner limit of the outer slot if possible. (Refer to Figure 3-1). Drill and tap the rudder tiller arm so that the Y1 dimension is equal to the Y2 dimension (Use 4.2 mm drill and 5 mm tap). Attach the ball joint to the tiller arm, and connect the transmitter rod to the ball joint at the rudder tiller arm.

Turn the helm wheel to set the rudder tiller arm to approximate center position.

Rotate the RF300 transmitter lever until it is also set to center position. (A simple method is to line up the transmitter lever to be opposite the cable entry into the feedback.)

Attach the transmitter rod to the RF300. Set the RF300 mounting location to be in accordance with Figure 3-1. The center of the RF300 should be in line with the center of the rudder post. Mount the RF300 to a suitable platform using the screws provided. If necessary, add blocking material under the RF300 to adjust the height of the transmission arm to be level with the rudder tiller arm.
Note!  
Due to space limitations, it may be necessary to cut the length of the transmitter rod to move the RF300 closer to the rudder post.

Tighten the mounting screws for both the RF300 feedback unit and the transmitter rod ball joint.

Have someone observe the RF300 while someone else turns the helm wheel through the complete range of travel from full port to full stbd. rudder to verify that the mechanical linkage to the RF300 is not obstructed.

3.3 Junction unit installation

The junction units (J3000X, J300X and J300X-40) are not weatherproof and should be mounted vertically as shown in a dry place between the control unit and the drive unit. The junction unit is designed to operate in a location that provides ambient temperatures below +55°C (+130°F).

Cable connections

Use only shielded cables. This includes Mains input, drive units and if necessary for the extension of the RF300 Rudder Feedback cable. The clutch/bypass cable and the solenoid cable should be 1.5 mm² (AWG14). Signal cables should be 0.5 mm² (AWG20) twisted pairs.

The mains supply cable and the drive unit motor cable should have sufficient wire gauge. This will minimize voltage drop and allow the drive unit to operate at full power.
Refer to the table below for recommended cable sizes.

<table>
<thead>
<tr>
<th>Cable length</th>
<th>Drive Unit Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Distribution Board to Junction Unit.</td>
<td>12 V</td>
</tr>
<tr>
<td>2. Junction Unit to Drive Unit motor (Length refers to each of the two cables)</td>
<td>24V</td>
</tr>
<tr>
<td>Up to 3 m (10 ft.)</td>
<td>AWG mm²</td>
</tr>
<tr>
<td>Up to 6 m (20 ft.)</td>
<td>AWG mm²</td>
</tr>
<tr>
<td>Up to 10 m (32 ft.)</td>
<td>AWG mm²</td>
</tr>
<tr>
<td>Up to 16 m (52 ft.)</td>
<td>AWG mm²</td>
</tr>
</tbody>
</table>

**Grounding and RFI**

The AP300X system has very good RFI protection and all units are using the Junction Unit as common ground/shield connection. The Junction Unit should therefore have a proper ground connection to the hull.

ROBNET cables and other signal cables (compass, feedback, NMEA) should not be run in parallel with other cables carrying RF or high current, such as VHF and SSB transmitters, battery chargers/generators and winches.

*Note!*

The Mains input is not polarity protected on J300X-40.

Remove the bottom cover to get access to the plug-in terminals. Strip about 1 cm (0.4") of the cable's insulation and pull the screen backwards to cover the insulation. Position the straps as shown and tighten well to make sure the screen has good contact.

Leave sufficient free wires so that the plug-in terminals can be easily connected/disconnected.
Pull out each terminal before connecting the wires. Remove all strands before putting on the terminal cover.

### 3.4 Drive unit installation

The relation between drive units, drive unit voltage, input voltage, drive output and interfacing to steering gear are shown in the table below. The AP300X system detects whether a reversible motor or a solenoid is connected and outputs the correct drive signal automatically.

Refer to the connecting diagram for the different drive units on page 74 onwards. **Pay particular attention to the difference in connecting a reversible motor as compared to solenoids.**

Installation instruction for the drive units are found in the manual for the individual units.

<table>
<thead>
<tr>
<th>Robertson Drive Unit type</th>
<th>Drive unit voltage</th>
<th>Input voltage (Mains)</th>
<th>Drive output</th>
<th>Interface to steering gear</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPU80, RPU100, RPU150, RPU160, RPU300 (Reversible hydraulic pump)</td>
<td>12V</td>
<td>12, 24, 32V</td>
<td>Proportional rate</td>
<td>Hydraulic plumbing</td>
</tr>
<tr>
<td>RPU200, (Reversible hydraulic pump)</td>
<td>24V</td>
<td>24, 32V</td>
<td>Proportional rate</td>
<td>Hydraulic plumbing</td>
</tr>
<tr>
<td>HLD350, HLD2000, HLD2000D (Hydraulic linear drive)</td>
<td>12V 12V 24V</td>
<td>12, 24, 32V 12, 24, 32V 24, 32V</td>
<td>12V to Bypass 12V to Bypass 12V to Bypass Proportional rate to motor,</td>
<td>Direct mechanical connection to rudder tiller arm</td>
</tr>
<tr>
<td>MRD100, (Reversible mechanical drive)</td>
<td>12V 24V</td>
<td>12, 24, 32V 24V, 32V,</td>
<td>12V to clutch 24V to clutch Proportional rate to motor</td>
<td>Chain/sprockets</td>
</tr>
<tr>
<td>MRD150</td>
<td>12V 32V</td>
<td>12, 24V 32V</td>
<td>12V to clutch 32V to clutch Proportional rate to motor</td>
<td>Chain/sprocket</td>
</tr>
<tr>
<td>RPU1/RPU3 (Continuous running hydraulic pump)</td>
<td>12V 24V 32V</td>
<td>12V 24V 32V (Solenoids)</td>
<td>12V</td>
<td>Hydraulic plumbing</td>
</tr>
</tbody>
</table>
**Note!** When selecting **DRIVE UNIT** voltage in the Installation setup, the clutch/bypass voltage is always set equal to the motor voltage. If a retrofit installation where e.g. a HLD2000 has a 12V motor and a 24V bypass valve, the bypass valve solenoid has to be changed back to standard 12V version. The drive unit output, terminals A-B, is a “bipolar” output which means you do not have to think about port and starboard. Also the clutch/bypass connection is independent of polarity.

The maximum drive current capability of the J3000X and J300X junction units are different. Use the table below as reference.

### HYDRAULIC PUMPS

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MOTOR VOLS</th>
<th>JUNCTION UNIT *</th>
<th>RAM CAPACITY</th>
<th>FLOW RATE</th>
<th>MAX PRESSURE</th>
<th>PWR. CONSUMPTION**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>MIN cm³ (cu. in.)</td>
<td>MAX cm³ (cu. in.)</td>
<td>AT 10 bar cm³/m in (cu. in/min)</td>
<td>bar</td>
</tr>
<tr>
<td>RPU80</td>
<td>12V</td>
<td>J3000X</td>
<td>80 (4,9)</td>
<td>250 (15,2)</td>
<td>800 (49)</td>
<td>50</td>
</tr>
<tr>
<td>RPU160</td>
<td>12V</td>
<td>J300X</td>
<td>160 (9,8)</td>
<td>550 (33,5)</td>
<td>1600 (98)</td>
<td>60</td>
</tr>
<tr>
<td>RPU200</td>
<td>24V</td>
<td>J300X</td>
<td>190 (11,6)</td>
<td>670 (40,8)</td>
<td>2000 (122)</td>
<td>80</td>
</tr>
<tr>
<td>RPU300</td>
<td>12V</td>
<td>J300X-40</td>
<td>290 (17,7)</td>
<td>960 (58,5)</td>
<td>3000 (183)</td>
<td>60</td>
</tr>
<tr>
<td>RPU3</td>
<td>24V</td>
<td>J300X</td>
<td>370 (22,4)</td>
<td>1700 (103)</td>
<td>3800/5000 (232/305)</td>
<td>40</td>
</tr>
<tr>
<td>RPU1</td>
<td>12V</td>
<td>J3000X</td>
<td>140 (8,5)</td>
<td>600 (36,6)</td>
<td>1400/2000 (120/185)</td>
<td>40</td>
</tr>
</tbody>
</table>

### LINEAR DRIVE UNITS

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MOTOR VOLS</th>
<th>JUNCTION UNIT*</th>
<th>MAX STROKE mm (in.)</th>
<th>PEAK THRUST kg (lb.)</th>
<th>MAX RUDDER TORQUE Nm (lb.in.)</th>
<th>HARD-OVER TIME sec. (30% load)</th>
<th>PWR. CONSUMPTION**</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLD200</td>
<td>12V</td>
<td>J3000X</td>
<td>300 (11,8)</td>
<td>200 (440)</td>
<td>490 (4350)</td>
<td>15</td>
<td>1,5-6 A</td>
</tr>
<tr>
<td>HLD350</td>
<td>12V</td>
<td>J3000X</td>
<td>200 (7,9)</td>
<td>350 (770)</td>
<td>610 (5400)</td>
<td>12</td>
<td>2,5-8 A</td>
</tr>
<tr>
<td>HLD2000L</td>
<td>12V</td>
<td>J300X</td>
<td>340 (13,4)</td>
<td>500 (1100)</td>
<td>1460 (12850)</td>
<td>19</td>
<td>3-10 A</td>
</tr>
<tr>
<td>HLD2000D</td>
<td>24V</td>
<td>J300X</td>
<td>200 (7,9)</td>
<td>1050 (2310)</td>
<td>1800 (15900)</td>
<td>11</td>
<td>3-10 A</td>
</tr>
<tr>
<td>HLD2000LD</td>
<td>24V</td>
<td>J300X</td>
<td>340 (13,4)</td>
<td>1050 (2310)</td>
<td>3180 (28000)</td>
<td>19</td>
<td>3-10 A</td>
</tr>
</tbody>
</table>

* Specified junction unit necessary to achieve max drive unit capacity

** Typical average: 40% of max. value.
Connecting a reversible pump

Connecting a hydraulic linear drive

Connecting a solenoid valve
3.5 Control unit installation

Avoid mounting the control unit(s) where it is easily exposed to sunlight, as this will shorten the lifetime of the displays. If this is not possible, make sure the units are always covered with the white protection cover when not used.

