Installation manual

Simrad PI50

Catch monitoring system

KONGSBERG

Simrad PI50

Installation manual

This manual provides you with the basic information required to install the Simrad PI50. For more detailed information about the practical use of the product, refer to the *Simrad PI50 Operator manual* or the *Simrad PI50 Reference manual*.

328459/B

Revision status

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Rev.A	28.04.2010	First release.
Rev.B	11.04.2011	Additional information added. See **Record of changes** in chapter *About this manual* on page 7.

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Disclaimer

Kongsberg Maritime AS endeavours to ensure that all information in this document is correct and fairly stated, but does not accept liability for any errors or omissions.

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 and/or injury to personnel. The user must be familiar with the contents of the appropriate manuals before attempting to install, operate or work on the equipment.
Kongsberg Maritime AS disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

Support information

If you require maintenance or repair, contact your local dealer. You can also contact us using the following address: simrad.support@simrad.com. If you need information about our other products, visit http://www.simrad.com. On this website you will also find a list of our dealers and distributors.

Table of contents

About this manual

Purpose

The purpose of this manual is to provide the information and basic drawings required for installation of the Simrad PI50.

For more detailed information about the practical use of the product, refer to the *Simrad PI50 Operator manual* or the *Simrad PI50 Reference manual*.

About the technical descriptions and the target audience

This manual describes the installation of the Simrad PI50.

The manual is intended for technical personnel; qualified maintenance engineers and technicians. It is assumed that the personnel is conversant with the general principles of maritime electronic equipment, in particular sonar, echo sounder and catch monitoring systems. The personnel must also be familiar with computer hardware, signal processing, interface technology and traditional troubleshooting on electronic and mechanical products.

The instructions must be followed carefully to ensure optimal performance. As a guide, installation procedures are presented in the order they are to be performed. Successful completion of each procedure is to be confirmed by checking off the corresponding box.

Note

The installation instructions given in this document must be adhered to. Failure to do so may render the guarantee void.

Kongsberg Maritime AS will accept no responsibility for any damage or injury to the system, vessel or personnel caused by equipment that has been incorrectly installed or maintained, or by drawings, instructions or procedures that have not been prepared by us.

The equipment described in this manual includes the complete system with associated cabinets, but not system units provided locally by the customer, installation shipyard or local dealer. The manual also defines the equipment responsibility, and provides instructions for unpacking and storage.

After installation, this document must be stored on board the vessel for later reference when updating or servicing the equipment.

Installation drawings

Detailed vessel specific mechanical drawings for the installation must be provided by the customer, or any shipyard contracted to perform the installation.

Kongsberg Maritime AS may, on special order, provide assistance to these drawings. Drawings must be approved by the appropriate vessel certification authority prior to installation of the system.

Applicable outline dimension and productions drawings are provided in the *Drawing file* chapter. Drawings may also be downloaded in PDF and/or DWG formats from http://www.simrad.com.

References

The following user manuals have been provided for the Simrad PI50.

All manuals may be downloaded from http://www.simrad.com.

- **English:**
  - Simrad PI50 Operator Manual **[328457]**
  - Simrad PI50 Reference Manual **[328458]**
  - Simrad PI50 Installation Manual **[328459]**
- **Español:**
  - Simrad PI50 Manual de Usuario **[349277]**
  - Simrad PI50 Manual de Referencia **[349276]**

Record of changes

This list describes in more detail the various changes made to this Simrad PI50 manual.

A **28.04.2010**: First version of manual

B **08.04.2011**:

a Added separate references to hydrophone and sensor installation to chapter *Installation procedures* on page 19.

b Added new procedure *Initial setup procedure* on page 24.

c Added new section in *Cable layout* chapter, see *Read this first!* on page 27.

d Added new cable drawing to *Cable layout* chapter, see *Computer/Receiver Unit serial line* on page 37.

Simrad PI50

Study this chapter to familiarize yourself with the Simrad PI50.

Topics

Related topics

Important

As with all other advanced instruments, there are a few important things that you must be aware of.

When the PI50 is not used

When you do not use the PI50, switch off the display and the computer.

You may switch of the PI50 Sensor Receiver too. It is not equipped with an on/off switch, but you can unplug the power supply if you are not going to use the PI50 for a while.

If something breaks down

If you believe that something has broken down, contact your local dealer. He will be able to assist.

A list of all our dealers is provided on http://www.simrad.com. If you are unable to contact a dealer, observe the support information in this chapter.

→ *Support information* on page 17

When you switch off the PI50

You must NEVER switch off the PI50 by means of the on/off switch on the computer.

You must ALWAYS exit the PI50 application by clicking the **Exit** button on the **Title Bar**.

If you power down the PI50 by means of the computer switch you may damage the software application and the interface parameters to external devices.

System description

The Simrad PI50 is designed for the professional fishery community implementing the latest innovations. The catch monitoring system allows you to stay in full control of the gear and its behaviour. The system is designed to be equally useful for all fishing types. Bottom trawlers, pelagic trawlers, purse or danish seiners - whatever kind of gear you use, all vessels can take advantage of the functionality provided by the PI50.

The Simrad PI50 comprises the following units:

- Colour display
- Processor Unit (The PI50 Marine Computer may be provided)
- Sensor Receiver
- Hydrophone

The hydrophone is mounted under the vessel's hull.

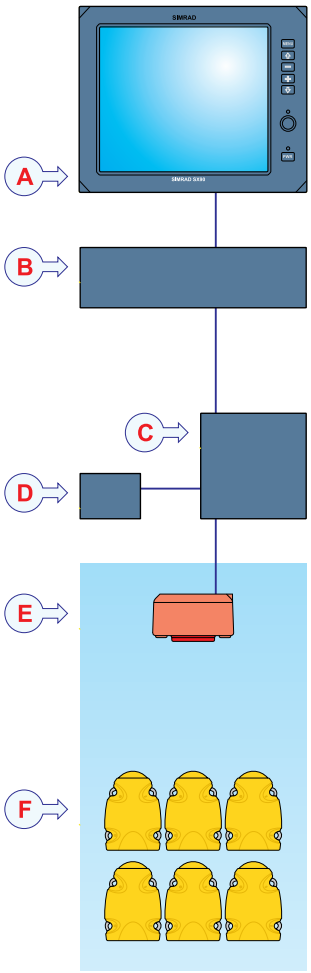
The system further comprises a number of small and robust sensors measuring the conditions on your fishing gear. The Simrad PI50 can receive information from six sensors simultaneously.

One or more sensor battery chargers are also required.

The sensors are powered by built-in rechargeable batteries. They are housed in titanium casings, and designed using advanced shock absorbing materials. The information collected by the sensors are sent through the water to the hydrophone by means of coded sound waves. The Sensor Receiver amplifies and decodes the information, converts it to digital format, and sends it to the Processor Unit (computer). The computer interprets the information, and finally presents it to you.

System diagram

Figure 1 System diagram



A basic PI50 system diagram is provided. Interface capabilities and power cables are not shown.

A *Display Unit*

B *Processor Unit*

C *Sensor Receiver*

D *Power Supply*

E *Hydrophone*

F *Catch Monitoring Sensors*

Additional units include:

- Sensor Battery Charger
- Loudspeaker

A loudspeaker is optional, and it must be installed if you wish to hear the audible alarms. Note that a loudspeaker can not be connected directly to the computer. An amplifier is required.

Main units

The Simrad PI50 comprises the following units:

- Colour display
- Processor Unit (The PI50 Marine Computer may be provided)
- Sensor Receiver
- Hydrophone

Colour display

Any commercial colour display can be used with the Simrad PI50 system. However, the chosen display must be fitted for maritime use, and it must meet the minimum performance specifications.

These specifications are:

- **Minimum screen resolution**: 1280 x 1024

In addition to the PI50 presentation, the colour display will also display the menu system for the interactive operation. In order to increase readability and comprehension, dedicated colour palettes have been chosen to improve the distinction between the various echoes and presentation elements.

Note that the colour display is not a standard part of the PI50 delivery.

Processor Unit

Note

The PI50 Marine Computer does not contain any fans. It will be very warm, even during normal operation.

Figure 2 PI50 Marine Computer

Minimum computer requirements

Observe the following minimum computer requirements.

- **Operating system:** Microsoft® Windows® XP® (32–bit) or Microsoft® Windows® 7 (32–bit) [1]

  On new installations, we recommend that Microsoft® Windows® 7 is used.
- **Processor speed:** 2 GHz Dual core
- **Memory:** 2 Gb
- **Free hard disk space:** 30 Gb
- **Graphic adapter:** DirectX9.0c compatible with Direct3d and OpenGL[2]

1. The PI50 software does not support Microsoft© Windows© NT or older operating systems.
2. A large number of commercial graphic adapters are available, and Simrad has not tested all of them. Even adapters meeting the minimum specifications may in some cases prove to fail with the PI50 software. We welcome any feedback with comments or experiences with graphic adapters.

- **Interfaces:**
  - One serial (RS-232) interface to communicate with the Receiver Unit

    Note that “PCI Express” serial interface boards are not supported.
  - One Ethernet interface to communicate with ship’s local area network (if required)
  - One or more serial line interfaces (depends on how many interfaces that are required for the specific integration)
- **Display resolution:** 1280 x 1024[3]

Sensor Receiver

The Simrad PI50 uses a custom built receiver.

The PI50 Receiver Unit is housed in a small cabinet. All necessary input and output sockets easily available. The unit is powered by a small external power supply.

Figure 3 PI50 Receiver Unit

The Receiver Unit provides the following interfaces:

- Serial line cable to the Processor Unit.
- One hydrophone
- External power supply

The maximum length of the serial line cable between the Sensor Receiver and the Processor Unit is 50 meters.

3. This is the minimum resolution. As with all other Windows applications, the PI50 software will work with higher resolutions, provided that it is supported by the graphic adapter in the computer and the display connected.

Hydrophone

Two hull mounted hydrophones are available, one for purse seining operations, and one for trawl operations. You can install both, and then select active hydrophone by means of a selector box on the bulkhead.

Purse seine hydrophone

Figure 4 Purse seine hydrophone

The hull mounted hydrophone for purse seining operations has a 90 degrees horizontal beam and a 30 degrees vertical beam to provide the PI50 with optimal reception from the sensors on a purse seine.

This specific beam pattern is especially suited for purse seining and the wide coverage area reduces the need for careful alignment.

Trawl hydrophone

The hull mounted hydrophone for trawling operations has a 50 degrees horizontal beam and a 30 degrees vertical beam to provide the PI50 with optimal reception from the sensors on a bottom or pelagic trawl.

This specific beam pattern is especially suited for trawling and the wide coverage area reduces the need for careful alignment.

Portable hydrophone

Figure 5 Portable hydrophone

A portable hydrophone is also available. It is designed as a temporary measure until a fixed hydrophone can be installed at the vessel's next planned dry docking. It has an omnidirectional beam and a 50 meter integrated cable.

The cable is sheathed in polyurethane providing robust external protection to compliment its 150 kg tensile strength.

The cable is supplied on a reel for convenient retrieval and stowage, and is equipped with a plug for easy attachment to the Receiver Unit.

Catch monitoring sensors

A large selection of sensors can be used with the PI50 system.

The current software version supports the following sensors:

- Bottom Contact
- Catch
- Depth
- Spread
- Temperature
- Height
- Spread/Depth
- Twin Spread
- Height/Depth
- SeineSounder
- Geometry

Related topics

- *About PI sensors* on page 73
- *Sensor configuration* on page 89
- *Charging procedures* on page 92

General supply conditions

The following supply conditions are applicable to this Simrad PI50 delivery.

Equipment responsibility

The shipyard performing the installation and/or equipment dealer becomes fully responsible for the equipment upon receipt unless otherwise stated in the contract. The duration of responsibility includes:

- The period of time the equipment is stored locally before installation.
- During the entire installation process.
- While commissioning the equipment.
- The period of time between commissioning and the final acceptance of the equipment by the end user (normally the owner of the vessel which the equipment has been installed).

Unless other arrangements have been made in the contract, the Simrad PI50 guarantee period (as specified in the contract) begins when the acceptance documents have been signed

Receipt, unpacking and storage

Upon accepting shipment of the equipment, the shipyard and/or the dealer should ensure that the delivery is complete and inspect each shipping container for evidence of physical damage. If this inspection reveals any indication of crushing, dropping, immersion in water or any other form of damage, the recipient should request that a representative from the company used to transport the equipment be present during unpacking.

All equipment should be inspected for physical damage, i.e. broken controls and indicators, dents, scratches etc. during unpacking. If any damage to the equipment is discovered, the recipient should notify both the transportation company and Kongsberg Maritime so that Kongsberg Maritime can arrange for replacement or repair of the damaged equipment.

Once unpacked, the equipment must be stored in a controlled environment with an atmosphere free of corrosive agents, excessive humidity or temperature extremes. The equipment must be covered to protect it from dust and other forms of contamination when stored.

For more information, see the appendix related to equipment handling.

→ *Equipment handling* on page 116

General installation requirements

The following installation requirements are applicable to this Kongsberg Maritime delivery.

Approval by classification society

The Simrad PI50 hydrophone installation must be approved by Det Norske Veritas (DNV) or another classification society. The shipowner and shipyard performing the installation are responsible for obtaining installation approval.

Supply power

The supply voltage to the equipment is to be kept within ±10% of the installation's nominal voltage. Maximum transient voltage variations on the main switchboard's bus-bars are not to exceed -15% to +20% of the nominal voltage (except under fault conditions).

Compass deviation

Once the installation is complete, the vessel must be swung with the system in both the operative and inoperative modes. The shipowner and captain are responsible for updating the deviation table accordingly with regard to the vessel's national registry and corresponding maritime authority.

Noise sources

The vessel's hull, rudder(s) and propeller(s) should be thoroughly inspected in dry dock prior to installation. Roughness below the water-line deformities in the shell plating and protruding obstacles can create underwater noise. These sources of turbulence must be smoothed or removed as best as possible. It is especially important that the propeller(s) is not pitted or damaged.

Dry docking

Make sure that ample clearance under the sonar trunk and/or protection blister is provided when dry docking the vessel. Avoid locating supporting blocks or structures in the vicinity of this equipment.

Note

The location of the hydrophone and/or protection blister must be noted on the vessel's docking plan for future reference.

Power down all hydroacoustic systems, and label each system accordingly to prevent accidental power on. Remove circuit breakers if necessary.

Wiring

All cables running between system cabinets located in different rooms and/or on different decks must be supported and protected along their entire lengths using conduits and/or cable trays. Note that the cables must not be installed in the vicinity of high-power supplies and cables, antenna cables or other possible sources of interference.

Note

Whenever possible, hydrophone cables must be run in steel conduits.

For more detailed information about cables and wiring, refer to the basic cable requirements.

→ *Basic cable requirements* on page 127

Support information

If you need additional technical support for your Simrad PI50 you must contact your local dealer, or one of our support departments.

Norway (Main office)

- **Address**: Strandpromenaden 50, 3190 Horten, Norway
- **Telephone**: +47 33 03 40 00
- **Telefax**: +47 33 04 29 87
- **E-mail address**: simrad.support@simrad.com
- **Website**: http://www.simrad.no

Spain

- **Address**: Poligono Partida Torres 38, 03570 Villajoyosa, Spain
- **Telephone**: +34 966 810 149
- **Telefax**: +34 966 852 304
- **E-mail address**: simrad.spain@simrad.com
- **Website**: http://www.simrad.es

USA

- **Address**: 19210 33rd Ave W, Lynnwood, WA 98036, USA
- **Telephone**: +1 425 712 1136
- **Telefax**: +1 425 712 1193
- **E-mail address**: simrad.usa@simrad.com
- **Website**: http://www.simrad.com

Installation procedures

This chapter provides the basic information required to install the physical Simrad PI50 units.

Note that physical installation of commercial units (computers, printers, displays etc.) is not described in this manual. Refer to the applicable user manual(s) provided with the product.

Topics

Related topics

Basic procedure

This is the basic installation procedure.

1 Check that you have received all parts required for the installation; cables, connectors, brackets, drawings etc.

→ *Drawing file* on page 63

2 Install the hydrophone and its cable according to the guidelines in the hydrophone manual and the drawings provided with it.

3 Mount the PI50 Processor Unit (or commercial computer).

→ *PI50 Marine Computer installation* on page 21

4 Mount the display unit.

5 Connect the computer and display cables.

a Power cable to display monitor.

b Power cable to computer.

c Video cable from computer to display monitor.

d Connect the pointing device (mouse or trackball).

e Connect the keyboard (if applicable).

→ *PI50 Cable layout* on page 26

6 Mount the Receiver Unit using the appropriate brackets.

→ *Receiver Unit installation* on page 22

7 Mount the power supply for the Receiver Unit.

8 Connect the cables to the Receiver Unit:

- Hydrophone cable
- Power cables

9 Prepare and install the serial line cable between the Receiver Unit and the computer:

10 Prepare and connect the required sensor interfaces.

a Navigation system (GPS) for speed, position, distance and heading information

b Trawl system for gear monitoring

c Echo sounder for depth monitoring

You can connect these devices using serial lines to the rear side of the PI50 computer. If applicable, you can also retrieve the information from these peripheral devices from the vessel's local area network (LAN).

