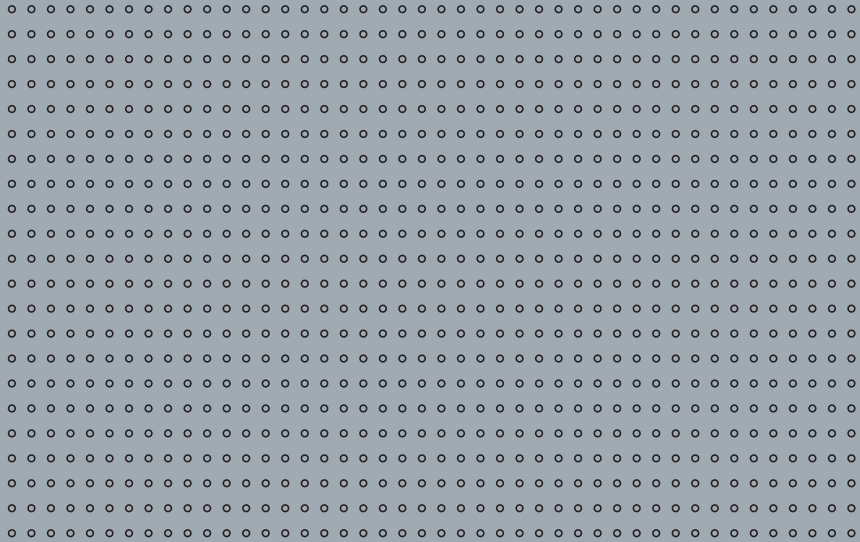


Installation manual

Simrad AP24/28 – EVC,
Volvo IPS Pilot System with
SG05 SimNet-Volvo Gateway

English



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Simrad AP24/28 – EVC,
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English

Document no: 20223210

Revision: A

Date: May 2008

The original language for this document is English. In the event of any discrepancy between translated versions and the English version of this document, the English document will be the official version.

To the best of our knowledge, the content in this publication was correct at the time of printing.

As we are continuously improving our products we retain the right to make changes to the product and the documentation at any time. Updated manuals are available from our website www.simrad-yachting.com, and are free to download.

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About this manual

Rev. A	08.05.08	First issue
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This manual is intended as a reference guide for installing and maintaining a Simrad autopilot system with the Simrad SG05 SimNet-Volvo Gateway for Electronic Vessel Control.

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

Important text that requires special attention from the reader is emphasized as follows:



Used to draw the reader's attention to a comment or some important information.



Used when it is necessary to warn personnel that a risk of damage to the equipment or hazard exists if care is not exercised.

Content

1 System description	5
1.1 General	5
1.2 How to use this manual.....	5
1.3 Software record	6
2 Installation	7
2.1 Installation checklist	7
2.2 Unpacking and handling	7
2.3 Determine system configuration	8
2.4 Autopilot system layout.....	9
2.5 SG05 Gateway installation.....	10
2.6 AP24 and AP28 Control unit installation	11
2.7 RC42 Compass installation	13
2.8 Interfacing	14
2.9 SimNet	15
3 Spare parts	19
4 Technical specifications	21
4.1 Autopilot System	21
4.2 AP24 Control Unit.....	23
4.3 AP28 Control Unit.....	24
4.4 SG05 Gateway.....	25
4.5 RC42 Rate Compass	26
4.6 AT10 SimNet/NMEA0183 converter	27
4.7 SimNet	29

4.8 IP protection 30

1 System description

1.1 General

The Simrad SG05 is a gateway for interfacing the AP24 and AP28 autopilot systems to Volvo Penta Electronic Vessel Control (EVC). It contains the steering computer and provides interface to other system components.

It communicates on the proprietary SimNet data and control network to establish a reliable digital communication and power distribution between the units in the autopilot system as well as other Simrad products.

SimNet provides high speed data transfer and control of Simrad products integrated in a total steering and navigation system.

1.2 How to use this manual

This manual is intended as a reference guide for installing and maintaining the Simrad SG05 Gateway and other components in an autopilot system.

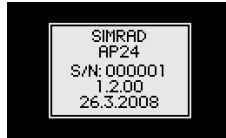
Please take time to read this manual to get a thorough understanding of the system components and their relationship to a complete autopilot system.

Other documentation material that is provided with your system includes an operator manual which includes the setup instructions for the system, a control unit installation guide and a warranty card. The warranty card must be filled out by the authorized dealer that performed the installation.

1.3 Software record

Control units

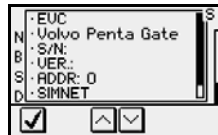
When the system is switched on, a status display shows the serial number and software version for the control unit.



The shown readout is only an example!

SimNet sources

Serial number and software version for other SimNet sources can be found under the control unit *User setup* menu. Refer to *Manual source selection* in the autopilot operator manual.