- Drill holes for the connectors and the 2 fastening screws (4x25mm) by using the panel mounting template as a guide. Make sure there is enough space behind the panel for the cables/ connectors.

- Screw the 2 fastening screw studs into the 2 holes at the back of the Control unit (They will easily self-tap into the plastic).

- Connect the Robnet cables to the control unit connectors. Insert the screw studs into the holes in the panel.

- Thread the two plastic “finger nuts” onto the screw studs from the back side and tighten them by hand. USE NO TOOLS!

- Mount the two bracket halves to the Control unit.

- Temporarily bolt together the other two halves of the bracket to the two other halves.

Figure 3-2  AP300CX
Bulkhead mounting

Figure 3-3  AP300DLX Bulkhead mounting

Figure 3-4  AP300CX
Bracket mounting

Figure 3-5  AP300DLX Bracket mounting
• Hold the Control unit in place by hand and mark the 4 holes for the fixing screws on the mounting surface.

• Remove the Control unit, drill the 4 mounting holes in the mounting surface.

• Unbolt the temporarily fitted bracket halves and screw them to the mounting surface.

• Assemble the complete bracket again and adjust the control head to best viewing angle and tighten up the mounting bracket bolts.

• Connect the Robnet cables to the control unit connectors.

Use the supplied AP300/AP300DL BEZEL MOUNTING CUT-OUT template to make the exact cut out for the connectors. Fasten the bezel to the panel by the 4 (6) countersunk screws. (Numbers in brackets are for AP300DL).

• If watertight mounting is required, add some silicon around the mounting bezel flange before mounting.

• Carefully tighten the screws making sure the bezel is not bent.

• Set the large "O-Ring" around the inside lip of the control head mounting flange.

• Connect the Robnet cables to the control unit connectors.

• “Snap” the Control unit into the bezel mount.
**ROBNET network cables**

As most Robnet units have 2 or 3 Robnet connectors they can be used as "jack points" for further expansion of the system. There are no dedicated "in" or "out" connectors. You may connect the cables to any available Robnet connector on the specific unit.

The Robnet cables are available in 7 and 15 m length and provided with 6 pin male connector at one or both ends. The 15 m cable to the junction unit has connector only at the control unit end.

Optional extension cable (10 m) is available and have a male and a female connector.

When installing a system, try to minimize total Robnet cable length by connecting all Robnet units to the nearest available Robnet connector.

Total length of Robnet cable installed in a system should not exceed 50 m (165').

Examples of interconnecting Robnet units:

Make sure that all unused Robnet plugs are fitted with the plastic cap to keep the connector free of dirt and moisture.

All connectors are crimp type, which can be easily dismantled if required in an installation where you can not drill holes as big as the connector is.

See table for pin configuration and color code of the network cable. **DO NOT MIX THE PINS AND THE CABLE COLOURS!**
Apply a thin layer of pure Vaseline on the connector threads and make sure the connectors are properly secured to the receptacle by the coupling ring. The connectors are weatherproof according to IP67, when properly installed.

<table>
<thead>
<tr>
<th>Cable pairs</th>
<th>Color code</th>
<th>Pin</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. pair</td>
<td>Pink</td>
<td>5</td>
<td>V SYSTEM+</td>
</tr>
<tr>
<td></td>
<td>Grey</td>
<td>4</td>
<td>V SYSTEM-</td>
</tr>
<tr>
<td>2. pair</td>
<td>Brown</td>
<td>1</td>
<td>Bus-</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>2</td>
<td>Bus+</td>
</tr>
<tr>
<td>3. pair</td>
<td>Yellow</td>
<td>3</td>
<td>On - Off</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>6</td>
<td>ALARM</td>
</tr>
</tbody>
</table>

**Note!**

For installations that require special cable length, contact your Robertson distributor for information.
3.6 RFC35 Fluxgate Compass installation

The heading sensor is the most important part of the AP300X system and great care should be taken when deciding the mounting location. As the sensor heading is displayed on the AP300X Control Unit, the heading sensor can be mounted at any location where there is a minimum of magnetic interference.

**Note!**

*An autopilot heading sensor should not be installed on the fly bridge or in the mast.*

The RFC35 compass can be deck mounted or on the bulkhead, athwartship or alongship. The heading offset feature in the AP300X will compensate for the mechanical offsets that may be a result of the selected location and orientation of the RFC35.

If the RFC35 is deck mounted or bulkhead mounted athwartship with the cable gland pointing aft, little if any offset correction is required. With the cable gland pointing forward a 180° correction is required.

When mounting RFC35 on a bulkhead alongship, a +90° or -90° correction is needed dependent on whether it is a port or starboard bulkhead.

Select a location that provides a solid mounting place free from vibration, and as close to the vessel's center of roll and pitch as possible, i.e. close to the water line. It should be as far as possible from disturbing magnetic influences such as the engines (min. 2 meters), engine ignition cables, other large metal objects and particularly the drive unit.

Use the supplied mounting kit and drill the holes through the center of the slots in the sensor or the mounting brackets.

The compass face-plate on the RFC35 is the TOP. Never mount it upside down! Level the sensor as close to horizontal as possible.
3.7 JP300 Jack Point installation

The JP300 is designed to be used in conjunction with the AP300PX portable control units. The JP300 provides the following:

- A quick and simple means of connection/disconnection of the AP300PX at different locations on the boat.

- A means of continuing the ROBNET network in installations that use an AP300PX portable control unit.

The JP300 includes a watertight connector cover which must be installed as shown. A 32 mm (1.26” dia.) hole needs to be drilled for flush installation, along with 3 small screw holes. As indicated, a watertight sealant must be applied to the mating surfaces of the JP300 and the mounting panel.
3.8 R3000X Remote Control installation

R3000X should be mounted in the supplied bracket that can be fixed by four mounting screws. The unit is weather proof and can be mounted outdoor.

3.9 S3 NFU Lever installation

Open the unit by unscrewing the two screws on the front. Mount the backplate to bulkhead or panel. There are no screw terminals so the cable must be soldered to the microswitches according to the diagram. Interchange the port and stbd wires to the screw terminals in the junction unit if necessary to make the direction of the lever movement coincide with the direction of the rudder movement.
### 3.10 S100 NFU Lever installation

The S100 Steering Lever is for indoor mounting in panels up to 8 mm (5/16") thick. The handle has to be removed from the unit before mounting. A 22 mm (7/8") hole should be cut in the panel. Be sure that the Robertson label is pointing forward to get correct direction of rudder movement (Port/Stbd.) when operating the steering lever. S100 is supplied with 2m (6.7’) cable and plug. Cut the plug and connect the wires to the junction unit Power PCB as shown. An optional extension cable is available from Simrad Robertson. Alternatively a suitable cable and junction box or terminal should be provided locally.

![Diagram of S100 NFU Lever installation](image)

### 3.11 Interfacing

With the AP300X autopilot system there are several possibilities to connect to other equipment for data exchange:

1. J3000X includes a single NMEA input/output port.
2. J300X includes two NMEA input/output ports and Clock Data interface to Anritzu and Furuno radars.
3. The optional NI300X NMEA Interface (expansion) Unit with 4 additional NMEA input/output ports.

A further interface expansion is to connect to the Robertson Databox to provide interface to Dataline sensors, Chart plotter and GPS Receiver antenna.

The NMEA output may also drive Dataline RUDDER and COMPASS instruments directly.

The different connecting diagrams below illustrate the interface possibilities.
Single NMEA input/output

NAV RECEIVER
OR PLOTTER
(NMEA talker)

JUNCTION UNIT
MAIN PCB

NAV RECEIVER
OR PLOTTER
(NMEA talker)

NMEA listener

RUDDER instr.
COMPASS instr.
RADAR

Double NMEA input/output

LORAN C
(OR PLOTTER)

GPS
(OR PLOTTER)

Databox/J3000X

DATALINE/IS11 DATABOX

J3000X JUNCTION UNIT
MAIN PCB

J3000X JUNCTION UNIT
MAIN PCB

Databox/J3000X

TO AVOID RFI FROM NMEA SIGNALS,
USE TWISTED PAIR CABLE
WITH SHIELDING.
IN CASE OF DOUBLE SHIELDING,
GROUND ONE SHIELD EACH END.
**Databox/J300X**

![Diagram showing connections of Databox/J300X components]

- **RX1**
  - Main PCB
  - Databox (NMEA Input)
  - Vbat+
  - Spare
  - Gnd
  - Red Wh Bn Gn Blk

- **TX1**
  - NMEA Output

- **TX1+**
  - RX1
  - NMEA Input

- **RX1+**
  - TX1
  - NMEA Output

- **J300X JUNCTION UNIT**
  - TB8 TB9 TB10

**Radar Clock/Data**

![Diagram showing connections of Radar Clock/Data components]

- **ANRITSU OR FURUNO RADAR**
  - J300X JUNCTION UNIT
  - POWER PCB
  - TB8 TB9 TB10

**DATALINE Instrument installation**

The DATALINE Instruments (RUDDER, COMPASS) are designed for panel mount in exposed locations. See separate installation description enclosed with the units.