→ *PI50 Cable layout* on page 26

PI50 Marine Computer installation

The PI50 Marine Computer is an industrial computer. It is small, rugged, and contains no moving parts. This means that fans, hard disks and CD drives are omitted. The computer provides Ethernet sockets, RS-232 serial lines, and a number of USB connectors. The hard disk is replaced with a solid state drive (SSD).

The Marine Computer is easily mounted with the brackets supplied with the unit.

A small external power supply is provided, and must be placed near the computer.

Note

The PI50 Marine Computer does not contain any fans. It will be very warm, even during normal operation.

Figure 6 PI50 Marine Computer

Two brackets and eight bolts enclosed. Mount the two brackets at the bottom of the computer.

1 Locate the most convenient location for the computer.

In order to allow for future maintenance, we strongly advice that you mount the computer with its rear panel available for immediate access.

Note

Make sure that you can access both the rear and front side of the computer after it has been installed.

2 Observe the outline dimension drawing.

→ *PI50 Marine computer* on page 64

3 Mark the location of the six holes provided on the two brackets.

4 Mount the unit using six bolts or screws.

5 Find a suitable location for the power supply.

6 Secure the power supply with wire straps, velcro, brackets, or any other means appropriate.

7 Connect the cables.

Note

When you connect the cables, make sure that they are all secured, and able to withstand the vibration and movements of the vessel.

Colour display installation

Different commercial colour displays are available. For installation and operation of the chosen display unit, refer to the manual supplied with the unit.

1 Before you start installation, check that all the following requirements are met.

- The display must be located so that it is best protected from glare which reduces readability.
- The display may be mounted in a panel, on the desktop or bulkhead, or overhead.
- Make sure that adequate ventilation is available to avoid overheating.
- The compass safe distance must be allowed for when planning the unit's location.
- Make sure that the installation allows for the physical movements and forces normally experienced on a vessel.
- Make sure that enough space is provided for maintenance work.

2 Install the colour display as described the applicable documentation provided with the unit.

3 Connect the cables.

Note

When you connect the cables, make sure that they are all secured, and able to withstand the vibration and movements of the vessel.

Receiver Unit installation

The PI50 Receiver Unit is housed in a small cabinet. All necessary input and output sockets easily available. The unit is powered by a small external power supply.

The Receiver Unit provides the following interfaces:

- Serial line cable to the Processor Unit.
- One hydrophone
- External power supply

Two brackets are mounted on the Receiver Unit to facilitate installation on a bulkhead or inside a cabinet wall. You need to find four 4 mm bolts or screws.

Figure 7 PI50 Receiver Unit

1. Locate the most convenient location for the Receiver Unit.

   In order to allow for future maintenance, we strongly advice that you mount the unit with both end panels available for immediate access.
2. Observe the outline dimension drawing.

   → *PI50 Receiver Unit* on page 65

   → *Power Supply for PI50 Receiver Unit* on page 66
3. Mark the location of the four holes provided by the two brackets.
4. Mount the unit using four bolts or screws.
5. Find a suitable location for the power supply.
6. Secure the power supply with wire straps, velcro, brackets, or any other means appropriate.
7. Connect the cables.

   Note

   When you connect the cables, make sure that they are all secured, and able to withstand the vibration and movements of the vessel.

Hydrophone installation

For hydrophone installation, refer to the documents provided with each hydrophone.

The following installation manuals apply:

- Purse seine hydrophone installation manual [164149]
- Trawl hydrophone installation manual [164472]
- Portable hydrophone installation manual [164730]

These installation manuals can also be downloaded from http://www.simrad.com.

Sensor installation

For information about sensor installation, see the documentation provided with each sensor.

This documentation can also be downloaded from http://www.simrad.com.

Related topics

- *About PI sensors* on page 73

Initial setup procedure

This procedure explains how to set up the communication between the Simrad PI50 computer and the Receiver Unit. This is normally done only one time.

Communication with the PI50 Receiver Unit is based on a serial line and proprietary telegrams. You can only set up this communication with a licensed version of the PI50 software.

Important

If you purchase the PI50 Maritime computer, serial port A (1) is set up and activated for this interface. If you use your own computer, make sure that it is equipped with an RS-232 serial port. This is the only way you can communicate with the Receiver Unit.

→ *Computer/Receiver Unit serial line* on page 37

The first step (with sub-steps) in this procedure explains how to do the physical cabling. The remaining steps describe how to set up the interface in the PI50 software.

1 Connect the PI50 computer to the Receiver Unit using a serial line.

a Locate a free serial port that can be used for this communication.

b On the chosen serial line socket on the PI50 computer (male connector), connect the RS-232 cable as follows:

- Receive signal **Rx** on pin 2.
- Transmit signal **Tx** on pin 3.
- Common **Ground** on pin 5.

c On the Receiver Unit, use the only serial line socket available (female connector). Connect the RS-232 cable in a 1:1 configuration.

Note

The connection between the computer and the Receiver Unit uses a 1:1 serial cable. A suitable cable with length 2 m is provided with the Transceiver Unit. If you need a longer cable, you can extend this cable, or make your own.

→ *Computer/Receiver Unit serial line* on page 37

d Ensure that the total length of the serial line cable does not exceed approximately 50 meters.

If a longer cable is required, you may need to use buffer amplifiers on the serial line.

2 Click the **Setup** icon under the **Main** menu to open the **Setup** menu.

3 Click the **Installation** button to open the **Installation** sub-menu.

On the sub-menu **I/O Setup** to open the **I/O Setup** dialog.

4 In the **I/O Setup** dialog, select which serial port to use for this communication.

5 Click on the chosen port to select it, then click the **Input** button to open the **Select Inputs** dialog.

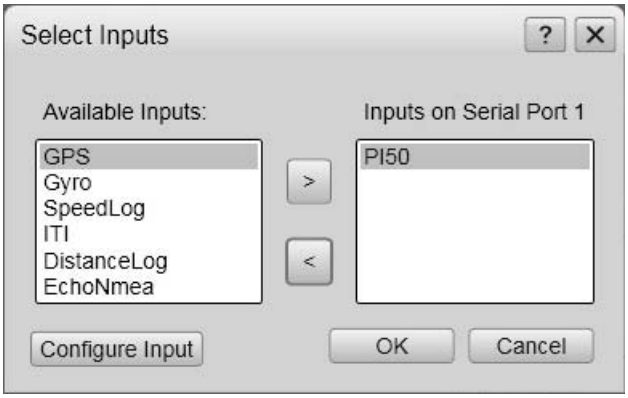
6 In the **Select Inputs** dialog, locate **PI50** on the left side, and click the [►] button to connect it.

7 Click **OK** to save the current settings and close the dialog.

8 In the **I/O Setup** dialog, click on the chosen port to select it, then click the **Setup** button to open the **Serial Port Setup** dialog.

9 In the **Serial Port Setup** dialog, enter the relevant parameters to set up the port.

- Baud rate: 4800
- Data bits: 8
- Parity: None



Important

If you use your own computer, you may need to verify these settings in the operating system.

In Windows XP, right-click **My Computer** on the desktop. Then, click **Properties →Hardware →Device manager →Ports**.

In Windows 7, open **Computer** from the "Start" icon. Then, click **System properties →Advanced system settings Hardware →Device manager →Ports**.

Right-click on **Ports** to view and/or define communication properties.

10 Click **OK** to save the current settings and close the dialog.

11 In the **I/O Setup** dialog, click on the chosen port to select it, then click the **Monitor** button to open the **Port Monitor** dialog.

12 Check the data flow on the communication line.

In order to monitor this data flow, the peripheral system must be active and transmitting information to the PI50.

13 If the data flow is operational, close all dialogs.

PI50 Cable layout

This chapter provides the cable plan and cable installation requirements for the Simrad PI50.

Topics

Read this first!

Detailed information about cable specifications, termination and connectors are provided. All cables are provided by Simrad unless otherwise specified. In order to provide for maintenance and to allow for vibration, make sure that some slack is provided for all cables.

A detailed drawing for each cable is provided. Each drawing provides additional specifications, and may, when applicable, include:

- Required minimum specifications
- Connections at each end (including reference to the corresponding: system unit, terminal board identification and plug/socket to be used)
- Corresponding terminations
- Number of cores

Cables fall into two categories.

- **System cables**: These cables are supplied by Kongsberg Maritime.
- **Shipyard cables**: These cables must be provided by the shipyard performing the installation, or the shipowner. It is very important that the cables used meet the minimum specifications provided in this manual.

  Kongsberg Maritime accepts no responsibility for damage to the system or reduced operational performance caused by improper wiring.

For more information, see the generic cable requirements.

→ *Basic cable requirements* on page 127

Note

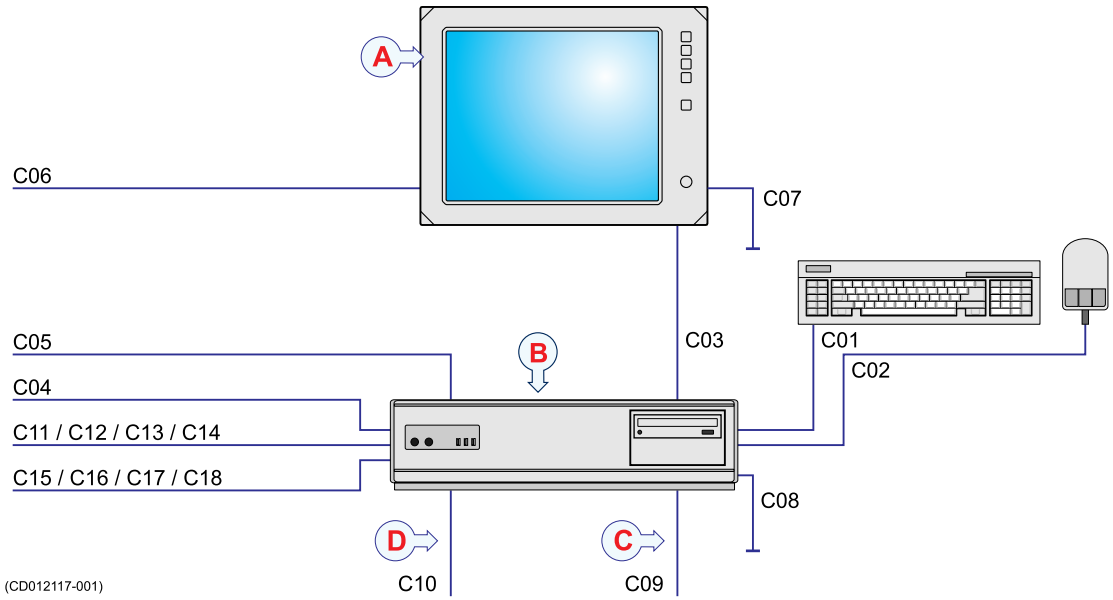
Before you perform the PI50 cabling, ensure that the mains circuit breaker for the system is switched off.

Note

All electronic installations and corresponding wiring must be in accordance with the vessel's national registry and corresponding maritime authority and/or classification society. If no such guidelines exist, we recommend that Det Norske Veritas (DNV) Report No. 80-P008 «Guidelines for Installation and Proposal for Test of Equipment» is used as a guide. Observe Basic cable requirements on page 127.

Cable plan

Figure 8 Cable plan, topside



A *Display*

B *Computer*

C *Ethernet cable to vessel LAN (C09, optional)*

D *RS-232 serial cable to Receiver Unit (C10)*

If a loudspeaker system is installed, use the appropriate output (audio or USB depending on the speaker system) on the rear side of the computer.

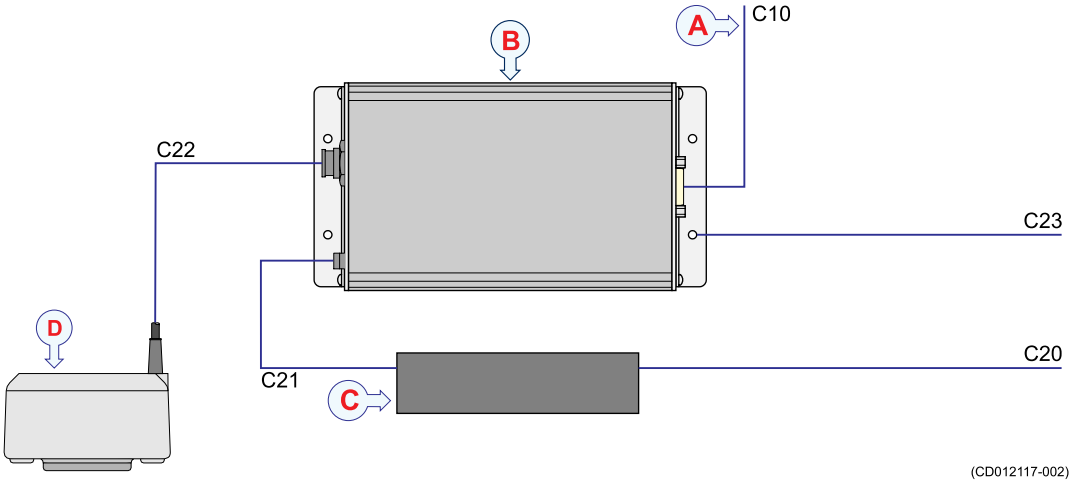
Important

If you use your own computer, make sure that it is equipped with an RS–232 serial port. This is the only way you can communicate with the Receiver Unit. Not all commercial computers provide this interface. You must also set up the serial port on your computer to offer the correct communication parameters. If in doubt, consult your dealer.

→ *Initial setup procedure* on page 24

→ *Computer/Receiver Unit serial line* on page 37

Figure 9 Cable plan, Receiver Unit



A *Serial cable to Processor Unit (C10)*

B *Receiver Unit*

C *Power supply*

D *Hydrophone*

Note that the individual units are not drawn to scale.

List of cables

The list below specifies each cable used on the PI50 system. References are made to the location of connector(s), detailed cable drawings and specifications.

C1 **PI50/C01 Keyboard**

This is a standard keyboard cable. It is usually fixed to the keyboard. The connection normally depends on the make and model of the computer. Most recent computers use a USB plug, older types use PS/2. Wireless keyboards are also available.

Note that the keyboard is an optional item. It is not a part of the PI50 delivery.

C2 **PI50/C02 Mouse, trackball or other pointing device**

This is a standard computer mouse, or other pointing device, cable. It is physically attached to the mouse. The cable is normally terminated in a USB plug. Wireless pointing devices are also available.

A commercial “trackball” pointing device is provided with the PI50 computer.

C3 **PI50/C03 Display cable**

This video cable is normally provided with the display, and it is often physically attached to the rear side of the display. It is a standard commercial cable.

The most common video formats and connectors are SVGA and DVI. Some computers also support the HDMI output format.

Make sure that the computer’s graphic adapter is fitted with a connector that matches the video cable provided with the display.

→ *VGA/SVGA Display* on page 45

→ *DVI–I Display* on page 48

C4 **PI50/C04 Printer**

A printer can be connected to the PI50 computer. A cable for this is normally provided with the printer.

The most common interface cable for printers is USB. Some older computers and printers also support parallel connection (Centronics).

→ *Universal Serial Bus (USB)* on page 46

→ *Parallel printer* on page 47

C5 **PI50/C05 Computer to AC mains**

The AC mains cable is provided with the PI50. It is a standard commercial mains cable. The computer end is normally terminated with an IEC C13 inline socket.

The other end is terminated in an AC connector suitable for the local conditions. If this is not the case, you must replace the AC connector. The typical cable length is between 1,5 and 2 meters. If this is too short you must use an extension cable (not recommended), mount a new power outlet within range, or make your own power cable.

The PI50 Marine Computer is fitted with an external power supply, and it can also be powered from a DC source. Observe the technical specifications.

→ *PI50 Marine Computer specifications* on page 69

→ *AC mains (IEC 60320)* on page 39

→ *Commercial DC power supply* on page 41

C6 **PI50/C06 Colour display to AC mains**

This cable is provided with the display. It is a standard commercial mains cable. The display end is normally terminated with an IEC C13 inline socket.

The other end is terminated in an AC connector suitable for the local conditions. If this is not the case, you must replace the AC connector. The typical cable length is between 1,5 and 2 meters. If this is too short you must use an extension cable (not recommended), mount a new power outlet within range, or make your own power cable.

→ *AC mains (IEC 60320)* on page 39

C7 **PI50/C07 Colour display to ground**

This is a standard commercial grounding cable. When applicable, connect this cable between the unit and ships' ground.

The cable must be provided by the installation shipyard.

→ *Vessel ground* on page 38

C8 **PI50/C08 Computer to ground**

This is a standard commercial grounding cable. When applicable, connect this cable between the unit and ships' ground.

The cable must be provided by the installation shipyard.

→ *Vessel ground* on page 38

C9 **PI50/C09 Ethernet to ship local area network (LAN)**

If the computer is equipped with an Ethernet connector, it may also be connected to the vessel's local area network (LAN).

A standard "straight" Ethernet cable is required, and the cable must be provided by the installation shipyard.

Note that screened Ethernet cables must be used (CAT5 or better).

→ *RJ45 Ethernet, straight* on page 43

C10 **PI50/C10 Serial line to Receiver Unit**

This cable provides all communication between the Receiver Unit and the computer.

A standard three-wire serial line is used.

The Receiver Unit provides a 9–pin D-connector socket. The same type of connector is normally used on the computer too.