2 Installation

An autopilot system includes several units that need to be mounted in different locations on the boat, and also need to connect with at least three different systems on the boat:

- EVC Autopilot Interface
- The boats electrical system (12V SimNet power)
- Other equipment on board (SimNet/NMEA interfacing)

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

2.1 Installation checklist

1. Determine the system configuration you are installing (Page 8)
2. Perform the hardware installation (Page 10)
3. Connect SimNet devices to SimNet (page 15)
4. Perform Set-up (refer to Operator manual)
5. Test Autopilot Operation at Sea (refer to Sea Trial instructions in the Operator manual)

2.2 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.

An autopilot system will include:

- Control unit (AP24 or AP28) with accessories
- SG05 Gateway with accessories
- Compass (RC42) with 5,5 m (18') SimNet cable attached
- Optional equipment that may have been ordered for the installation.

2.3 Determine system configuration

It is important to become familiar with the configuration of the system prior to beginning the installation. An autopilot basic single station system with optional station is shown in Figure 2-1

Plan your cabling and configure the SimNet network in accordance with chapter 2.9 on page 15.

As most of the units are communicating on a common network (SimNet) with identical connectors, the installation is simple. Try to mount the units within the standard cable length supplied with each unit. SimNet cables are available from your distributor (see page 20) for connection to other SimNet devices and cable extension.

2.4 Autopilot system layout

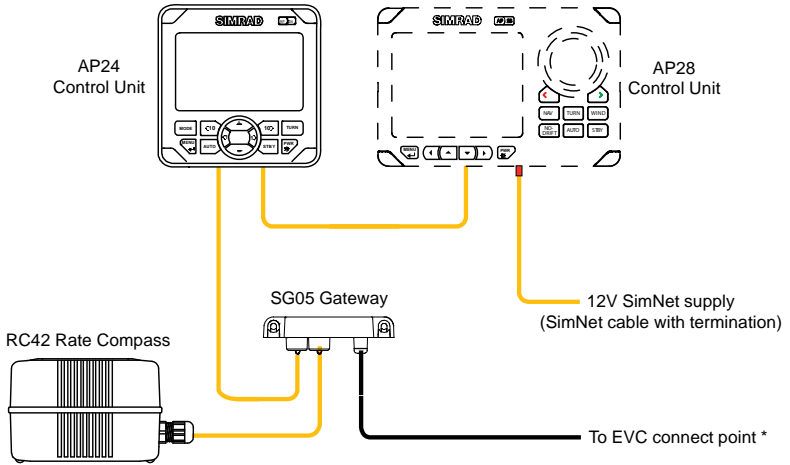


Figure 2-1

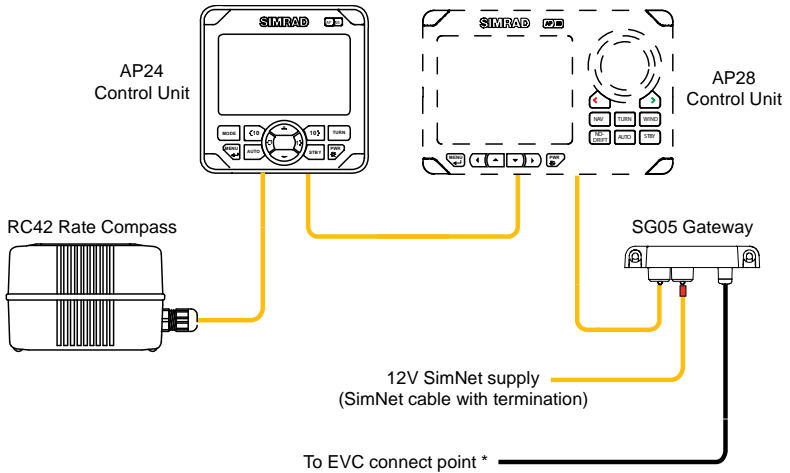


Figure 2-2

- * The EVC connect point is a connector on the Volvo Penta Autopilot Interface kit. It can be ordered from Volvo Penta under P/N 3819744 (See Figure 2-4).

2.5 SG05 Gateway installation

- The SG05 is bulkhead mounted by the enclosed screws. The SimNet connectors must be pointing downwards. Figure 2-3.
- Connect other units according to Figure 2-1. Use only readymade SimNet cables and accessories. For SimNet network termination refer to section 2.9 on page 15.
- Connect 12V SimNet supply. Refer to Figure 2-10 for correct polarity
- Connect the 1 m pigtail plug into mating connector of the Volvo Penta Autopilot Interface. Figure 2-4



SG05 has a built in LED that will alternate with 1 Hz when the unit is up running.