![Diagram showing connections of DATALINE Instrument components]

**Note!**

You can only connect the instrument as shown if the Mains input is 12 V. If Mains has a 24 V or 32 V source a separate 12 V source must be provided for the instrument Vbat+ and Gnd input.
**External Alarm**

The external alarm circuit has an open collector output for an external alarm relay or buzzer. The alarm voltage is the same as the main supply voltage. Max. load on external alarm output is 0.9 Amp.

**NI300X NMEA Interface Unit**

The NI300X is normally installed inside a console or locker close to Nav receivers, radar and instruments to keep cables short. The unit does not have controls that need to be operated during installation or use, but you should be able to take the lid off for inspections, to view LED indication of received signals. It should be installed with the cable inlet and the Robnet connectors facing down. The NI300X is designed to operate in a location that provides ambient temperatures below +55°C (+130°F). It is fastened to the panel/bulkhead by the external mounting brackets.

**Note!**

_The NI300X is not weatherproof, and must be installed in a dry location!_

The NI300X NMEA Interface (expansion) Unit is designed to handle installations where more NMEA lines have to be tied into the system. Four NMEA ports are available. An additional output data-port with DATA/CLOCK signal is capable of generating heading data in the format used by some radar displays made by Anritzu and Furuno. This feature is thus added to the system if a J3000X Junction Unit is installed (J3000X has no radar Clock/Data output as compared to J300X and J300X-40).

Configuration for Anritzu or Furuno is selected in the Installation Setup Menu.

12V out is for driving (max. 2) 12V Dataline instruments (max. 250mA load).
The NMEA 1-4 ports are identical in HW and SW and can be connected as desired.

**LF3000 Linear Feedback**

*Note!*

The rod of the LF3000 is not locked in place in the cylinder. If caution is not exercised it may slip out of its housing and end up over the side, so be careful!

The LF3000 is a waterproof feedback unit. It has a 300 mm (11.8") stroke and comes with a special mounting bracket which secures the LF3000 to the cylinder of the existing outboard drive unit.

The 8,5 m (28’) cable is terminated in the LFI3000 Linear Feedback Interface according to the wiring diagram.

Center the drives. Loosely secure the LF3000 to the supplied mounting bracket, across the center of the drive unit cylinder. Either cylinder may be used if there is a dual set up. You may mount the feedback in either direction, i.e. the shaft of LF3000 may point to port or starboard.
Loosen the end bolt (a) used to secure the cylinder to the drive unit mount. Insert the rod retaining assembly (b) (end plate) and retighten this bolt. Secure the feedback rod to the end plate using the two washers and cap nut provided. Adjust the location of the LF3000 Linear Feedback to allow full travel of the hydraulic cylinder without causing the endplate of the LF3000 hitting the end of the cylinder. Check that the outboard motor can be tilted freely. Tighten all nuts and the mounting bracket.

Turn the helm slowly by hand to the stops on either side, making sure that the rod does not bind up in any direction. Also, clamp cable to allow full engine movement to port and starboard. The mounting hardware provided with this system is meant to interface with Teleflex HC5340 cylinders and Hynautic K7 and K10 Cylinders. If you are attempting to interface to another system the hardware enclosed may not be appropriate! Contact your dealer to obtain the correct mounting kit.
Note! A previous version of the LF3000 has been delivered with an alternative cable with a different color code. The alternative cable is connected according to the drawing below:

![Cable Diagram]

CI300X Analogue Interface Unit

The CI300X analog interface unit is an optional module, designed to enable a variety of different equipment to connect into AP300X systems. The CI300X converts the analog inputs into Robnet compatible signals for use by AP300X system components. The CI300X adds the following capabilities to the AP300X system, and allows connection of each of the following simultaneously:

- Magnetic compass connection (Robertson APC100 or APC135 with CD100 course detector).
- Gyrocompass connection for Robertson RGC50, RGC10
- Analog input of SIN/COS for either one of the following:
  - Fluxgate compass connection (for other manufacturers SIN/COS fluxgate compasses)
  - Analog windvane (SIN/COS)
- Steering lever connection for either one of the following:
  - S9 Remote steering lever connection
  - S3 local steering lever connection

For detailed information, see separate CI300X Manual
Note!

When CD100 Course Detector is mounted upside down, the yellow and gray conductors must be interchanged.
CD100 Course Detector

On some installations the owner may prefer to use the boat's own compass. The compass must be fully gimbaled and have a flat surface underneath to fit the CD100. Make hole for a 6 mm screw in the bottom of the compass and mount the CD100 as shown on the drawing. Secure the 6 mm screw through the centre hole of the CD100. Make sure the cable does not prevent the compass from moving freely in the gimbals.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Screw M6x25mm, non magnetic</td>
</tr>
<tr>
<td>2</td>
<td>Washer, non magnetic</td>
</tr>
<tr>
<td>3</td>
<td>Course detector</td>
</tr>
<tr>
<td>4</td>
<td>Cable clamp, nylon</td>
</tr>
<tr>
<td>5</td>
<td>Washer, non magnetic</td>
</tr>
<tr>
<td>6</td>
<td>Screw M3x10mm, non magnetic</td>
</tr>
</tbody>
</table>

**Note!**

Lock nut on mounting screw (pos. 1) for transportation only. To be removed before mounting.

CDI35 Interface

Locate the CDI35 as close to the compass as possible so that there will be no problem finding it in the event of a service.

Put the two fixing screws in the slots and secure the unit to the bulkhead. Open the unit to access the screw terminals.

Cut the CD100 cable to make a suitable length and connect both cables as shown on the diagram below.

**Note!**

When CD100 Course Detector is mounted upside down, the yellow and gray conductors must be interchanged.
3.12 Software Setup Procedure

Description of Installation Settings

The design of the AP300X includes advanced features that have simplified the installation and setup of an autopilot. The principle advantage is that manual adjustments that needed to be done on previous models are no longer necessary with the AP300X.

Note!
The installation settings must be performed as part of the installation of the AP300X system. Failure to correctly set the values in the installation settings may prohibit the AP300X from functioning properly!

The Installation Settings are grouped into the following functional categories:

- **Language**: Selects language used for display information
- **Dockside Settings**: Sets values of items to be set prior to seatrials
- **Interface Setup**: Sets the identification of navigation and optional equipment connected to the AP300X system
- **Seatrial Settings**: Determines automatic calibrations and steering parameters
- **View Parameters**: Permits viewing, setting, or changing steering parameters

Each group is designed to focus on specific functions related to an installation activity, and enable quick access when changes need to be made.

Some important points regarding the installation settings values:

- When the AP300X is delivered new from the factory, (AND ANY TIME AFTER A MASTER RESET OF MEMORIES HAS BEEN PERFORMED) the Installation Settings are all reset to preset (default) values. The warning message "Installation Setup Required" will appear at turn on and if an attempt is made to access the AUTO or NAV modes.
- The Dockside, Interface and Seatrial settings can only be accessed when the system is in STBY mode.
- The values that are selected (also referred to as "PARAMETERS") from within the Installation Settings Menu, are stored in the memory of the AP300X system. No specific action is required to "SAVE" the selected values. Once the value is changed, it is stored until the next time the menu item is selected and changed.
- The Installation Settings are considered global, enabling values to be available to all control units in the system.
• The values in the Seatrial Settings are dependent on successful completion of the Dockside Settings.

• Before attempting to turn on the AP300X and perform an Installation Setup, the hardware installation and electrical installation must be completed in accordance with the installation instructions.

**Installation Settings Menu**

The Installation Settings Menu (ISM) is presented on the autopilot display by pressing and holding the NAV/SETUP pushbutton for 5 seconds.

**Note !**

*The INSTALLATION SETTINGS MENU is different from the USER SETUP MENU. Refer to flow diagram on the opposite page for a pictorial view of Installation Settings Menu.*

There are several actions that you can do once you have accessed the ISM:

- Answer YES to the question by rotating the course selector dial clockwise
- Proceed to the next item in the menu by pressing the STBD pushbutton. (Proceeding to the next item when presented with a question is the same as answering NO to the question.)
- Proceed back to the previous item in the menu by pressing the PORT button
- Change the selected item shown rotating the course selector dial
- Leave the ISM by selecting STBY, AUTO, or NAV.

On new installations, and whenever a control unit, junction unit, or software is replaced in an AP300X system, it is recommended that a MASTER RESET be performed as described in the ISM prior to proceeding with the setup procedure.