→ *Initial setup procedure* on page 24

→ *Computer/Receiver Unit serial line* on page 37

C11 **PI50/C11 Serial interface line**

The number of serial lines available depends on the chosen computer make and model.

One serial line is required to interface the Receiver Unit.

→ *Generic RS-232 Serial line* on page 35

C12 **PI50/C12 Serial interface line** (same as C11)

C13 **PI50/C13 Serial interface line** (same as C11)

C14 **PI50/C14 Serial interface line** (same as C11)

C15 **PI50/C15 Universal Serial Bus (USB) interface**

Most computers support one or more USB connectors for peripheral devices. In a typical PI50 configuration, the USB connectors are not used.

However, a USB interface may be used to accept serial line information (providing a converter is used). You can also use the USB interfaces to connect a mouse, keyboard, printer or memory devices. The number of USB sockets available depends on your computer make and model.

→ *Universal Serial Bus (USB)* on page 46

C16 **PI50/C16 Universal Serial Bus (USB) interface** (same as C15)

C17 **PI50/C17 Universal Serial Bus (USB) interface** (same as C15)

C18 **PI50/C18 FireWire interface**

Most current computers supports a FireWire (IEEE 1394) interface, and provides 4–circuit or 6–circuit sockets. This interface is however not required by the PI50.

C19 **Not used**

C20 **PI50/C20 Power supply to AC mains**

This cable is provided with the power supply.

It may be a standard mains supply cable, or it may be integrated with the power supply.

If a loose cable is used, the power supply end is normally terminated with an IEC C13 or IEC320/C7 inline socket. The other end is terminated in an AC connector suitable for the local conditions. If this is not the case, you must replace the AC connector.

→ *AC mains (IEC 60320)* on page 39

→ *AC mains (IEC320/C7)* on page 40

C21 **PI50/C21 DC power cable**

The PI50 Receiver Unit powered from a DC supply. The power supply – with all cables – are provided with the PI50 delivery.

→ *Receiver Unit power supply* on page 42

C22 **PI50/C22 Hydrophone cable**

The hydrophone is connected to the dedicated socket on the Receiver Unit.

→ *Hydrophone junction box* on page 50

→ *Hydrophone* on page 51

C23 **PI50/C23 Receiver Unit to ground**

This is a standard commercial grounding cable. When applicable, connect this cable between the unit and ships' ground.

The cable must be provided by the installation shipyard.

→ *Vessel ground* on page 38

On the Receiver Unit, secure the cable using one of the mounting bolts for the cabinet.

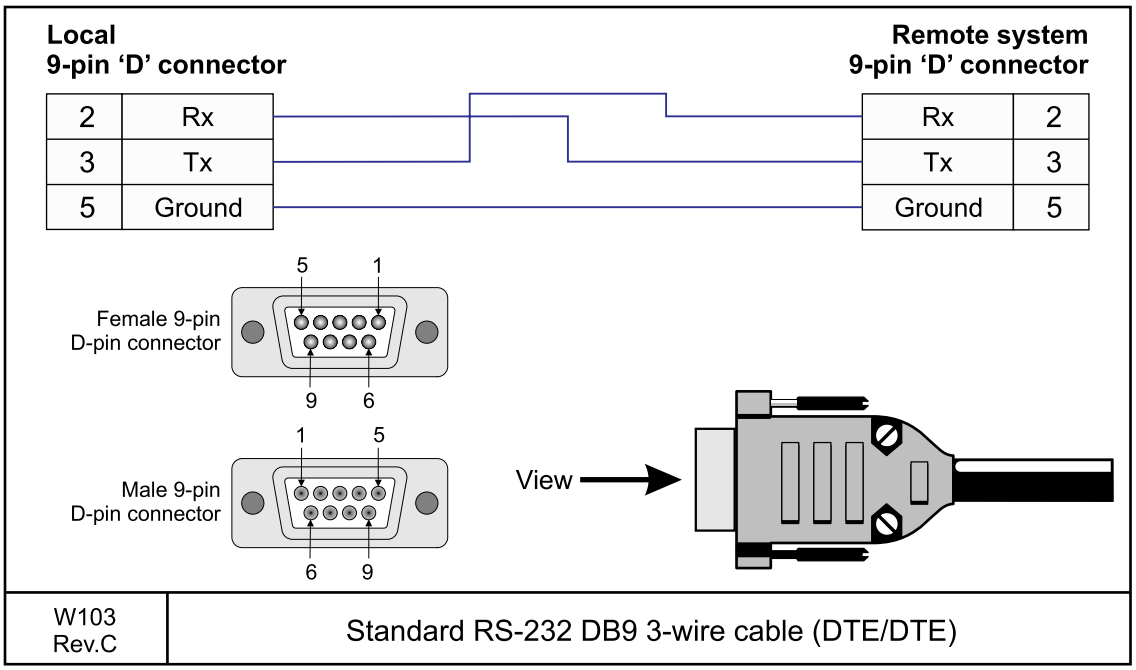
Cable drawings

This chapter provides details cable drawings offering cable specifications and termination information.

Topics

Generic RS-232 Serial line

This cable holds a multi purpose serial line. It provides interface with any peripheral unit. One end of the cable connects to the local unit (DTE) with a 9-pin D-connector, while the other connects to the peripheral (DCE) as described in the peripheral unit's documentation. Note that this cable does not support all the signals in the standard RS-232 specification.



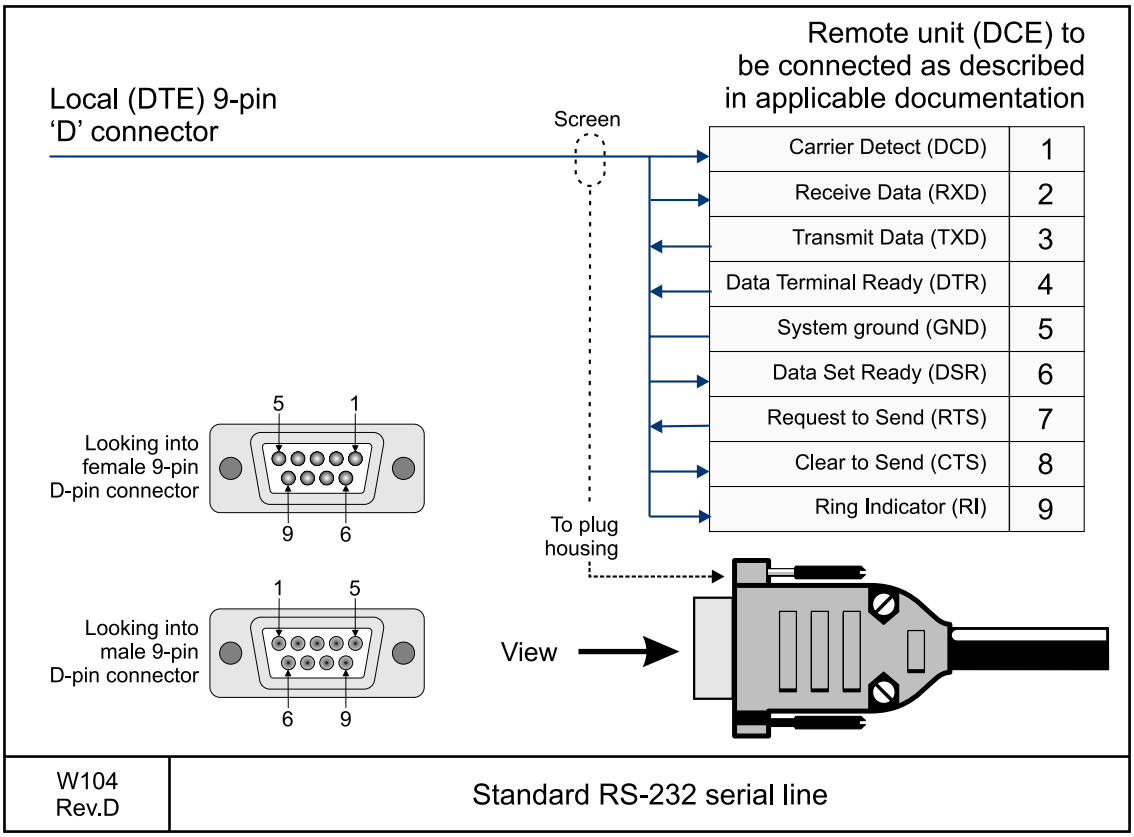
Cable specifications

- **Conductors**: 3 x 0.5 mm²
- **Screen**: Overall braided
- **Voltage**: 60 V
- **Maximum cable diameter**: Limited by the plugs

Generic RS-232 Serial line

This cable comprises a multi purpose serial line. It provides interface with any peripheral unit. One end of the cable connects to the local unit **(DTE)** with a 9-pin D-connector, while the other connects to the peripheral **(DCE)** as described in the peripheral unit's documentation.

In many cases, only the **RxD**, **TxT** and **GND** pins are used. Twisted pairs are sufficient in the cable.

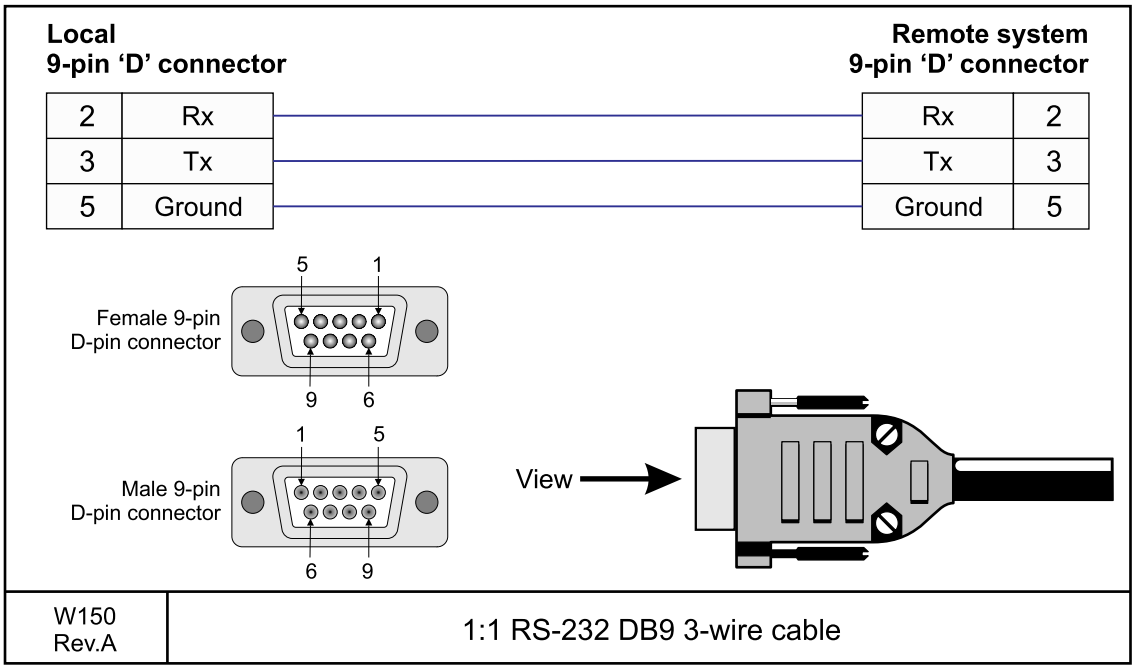


Cable specifications

- **Conductors**: 5 x 2 x 0.5 mm²
- **Screen**: Screened twisted pairs and overall braided
- **Voltage**: 60 V
- **Maximum diameter**: Limited by the plugs

Computer/Receiver Unit serial line

This cable holds the communication between the PI50 computer and the Receiver Unit.

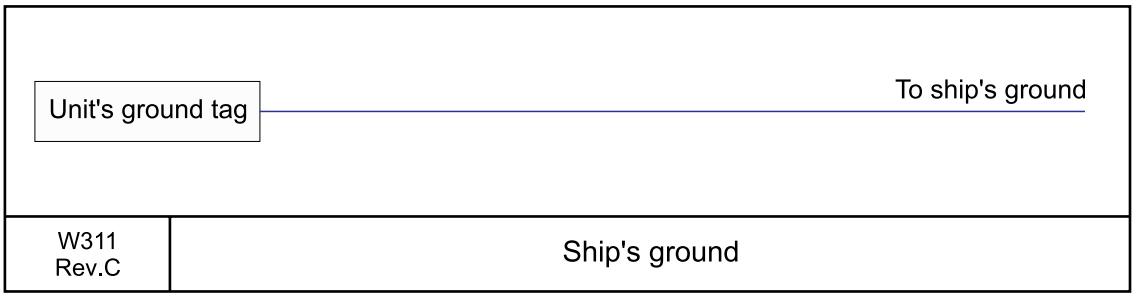


Cable specifications

- **Conductors**: 3 x 0.5 mm²
- **Screen**: Overall braided
- **Voltage**: 60 V
- **Maximum cable diameter**: Limited by the plugs

Vessel ground

This cable is used to connect a system unit to the ship’s ground. Note that this cable must be as short as possible.

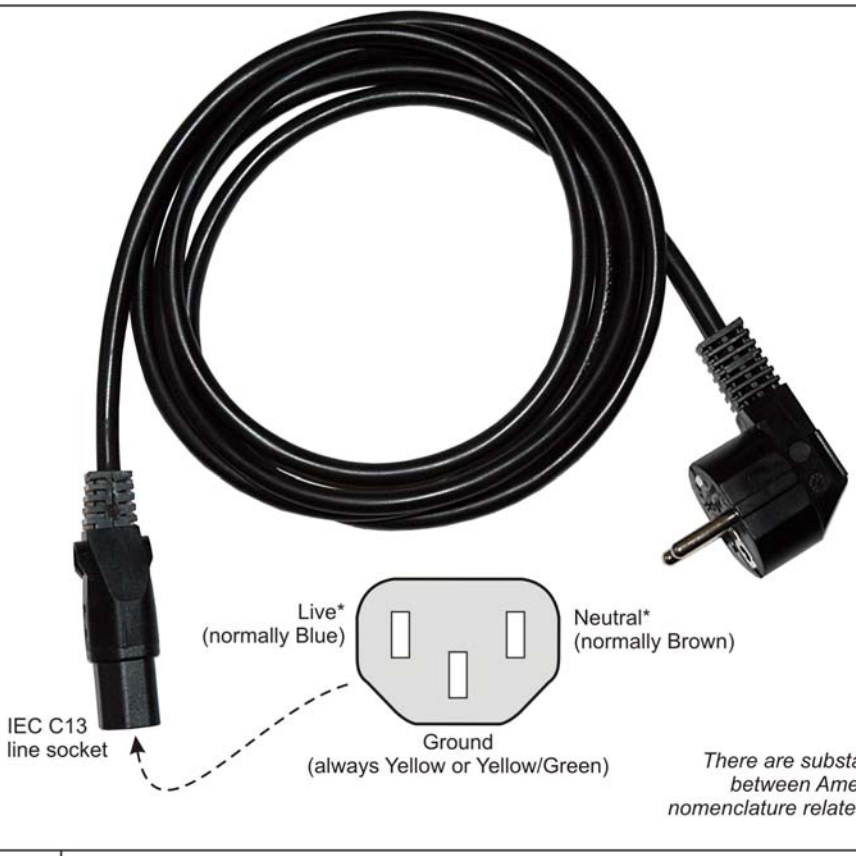


Cable specifications

- **Conductors**: 1 x 6 mm²
- **Screen**: None
- **Voltage**: 60 V
- **Maximum diameter**: N/A

AC mains (IEC 60320)

This is a commercial 230 Vac power cable for mains power. One end is fitted with an IEC plug, the other with a standard European mains plug. This is a standard cable type supplied in different lengths.



W320 Rev.C	Commercial power cable for AC mains

Cable specifications

- **Conductors**: 2 x 1.5 mm² + GND
- **Screen**: None
- **Voltage**: 750 V
- **Maximum diameter**: Set by the plugs

More information

- http://en.wikipedia.org/wiki/IEC_320

AC mains (IEC320/C7)

This is a commercial 230 Vac power cable for 2-phase mains power. One end is fitted with an IEC320/C7 plug, the other with a standard European mains plug. This is a standard cable type supplied in different lengths.

W324 Rev.A	Commercial power cable for 110-230 Vac 2-phase

Cable specifications

- Not applicable. This is a commercial cable.

Commercial DC power supply

This is a commercial low voltage DC power supply. The input is a standard IEC320/C8 connector. The output cable is fastened to the power supply, and holds a standard circular plug. The polarity is printed on the supply.