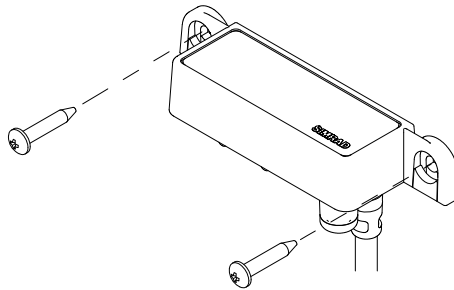


Figure 2-3 SG05 mounting

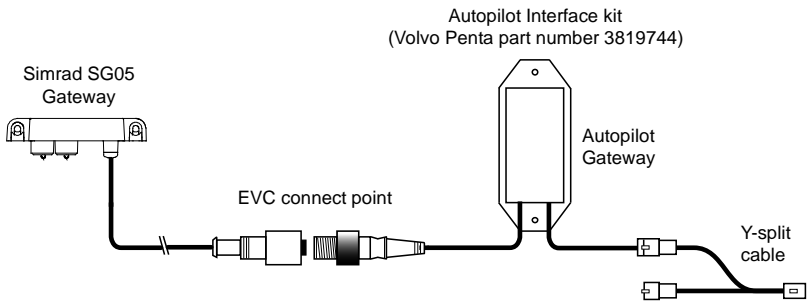


Figure 2-4 SG05 connection to Volvo Penta Autopilot Interface

2.6 AP24 and AP28 Control unit installation

Avoid mounting the control unit(s) where it is easily exposed to sunlight, as this will shorten the lifetime of the display.



Do not install the control unit where moisture is present at the rear. It may cause damage by entering the breathing hole or by coming into contact with the electrical connectors.

Panel mounting

The mounting surface must be flat and even to within 0.5 mm.

- Drill the 4 mounting holes and make a panel cut-out according to supplied template.
- Connect the SimNet cable(s) to the control unit connector(s)
- To daisy chain units remove the blocking plug with a pair of pliers.
- Use the supplied 19 mm screws to fasten the control unit to the panel.
- Apply the front panel corners.

Do not over-tighten the mounting screws!