When using the ISM refer to the diagram "Installation settings Menu Flow Chart" on page 95.
Language selection

Dependent on the software version the AP300X can present the display in two different combinations of 5 languages:

- English, Deutsch, Francais, Espanol, Italiano (software version V. R. 1)
- English, Deutsch, Dutch, Svensk, Norsk (software version V. R. 2)

To access the language selection in the ISM:

1. Turn on the equipment and wait approx. 5 seconds.
2. Press the NAV/setup button for about 5 seconds until the display is changed to:

   ![INSTALLATION Language English]

3. Turn the course selector until the language you wish to use is displayed.
4. Leave the ISM by a press on the STBY button, or continue to next item in the ISM by pressing STBD [>] button.

Dockside settings

The following menu items are accessible and can be set up in the Dockside Setup Menu:

- Boat type
- Drive Unit voltage
- Rudder Feedback calibration
- Automatic Rudder test
- Transition Speed
- Master Reset of memories (only if required)

Select STBY mode and enter the ISM as previously described. Go to "Dockside Settings" by pressing STBD [>] button.

To access the Dockside settings, turn the course selector clockwise.

The display will show:

![INSTALLATION Dockside settings?]

Actual boat type is selected by turning the rotary course selector. The options are: Displacement, Planing, Sail.

Type of boat will affect the steering parameters, and the functions available in the autopilot system. Select appropriate boat type and press STBD [>] button.
**Drive unit voltage selection**

This menu option requires the installer to set the drive unit voltage to the correct level. The selections are 12V, 24V or 32V and should be set to the voltage specified for your drive unit.

**Note!**

*Selection of improper voltage level for your drive unit may damage both the drive unit and junction unit even if the protection circuits in the junction unit are activated.*

Refer to the drive unit table on page 72 for information. It is not possible to select a higher voltage than the input voltage. The CLUTCH/BYPASS voltage is automatically set to the same as the drive unit voltage. The AP300X system will also automatically detect whether the drive unit is a reversible motor or solenoid operated.

To change the voltage selection, rotate the course selector.

Proceed to next menu item by pressing STBD [>] button.

**Rudder Feedback Calibration**

This function enables you to compensate for any non-linearity in the mechanical transmission between rudder and Rudder Feedback Unit.

Confirm by rotating the course selector clockwise. The display may now show:

Manually turn the helm wheel to starboard until the rudder stops at maximum starboard rudder.

The value shown on the display is the value read by the feedback unit before any adjustment is made. The **arrow** indicates to which side the rudder is positioned. If the displayed angle is different from the actual angle, set correct rudder angle on the display by turning course selector clockwise to increase the value or counter clockwise to decrease the value.
**Note!**

*If the rudder feedback is mounted upside down, the displayed rudder angle may be to the wrong side before you start the adjustment (arrow pointing to Port).*

Advance to the next step by pressing the STBD [>] button.

Manually turn the helm wheel to port until the rudder stops at maximum port rudder.

Adjust the displayed angle the same way as for starboard adjustment. (This time you need not correct for wrong side if the Rudder Feedback is upside down).

**Note!**

*Rudder zero may still be wrong but will be adjusted later during Sea Trial.*

Proceed to next menu item by pressing STBD [>] button.

---

**Automatic Rudder Test**

**Note!**

*Move the rudder manually to midship position before starting the test. It is important also that if the boat uses power assist steering, that the engine or electric motor used to enable the power assist steering be turned on prior to this test. Stand CLEAR of the wheel and do not attempt to take manual control of the wheel during this test!*

Activate the automatic rudder test by turning the course selector clockwise.

The AP300X will issue a series of PORT and STBD rudder commands and automatically verify correct motor direction, and reduce the rudder speed if it exceeds the maximum acceptable speed for autopilot operation.

When test is finished the display will read:

```
INSTALLATION
Rudder test
Motor OK
```

or

```
INSTALLATION
Rudder test
solenoids OK
```

Proceed to next menu item by pressing STBD [>] button.
Transition Speed

The transition speed is the speed where the AP300 will automatically change the steering parameter set from the HI speed to LO speed parameters, or vice versa.

The default setting of transition speed is zero, which requires that steering parameter selection be done manually. If a GPS, Loran, or external speed log input (from Dataline or other instrument systems) is connected, it is recommended to set the transition speed to a value greater than 0, to enable the automatic speed selection feature in the AP300X.

It is recommended that you set the transition speed to a speed that represents the speed where the hull begins to plane, or where you would manually change the parameters from HI to LO.

The speed used for the automatic transition is obtained as follows:

1. Data from the source set in the interface setup for the S / D channel. If this is a valid source of VHW (speed through the water) data, then this data is used for determination of when to change parameter sets.

2. If VHW data is not available from the S/D channel or if the S/D channel is not configured, the AP300X system will use the speed data obtained from the VTG (speed over ground) sentence received from the currently selected POS source.

If no speed data is available on either the S/D channel (VHW) or the POS source (VTG), manual speed selection is required. The AP300 will always default to the HI speed steering parameters when the system is first turned on, and with speed data failure.

If manual speed selection occurs (the user manually selects HI or LO parameters), the manual parameter set will remain in effect until the AUTO mode is reselected.

Rotate the course dial clockwise until the transition speed is set to the desired value in knots.

Proceed to next menu item by pressing STBD [>] button.
**Master Reset**

**Note !**

A Master Reset is part of the final test at factory and will reset the memories to factory settings. Unless you need to clear all stored values during the installation setup procedure, you should not perform a Master Reset.

The Master Reset needs a double confirmation to prevent an unwanted reset. To perform a Master Reset, rotate the course selector clockwise and observe the display; then rotate the course selector counter clockwise.

**Interface Settings**

The AP300X system provides a totally flexible approach to the input of data from optional equipment. Identification of the type of equipment connected to the AP300X system is performed in the Interface Setup Menu.

If your system includes connection of external equipment to the NMEA0183 data ports in Junction Unit or NI300X, or if the CI300X is installed with optional compass units or an optional analog wind vane unit, they must be configured under this menu. This procedure allows you to assign an abbreviated name to identify the type of equipment that is connected to each of the available hardware ports in the AP300 system.

<table>
<thead>
<tr>
<th>Abbreviated name</th>
<th>Description / Usage</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPS1</td>
<td>Primary GPS</td>
<td>Can be used as either NAV source or POS source. Also for VTG data for automatic AUTO HI/LO speed selection</td>
</tr>
<tr>
<td>GPS2</td>
<td>Backup GPS</td>
<td></td>
</tr>
<tr>
<td>LC 1</td>
<td>Primary Loran</td>
<td></td>
</tr>
<tr>
<td>LC 2</td>
<td>Backup Loran</td>
<td></td>
</tr>
<tr>
<td>NAV1</td>
<td>Chart plotter</td>
<td></td>
</tr>
<tr>
<td>NAV2</td>
<td>Other Nav source like Decca etc.</td>
<td></td>
</tr>
<tr>
<td>WIND</td>
<td>Source of wind data for wind instrument and wind sailing.</td>
<td>Wind speed and angle from Junction Unit, NI300X or CI300X (No speed)</td>
</tr>
<tr>
<td>INSTR</td>
<td>Source of data for instrument displays. Also for automatic HI/LO parameter selection</td>
<td>Uses log input (VHW) for speed data and either DBK or DBT for depth data</td>
</tr>
</tbody>
</table>
### Abbreviated name | Description / Usage | NOTES
--- | --- | ---
RFC | For use when selecting between Robertson fluxgate compasses | RFC : J300X, RFC35 compass connected to junction unit  
RFC : RFC300, RFC300 compass connected to ROBNET
MAGN | For use with magnetic compass (APC100) with course detector (CD100) | MAGN : J300X, CDI35 + CD100 connected to junction unit.  
MAGN : CI300X, CD100 connected to CI300X
FLUXG | For use with non-Robertson fluxgate compasses that output SIN/COS | Optional CI300X item. Only available if WIND has not been set to CI300X
GYRO | For use with Robertson RGC50, RGC10 gyro | Optional CI300X item. True data displayed for HDG, COG, bearing to waypoint
Output INSTR | For high speed NMEA output of compass heading | HDM or HDT output increased from 1 to 5 times/sec. on TX1 port
Output RADAR | Clock/data heading output to radars | Selectable between Anritzu and Furuno. (On both J300X and NI300X)

The Interface Setup Menu presents these names so that they can be assigned to a hardware input or output port. Each abbreviated name is then presented in appropriate locations of the USER SETUP MENU to provide the user with choices of data sources, or identified to the AP300X where to look for various types of data.

When you assign a hardware port to an abbreviated name, you are simply telling the AP300X system that when the user chooses an abbreviated name as a data source it should look to the hardware port assigned to the abbreviated name for the data.

It is recommended that upon completion of the ISM that the configuration be recorded in the Interface Setup Table on page 100.

- Enter the Interface Setup part of the ISM by pressing and holding the NAV/ Setup button for five seconds.
- Scroll through to the **Interface setup ?** prompt by pressing the STBD [>] button.

The following display will be presented:

| INSTALLATION |
| Interface Setup? |

To access the Interface Setup items, turn the course selector clockwise.

The display will show:
The display is now showing the first name on the list. Assign a hardware port to the name by turning the course selector until the hardware port is displayed.