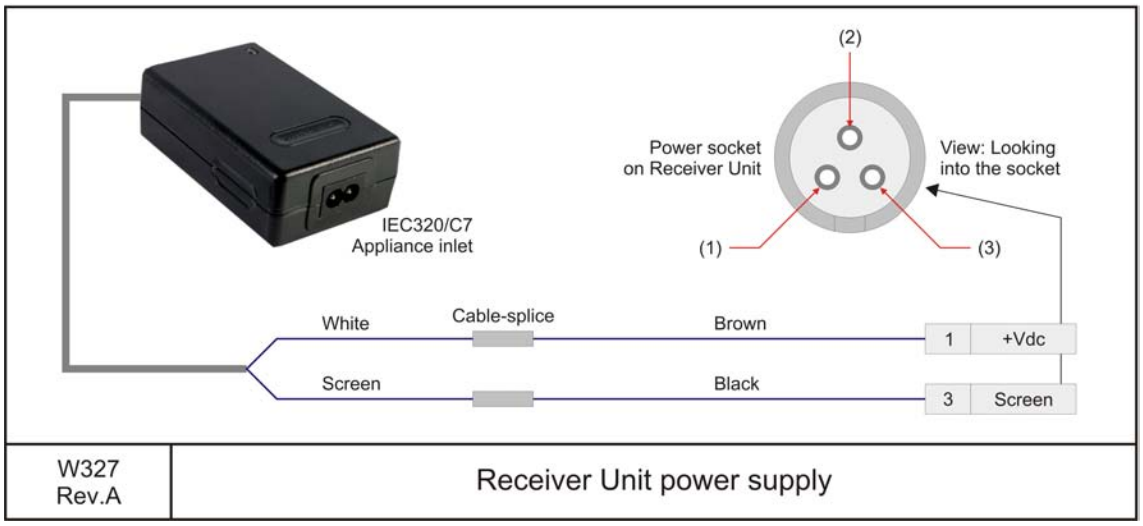
W325 Rev.A	Commercial power supply

Cable specifications

- Not applicable. This is a commercial cable.

Receiver Unit power supply

This cable is used to connect the DC power supply from the commercial power supply to the Receiver Unit. The cable is provided fixed to the power supply, and it connects to a three-pin socket on the Receiver Unit.



W327 Rev.A	Receiver Unit power supply

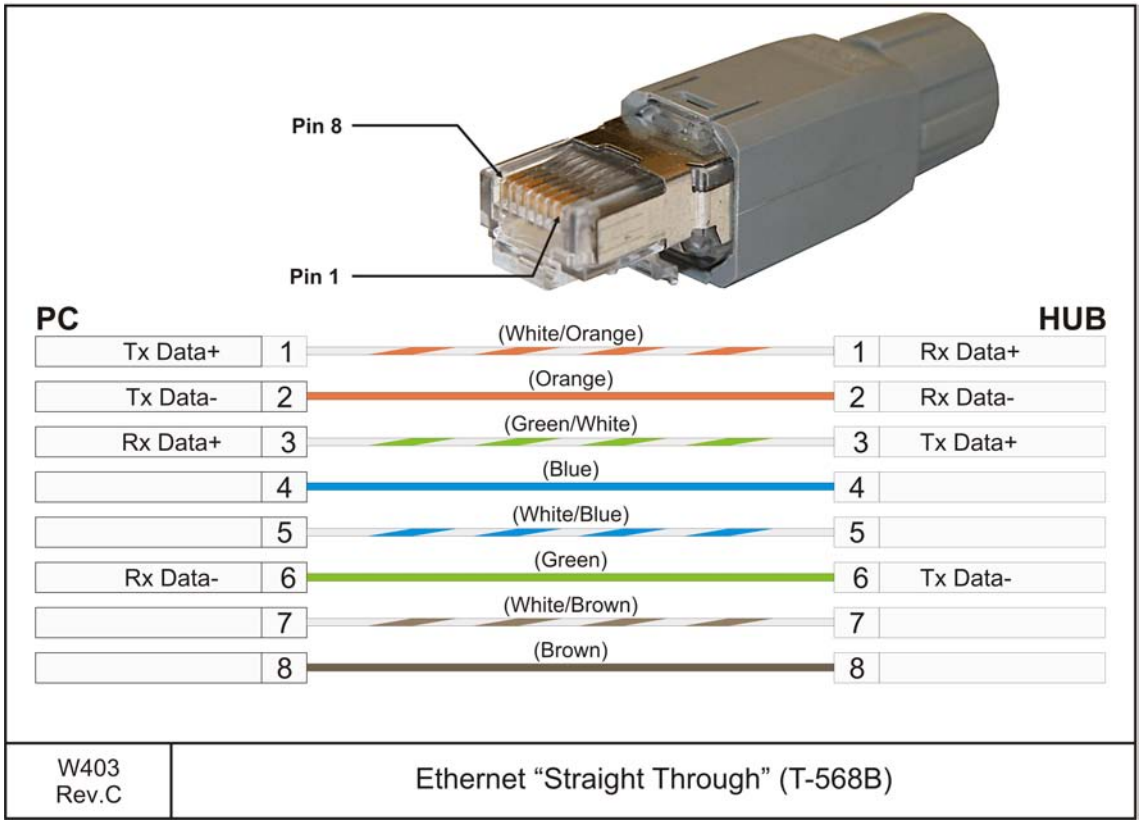
Cable specifications

- Not applicable. This is a commercial cable.

RJ45 Ethernet, straight

This cable is used to provide standard Ethernet connections. Note that various categories exists. Normally, **CAT-5E** and **CAT-6** cables are used in local area networks with bandwidth exceeding 100 Mbit. Ethernet cables are available commercially in different lengths, colours and categories.

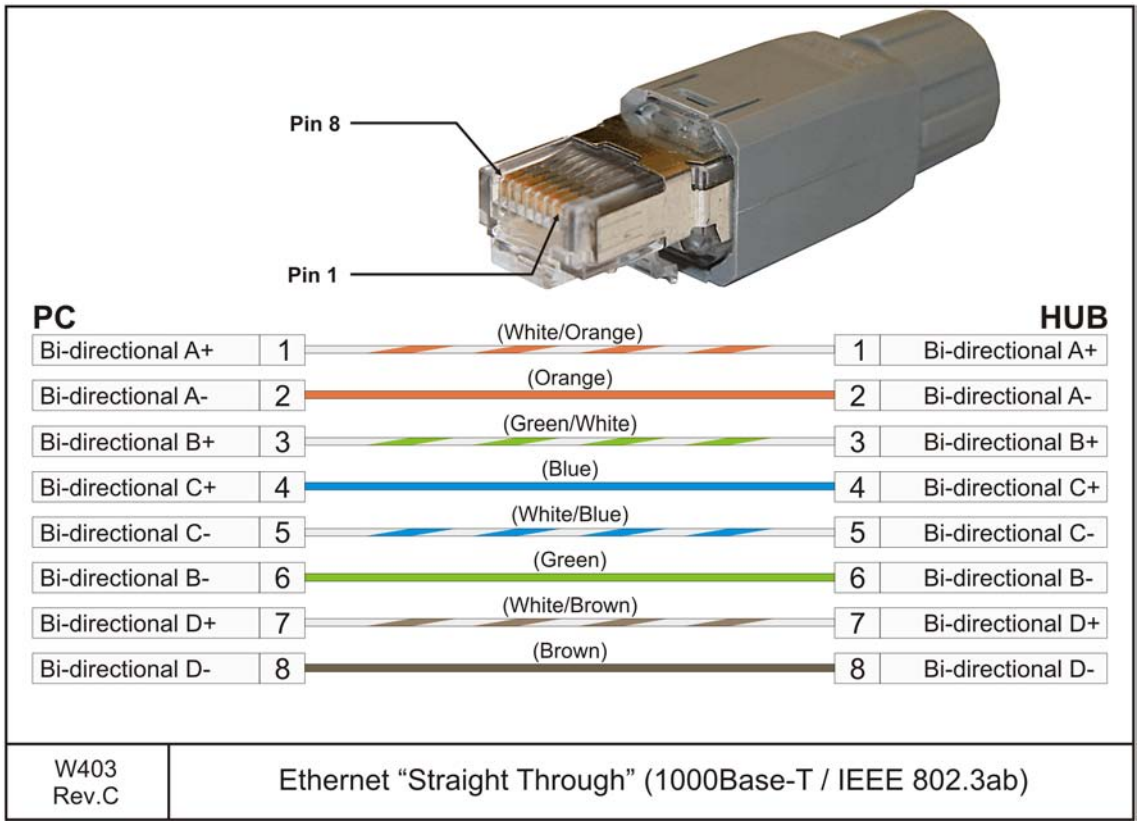
10Base-T Low-speed Ethernet connections



Cable specifications

- Not applicable. This is a commercial cable.

1000Base-T High-speed Ethernet connections (CAT5E and faster)



Cable specifications

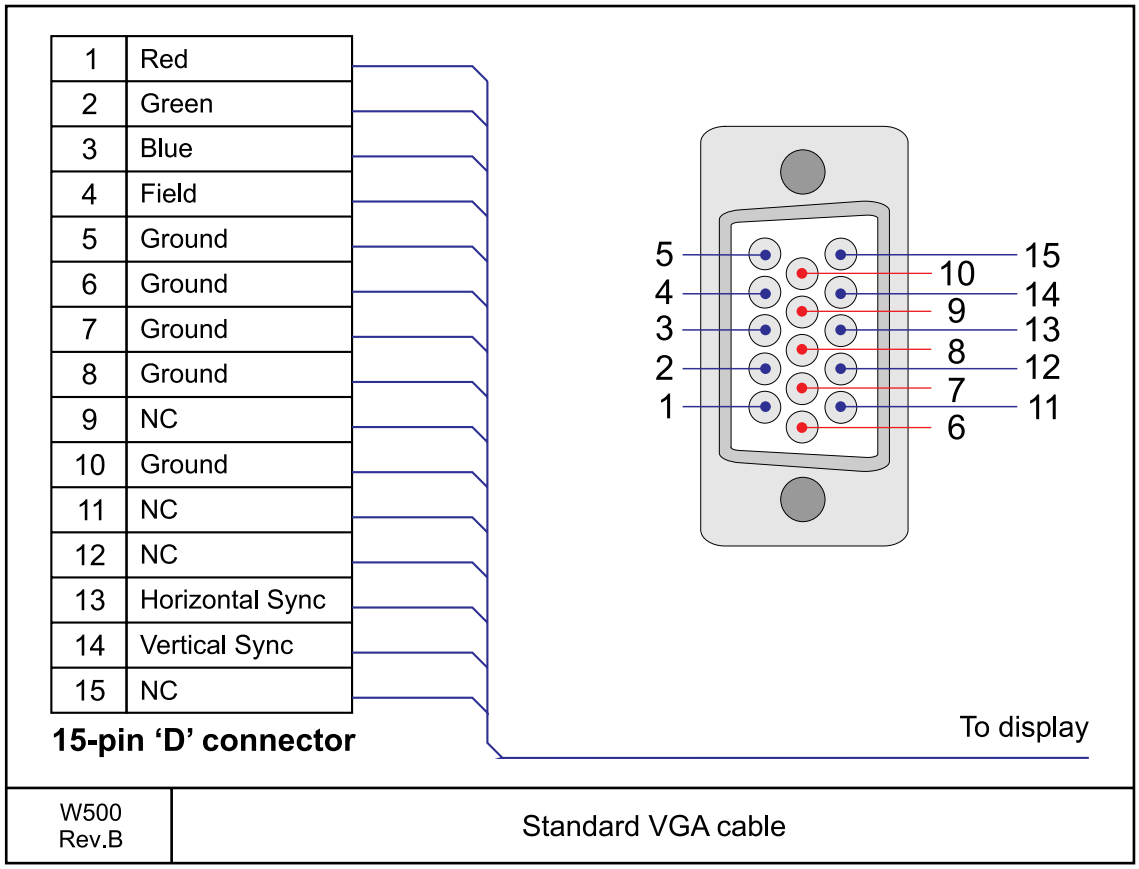
- Not applicable. This is a commercial cable.

More information

- http://en.wikipedia.org/wiki/TIA/EIA-568-B
- http://en.wikipedia.org/wiki/Category_5_cable

VGA/SVGA Display

This is a standard VGA and SVGA video cable. One end is normally connected to the display, while the other end is terminated in a standard D-connector.

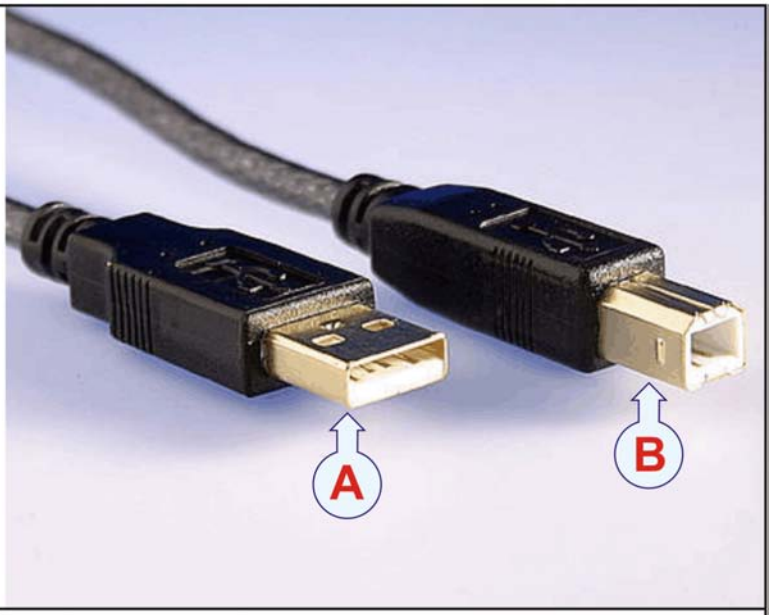


Cable specifications

- Not applicable. This is a commercial cable.

Universal Serial Bus (USB)

Just about any computer that you buy today comes with one or more Universal Serial Bus (USB) connectors on the back. These connectors let you attach everything from mouse to printers to your computer quickly and easily. Since the operating system supports USB, installation of device drivers is also easy. In most cases, the USB cable is commercial, and they are normally supplied with the external devices, However, USB cables are also available commercially in different fixed lengths.

Universal Serial Bus (USB) cable terminated with an **A-plug** in one end and a **B-plug** in the other. Internal cables: **Pair 1:** 28 AWG twisted pair (data, green, white) **Pair 2:** 20 AWG twisted pair (Power, red, black) **Shield:** Foil and braid	
W501 Rev.B	Commercial USB cable

Cable specifications

- Not applicable. This is a commercial cable.

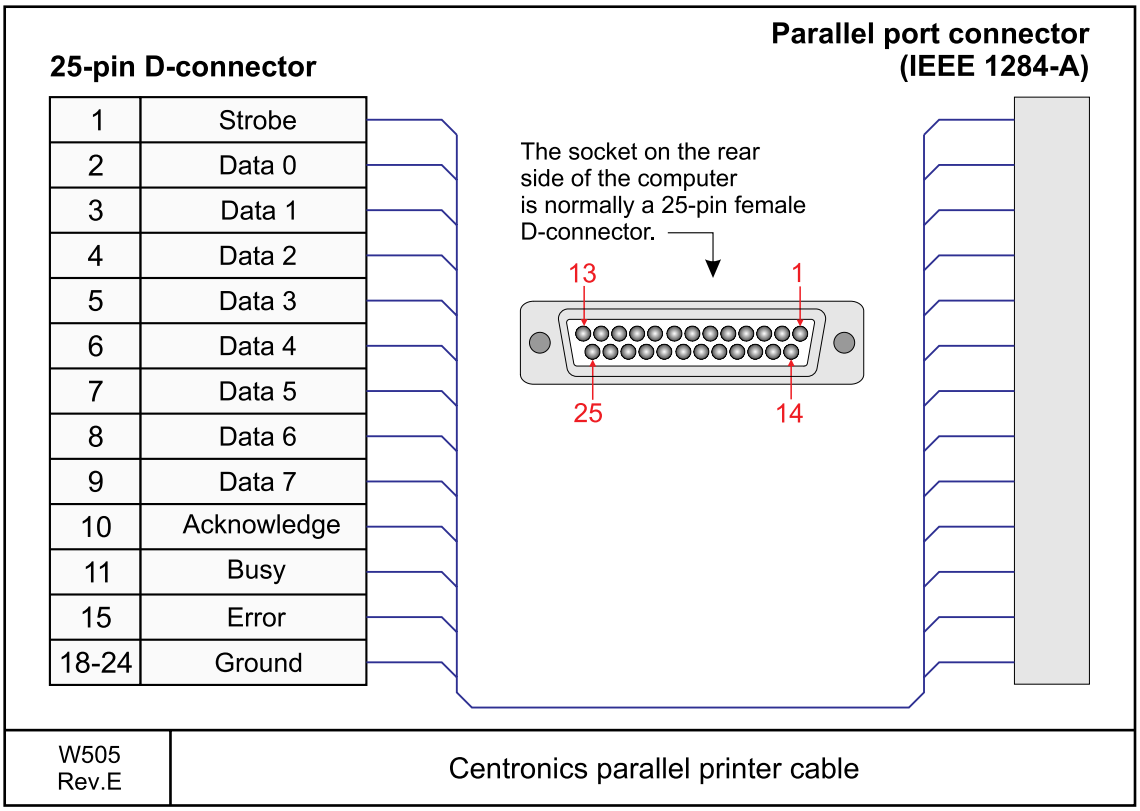
More information

- http://en.wikipedia.org/wiki/usb

Parallel printer

This is a standard “Centronics” parallel printer cable. It is provided ready-made with printers, and also obtainable from commercial retailers.