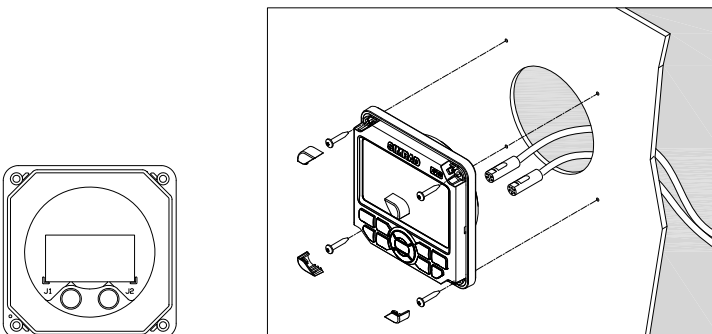


Figure 2-5 AP24 Panel mounting

Optional bracket mounting

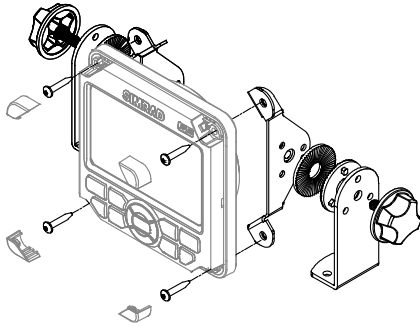


Figure 2-6 AP24 Bracket mounting

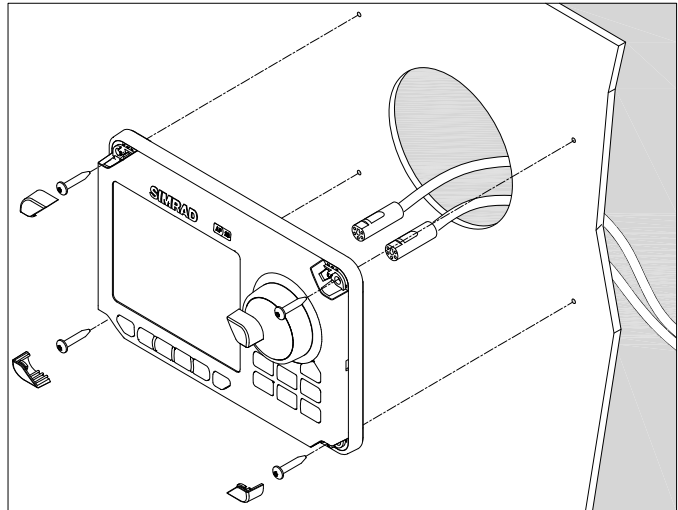


Figure 2-7 AP28 Panel mounting

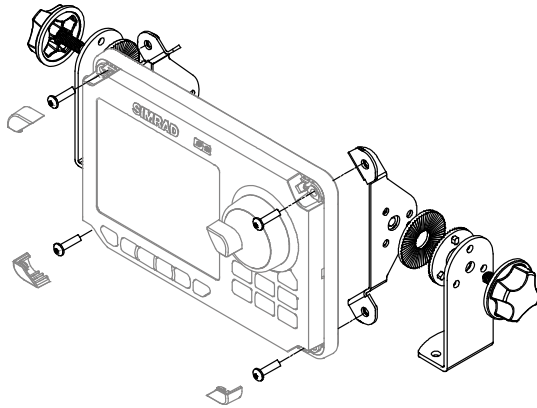


Figure 2-8 AP28 Bracket mounting

2.7 RC42 Compass installation

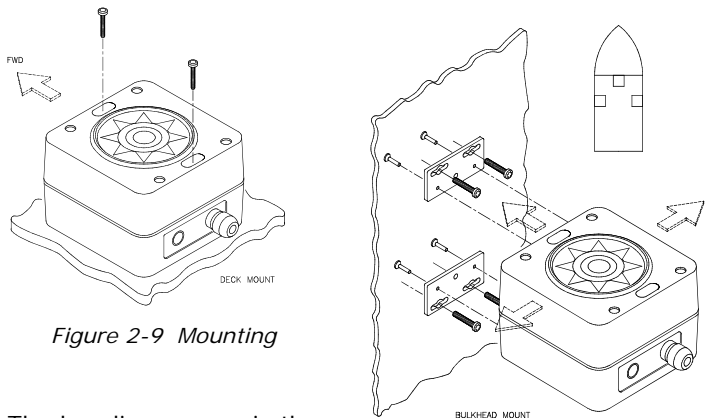


Figure 2-9 Mounting

The heading sensor is the most important part of the autopilot system and great care should be taken when deciding the mounting location. As the heading is displayed on the control unit, the heading sensor can be mounted at a remote location.

The compass can be mounted on deck or bulkhead, athwart ship or along ship. Some of the products connected to the SimNet network may have a heading offset feature. This will compensate for the mechanical offsets that may be a result of the selected location and orientation of the compass.



If the connected products have no offset feature, the compass must be deck or bulkhead mounted athwart ship with the cable gland pointing back.

Select a location that provides a solid mounting place free from vibration, and as close to the vessel's centre of roll and pitch as possible, i.e. close to the water line. It should be as far as possible from disturbing magnetic interference e.g. engines (min. 2 meters), engine ignition cables, other large metal objects and particularly the autopilot drive unit. On steel hull boats it should be mounted 0,75-1 m above the wheel house on a non magnetic stand.



The compass face plate is the TOP. Never mount it upside down! Level the sensor as close to horizontal as possible.

Use the supplied mounting kit and drill holes through the centre of the slots.

Connect the compass to an available SimNet connector in the SimNet "backbone".

2.8 Interfacing

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

- 1 Use SimNet
- 2 Use SimNet via AT10 Universal SimNet/NMEA Converter
- 3 Connect to a NMEA2000 network via adapter (drop) cable, part no. 24005729.

The different connecting diagrams on the following pages illustrate the interface possibilities of the autopilots.

2.9 SimNet

The SimNet cable system with very small plugs in both ends makes it easy to run the cables, only 10 mm (3/8") holes are required through panels and bulkheads. The SimNet accessory program contains the necessary items to make a successful installation. Refer to ***SimNet cables and accessories***, page 20.

SimNet network cables

A SimNet unit has one or two yellow SimNet connectors. There are no dedicated "in" or "out" connectors. Route the SimNet cables with Figure 2-11 or Figure 2-12 as a guideline. Select cables and accessories from the SimNet accessory program. Connect products with two SimNet connectors in a daisy chain and use drop cables and T-joiners when required. For cable extension in-line cable joiners are available. Total length of SimNet cable installed in a system should not exceed 150 meter (500').

If you plan to extend your SimNet system in the future it may be advantageous to prepare for it by adding a few T-joiners in central locations. The T-joiners provide easy access to the network and can be replaced with a new product, or the new product can be connected via a drop cable.



The connectors are weather proof according to IP66, when properly installed. All unused SimNet connectors must be fitted with the plastic cap to protect them against dirt and moisture.

SimNet power and termination

The following rules should be observed when installing SimNet.

- 1** It must have a separate 12VDC power from the battery bus or the circuit breaker board to reduce interference
- 2** It will power a SimNet compatible instrument system. Hence SimNet to other equipment can be

supplied via the autopilot, see Figure 2-11 and Figure 2-12.

- 3 SimNet must be properly terminated, i.e. unless it is a small system (see Figure 2-1 and Figure 2-2) there must be terminations at each end of the Simrad backbone.

The SimNet network has to be terminated according to the number and type of products connected.

For additional information about SimNet ask for the separate SimNet Manual.