Proceed to the names on the list that shall be assigned by pressing STBD [>] button. Select appropriate NMEA ports by turning the course selector, or exit from menu by stepping through the list of names by pushing STBD [>] button.

**Note!**

At the completion of the Interface Setup, the names of items that you have assigned hardware ports to will be available as sources of data for NAV (navigation) and POS (position) in the USER SETUP MENU. It is recommended that you access the User Setup Menu directly after completing the Interface Setup to select the desired data. Refer to page 34 for details on changing the items in the User Setup Menu.

<table>
<thead>
<tr>
<th>Abbreviated Name</th>
<th>Hardware Port</th>
<th>Equipment connected</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPS1:</td>
<td>J300X-1 on J3000X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J300X-2 on J300X, J300X-40</td>
<td></td>
</tr>
<tr>
<td>GPS2:</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>LC1:</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>LC2:</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>NAV 1:</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>NAV 2:</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>WIND:</td>
<td>J300X-1</td>
<td></td>
</tr>
<tr>
<td>INSTR:</td>
<td>J300X-1</td>
<td></td>
</tr>
<tr>
<td>RFC:</td>
<td>J300X</td>
<td></td>
</tr>
<tr>
<td>MAGN:</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>FLUXG:</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>GYRO:</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

The listed HW ports are factory (default) assignments after a Master Reset. The names may be assigned to other HW ports as per below dependant of the system configuration.
## Installation

<table>
<thead>
<tr>
<th>System unit</th>
<th>Hardware port:</th>
<th>Display readout:</th>
</tr>
</thead>
<tbody>
<tr>
<td>All junction units</td>
<td>NMEA Port #1</td>
<td>J300X-1</td>
</tr>
<tr>
<td>J300X, J300X-40</td>
<td>NMEA Port #2</td>
<td>J300X-2</td>
</tr>
<tr>
<td>All junction units</td>
<td>Heading Sensor</td>
<td>J300X</td>
</tr>
<tr>
<td>NI300X</td>
<td>NMEA Port #1</td>
<td>NI300-1</td>
</tr>
<tr>
<td>NI300X</td>
<td>NMEA Port #2</td>
<td>NI300-2</td>
</tr>
<tr>
<td>NI300X</td>
<td>NMEA Port #3</td>
<td>NI300-3</td>
</tr>
<tr>
<td>NI300X</td>
<td>NMEA Port #4</td>
<td>NI300-4</td>
</tr>
<tr>
<td>CI300X</td>
<td>ANALOGUE (other</td>
<td>CI300X</td>
</tr>
<tr>
<td></td>
<td>Fluxgate), MAGN.</td>
<td></td>
</tr>
<tr>
<td>RFC35R, RFC300</td>
<td>Robnet</td>
<td>ROBNET</td>
</tr>
</tbody>
</table>

### Output signal setup

<table>
<thead>
<tr>
<th>Display readout</th>
<th>Hardware Port</th>
<th>Equipment connected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output INSTR: J300X-1*</td>
<td>J300X-1</td>
<td>Note</td>
</tr>
<tr>
<td>Output RADAR: Anritsu*</td>
<td>RADAR</td>
<td></td>
</tr>
<tr>
<td>Output RADAR: Furuno</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* default setting

**Note!**

The standard NMEA output rate is 1x/second. When Output INSTR is set to J300X-1, the Junction Unit output port #1 (TX1) will have an output rate of 5x/second for HDM or HDT messages (heading). The RSA (rudder angle) message is always 5x/second.

### 3.13 Sea Trial

The Sea-trial menu can only be accessed if the Dockside Settings are done and confirmed. It is also recommended that the Interface Setup be performed prior to Sea trial settings.

The seabtrial settings do the following:

- Rudder zero adjust (To tell the AP300 the precise midships position of the rudder)
- Compass calibration (To automatically compensate for onboard magnetic Deviation)
- Compass Offset (To offset the final compass heading readout)
• Automatic tuning (An optional method of determining the steering parameters)

Advance through the ISM until the following display is presented:

```
INSTALLATION
Seatrial settings?
```

Confirm by rotating the course dial Clockwise.

```
INSTALLATION
Set rudder zero?
```

**Rudder zero adjust**

The adjustment should be made in calm sea and side forces from wind or current should be avoided.

• Bring the boat up to cruising speed, and head directly into the wind.
• If the boat has twin engines, synchronize the engine RPM's.
• Set the trim tabs and stabilizers to have no effect on the boat's heading.
• Steer the boat manually on a steady course.
• Confirm the rudder ZERO position by rotating the course selector clockwise.

The display will then show:

```
INSTALLATION
Rudder zero confirmed
```

Press STBD [>] to proceed to next menu item.

**Compass calibration**

This function will activate the compass calibration procedure. The procedure will enable the RFC35 Electronic Fluxgate compass or the CDI35 Course Detector Interface to automatically correct for magnetic deviation.

*Note!*  
*If an optional magnetic compass is installed or if a GYRO compass, or other manufacturers fluxgate connected to a CI300X is installed, refer to the Optional Compass Calibration Procedure accompanying the CI300X.*

Before you begin the compass calibration procedure, make sure you have enough open water around you to make a full clockwise turn with the boat. Let the boat turn at idle.
The calibration should be done in calm sea conditions and with minimal wind to obtain good results.

1. Begin turning the boat to starboard.
2. Start compass calibration by turning the course selector clockwise.
3. When the calibration is completed, (after having completed approximately 1 1/4 turns), it will be confirmed in the display.

If the compass is close to disturbing magnetic objects, the compass calibration may fail, and the display will show:

In that case move the compass to a better location and recalibrate.

After calibration, check the compass readout against a known reference, other compass or leading line. If the reading is correct (+/-3°) except for a fixed offset, use the COMPASS OFFSET setting to input a fixed correction to offset the heading readout.

Press STBD [>] button to proceed to next menu item.

**Compass Offset**

The compass OFFSET feature allows you to correct for a constant compass heading offset, that may be present as a result of the RFC35 being installed with a lubber line offset or a fixed offset remains after the calibration procedure has been completed. The value of compass offset is specific to the heading sensor that is selected at the time the offset is entered. (For multiple heading sensor offset procedure, refer to separate CI300X manual).

The following display is presented when accessing the COMPASS OFFSET entry screen:

Dial in the correction by turning the course dial to offset the RFC35 heading to agree with the known, accurate heading. The offset value can be either positive or negative.

**Note!** The OFFSET required may be as great as 90 degrees, caused by the orientation of the compass when installed. If an OFFSET still exists after having accounted for the mechanical offset, one of the following problems may still exist:
• The heading reference that you are comparing the RFC35 is not accurate.

• The automatic calibration obtained by the RFC35 is not correct, and may be due to a large magnetic influence near the RFC35. (A relocation may be needed.)

Proceed to the AUTOTUNE function by pressing the STBD [>] button, or return to STBY mode.

**Automatic tuning**

AUTOTUNE is a new dynamic function that enables the AP300X system to automatically set up the steering parameters (Rudder, Counter Rudder, Autotrim) for the boat. The scaling factors of the parameters are also set automatically as a function of the boat type selection performed in the Dockside Settings menu.

**Note !**

*Autotune is an optional procedure that is not required for the AP300X to function. The AP300X is preset with steering parameters that should steer most boats in the 30 - 50 foot range and Autotune may not be required if the preset parameters steer your boat acceptably.*

Recommended speed during Autotune is 5-10 knots. Autotune should not be performed at planing speed. It is recommended that the Autotune be done in an East or West direction if possible, as these will yield the best balanced parameters.

**Caution !**

*The Autotune function will take control of the boat and perform a number of S-turns. It must always be performed in open waters with sufficient safe distance to other traffic. The Autotune function may take from 1 to 2 minutes to complete.*

Activate the AUTOTUNE, by rotating the course selector clockwise.

After the Autotune has been completed the rudder must be controlled manually, as the mode is returned to STBY.

When the Autotune has been completed, there should normally be no need for further adjustments. On certain installations, however, you may want to "fine tune" the parameters after the Autotune due to the special steering characteristic of a specific boat. Viewing or changing the Autotune parameters are done from within the VIEW PARAMETERS menu item.

Exit the Seatrial Settings menu by pushing STBD [>] button to proceed to the View parameters menu, or press STBY to return to normal AP300X operation.
View parameters

A boat's steering parameters found by Autotune can be looked at and if needed changed under this menu item. The steering parameters can also be set to values manually instead of performing an Autotune. The parameters are divided into two sets:

- HI = Steering parameters for automatic steering at HI speed
- LO = Steering parameters for automatic steering at LO speed

Note!

As a sail boat's steering characteristic is very much dependent on sail trim, the parameters may be optimized manually from values found by Autotune.

Manual parameter adjust

<table>
<thead>
<tr>
<th>Displayed parameter</th>
<th>BOAT TYPE:</th>
<th>Own boat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Displacement</td>
<td>Planing</td>
</tr>
<tr>
<td>LOw speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rudder LO</td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>Cont Rudder LO</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Autotrim LO</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Rudder lim LO</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIgh speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rudder HI</td>
<td>0.35</td>
<td>0.2</td>
</tr>
<tr>
<td>Cont Rudder HI</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Autotrim HI</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Rudder lim HI</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

Note!

The values in the table are factory set and listed for information only. After having performed the Autotune, the values may differ from those listed in the table. It is recommended that you write down the parameters “learned” by the Autotune prior to making any adjustments.