Termination is made with 25–pin “D-sub” connector in one end, parallel port connector in the other end (IEEE 1284–A)



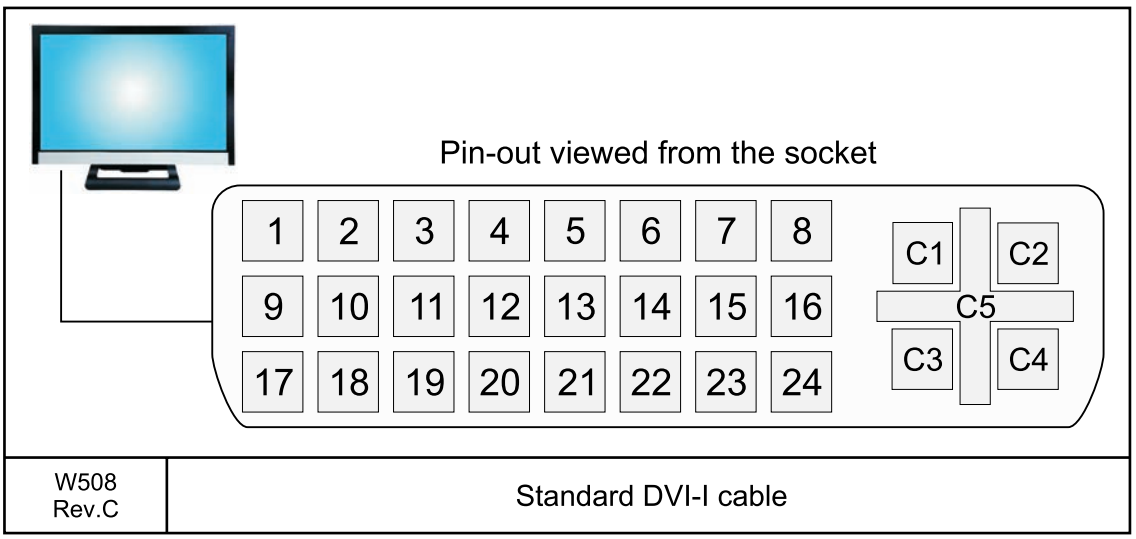
Cable specifications

- Not applicable. This is a commercial cable.

DVI–I Display

This cable is a standard DVI-I cable. It is normally provided with the colour display.

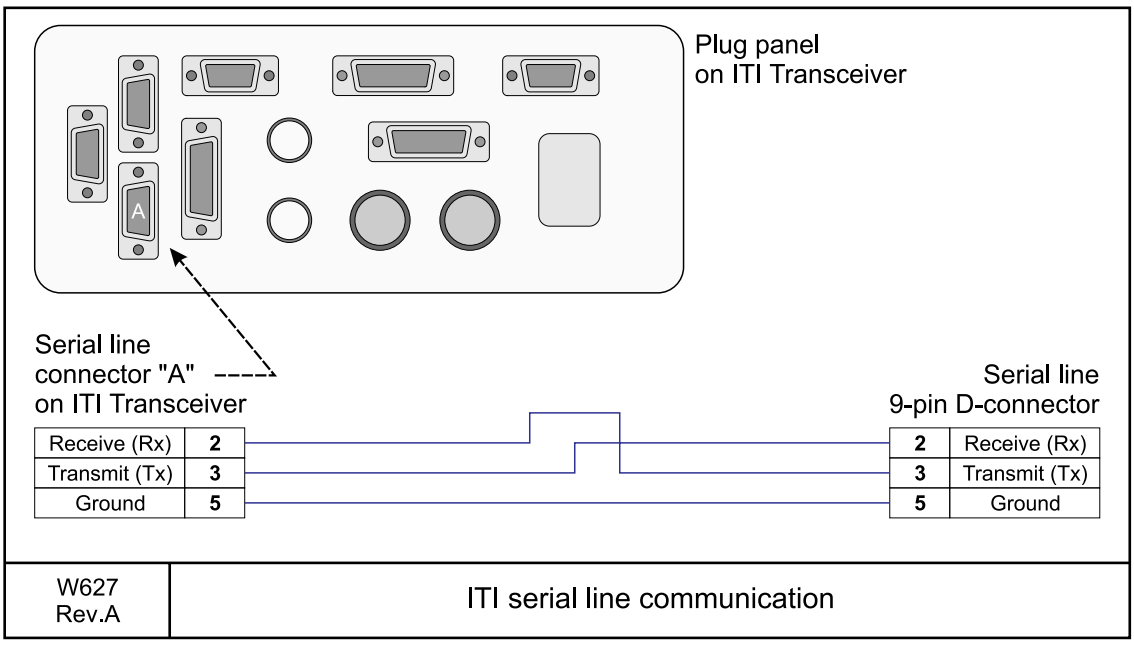
For more information about the DVI signals, see http://en.wikipedia.org.



Pin	Signal	Pin	Signal
1	TMDS Data 2- (Digital red - (Link 1))	15	Ground (Return for pin 14 and analog sync)
2	TMDS Data 2+ (Digital red + (Link 1))	16	Hot plug detect
3	TMDS Data 2/4 shield	17	TMDS data 0- (Digital blue - (Link 1) and digital sync)
4	TMDS Data 4- (Digital green - (Link 2))	18	TMDS data 0+ (Digital blue + (Link 1) and digital sync)
5	TMDS Data 4+ (Digital green + (Link 2))	19	TMDS data 0/5 shield
6	DDC clock	20	TMDS data 5- (Digital red - (Link 2))
7	DDC data	21	TMDS data 5+ (Digital red + (Link 2))
8	Analog vertical sync	22	TMDS clock shield
9	TMDS Data 1- (Digital green - (Link 1))	23	TMDS clock+ (Digital clock + (Links 1 & 2))
10	TMDS Data 1+ (Digital green + (Link 1))	24	TMDS clock- (Digital clock - (Links 1 & 2))
11	TMDS Data 1/3 shield	C1	Analog red
12	TMDS Data 3- (Digital blue - (Link 2))	C2	Analog green
13	TMDS Data 3+ (Digital blue + (Link 2))	C3	Analog blue
14	+5 Vdc (Power for monitor when in standby)	C4	Analog horizontal sync
TMDS = Transition Minimized Differential Signaling		C5	Analog ground (Return for R, G and B signals)

ITI serial line

This cable is used to provide a two-way communication to a Simrad ITI Trawl system.



Cable specifications

- **Conductors**: 9 x 2 x 0.5 mm²
- **Screen**: Screened twisted pairs and overall braided
- **Voltage**: 60 V
- **Maximum diameter**: Limited by the plugs

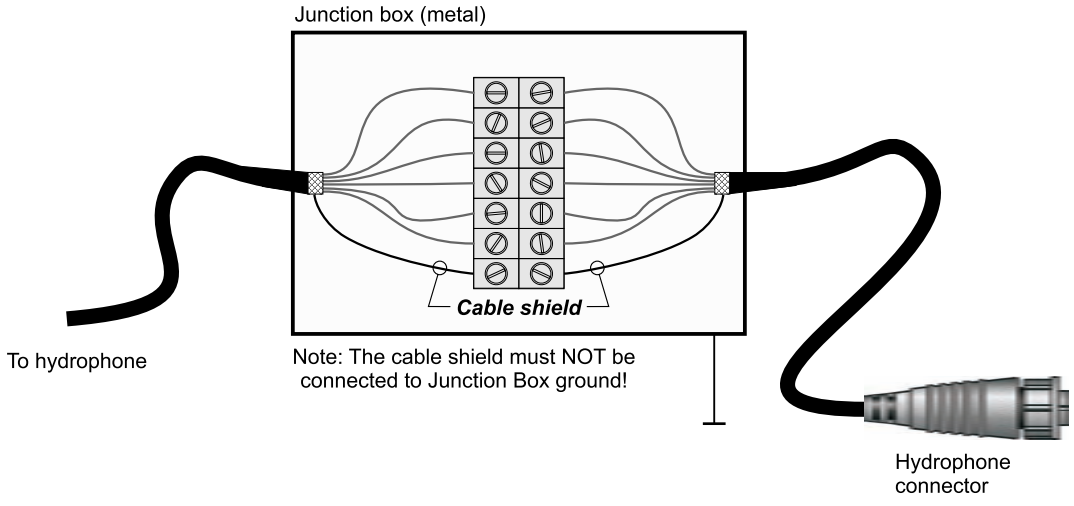
Hydrophone junction box

The hydrophone cable will need to be spliced. Do not splice with solder and electrical tape, or a commercial terminal block for home lightning! The cable shielding must however not be grounded in the junction box.

Note

You must use a metal box, and the box must be grounded.

A suitable junction box must be provided by the installation shipyard.



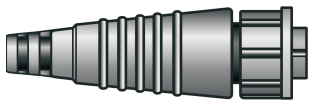
W813A Rev.B	Hydrophone cable - Junction box

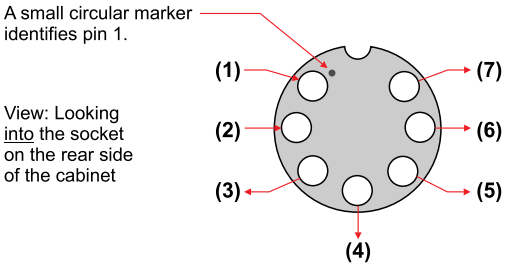
Cable specifications

- **Conductors**: 6 x 0.5 mm² + Ground
- **Screen**: Overall braided
- **Voltage**: 60 V
- **Maximum diameter**: 8 mm

Hydrophone

The hydrophone is connected to the dedicated socket on the Receiver Unit.





HYD1 (-12 Vdc)	1	RED
Not used	2	BLACK
Not used	3	BLUE
HYD GND (scr)	4	SCREEN
Not used	5	WHITE
Not used	6	GREEN
HYD2 (+12 Vdc)	7	YELLOW

The colours are those used by the cable supplied with the system.

Male socket on the Receiver Unit

W813B Rev.B	Hydrophone cable

Cable specifications

- **Conductors**: 6 x 0.5 mm² + Ground
- **Screen**: Overall braided
- **Voltage**: 60 V
- **Maximum diameter**: 8 mm

Software installation

The purpose of this information is to guide you through the required tasks related to software installation and/or upgrading on the Simrad PI50.

A software upgrade is useful whenever the PI50 software is modified.

If the PI50 system is provided with a computer, it is delivered with all necessary software installed, configured and tested. If you use your own computer, you must do this yourself. To check which software version you have, observe the **About** dialog opened from the **Display** menu.

Topics

How to install the PI50 software

Use this procedure when you wish to install the PI50 software on a computer.

Note that minimum hardware and software requirements must be met by the computer.

1 Power up the computer.

2 Insert the PI50 CD-ROM.

If your computer is not fitted with a CD or DVD drive, copy the files from the CD to a USB memory stick.

3 Observe that the installation program opens.

If the installation program does not start automatically, use a file manager to access the CD or USB memory stick. Double-click on the **Setup.exe** file to start the installation.

4 Allow the installation program to run. Follow the instructions provided.

5 Once the installation has been completed, double-click the program icon on the desktop to start the application.

6 If you use **Windows 7** operating system:

a Observe that **Windows 7 Firewall** will open a dialog requesting information about the network.

Select *Public*, and click **Allow access**.

b The operating system may also open other dialogs to verify that the PI50 software can run on the computer. You must permit this.

7 Observe the relevant start-up procedure.

The initial start–up procedure is provided in chapter *Installation procedures*.

→ *Initial setup procedure* on page 24

How to obtain the PI50 license

The PI50 requires a valid license to operate.

Without a license you will not be able to communicate with the PI50 Receiver.

Note

If you replace your computer, or if you replace major components inside your computer, you will need a new license code.

We strongly advice you to record the license code for safe keeping. You may for example write it down in the beginning of this manual.

1 Double-click the PI50 icon on the desktop to start the application.

2 Click the **Setup** icon under the **Main** menu to open the **Setup** menu.

3 Click **Installation** to open the **Installation** sub-menu.

On the sub-menu, click **Software License** to open the **Software License** dialog.

4 Write down the **Hardware ID** provided by the **Software License** dialog.

5 Contact your dealer to order the software license.

Your dealer will need the following information from you to place the order:

- Vessel name and call sign
- Vessel type (trawler, purse seiner, etc.)
- Vessel owner's name, address and contact information
- Hardware ID

6 When the software license is returned to you, start the PI50, open the **Software License** dialog, and click **Enter Licence String**.

7 Write down the code, and click **Ok**.

8 Click **OK** to save the current settings and close the dialog.

How to upgrade the PI50 software

Use this procedure if you wish to reinstall the software, or receive a new CD-ROM with a software upgrade.

1 Observe the procedure for software installation.

→ *How to install the PI50 software* on page 53

Unless you have made any hardware changes on your computer, the existing software license will be used.

How to remove the PI50 software

You may wish to remove the PI50 software from your computer.

1 Observe the operating system's functionality for software removal.

Interfaces and integration

The Simrad PI50 computer provides one or more multi purpose serial and Ethernet ports for external interfaces.

Which interfaces to use, and how many, must be decided by considering the available serial lines on the computer and the need for integration with other hydroacoustic and navigation systems.

Topics

About NMEA interfaces and telegrams

The Simrad PI50 can send and receive information to and from several different peripherals. All transmissions take place as **telegrams** with data sentences. Each telegram has a defined format and length.

The **NMEA 0183** standard is the most common protocol used to receive and transmit data to and from peripheral sensors. A parametric sentence structure is used for all NMEA data. The sentence start with a "$" delimiter, and represent the majority of approved sentences defined by the standard. This sentence structure, with delimited and defined data files, is the preferred method for conveying information.

For more information about the NMEA standard, the format and the data sentences, refer to their official publications. Their document *NMEA 1083 - Standard for interfacing marine electronic devices* explains the formats in detail. The document can be obtained from http://www.nmea.org.

Related topics

- *About NMEA* on page 104
- *Telegrams* on page 104
- *Standard NMEA 0183 communication parameters* on page 105
- *Sentence structure* on page 105

External interfaces

This section describes how to set up the various interfaces provided by the PI50. The interfaces are set up to transmit and/or receive information by means of Ethernet and/or serial lines.

Topics

- *How to set up the PI sensor data output* on page 56
- *How to set up the Simrad ITI Trawl system interface* on page 58
- *How to set up the Simrad echo sounder input* on page 59
- *How to set up the navigation system interface* on page 61

How to set up the PI sensor data output

The PI50 will provide PI sensor information on an output line.

→ *PSIMP-D1 PI Sensor data* on page 112

The first step (with sub-steps) in this procedure explains how to do the physical cabling. The remaining steps describe how to set up the interface in the PI50 software.

1 Connect the PI50 to the peripheral system using a serial line.

a Locate a free serial port that can be used for this communication.

b On the serial line socket on the PI50 computer, connect the RS-232 cable as follows:

- Receive signal **Rx** on pin 2.
- Transmit signal **Tx** on pin 3.
- Common **Ground** on pin 5.

→ *Generic RS-232 Serial line* on page 35

→ *Generic RS-232 Serial line* on page 36

c On the external system, wire as described in the relevant documentation.

d Ensure that the total length of the serial line cable does not exceed approximately 50 meters.

If a longer cable is required, you may need to use buffer amplifiers on the serial line.

2 Click the **Setup** icon under the **Main** menu to open the **Setup** menu.

3 Click the **Installation** button to open the **Installation** sub-menu.

On the sub-menu **I/O Setup** to open the **I/O Setup** dialog.

4 In the **I/O Setup** dialog, select which serial line to use to export the PI information.

5 Click on the chosen port to select it, then click the **Output** button to open the **Select Outputs** dialog.

6 In the **Select Outputs** dialog, locate the **PI_NMEA** option on the left side, and click the [►] button to connect it.

7 Click once on the **PI_NMEA** option on the left side, then click **Configure Output**.

8 Observe that the **PI Data Output** dialog opens.

9 In the **PI Data Output** dialog, click to enable the Data telegrams to be exported.

10 Click **OK** to save the current settings and close the dialog.

11 Observe that you are back in the **Select Outputs** dialog.

12 Click **OK** to save the current settings and close the dialog.

13 In the **I/O Setup** dialog, click on the chosen port to select it, then click the **Setup** button to open the **Serial Port Setup** dialog.

14 In the **Serial Port Setup** dialog, enter the relevant parameters to set up the port.

→ *Standard NMEA 0183 communication parameters* on page 105

15 Click **OK** to save the current settings and close the dialog.

16 In the **I/O Setup** dialog, click on the chosen port to select it, then click the **Monitor** button to open the **Port Monitor** dialog.

17 Observe the data flow on the output.

In order to monitor the data flow, the PI50 must be active and transmitting information out on the serial line.

18 If the data flow is operational, close all dialogs.

How to set up the Simrad ITI Trawl system interface

This procedure explains how the PI50 can be set up to receive ITI and FS information on a serial port.

Communication with the Simrad ITI (Integrated Trawl Instrumentation) and Simrad FS70 is based on NMEA and proprietary telegrams.

The following telegram formats are supported:

→ *DBS Depth below surface* on page 106

→ *DBS Depth of trawl below surface* on page 112

→ *HFB Trawl headrope to footrope and bottom* on page 112

The first step (with sub-steps) in this procedure explains how to do the physical cabling. The remaining steps describe how to set up the interface in the PI50 software.

1 Connect the PI50 to the ITI using a serial line.

a Locate a free serial port that can be used for this communication.

b On the serial line socket on the PI50 computer, connect the RS-232 cable as follows:

- Receive signal **Rx** on pin 2.
- Transmit signal **Tx** on pin 3.
- Common **Ground** on pin 5.