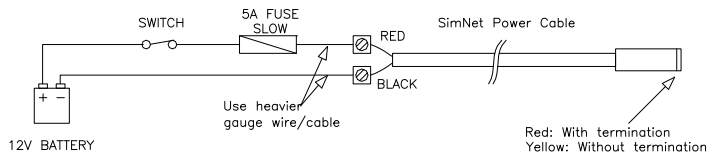


Figure 2-10 SimNet Power connection

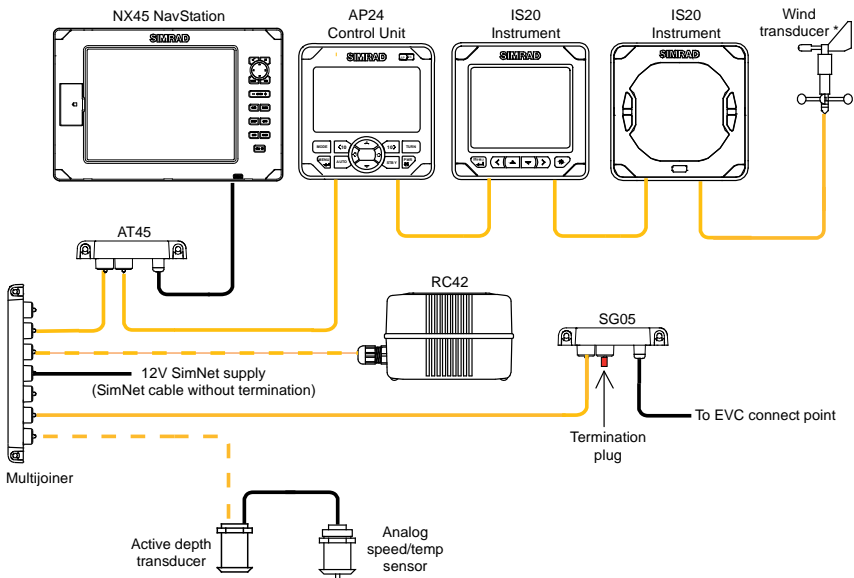


Figure 2-11 SimNet network, medium system

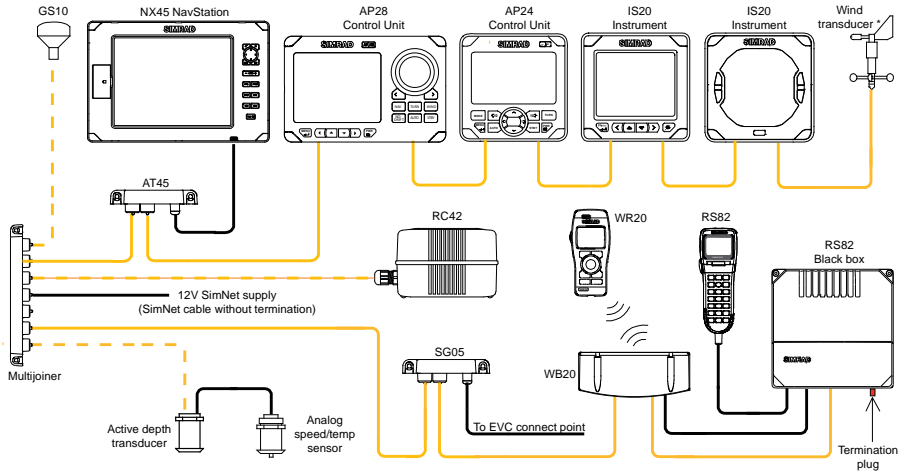


Figure 2-12 SimNet network, expanded system



1. Maximum total length of SimNet cables is 150 m (500 ft.)
2. Drop cables must not exceed 6 m (19 ft) of length and the total length of drop cables must not exceed 60 m (200 ft).
3. Equipment should not be daisy-chained in a drop cable.
4. The wind transducer (*) has a built in terminator.

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3 Spare parts

AP24 Control Unit

22096614	AP24 Control Unit
22096630	Mounting kit consisting of:
22095483	Cabinet corners (6)
44165181	Screw 3,5x19 (4)
24006355	SimNet blocking plug
22096820	Optional mounting bracket kit
24006355	SimNet blocking plug
22096515	AP24 Weather Cover

AP28 Control Unit

22096622	AP28 Control Unit
22096630	Mounting kit consisting of:
22095483	Cabinet corners (6)
44165181	Screw 3,5x19 (4)
24006355	SimNet blocking plug
22096820	Optional mounting bracket kit
24006355	SimNet blocking plug
22096572	AP28 Weather Cover

SG05 SimNet-Volvo Gateway

24006793	SG05 SimNet-Volvo Gateway w/acc.
24006686	SG05 SimNet-Volvo Gateway
44149292	Screw 3,5x10 (2)

RC42 Rate Compass

22090195	RC42 Rate Compass w/accessories
22081442	Installation Accessories Consisting of:
20104972	Mounting plate (2)
44140762	Screw 3.5x25 (2)
44140770	Screw 30x9 (4)
22081376	Plug (2)
24006363	SimNet Cable, 5.5 m (18') with one plug