The two most important parameters that determine the performance of the automatic steering are Rudder and Counter Rudder.

Rudder sets the rudder gain which is the ratio between the commanded angle and the heading error (P-factor).
Too little rudder and the autopilot fails to keep a steady course.

Too much rudder gives unstable steering and reduces speed.

Low speed requires more rudder than high speed.

Counter Rudder is the parameter that counteracts the effect of the boat's turn rate and inertia. For a short time period it is superimposed on the normal rudder response as provided by the Rudder parameter. It may sometimes appear as if it tends to make the rudder move to the wrong side (counter rudder).

The best way of checking the value of the Counter Rudder setting is when making turns. The figures illustrate the effects of various Counter Rudder settings.

Autotrim standard value is 40 which should work well on most boats. On sailboats it may be preferable to set Autotrim to zero, to avoid unwanted rudder offset when changing course.

Rudder Limit should be kept at 20 degrees unless there is a need for more rudder when performing dockside maneuvers.

**Note!** In no event should the Rudder Limit be set to a value higher than the actual maximum rudder angle.
Final sea trial

After having completed all settings in the Installation Settings Menu, take the boat out and perform a final sea trial in open waters with sufficient distance to other traffic.

- Steer the boat on all cardinal headings in AUTO mode.
- Start with low and medium speeds to get familiar with the response from the AP300X.
- Try the effect of LO and HI speed settings.
- If the hardware for automatic HI/LO speed selection is connected and configured, verify that the HI/LO transition is occurring, and the HI/LO parameters are changing after the transition speed is crossed (by more than 1 Knot higher or lower speed).
- Try the Dodge function and the U-turn.
- If a Non-Follow Up lever (or handheld remote) is connected, test the mode switching and verify Port and Stbd steering commands of the lever.
- If the installation is on a sailboat, try the specific sailboat functions using the owner as a consultant on the boats specific steering characteristics when sailing. Be careful to avoid hazardous situations until you gain experience.
- Set waypoints into each navigator connected to the system, and verify that the AP300CX or AP300DLX steers in NAV mode for each NAV source.
- Provide the owner with user training.

Providing user training

The user should be instructed in the "basic" operational functions, such as:

- Turning the system on and off
- Explain how to change modes (explain briefly what takes place in the different modes).
- Regaining manual control from any mode. Point out in what modes the helm is engaged by the autopilot (bypass/clutch).
- How to take command at an "inoperative" station if applicable.
- Lock mode and how to lock/unlock and how to shut the system down from a locked control unit if applicable.
- Show NFU and FU steering and show the difference.
- Review how to use a NFU controller if connected.
- Course change by rotary knob and buttons.
Go through the user SETUP menu and show how to (and why) change the settings.

Also include Nav. source, Pos. source and Wind sensor selection if applicable.

Show the owner where the compass (or compasses) is mounted and instruct him to keep magnetic items away.

Show where the Mains circuit breaker is.

If an AP300DLX is installed, provide the user with the following additional instructions:

Setting the POS source in the USER SETUP menu

Setting the AP300DLX as the NAV source in the USER SETUP menu.

Go through each of the primary screens in the AP300DLX:

How to input waypoints

- Manual input
- Saving present position

How to steer to waypoints

- Stored waypoints
- TEMP waypoint
- MOB waypoint

Navigating with waypoints in the AP300DLX and the pilot in NAV mode

Building routes from previously saved waypoints

Navigating with routes in the AP300DLX and the pilot in NAV mode
4 MAINTENANCE

4.1 Control unit

The AP300X Control Unit will under normal use require little maintenance as the cases are made from high impact material (polycarbonate) to withstand the rigorous of an exposed cockpit.

If the unit requires any form of cleaning, use fresh water and a mild soap solution (not a detergent). It is important to avoid using chemical cleaners and hydrocarbons such as diesel, petrol etc.

Make sure that all open ROBNET connectors are fitted with a protection cap.

It is advisable at the start of each season to check all connections to the control unit head and cover with Vaseline or WD40. If the Control unit is not removed from the boat, it should be covered with the white protection cover.

4.2 Junction Unit

No special maintenance is required. It is advisable, however, at the start of each season to make a visual inspection of the internal and check all connections.

4.3 Rudder Feedback

Make a visual inspection at 2-3 month intervals and at the start of each season. Apply some grease at the ball joints when required (RF300)

4.4 Compass

If the compass is exposed to the weather, make a visual inspection at 2-3 months intervals, and at the start of each season.

4.5 Drive unit

Refer to the drive unit manual for maintenance instructions.
4.6 Exchange of EPROMS
* REMOVE THE EPROM FROM THE SOCKET BY MEANS OF THE SPECIAL EXTRACTION TOOL (P/N 44139806)

* INSERT THE TOOL BY PRESSING THE TWO GRIP PINS DOWN INTO THE TWO SLOTS IN THE CORNERS OF THE SOCKET

* SQUEEZE THE TOOL AND PULL OUT THE EPROM

* WHEN INSERTING NEW EPROMS, MAKE SURE THE CUT-OFF CORNER MATCHES WITH THE ONE IN THE SOCKET. PRESS IT GENTLY INTO THE SOCKET.

* THE IDENTIFICATION TAG INDICATES:
  - NAME OF UNIT
  - ROBERTSON PART NUMBER
  - SOFTWARE VERSION

**WARNING:**
MAKE SURE THAT THE RIGHT EPROM IS MOUNTED IN THE ACTUAL UNIT.

EPROM FOR ALL AP300X CONTROL UNITS:
- LANGUAGE ITEM #1 SOFTWARE VERSION V.R. 1 (ENGLISH, GERMAN, FRENCH, SPANISH, ITALIAN) PART NO. 22081467
- LANGUAGE ITEM #2 SOFTWARE VERSION V.R. 2 (ENGLISH, GERMAN, DUTCH, SWEDISH, NORWEGIAN) PART NO. 22081475

EPROM FOR J300X, J300X-40 AND J3000X JUNCTION UNITS:
PART NO. 22081640

* AFTER CHANGE OF EPROM, PERFORM A MASTER RESET AS DESCRIBED ON PAGE 3-34.
5 TROUBLE SHOOTING

An autopilot is a complex system and the performance is dependent of a proper installation and a successful sea trial.

In the event of a failure, you will be helped by the AP300X software which contains several test features that will assist you in isolating a probable fault.

Audible and visual alarms are given in the event a fault is detected.

The audible alarm is reset by pressing any button (e.g. by changing mode from AUTO to STBY). The visual alarm will remain and alternate with the operating display until the fault has been rectified. Refer to the table below for hints and try to solve the problem yourself, or consult your nearest Simrad Robertson dealer for assistance.

Perform the repair action in the listed order.

5.1 Alarms

<table>
<thead>
<tr>
<th>Display readout</th>
<th>Probable fault</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System failure Alarms:</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Rudder feedback failure | Rudder feedback signal missing or erratic | 1. Check all connections.  
2. Replace rudder feedback unit. |
| Rudder response failure | No response to rudder command. | 1. Check all connections  
2. Check Rudder FB transm. link.  
3. Check Drive unit motor/brushes.  
4. Replace junction unit Power PCB. |
| Rudder test too slow | Excessive load on steering gear.  
Air in hydraulic system.  
Insufficient drive unit capacity. | 1. Look for mechanical obstructions at the rudder/tiller/quadrant. Check the back drive force.  
2. Bleed the hydraulic system  
3. Replace with bigger pump unit. |
| Compass data missing | No data from selected compass. | 1. If more that one compass is connected to the system, refer to the USER SETUP menu to select a different compass.  
2. Check connections.  
3. Replace PCB or complete unit. |
| Comm. failure active AP300X | Active control unit goes silent, typical if AP300PX is disconnected. | 1. Press STBY button on "Inactive" unit to reset.  
2. Check/repair Robnet cable  
3. Replace Control unit or PCB |
<table>
<thead>
<tr>
<th>Display readout</th>
<th>Probable fault</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td>J3XX current overload</td>
<td>Drive unit shut down due to excessive load or short circuit.</td>
<td>1. Check Drive unit/Drive unit installation/Manual steering/Rudder</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Disconnect Drive unit. If fault still present, replace junction unit Power PCB.</td>
</tr>
<tr>
<td>Low 15 volt</td>
<td>Internal 15 Volt supply in Junction Unit below limit.</td>
<td>1. Replace junction unit Main PCB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Replace junction unit Power PCB if Mains voltage is 12V.</td>
</tr>
<tr>
<td>Bypass/clutch overload</td>
<td>Clutch/bypass current exceeds 2,5 Amps (overload or short circuit).</td>
<td>1. Check actual current</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check voltage marking on coil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Check coil resistance (through connecting wires)</td>
</tr>
<tr>
<td>Bypass/Clutch disengaged</td>
<td>Poor connection or open circuit in bypass/clutch coil</td>
<td>1. Check connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Replace bypass/clutch if open.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Perform new &quot;Rudder test&quot;.</td>
</tr>
<tr>
<td>J3XX high temp.</td>
<td>Excessive temperature in Junction Unit (&gt;75°C), possible long term overload.</td>
<td>1. Switch off autopilot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check for backload in Drive unit/steering system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Check that Junction unit specifications matches Drive unit.</td>
</tr>
<tr>
<td>Data failure J3XX</td>
<td>Wrong checksum on memory parameters or variables. Junction unit will use default values.</td>
<td>Perform a &quot;Master reset&quot; and make a new &quot;Dockside set-up&quot;. Switch off and on again. If the alarm is repeated, replace Junction unit Main PCB.</td>
</tr>
<tr>
<td>Com. failure with J3XX</td>
<td>Junction Unit faulty or possible poor connections in Robnet cable from same.</td>
<td>1. Check Robnet connectors and cable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Replace Junction unit Main PCB.</td>
</tr>
<tr>
<td>Low supply voltage</td>
<td>Mains voltage less than 9 Volts</td>
<td>1. Verify by System Data Menu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Switch autopilot off, charge batteries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Check/repair battery charger</td>
</tr>
<tr>
<td>High supply voltage</td>
<td>J300X, J300X-40 Mains exceeds 44V. J3000X Mains exceeds 29V</td>
<td>1. Verify by System Data Menu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Switch autopilot off</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Check / repair battery charger</td>
</tr>
<tr>
<td>Display readout</td>
<td>Probable fault</td>
<td>Recommended action</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------</td>
<td>--------------------</td>
</tr>
<tr>
<td><strong>Alarms in AUTO or NAV:</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| The boat is off course | Extreme weather conditions, too slow speed. Boats heading is outside fixed off course limit of 20 deg. (Automatic reset when inside limit.) | 1. Check steering parameters (Rudder, Autotrim, Seastate-filter.  
2. Increase Rudder value.  
3. Increase boat speed, if possible, or steer by hand. |
| End of route (NAV mode) | Final waypoint in route is passed when navigating from AP300DLX. | |
| **Alarms in NAV/WIND** | | |
| NAV. data failure | Missing or invalid NAV data. | 1. Use NMEA Test Menu  
2. Check Nav. receiver setup. |
| Wind data failure | Missing or invalid NAV data. | 1. Use NMEA Test Menu  
2. Check wind vane and wind data computer/transmitter. |
| Wind shift | Wind shift exceeding 15°, causing heading reference change of same magnitude. | Automatic reset when within limit. |
| **Alarm in all modes:** | | |
| Shallow water (AP300DLX only) | Water is shallower than set limit on S/D display, depth data input missing or the depth is outside range of depth sounder. Automatic reset when depth is safe. | Check that the set limit corresponds to the actual depth. |
5.2 NMEA Test