→ *Generic RS-232 Serial line* on page 35

→ *Generic RS-232 Serial line* on page 36

c On the ITI transceiver, use connector **Serial A**. Connect the cable as follows:

- Receive signal **Rx** on pin 2.
- Transmit signal **Tx** on pin 3.
- Common **Ground** on pin 5.

→ *ITI serial line* on page 49

d Ensure that the total length of the serial line cable does not exceed approximately 50 meters.

If a longer cable is required, you may need to use buffer amplifiers on the serial line.

2 Click the **Setup** icon under the **Main** menu to open the **Setup** menu.

3 Click the **Installation** button to open the **Installation** sub-menu.

On the sub-menu **I/O Setup** to open the **I/O Setup** dialog.

4 In the **I/O Setup** dialog, select which serial line to use to accept ITI information.

5 Click on the chosen port to select it, then click the **Input** button to open the **Select Inputs** dialog.

6 In the **Select Inputs** dialog, click **ITI-FS** on the left side, and click the [►] button to connect it.

7 Click **OK** to save the current settings and close the dialog.

8 In the **I/O Setup** dialog, click on the chosen port to select it, then click the **Setup** button to open the **Serial Port Setup** dialog.

9 In the **Serial Port Setup** dialog, enter the relevant parameters to set up the port.

→ *Standard NMEA 0183 communication parameters* on page 105

10 Click **OK** to save the current settings and close the dialog.

11 In the **I/O Setup** dialog, click on the chosen port to select it, then click the **Monitor** button to open the **Port Monitor** dialog.

12 Check the data flow on the communication line.

In order to monitor this data flow, the peripheral system must be active and transmitting information to the PI50.

13 If the data flow is operational, close all dialogs.

How to set up the Simrad echo sounder input

Communication with the Simrad ES Family echo sounder systems is based on NMEA and proprietary telegrams. Depth information is also accepted from other echo sounders, provided that one of the listed datagram formats are used.

→ *DBS Depth below surface* on page 106

The first step (with sub-steps) in this procedure explains how to do the physical cabling. The remaining steps describe how to set up the interface in the PI50 software.

1 Connect the PI50 to the echo sounder using a serial line.

a Locate a free serial port that can be used for this communication.

b On the serial line socket on the PI50 computer, connect the RS-232 cable as follows:

- Receive signal **Rx** on pin 2.
- Transmit signal **Tx** on pin 3.
- Common **Ground** on pin 5.

→ *Generic RS-232 Serial line* on page 35

→ *Generic RS-232 Serial line* on page 36

c On the echo sounder computer, use a similar serial line output. Connect the RS-232 cable as follows:

- Receive signal **Rx** on pin 2.
- Transmit signal **Tx** on pin 3.
- Common **Ground** on pin 5.

Note

Remember that the transmit signal on the echo sounder computer is the receive signal on the PI50 computer. See Generic RS-232 Serial line on page 35.

→ *Generic RS-232 Serial line* on page 35

d Ensure that the total length of the serial line cable does not exceed approximately 50 meters.

If a longer cable is required, you may need to use buffer amplifiers on the serial line.

2 Click the **Setup** icon under the **Main** menu to open the **Setup** menu.

3 Click the **Installation** button to open the **Installation** sub-menu.

On the sub-menu **I/O Setup** to open the **I/O Setup** dialog.

4 In the **I/O Setup** dialog, select which serial line to use to accept the depth information.

5 Click on the chosen port to select it, then click the **Input** button to open the **Select Inputs** dialog.

6 In the **Select Inputs** dialog, locate **EchoNMEA** on the left side, and click the [►] button to connect it.

7 Click **OK** to save the current settings and close the dialog.

8 In the **I/O Setup** dialog, click on the chosen port to select it, then click the **Setup** button to open the **Serial Port Setup** dialog.

9 In the **Serial Port Setup** dialog, enter the relevant parameters to set up the port.

→ *Standard NMEA 0183 communication parameters* on page 105

10 Click **OK** to save the current settings and close the dialog.

11 In the **I/O Setup** dialog, click on the chosen port to select it, then click the **Monitor** button to open the **Port Monitor** dialog.

12 Check the data flow on the communication line.

In order to monitor this data flow, the peripheral system must be active and transmitting information to the PI50.

13 If the data flow is operational, close all dialogs.

How to set up the navigation system interface

This procedure explains how to connect a GPS system to the PI50 using serial line or Ethernet communication.

Most Global Positioning System (GPS) receivers provide NMEA 0183 telegrams containing speed, heading and sailed distance as well as geographical latitude and longitude.

Supported telegram formats for heading:

→ *HDG Heading, deviation and variation* on page 108
→ *HDT Heading, true* on page 109
→ *HDM Heading, magnetic* on page 109
→ *VHW Water speed and heading* on page 110

Supported telegram formats for distance

→ *RMC Recommended minimum specific GNSS data* on page 109
→ *VHW Water speed and heading* on page 110
→ *VLW Dual ground/water distance* on page 111
→ *VTG Course over ground & ground speed* on page 110

Supported telegram formats for positioning

→ *GLL Geographical position latitude/longitude* on page 107
→ *GGA Global positioning system fix data* on page 108
→ *RMC Recommended minimum specific GNSS data* on page 109

Supported telegram formats for speed

→ *RMC Recommended minimum specific GNSS data* on page 109
→ *VHW Water speed and heading* on page 110
→ *VTG Course over ground & ground speed* on page 110

The first two steps (with sub-steps) in this procedure explain how to do the physical cabling using a serial line or an Ethernet connection. The remaining steps describe how to set up the interface in the PI50 software.

1 Connect the PI50 to the GPS system using a serial line.

a Locate a free serial port that can be used for this communication.

b On the serial line socket on the PI50 computer, connect the RS-232 cable as follows:

- Receive signal **Rx** on pin 2.
- Transmit signal **Tx** on pin 3.
- Common **Ground** on pin 5.

→ *Generic RS-232 Serial line* on page 35

→ *Generic RS-232 Serial line* on page 36

c On the GPS system, wire as described in the relevant documentation.

d Ensure that the total length of the serial line cable does not exceed approximately 50 meters.

If a longer cable is required, you may need to use buffer amplifiers on the serial line.

2 Connect the PI50 to the GPS system using an Ethernet line.

a Locate the Ethernet port you wish to use.

If no Ethernet port is available, an Ethernet switch may be inserted between the computer and the transceiver.

b Connect an Ethernet cable from the PI50 computer to the peripheral system.

We strongly recommend that you use high quality Ethernet cables, minimum CAT-5.

→ *RJ45 Ethernet, straight* on page 43

3 Click the **Setup** icon under the **Main** menu to open the **Setup** menu.

4 Click **Navigation** to open the **Navigation** dialog.

5 For each tab:

a Select which port to use.

b Click **Setup** for the selected port to define the communication parameters.

c Select which **NMEA Sentence** to use.

If you choose *Auto*, the PI50 will automatically choose among the incoming information according to a predefined priority list.

d If applicable, define the **Talker ID**.

6 Click **OK** to save the current settings and close the dialog.

Drawing file

This chapter contains relevant drawings related to the installation and maintenance of the Simrad PI50.

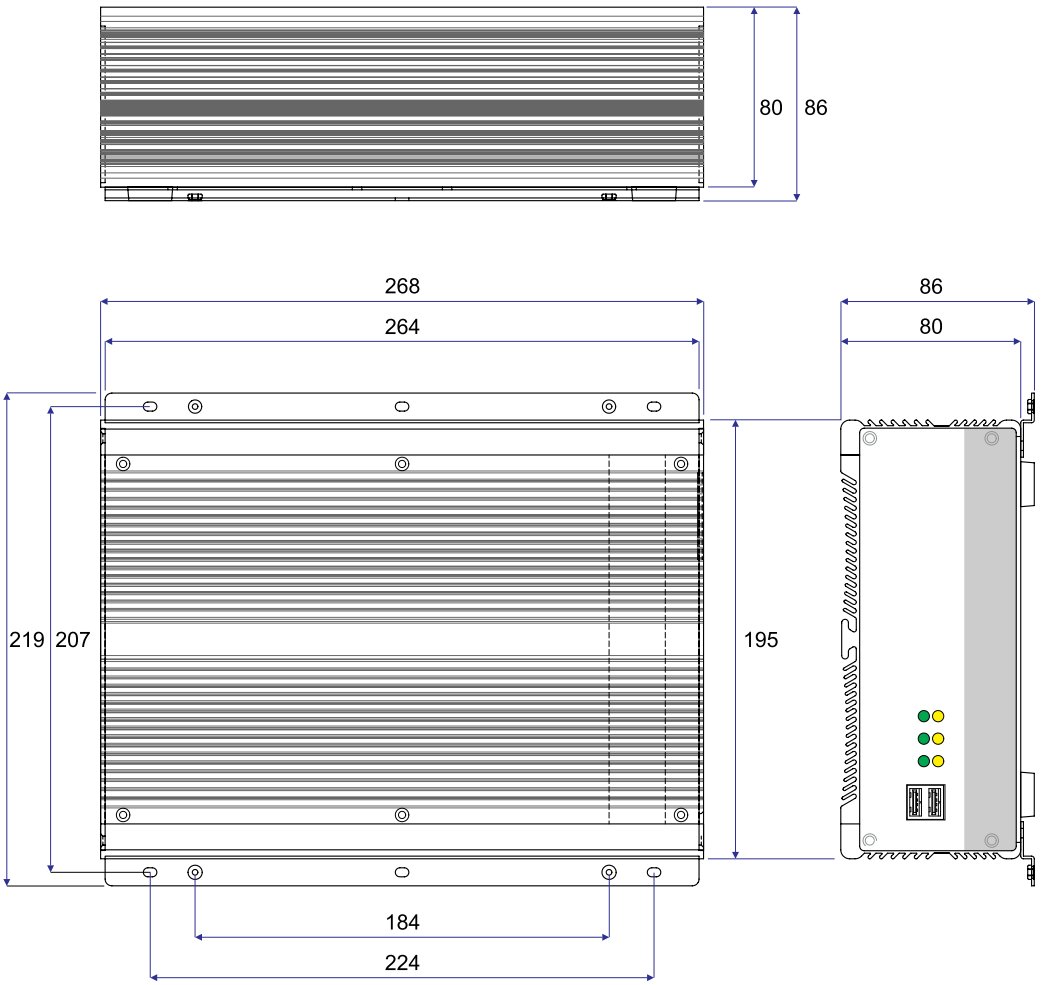
Note

The mechanical drawings are for information and guidance only. They are not in scale. All dimensions are in mm unless otherwise is noted. The original installation drawings are available on PDF and/or AutoCad's DWG format.

Visit www.simrad.com to download.

Topics

PI50 Marine computer



Note:
All measurements are in mm.
The drawing is not in scale.

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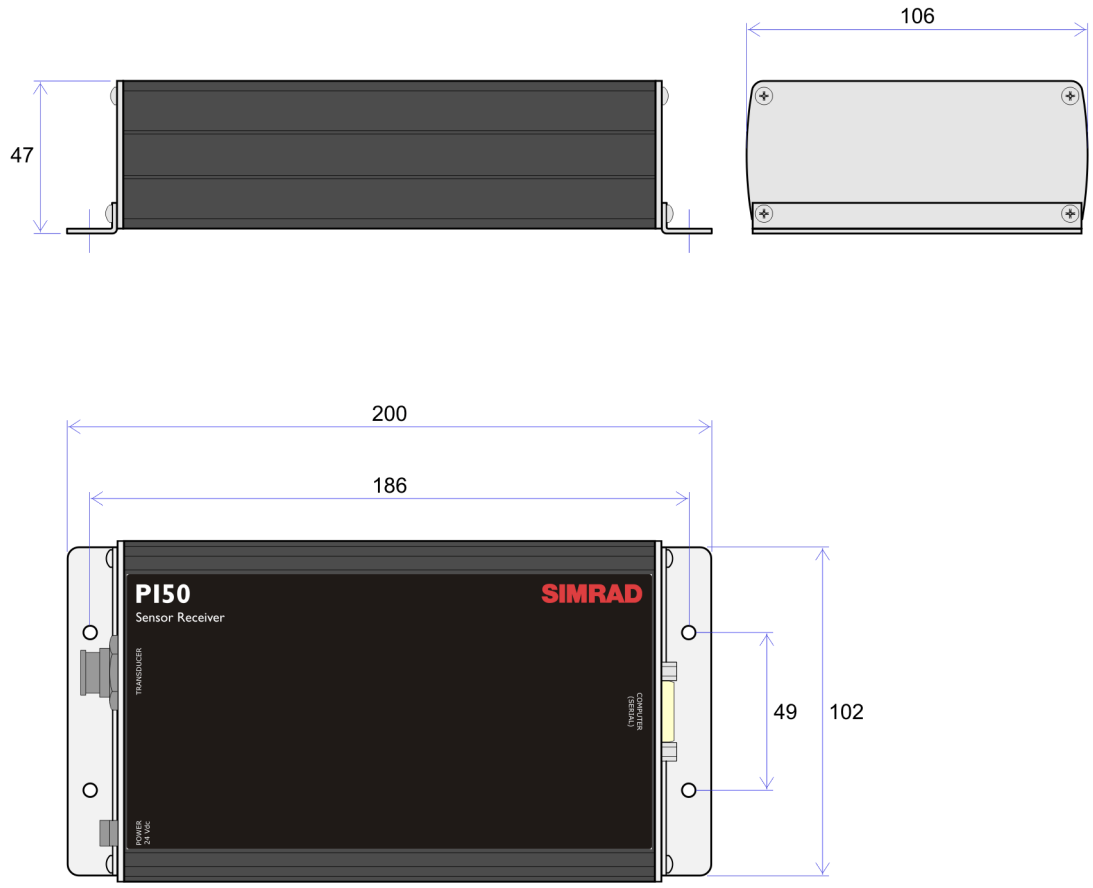
Rev.A

PI50 Receiver Unit



All measurements in mm.
The drawing is not in scale

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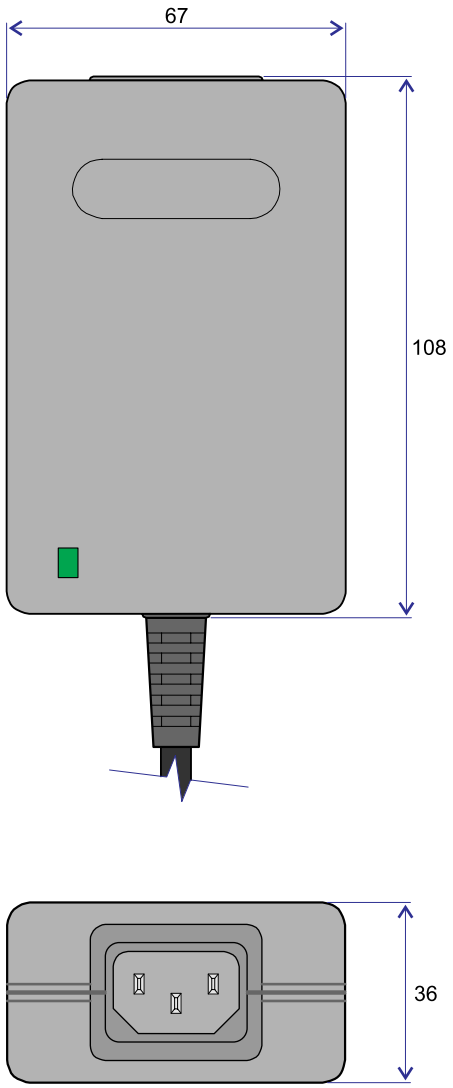
CD012118-002 Page 1 of 1

Power Supply for PI50 Receiver Unit



All measurements in mm.
The drawing is not in scale

344703 Rev.A
CD012118-050 Page 1 of 1

Technical specifications

This chapter provides the technical specifications and requirements related to the Simrad PI50.

In Kongsberg Maritime, we are continuously working to improve the quality and performance of our products. Technical specifications may therefore be changed without prior notice.

Topics

Catch monitoring system specifications

- **Communication channels**: Maximum 30 channels
- **Communication frequencies**: 43,5 to 49,5 kHz
- **Maximum number of communication channels in simultaneous use**: 6
- **Single channel sensor types**:
  - PI Catch [and PI Rip]
  - PI Depth
  - PI Temperature
  - PI Bottom Contact
  - PI Height
  - PI Remote/Depth
  - PI Geometry Differential
  - PI Spread
- **Dual channel sensor types**:
  - PI Temperature/Depth
  - PI Height/Depth [and PI SeineSounder]
  - PI Spread/Depth
  - PI Twin Spread
  - PI Geometry
- **Secondary data based on sensor information**:
  - Vertical geometry [using a depth sensor on each trawl door]
  - Total water depth [using one height and one depth sensor]
  - Trawl opening [using information added to the PI Height setup]
- **Sensor update rate**: Individually adjusted on each sensor to Fast, Normal or Slow
- **Presentation modes**:
  - Sensor views [alphanumerical with history views]
  - Trend views [historical values presented in graphs]
- **User settings**: Unlimited (except by hard disk capacity)
- **Information storage**: Unlimited (except by hard disk capacity) number of screen captures

Interface specifications

Numerous external interfaces are provided for the Simrad PI50.