SimNet cables and accessories

24005829	SimNet cable 0.3 m (1')
24005837	SimNet cable 2 m (6.6')
24005845	SimNet cable 5 m (16.6')
24005852	SimNet cable 10 m (33')
24006363	SimNet cable, 5.5 m (18') with one plug
24005902	SimNet power w/termination 2 m (6.6')
24005910	SimNet power w/o termination 2 m (6.6')
24005729	SimNet to Micro-C male. Adapter cable 0.5 m for SimNet products in a NMEA2000 network.
24005860	SimNet T-joiner (3p)
24006298	SimNet multijoiner (7p)
24005894	SimNet termination plug
44172260	SimNet In-line joiner w/o termination
44172278	SimNet In-line joiner w/termination
24005936	AT10 Universal NMEA0183 converter
AS000469	AT40 NMEA0183 interface to NX40
AA010169	AT45 NMEA0183 interface to NX45
24005878	SimNet cable gland
24005886	SimNet protection plug
24006355	SimNet blocking plug
24005928	SimNet cable protection cap

4 Technical specifications

4.1 Autopilot System

Boat size and type: Up to 50 feet, Displacement, Outboard, Planing

Steering system types: Volvo Penta EVC

Inter-unit connection: SimNet network

Maximum number of products connected in a network: 50

System ON/OFF: From control units

Supply voltage: 8-16V

Power consumption: Dependent on system configuration

EMC protection: CE IEC60945 Fourth edition 2002-08

Automatic Steering control:

Rudder Drive: Volvo Penta EVC

Parameter selection: Automatic (Autotune) with
manual override

Sea state control: Adaptive sea state filter or manual

Language selection: Dutch, English, French, German,
Italian, Norwegian, Spanish, Swedish.

NMEA2000 interface: Via SimNet port and
SimNet/NMEA2000 adapter cable

Heading sensor: RC42 Rate Compass

Course Selection: Push keys, Rotary knob (AP28)

Alarms: Audible and visual

Alarm modes: Off course, system failures

Steering modes: Standby, Power steering, Auto, NoDrift, Nav

Special Turn modes: U-Turn, C-Turn, Spiral, Zigzag, Square,
Lazy S, Depth Contour Tracking DTC.

Instrument data page interface:

Instrument screen	SimNet/NMEA2000 PGN*
Heading	PGN127250, PGN130577
Rudder angle	PGN127245
Speed	PGN128259, PGN129026, PGN130577
Depth	PGN128267
Wind angle, speed and direction	PGN130306
Position	PGN126992, PGN127250, PGN127258, PGN129025, PGN129026, PGN129029, PGN129033, PGN130577
NAV	PGN129283, PGN129284, PGN129285, PGN129029, PGN129291
Log	PGN128275
Sea temperature	PGN130310, PGN130311

* Parameter Group Number

4.2 AP24 Control Unit

Dimensions: See Figure 4-1

Weight: 0,3 kg (0,7 lbs)

Material: Front: Black ABS+PC, Back: Dark gray ABS+GF

Supply and interface: 12V via SimNet

Power consumption 1,2 W

SimNet Network load factor (NL): 2

SimNet ports (input/output): 2

Display:

Type: Backlit LCD matrix display

Resolution: 130 x 79 pixels

Illumination (Red or white): Adjustable in 10 steps

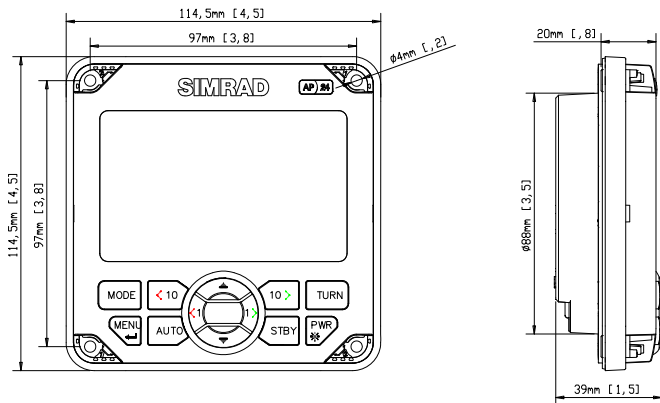
Safe distance to compass: 0.3 m (1.0 ft.)

Environmental Protection: IP56 from front, IP43 from back

Temperature:

Operating: 0 to +55 °C (+32 to +130 °F)

Storage: -30 to +70 °C (-22 to +158 °F)



*Figure 4-1 AP24 Control Unit – dimensions
(Mounting bracket is optional equipment)*

4.3 AP28 Control Unit

- Dimensions: See Figure 4-2
- Weight: 0,5 kg (1.1 lbs)
- Material: Front: Black ABS+PC, Back: Dark gray ABS+GF
- Supply and interface: 12V via SimNet
- Power consumption 1,7 W
- SimNet Network load factor (NL): 3
- SimNet ports (input/output): 2
- Display:
 - Type: Backlit LCD matrix display
 - Resolution: 130 x 104 pixels
 - Illumination (Red or white): Adjustable in 10 steps
 - Safe distance to compass: 0.3 m (1.0 ft.)
 - Environmental Protection: IP56 from front, IP43 from back.
 - Temperature:
 - Operating: 0 to +55 °C (+32 to +130 °F)
 - Storage: -30 to +70 °C (-22 to +158 °F)