The NMEA test menu is accessed from the User Set Up Menu (page 34). It provides you with status information of the different NMEA messages used in the system.

**Decoding**

The incoming signals are decoded according to a built-in priority table.

Cross Track and bearing information is taken from the NMEA messages with highest priority.

One of the following codes will be displayed:

--- No data or no NMEA sentence containing the message needed at the input port.

OK Valid data found

INV Message with invalid information.

FRM Message has format failure such as
a. Incorrect check sum
b. One or more datafields are empty
c. Wrong contents in datafield(s)

Check status and set up of data source.

**NMEA signal monitor**

Close to the NMEA terminals in the junction unit you will find a green LED. A flickering LED indicates that a NMEA signal is received. It does not, however, qualify the contents of the message.

**NMEA hardware test**

Refer to next page, System Data Menu.
5.3 System Data Menu

The menu is accessed from the User Set up Menu (page 34). It provides you with additional system data that can be useful when testing or trouble shooting the system.

**NMEA hardware test**

On the main PCB in the junction unit disconnect three cables and connect TX1+ to RX1+ and TX1– to RX1–. Similar on the Power PCB connect the NMEA ports the same way (not available on J3000X).

Select the Loopback test menu(s) and verify that the hardware is OK. If not, replace the corresponding PCB(s) to rectify.

- SETUP -

SYSTEM DATA?

SYSTEM DATA
Compass Head.
242.9 M

SYSTEM DATA
Rudder Ang.
10.4

SYSTEM DATA
Input voltage
14V

SYSTEM DATA
Drive output
60%

SYSTEM DATA
Clutch/By-pass
Not installed

SYSTEM DATA
Loopback test
J3XX Port no.1
O.K.

SYSTEM DATA
Loopback test
J3XX Port no.2
O.K.

SYSTEM DATA
Filter Values
FC: 01s db: 03
State: Waves

Displays values set by the automatic seastate filter.
FC = Filter time constant in seconds
db = Deadband in degrees to each side of set course.
Boat has to be outside db before autopilot responds.

Compass heading readout
M = Magnetic, G = Gyro (True)

Rudder angle. Normally between zero and 45 degrees.

Mains voltage on input terminals.

Power to drive unit in percentage of full (100%).

Verifies if clutch has been activated when performing the rudder test.

See NMEA hardware test.

See NMEA hardware test.
6 TECHNICAL SPECIFICATIONS

6.1 AP300X Autopilot System

Boat size and type: Up to 80 feet, Power and Sail
Steering system types: Hydraulic, Mechanical
Inter-unit connection: ROBNET network
System ON/OFF: From control units
Power consumption: Dependent on system configuration

Environmental Protection:
- Control Units: IP56
- RFC35, RF300: IP56
- NI300X, CI300X: IP44
- J300X: IP22

EMC protection: EN55022, EN55101

AutoSteering control:
- Rudder Drive: Proportional rate or solenoid on/off
- Parameter selection: Automatic with manual override
- Sea state control: Adaptive sea state filter
- Language selection: English, French, Spanish, German, Italian or English, German, Dutch, Swedish, Norwegian

Electronic Interface:
- Navigation interface: Standard (NMEA 0183)
- Input/output ports: 6 (maximum with NI300X)
- Optional output: Anritzu and Furuno radar display (clock/data)

Heading sensors:
- Standard: RFC35 Electronic Fluxgate compass
- Options: Magnetic compasses, Robertson RGC gyrocompasses

Course Selection: Rotary knob and push button
Alarms: Audible and visual, optional external
Alarm modes: Off course, system failures, overload
Steering modes: Standby, Non-follow up, Follow-up, Auto, Nav, Wind, Dodge

Special Turn modes: U-turn, Tacking
6.2 Control Units (AP300CX, AP300PX, AP300DLX)

Autopilot Display:
- Type: Backlit LCD matrix display
- Resolution: 80 x 32 pixels

Graphic Display (AP300DLX only):
- Type: Backlit LCD matrix display
- Resolution: 160 x 128 pixels

Push buttons: Tactile silicone pads

Material: High quality Bayblend(ABS/Polycarbonate)

Colour: Black

Illumination:
- LCD display and Push buttons: Adjustable in 10 steps

Environmental Protection: IP56

Safe distance to compass: 0.4 m

Temperature:
- Operating: 0 to +55 °C (+32 to +130 °F)
- Storage: -30 to +80 °C (-22 to +176 °F)

6.3 Junction units

Reverse voltage protection: Yes (not J300X-40)

Power consumption: 5 Watt (electronics)

Heading Sensor input: Composite pulse width modulated

Rudder feedback input: Frequency signal, 3400 Hz., 20 hz/deg.

Rudder feedback units: RF300 or RF45

External Alarm: Open collector

Temperature range:
- Operation: 0 to +55 °C (+32 to +130 °F)
- Storage: -40 to +80 °C (-40 to +176 °F)

Mounting: Bulkhead mount

Material: Anodized aluminum and black ABS cover

For other specifications please refer to pages 12 and 70
6.4 RFC35 Fluxgate compass

Supply and output: Polarity independent 2-wire supply with superimposed pulse width modulation

Automatic Performance:

- Calibration: Automatically activated by control head
- Gain compensation: Automatically adjusted continuously
- Repeatability: +/- 0.5 degrees
- Roll/Pitch: +/- 35 degrees
- Accuracy: +/- 3 degrees after calibration

Cable supplied: 15 m shielded cable

Temperature range:

- Operation: 0 to +70 °C (+32 to +158 °F)
- Storage: -40 to +80 °C (-40 to +176 °F)

Environmental Protection: IP56

Mounting: Deck or bulkhead

Material: Black ABS

6.5 CDI35 Course Detector Interface

Supply and output: Polarity independent 2-wire supply with superimposed pulse width modulation

Automatic Performance:

- Calibration: Automatically activated by control head
- Gain compensation: Automatically adjusted continuously
- Repeatability: +/- 0.5 degrees
- Accuracy: +/- 0.5° (not including errors from course detector)

Cable supplied: 15 m TP shielded cable

Dimensions: 160 mm x 126 mm (6.3 in x 5 in.)

Weight: 0.9 kg including cable (2.0 lbs.)

Power consumption: 0.9 watts

Temperature range:

- Operation: 0 to +70 °C (+32 to +158 °F)
- Storage: -30 to +80 °C (-22 to +176 °F)

Environmental Protection: IP56

Mounting: Deck or bulkhead

Material: Black ABS
6.6 RF300 Rudder Feedback

Rudder angle: ................................................................. +/- 90 degrees
Output signal: ......................... Polarity independent frequency signal
Frequency resolution: ....... Center: 3400 Hz, 20 Hz/degree of change
Linearity: ................................................... +/- 3 degrees up to 45 degrees of rudder
Cable supplied: ......................... 10 m twisted pair shielded cable
Mounting: ................................. Horizontal, vertical, upside down
Material: .................................................. Polyacetal (POM)
Environmental Protection: .................................................. IP56

Temperature range:
  Operation: .............................. -10 to +55 °C (+14 to +130 °F)
  Storage: ................................. -30 to +80 °C (-22 to +176 °F)

Transmission link: ............... Stainless 350mm (13.8") with 2 ball joints.
  Ball joint stud for rudder arm requires 4.2mm dia hole and 5mm tap.