- **Outputs:**
  - PI data (proprietary telegram formats)

- **Inputs:**
  - Navigation data (NMEA format)
  - Depth (NMEA format)
  - ITI data (proprietary telegram formats)

Colour display specifications

Commercial display

The Simrad PI50 may be supplied with one of several commercial displays, and several sizes are available. Displays may also be purchased locally.

Specifications are supplied with the displays.

Refer to the applicable documentation provided with the unit for more information.

PI50 Marine Computer specifications

Operational specifications

- **Processor and memory:**
  - **Processor**: Core Duo (T2500)
  - **Clock frequency**: 2 GHz
  - **Chipset**: Intel® 852 GM(E)
  - **RAM**: 4 Gb
  - **Hard disk**: 30 Gb Solid State Drive
  - **Moving parts**: None
- **Interfaces:**
  - **USB 2.0**: 6 sockets
  - **Keyboard/mouse**: Dual PS/2 connector (adapter is included)
  - **Serial lines**: 4 ea RS-232/RS-422/RS-485 (adapter is included)
  - **Network**: 2 x 10/100/1000 Mhz Ethernet LAN
  - **Video**: VGA and DVI
- **Power requirements:**
  - **External power supply**: 100 to 240 Vac input, +19 Vdc output
  - **DC operation**: +12 to 30 Vdc
- **Certification:**
  - CE
  - FCC

Physical and environmental specifications

- **Mechanical construction:**
  - Chassis: Aluminium
  - Cooling: Integrated cooling ribs
  - Mounting: Brackets on each side
- **Physical dimensions:**
  - Depth: 195 mm
  - Width: 268 mm
  - Height: 80 mm
- **Environmental specifications:**
  - Operating temperatures: -10 to +50°C
  - Storage temperatures: -20 to +80°C
  - Relative humidity: 10 to 90% (non-condensing)

Local purchase

If you purchase a computer locally, it is important to make sure that the chosen model meets the functional system requirements.

- It is important that the computer can facilitate the various interface requirements made by the system, and you may need to add extra Ethernet and serial adapters.
- Make sure that the computer design and construction allows for marine use and safe installation.
- A lap-top computer may be used as long as it meets the functional requirements.

Minimum computer requirements

Observe the following minimum computer requirements.

- **Operating system:** Microsoft® Windows® XP® (32–bit) or Microsoft® Windows® 7 (32–bit) [4]

  On new installations, we recommend that Microsoft® Windows® 7 is used.
- **Processor speed:** 2 GHz Dual core
- **Memory:** 2 Gb
- **Free hard disk space:** 30 Gb
- **Graphic adapter:** DirectX9.0c compatible with Direct3d and OpenGL[5]
- **Interfaces:**
  - One serial (RS-232) interface to communicate with the Receiver Unit

    Note that “PCI Express” serial interface boards are not supported.
  - One Ethernet interface to communicate with ship’s local area network (if required)

4. The PI50 software does not support Microsoft© Windows© NT or older operating systems.
5. A large number of commercial graphic adapters are available, and Simrad has not tested all of them. Even adapters meeting the minimum specifications may in some cases prove to fail with the PI50 software. We welcome any feedback with comments or experiences with graphic adapters.

  - One or more serial line interfaces (depends on how many interfaces that are required for the specific integration)

- **Display resolution:** 1280 x 1024[6]

6. This is the minimum resolution. As with all other Windows applications, the PI50 software will work with higher resolutions, provided that it is supported by the graphic adapter in the computer and the display connected.

Hydrophone installation

For hydrophone installation, refer to the documents provided with each hydrophone.

The following installation manuals apply:

- Purse seine hydrophone installation manual [164149]
- Trawl hydrophone installation manual [164472]
- Portable hydrophone installation manual [164730]

These installation manuals can also be downloaded from http://www.simrad.com.

About PI sensors

This chapter describes the various sensors you can use with the Simrad PI50. It also provides the basic – and important! – information related to sensor configuration, and it explains how to use the sensor chargers.

Topics

Sensors overview

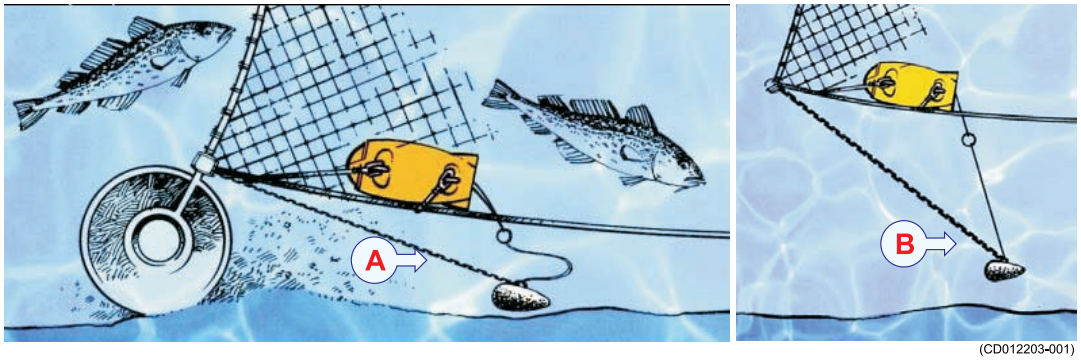
A large amount of sensors may be used with the Simrad PI50 Catch monitoring system to read important operational parameters from the trawl, purse seine or Danish seine. A complete description of each sensor is provided on Simrad's website http://www.simrad.com and in the individual sensor instruction manuals.

Topics

PI Bottom Contact purpose and application

This is an **S-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MiniCharger**.

Figure 10 PI Bottom Contact application



A *The trawl follows the bottom. The detection wire on the sensor is not released.*

B *The trawl has lifted off the bottom, and the detection wire is released.*

The purpose of the Simrad PI Bottom Contact sensor is to detect if a bottom trawl is accidentally lifted up from the seabed. This will allow fish to escape under the gear.

- On a pelagic trawl, the sensor will notify you if you move the gear too close to the bottom.
- Used on a purse seine you will be notified once the seine reaches the bottom, and this allows you to fish even on a rough bottom.
- On a Danish seine the Simrad PI Bottom Contact sensor will let you know when the net has a stable bottom contact, and when it is time to haul.

PI Catch purpose and application

This is an **S-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MiniCharger**.

Figure 11 PI Catch application

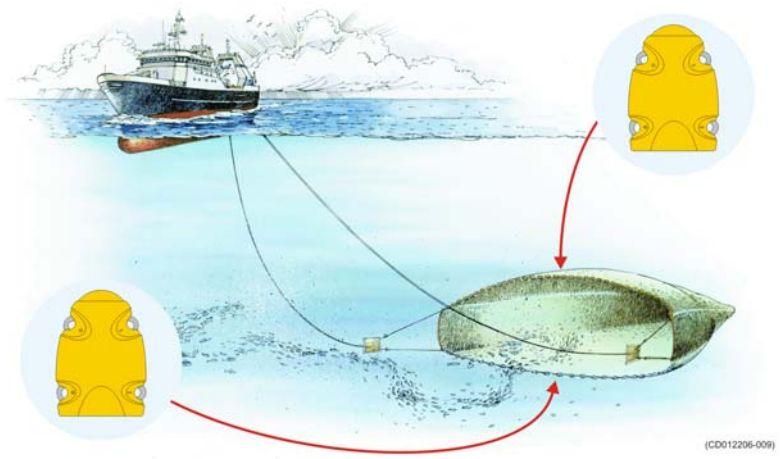
Using the Simrad PI Catch sensor, you can easily monitor the filling rate and the amount of catch in the trawl. The sensor simply monitors the expansion of the meshes in the cod-end. Once the volume caught is enough to expand the meshes, they will pull the detector wires and engage the sensor. The sensitivity of the sensor can easily be adjusted by extending the detection rubber bands to span additional meshes.

To monitor the filling rate, we recommend that you use minimum two sensors. Place the first sensor at the far end of the cod-end, it will tell you that the trawl is actually fishing. Place the second sensor closer to the trawl opening. Once the trawl is filled to the chosen location, the sensor is engaged, and you know that it is time to haul.

PI Depth purpose and application

This is an **S-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MiniCharger**.

Figure 12 PI Depth application



The Simrad PI Depth sensor provides information about the current depth and the depth changes of your gear.

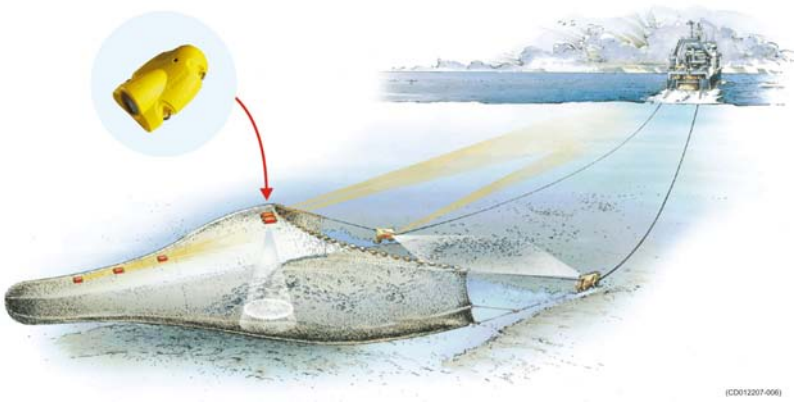
- On a bottom trawl, you will use the sensor to achieve full control when shooting, and to position the trawl on the slope.
- During pelagic trawling, you know how important it is to position the trawl relative to the largest concentration of fish. By using a PI Depth sensor, you can monitor the exact depth relative to the surface, and adjust the trawl depth accordingly. Additional depth sensors on the doors will monitor if the doors stay at the same depth.
- During seining, use the PI Depth sensor to monitor the depth of the net, and the descending speed of the net. Then you will know when to start pursing, and which speed to use.
- Mounted on a Danish Seine the PI Depth sensor monitors the sinking speed of the net, and it will tell you when to start hauling once the net has stopped sinking.

Three sensor versions are available. These are set up for maximum depth 300 m, 600 m or 1000 m. The depth range is fixed by the factory, and can not be changed in the PI Configurator utility.

PI Height purpose and application

This is an **L-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MaxiCharger**.

Figure 13 PI Height application



The Simrad PI Height sensor measures the height over the bottom, that is the distance from the bottom and up to wherever the sensor is located. This provides you with a valuable range of applications for bottom and pelagic trawling.

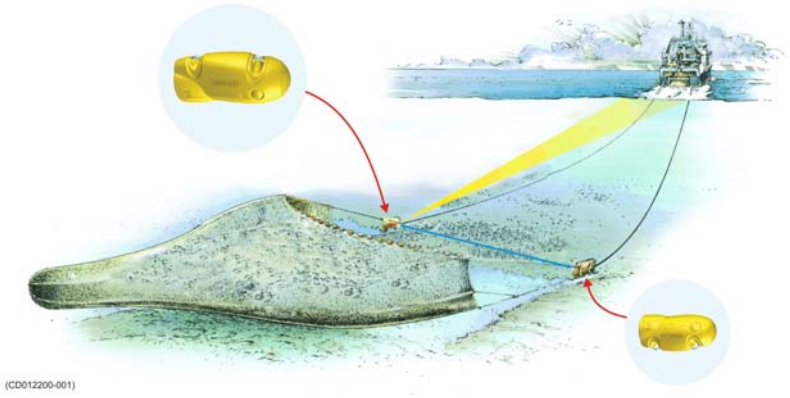
- On a bottom trawl, place the sensor behind the headrope. From this position it will tell you the height of the trawl opening. This allows you to adjust you equipment immediately if the opening is reduced, and you will avoid losing catch.
- On a pelagic trawl, place the sensor behind the footrope. You will then know at once if the trawl approaches the bottom. If you use a second sensor behind the headrope, the difference between the two measurements will give you the height of the trawl opening.

The sensor contains a small echo sounder to measure the height above the bottom.

PI Spread purpose and application

This is an **L-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MaxiCharger**.

Figure 14 PI Spread application



The purpose of the Simrad PI Spread sensor system is to measure the distance between the two trawl doors. The PI Spread sensor will always require a PI Remote sensor on the other door to carry out this measurement. The PI Spread sensor system has been developed to be used on both bottom and pelagic trawls.

- Use a PI Spread sensor on the port door and a PI Remote sensor on the starboard door.
- The two sensors communicate using a special transverse acoustic link.
- Using this link the PI Spread sensor measures the exact distance between the two sensors.

Two Spread versions are available. These are set up for standard or extended (XT) spread range. This configuration can be changed in the PI Configurator utility.

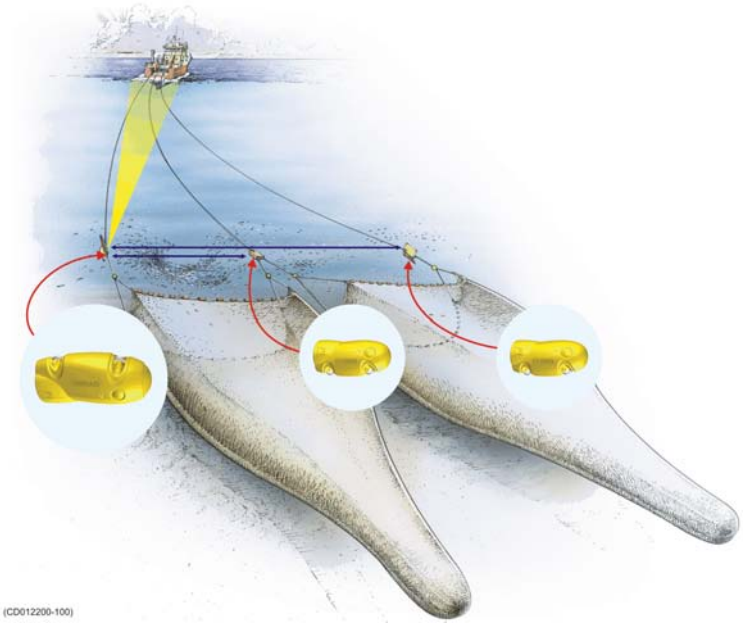
PI Twin Spread purpose and application

This is an **L-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MaxiCharger**.

Note

This is a "dual" sensor. It will seize two communication channels on the PI50.

Figure 15 PI Twin Spread application



The purpose of the Simrad PI Twin Spread sensor system is to measure the distances between the two trawl openings on a dual bottom or pelagic trawl. A PI Twin Spread sensor is mounted on the port door, while two PI Remote sensors are placed on the centre clump and on the starboard door.

The three sensors communicate using special transverse acoustic links. Using these links the PI Twin Spread sensor measures the exact distance between the three sensors.

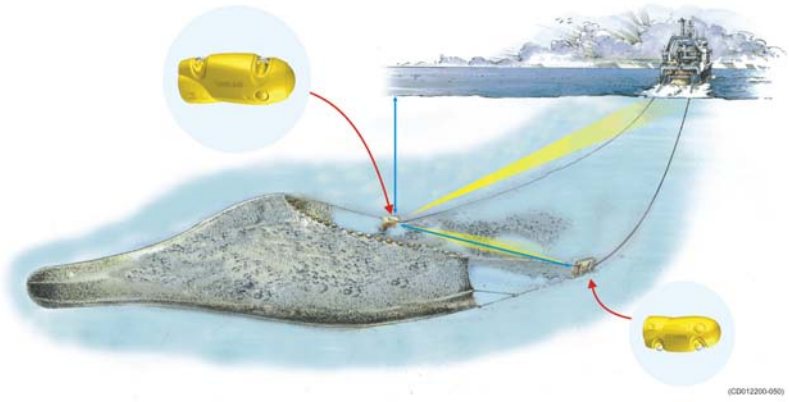
PI Spread/Depth purpose and application

This is an **L-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MaxiCharger**.

Note

This is a "dual" sensor. It will seize two communication channels on the PI50.

Figure 16 PI Spread/Depth application



The purpose of the Simrad PI Spread/Depth dual sensor is to achieve accurate measurements of both the water depth and the distance between the two trawl doors.

The PI Spread/Depth sensor thus contains both a pressure sensor to measure the water depth, and a spread sensor to measure the distance to the Remote sensor on the other trawl door. The PI Spread/Depth sensor has been developed to be used on both bottom and pelagic trawls.

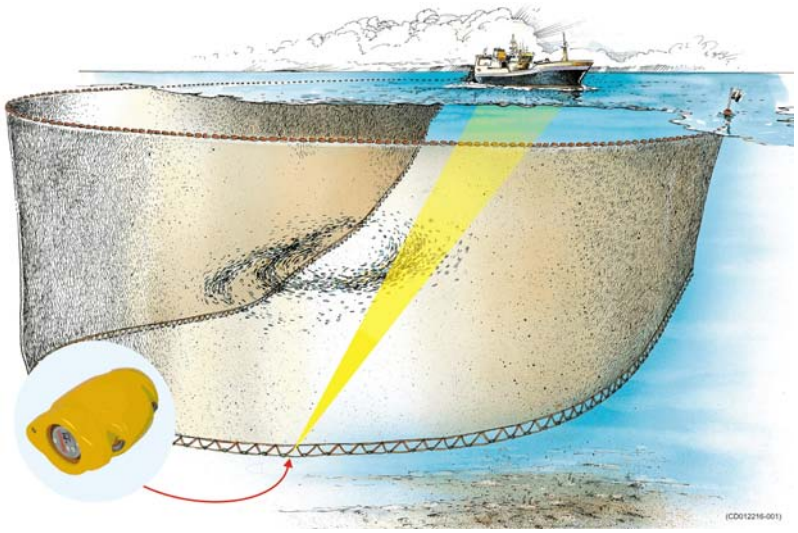
The sensor is normally installed on the port trawl door using an adapter.