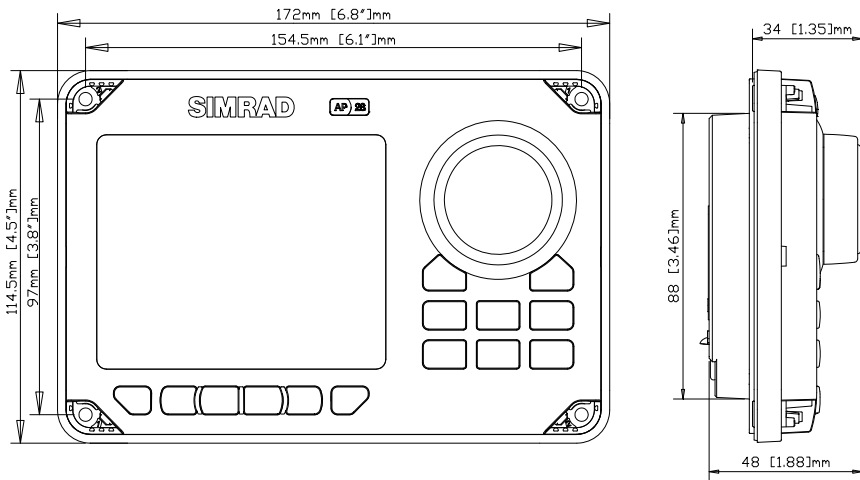


Figure 4-2 AP28 Control Unit – dimensions
(Mounting bracket is optional equipment)

4.4 SG05 Gateway

Dimensions:	See Figure 4-3
Weight:	0,1 kg (0,2 lbs)
Material:	Polyamide
Environmental Protection:	IP44
Supply and interface:	12V via SimNet
Power consumption:	0.9 W
SimNet Network load factor (NL):	2
SimNet ports (input/output):	2
Safe distance to compass:	0.5 m (1.6 ft.)
Temperature range:	
Operation:	0 to +55 °C (+32 to +130 °F)
Storage:	-30 to +70 °C (-22 to +158 °F)
Mounting:	Bulkhead mount

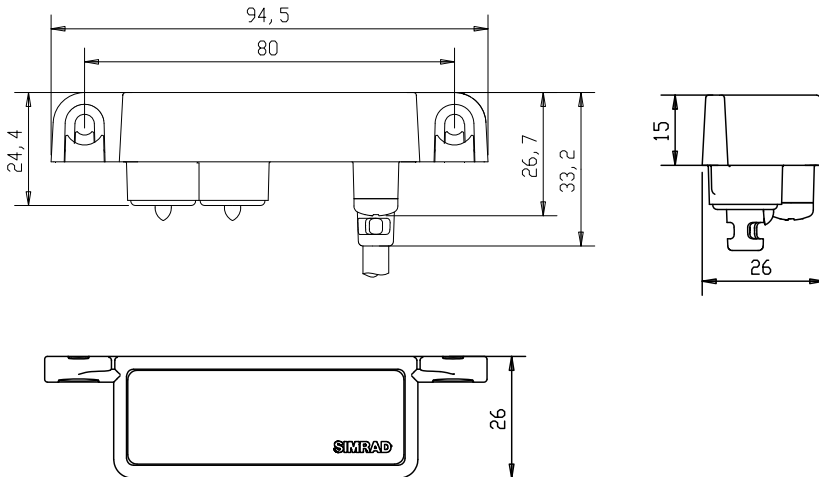


Figure 4-3 SG05 - Dimensions

4.5 RC42 Rate Compass

Dimensions:	See Figure 4-4
Weight:	0,9 kg (2,0 lbs)
Material:	Off-white ABS
Environmental Protection:	IP56
Temperature range:	
Operation:	0 to +55 °C (+32 to + 130 °F)
Storage:	-30 to +70 °C (-22 to +158 °F)
Supply and interface:	8-16V via SimNet
Power consumption:	0,9 W
SimNet Network load factor (NL):	2
SimNet ports (input/output):	1
Cable supplied:	5.5 m (18') SimNet cable with connector
Mounting:	Deck or bulkhead
Automatic Performance:	
Calibration:	Automatically activated from control head
Rate offset:	Automatically adjusted continuously
Deviation control:	Automatic
Heading output:	Rate sensor stabilized
Static Performance:	
Roll/Pitch:	$\pm 35^\circ$
Accuracy:	± 3 degrees after calibration
Repeatability:	$\pm 1.0^\circ$
Dynamic Performance:	
With random excitation of $\pm 10^\circ$ at max. 1 Hz:	
Heading error	$< 2^\circ$
With heading step input of 90° at a rate of $10^\circ/\text{s}$:	
Heading error 10 sec after turn	$< 2^\circ$
Output signal	PGN127250, 127251
NMEA2000 compliant	