6.7 CI300X Compass Interface

Power consumption: ................................................................. 2 W
Gyro compass input: ...... Syncro 1:1 (RGC10/RGC50 gyrocompasses)
Heading or windvane input: ..................... Sin/cos max 12V DC
NFU steering lever input: ............ Port/stbd potential free contact
Robnet network interface: ..................... 2 network connectors
Cable inlets: .......................... Rubber glands for cable diam. 10-14mm
Mounting: ................................. Bulkhead mount
Material: .................................................. Epoxy coated aluminum
Environmental Protection: .................. IP44

Temperature range:
  Operation: .............................. 0 to +55 °C (+32 to +130 °F)
  Storage: ................................. -30 to +80 °C (-22 to +176 °F)

6.8 NI300X NMEA Interface

Power consumption: ................................................................. 3 W
NMEA183 input/output: .................... 4 ports, max output load 20mA
Heading output: ......................... Anritzu and Furuno radar display
  (clock/data, 0-5V, 50msec.)
NMEA instrument supply: ....................... 12V DC, max 0.25A
Robnet network interface: ......................................... 2 network connectors
Cable inlets: ........................................ Rubber glands for cable diam 10-14mm
Mounting: ........................................................... Bulkhead mount
Material: .......................................................... Epoxy coated aluminum
Environmental Protection: ........................................ IP44
Temperature range:
  Operation: ............................................. 0 to +55 °C (+32 to +130 °F)
  Storage: .................................................. -30 to +80 °C (-22 to +176 °F)

6.9 LF3000 Linear Feedback

Stroke: ............................................................................ 300 mm
Operating principle: .. Variable differential transformer, excitation and
  signal conversion by separate LFI3000 Interface unit
Power: .......................................................... Supplied by LFI3000
Dimensions: .................................................. 465 mm (18,3") x 22 (0,86") dia.
Mounting: .......................................................... Clamped to hydraulic ram
Material: .. Rod: .......................................................... Stainless
  Tube: .......................................................... Epoxy coated sea water resistant aluminium
Environmental protection: .................................................. IP67

6.10 LFI3000 Feedback Interface

Supply: .......................................................... From Junction Unit
Output signal .................................................. Polarity independent variable frequency
Frequency resolution .................. Center 3400Hz, 20Hz/degree equal to 1,7 mm travel
Linearity: .................................................. +/- 3 degrees up to 45 degrees of rudder
Cable supplied: .......................................................... 1,5 m TP shielded cable
Dimensions: .................................................. 160 mm x 126 mm (6.3 in x 5 in.)
Weight: .......................................................... 0,7 kg including cable (1,6 lbs.)
Power consumption: .................................................. 0,9 watts
Temperature range:
  Operation: ............................................. 0 to +70 °C (+32 to +158 °F)
  Storage: .................................................. -30 to +80 °C (-22 to +176 °F)
Environmental Protection: .................................................. IP56
Mounting: .......................................................... Deck or bulkhead
Material: .......................................................... Black ABS
## NMEA data and messages overview for AP300CX, AP300PX and AP300DLX

| Message in               | APB | APA | ATE | XTR | BGD | BMW | NMC | RMB | RSA | HHC | RKC | ZFC | MVV | VLV | MIT | PSTD | PTOE | IDE | IDE | HOM | HBC | HSC | NBA | Data use | Remarks            |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|---------------------|
| Source                  | n   | n   | n   | n   | n   | n   | p   | p   | n   | p   | n   | n   | p   | n   | p   | x   | h   | n   | c   | p   | p   | m       | *no nav data warning, p-pos, data warning |
| Acceptance cond.        | n   | n   | n   | n   | n   | n   | n   | p   | p   | p   | p   | n   | p   | p   | p   | p   | p   | p   | p   | p   | p   | m       | *no nav data warning, p-pos, data warning |
| Data type               |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x       | *same as bearing pos wp  |
| Bearing wp          6   | 5   | 4   | 2   | 1   | 2   | 2   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x     | *same as bearing pos wp  |
| Bearing pos          6   | 5   | 4   | 2   | 1   | 2   | 2   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x     | *same as bearing pos wp  |
| Present position     5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| To wp position       5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| To wp ident          5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| From wp position     5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Distance pos wp      5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| UTC time             5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Magnetic variation   5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Speed over ground    5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Speed through water  5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Apparent wind angle  5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Apparent wind speed  5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Depth                5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Time to go           5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Log distance         5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Water temperature    5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Datalogger           5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Compass heading      5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Heading steering     5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |
| Rudder angle         5   | 4   | 3   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | x, x, x   |                        |

Numbers in horizontal lines show priority for Data reading. When different messages with same data are available, (highest number is first priority).

Number gives transmission intervals in sec.
0.2 sec if "Instrument ports" installation is set up.
* Only when new data.
## 7 AP300X AUTOPILOT SPARE PARTS LIST

### AP300CX Control Unit
- P300CX Control Unit (20191565)
- Installation accessories
- P300CX Front Housing Ass’y (22082218)
- P300CX PCB Ass’y with back cover (22082200)
  - Comprising:
    - AP300 Board Ass’y P/N 20191573
    - Back cover P/N 20191516
    - PROM P/N *

*) Please specify PROM P/N as per below

- P300X PROM V.R.1 (22081467)
- AP300X PROM V.R.2 (22081475)

### AP300DLX Control Unit
- P300DLX Control Unit (22081418)
- Installation accessories
- P300DLX Front Housing Ass’y (22082234)
- P300DLX PCB with back cover (22082226)
  - Comprising:
    - P300DL Board Ass’y P/N 20191573
    - Back cover P/N 20191318
    - PROM P/N *

*) Please specify PROM as per below

- AP300X PROM V.R.1 (22081467)
- AP300X PROM V.R.2 (22081475)

### AP300PX Portable Control Unit
- P300PX Portable Control Unit (22081426)
- Installation accessories
- P300PX Front Housing Ass’y (22082242)
- P300PX Display PCB Ass’y (20191870)
- P300PX Main PCB Ass’y (20191763)
  - Comprising
    - PROM P/N *

*) Please specify PROM P/N as per below

- AP300X PROM V.R.1 (22081467)
- AP300X PROM V.R.2 (22081475)
**Junction Units**

- 22081830 J300X Junction unit
- 22081822 J3000X Junction unit
- 22081954 J300X-40 Junction unit
- 22081707 J300X Installation accessories
- 22081855 J3000X Installation accessories
- 22081962 J300X-40 Installation accessories
- 22081251 J300X Power PCB Ass’y
- 22081715 J3000X Power PCB Ass’y
- 22081947 J300X-40 Power PCB Ass’y
- 22081285 J300X Main PCB Ass’y (All models)
- 22081640 PROM for all junction units
- 22081434 J300X/J3000X Base plate
- 22082036 J300X-40 Base plate
- 22081350 Main cover
- 22081368 Terminal cover

**RFC35 Electronic Fluxgate Compass**

- 22081459 RFC35 Fluxgate Compass
- 22081442 Installation accessories consisting of:
  - 20104972 Mounting plate (2)
  - 44140762 Screw 3.5x25 (2)
  - 44140770 Screw 30x9 (4)
- 22081376 Plug (2)
- 22081178 RFC35 PCB Ass’y

**RF300 Rudder Feedback Unit**

- 20193462 RF300 Rudder Feedback
- 20193470 RF300 transmission lever
- 20193454 RF300 transmission link
- 44133122 Transmission rod M5x325mm
- 20193624 RF300 Ball joint Ass’y (2)

**CI300X Compass Interface**

- 22081137 CI300X Compass Interface
- 22082044 CI300X PCB Ass’y
- 20193256 Box
- 20193264 Cover
- 44138816 Cover nutknobs
- 20191607 Robnet Cable 7m
### NI300X NMEA Interface
- 22081129  NI300X NMEA Interface
- 20191607  Robnet cable 7m
- 22081913  NI300X PCB Ass'y
- 20193256  Box
- 20193264  Cover
- 44138816  Cover nutknobs

### Robnet cables and connectors
- 22081145  Robnet cable 15 m (49") with one male connector
- 20191607  Robnet cable 7m (23') with male connectors
- 20191615  Robnet cable 15m (49’) with male connectors
- 20192266  Robnet extension cable 10m (33’) with male and female connector
- 44138048  Robnet cable (bulk)
- 44160844  Male connector - crimp type
- 44160851  Female connector - crimp type (for extension cable only)

### Tools
- 44139707  Key for Lock ring on Robnet receptacles
- 44139806  Extraction tool for PROM
- 44161792  Robnet pin extraction tool (for crimp type connectors)
SALES AND SERVICE WORLDWIDE (000929)

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The above companies represent only main importers. Each country is in addition served by a network of local service outlets.

Some importers represent only specific market segments according to the following codes:

Professional: Coastal and Fishery market

MarineLine: Leisure market