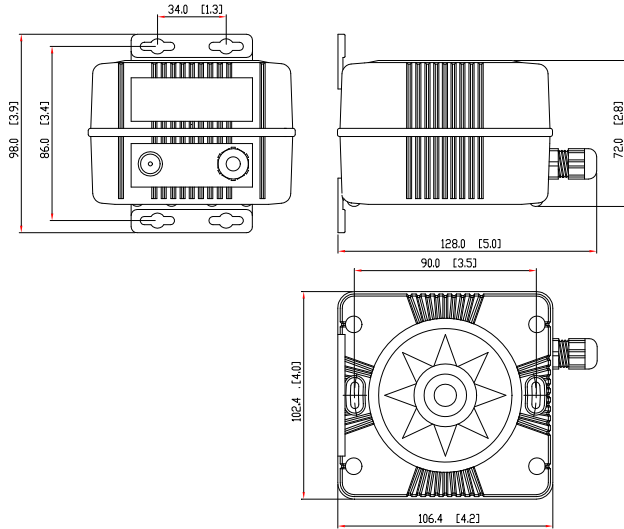
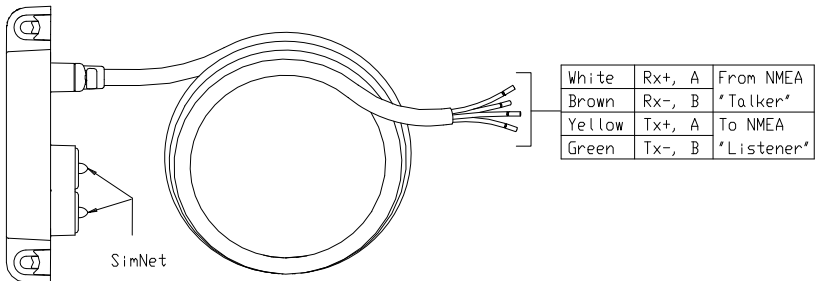


Figure 4-4 RC42 Rate Compass – Dimensions

4.6 AT10 SimNet/NMEA0183 converter



Data converted from SimNet/NMEA2000 to NMEA0183 (TX) and vice versa (RX).

NMEA0183 sentence	TX (max rate [Hz])	RX
APB	0.5	x
BWC	0.5	x
BWR		x
DBT		x
DPT	0.5 1 ¹⁾	x
GGA		x
GLL	0.5 ²⁾	x
HDG	4	x
HDM		x ²⁾
HDT	4	x
HSC	0.1	
MTW	0.2	x
MWV Relative Wind	1	x
MWV True Wind	1	x
RMA		x
RMB	0.5	x
RMC	0.5	x
RSA	3.33	
VHW	0.5	x
VTG	0.5	x
VLW	0.2 0.5 ¹⁾	x
VWR		x
WPL		x
XTE		x
ZDA	0.5	x
ZTG		x

Open cells indicates no transmission or reception.

¹⁾ Applies only for units with P/N – S/N code AA

²⁾ Applies for units with P/N – S/N code BA onwards

4.7 SimNet

Maximum number of products connected in a network:	50
Maximum cable length:	150 m (500')
Bit rate of the bus:	250 Kbit/second
Maximum DC current through a single SimNet plug.....	5A
SimNet power supply:	12VDC
Maximum drop cable length:	6 m (20')
Maximum total length of all drop cables (accumulated):	60 m (200')
Environmental protection: Cable and plug/connector system	IP66
Maximum temperature:	70 °C (158 °F)

4.8 IP protection

Each part of a Simrad autopilot system has a two digits IP protection code.

The IP rating is a method to classify the degree of protection against solid objects, water ingress and impact afforded by electrical equipment and enclosures. The system is recognized in most European countries and is set out in a number of British and European standards.

The first code number describes the protection against solid objects, and the second number describes the protection against liquids.

	FIRST NUMBER Protection against solid objects		SECOND NUMBER Protection against liquids
IP	TESTS	IP	TESTS
0	No protection	0	No protection
1	Protection against solid objects up to 50 mm, e.g. accidental touches by hands.	1	Protected against vertically falling drops of water (e.g. condensation).
2	Protection against solid objects up to 12 mm, e.g. fingers.	2	Protected against direct sprays of water up to 15° from the vertical.
3	Protection against solid objects over 2.5 mm (tools + wires)	3	Protected against sprays to 60° from the vertical.
4	Protection against solid objects over 1 mm (tools + wires + small wires)	4	Protected against water sprayed from any direction.
5	Protection against dust - limited ingress (no harmful deposit)	5	Protected against low pressure jets of water from all directions - limited ingress permitted.
6	Totally protected against dust	6	Protected against strong jets of water, e.g. for use on ship decks - limited ingress permitted.
		7	Protected against the effects of immersion between 15 cm and 1 m.
		8	Protected against long periods of immersion under pressure.

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Master the Elements