Three sensor versions are available. These are set up for maximum depth 300 m, 600 m or 1000 m. The depth range is fixed by the factory, and can not be changed in the PI Configurator utility.

PI Temperature purpose and application

This is an **S-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MiniCharger**.

Figure 17 PI Temperature application



The Simrad PI Temperature sensor tells you the exact sea water temperature while you are fishing.

The water temperature is an important parameter. Fish and bait are temperature sensitive, and they are normally found within specific temperature zones for feeding and spawning. However, the temperature layers in the water are constantly changing, and for this reason the temperature must be monitored constantly.

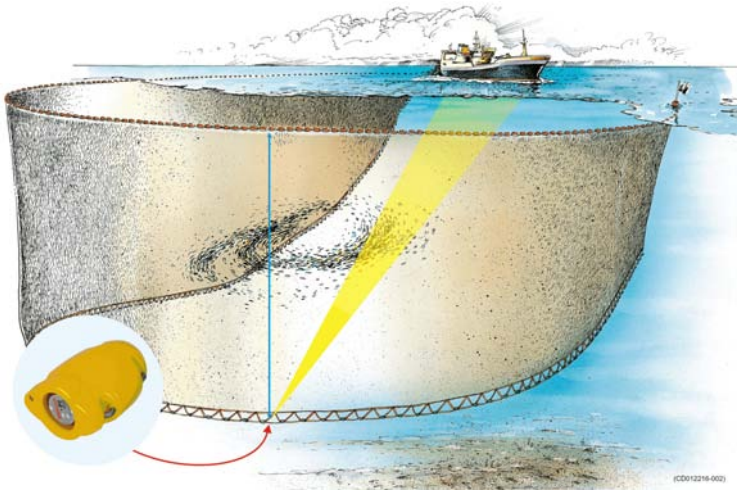
PI Temperature/Depth purpose and application

This is an **L-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MaxiCharger**.

Note

This is a "dual" sensor. It will seize two communication channels on the PI50.

Figure 18 PI Temperature/Depth application



The purpose of the Simrad PI Temperature/Depth dual sensor is to achieve accurate measurements of both the water depth and the temperature.

The PI Temperature/Depth sensor thus contains both a pressure sensor to measure the water depth, and a temperature sensor to measure the temperature. The sensor has been developed to be used on both bottom and pelagic trawls, as well as seines.

On a trawl, she sensor is normally installed on the headrope or footrope.

Three sensor versions are available. These are set up for maximum depth 300 m, 600 m or 1000 m. The depth range is fixed by the factory, and can not be changed in the PI Configurator utility.

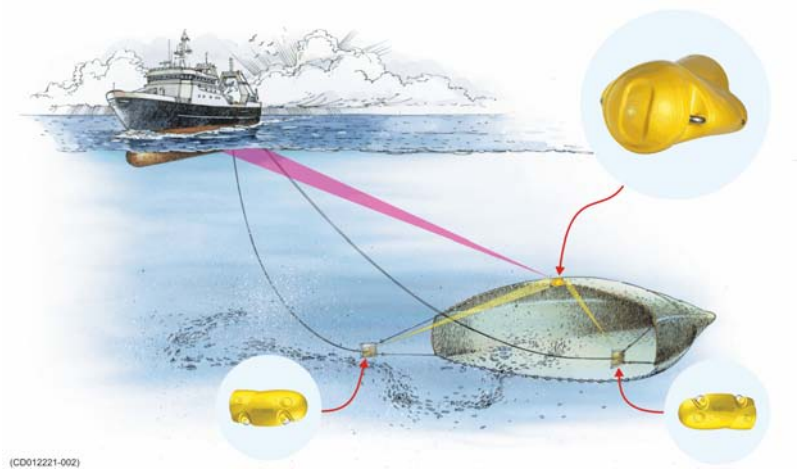
PI Geometry purpose and application

This is an **L-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MaxiCharger**.

Note

The PI Geometry Differential (DF) sensor versions are both "single" sensors. The other PI Geometry versions are all "dual" sensors. They will seize two communication channels on the PI50.

Figure 19 PI Geometry application



The purpose of the Simrad PI Geometry sensor system is to monitor the geometry of your trawl or danish seine.

This is achieved by making accurate measurements of the distances between the centre of the headrope above the trawl opening (or the footrope at the bottom) and each of the trawl doors or wing ends. If these distances are not identical the trawl (or danish seine) will be skewed and unbalanced, and this reduces the catch efficiency.

The following PI Geometry versions exist:

- **Geometry Fine** – High resolution icon to detect smaller changes
- **Geometry Coarse** – Low resolution icon to detect larger changes
- **Geometry XT (Extended) Fine** – Extended range, high resolution icon to detect smaller changes
- **Geometry XT (Extended) Coarse** – Extended range, low resolution icon to detect larger changes
- **Geometry DF (Differential) Fine** – differential measurement (single channel), high resolution icon to detect smaller changes
- **Geometry DF (Differential) Coarse** – differential measurement (single channel), low resolution icon to detect larger changes

The **DF (Differential)** Geometry sensor setting will only use one channel on the PI system, but will not provided extended range.

The **Coarse** or **Fine** settings are not defined by the sensor configuration, but in the PI menu system.

On the PI44/54 systems the phrases **Sensitive** and **Coarse** are used.

The Simrad PI Geometry sensor system has been developed to be used on both bottom and pelagic trawls, as well as pair trawls and danish seiners. In addition to the PI Geometry sensor, the system uses two PI Mini-R transponders. These are mounted on the trawl doors (or trawl wings).

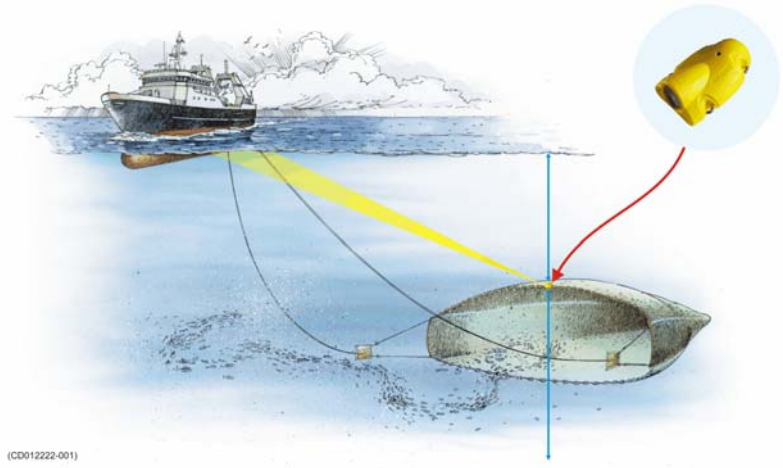
PI Height/Depth purpose and application

This is an **L-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MaxiCharger**.

Note

This is a "dual" sensor. It will seize two communication channels on the PI50.

Figure 20 PI Height/Depth application



The purpose of the Simrad PI Height/Depth dual sensor is to achieve accurate measurements of both the water depth and the distance from the sensor and down to the bottom.

The PI Height/Depth sensor thus contains both a pressure sensor to measure the water depth, and a small echo sounder to measure the height above the bottom. The PI Height/Depth sensor has been developed to be used on both bottom and pelagic trawls.

The sensor is normally installed on the headrope or footrope.

Three sensor versions are available. These are set up for maximum depth 300 m, 600 m or 1000 m. The depth range is fixed by the factory, and can not be changed in the PI Configurator utility.

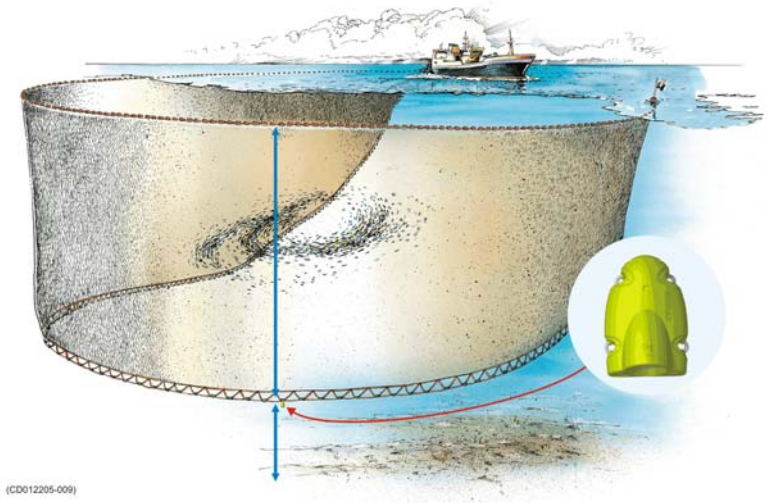
PI SeineSounder purpose and application

This is an **L-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MaxiCharger**.

Note

This is a "dual" sensor. It will seize two communication channels on the PI50.

Figure 21 PI SeineSounder application



The purpose of the Simrad PI SeineSounder dual sensor is to achieve accurate measurements of both the water depth and the height above the seabed with a single sensor.

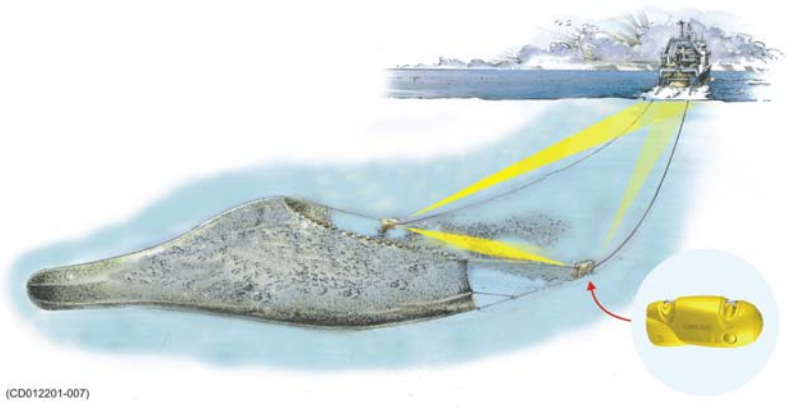
The PI SeineSounder thus contains both a pressure sensor to measure the water depth, and an echo sounder with two transducers to measure the height above the seabed.

The Simrad PI SeineSounder has been developed to be used on both bottom and pelagic trawls and on purse and Danish seiners. The sensor must be installed in two different ways depending on the application. On a trawl, it is mounted horizontally behind the headrope. On a purse seine, it is mounted vertically below the footrope.

PI Remote/Depth purpose and application

This is an **L-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MaxiCharger**.

Figure 22 PI Remote/Depth application



The purpose of the Simrad PI Remote/Depth dual sensor is to achieve accurate measurements of the water depth, while at the same time communicate with the PI Spread or PI Spread/Depth sensor to measure the distance between the two trawl doors.

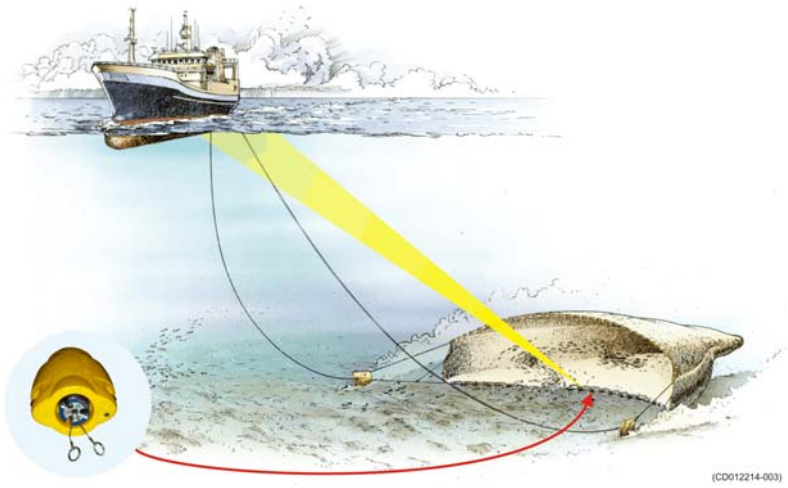
In order to measure the distance, it must be installed in a pair with a PI Spread or PI Spread/Depth sensor.

The PI Remote/Depth sensor has been developed to be used on both bottom and pelagic trawls. The sensor is normally installed on the starboard trawl door using an adapter.

PI Rip purpose and application

This is an **S-type** PI sensor. To charge this sensor, use the **Simrad PI Charger** or the **Simrad PI MiniCharger**.

Figure 23 PI Rip application



The PI Rip sensor will let you know immediately if your net is torn apart.

The Simrad PI Rip sensor is identical to the PI Catch sensor, but uses other rubber band sensors. It can thus be regarded as a second application for the Simrad PI Catch sensor.

Place the sensor on the trawl belly behind the footrope, and use it to detect if the trawl is damaged by rocks or other items on the bottom. If this is detected, you can immediately adjust the gear to minimise the damage.

Sensor configuration

In order to allow the information from the various sensors to be accepted and understood by the PI catch monitoring system, the PI receiver must be set up correctly. This means that you must tell the receiver that the sensor exists by entering the sensor type, communication channels and update rate.

All sensors are provided from Simrad with factory default channels and update rates. Refer to the table in section *Default communication channels and update rates* on page 89.

Topics

Default communication channels and update rates

See the table below for the initial values for the communication channels and update rates for the various sensors.

Table 1 Default communication channels and update rates

Sensor	Com.channel(s)	Update rate
PI Bottom Contact	6	Normal
PI Catch	4	Normal
PI Depth	Depth 300M: 16 Depth 600M: 12 Depth 1000M: 10	Fast Fast Fast
PI Height	14	Normal
PI Height/Depth Mk.1	Depth 300M: 5 Depth 600M: 9 Depth 1000M: 1 Height: 14	Fast Fast Fast Fast
PI Height/Depth Mk.2 PI SeineSounder	Depth 300M: 3 Depth 600M: 9 Depth 1000M: 1 Height: 14	Fast Fast Normal Same as depth
PI Remote/Depth	Depth 300M: 11 Depth 600M: 15 Depth 1000M: 13	Normal Normal Normal
PI Spread	2	Normal
PI Spread/Depth	Depth 300M: 16 Depth 600M: 12 Depth 1000M: 10 Spread: 2	Normal Normal Normal Normal
PI Twin Spread	2 and 7	Normal

Table 1 Default communication channels and update rates (cont'd.)

Sensor	Com.channel(s)	Update rate
PI Temperature	8	Normal
PI Geometry	Standard: 1 and 3 Extended range (XT): 1 and 3 Differential (DF): 1	Normal Normal Normal

Changing a communication channel

It may be required to change one or more communication channels, and there may be many reasons for this.

- You have more than one of each sensor. For example, if you have three temperature sensors, they MUST communicate on three different channels.
- Other vessels near your use the same PI catch monitoring system (or a similar), and they have one or more of their sensors set up to the same communication channels as you have. This will create interference, as you will "read" each others sensors.
- If your sensors are set up to use communication channels too close to each other (for example, you have chosen channels 4, 5 and 6), this will limit the vessel speed. The reason for this is the Doppler effect. If the speed is too high, the Doppler will cause the transmission frequencies to change so much that they overlap, and this will create interference. The PI system will provide a warning if this is about to happen! You must then either change to other communication channels further apart, or reduce the maximum shooting speed.
- If you operate at the maximum range of the sensors, you may be able to increase this range slightly if you use lower communication channels. This is because the lower communication channels use lower transmission frequencies.

All sensors are provided from Simrad with a default communication channel. In some cases you may find that the chosen channel does not suit your operational needs, for example if you have more than one sensor of any given type. This is a decision you have to make depending on how many sensors you use, and how many of these that are identical.

→ *Default communication channels and update rates* on page 89

Changing the update rate

It may be required to change the update rate on a sensor, that is how often it sends information back to the PI catch monitoring system. A high update rate will give frequent information updates, but the sensor will use more battery power. If you need your batteries to last as long as possible, you must consider lowering the update rate.

- A low update rate will provide you with fewer information updates, but the battery will last very long.
- A high update rate will give you frequent information updates, but the battery will run out faster.

All sensors are provided from Simrad with a default update rate setting. In some cases you may find that this update rate does not suit your operational needs. This is a decision you have to make depending on the local fishing conditions.

→ *Default communication channels and update rates* on page 89

PI Configurator

Simrad has developed a dedicated computer utility to change the sensor configurations. By means of an ordinary desktop computer and a special interface unit you can do this job yourself.

You can also use the PI Configurator utility to verify that the sensor is operational.

The PI Configurator utility can be downloaded free of charge from www.simrad.com. It will run on all computers with operating systems Microsoft® XP® and Microsoft® 7.

You can run the PI Configurator utility on the same computer as the PI50, but both programs must not run simultaneously.

If you do not require frequent configurations, you can contact you local dealer for assistance.

Charging procedures

WARNING

Charging a sensor at sub zero temperature may develop explosive gases representing a potential danger. Simrad assumes no liability for improper charging, or the use of other chargers than those approved by us.

This section explains how you shall recharge the battery in the Simrad PI Sensors. All sensor and charger types are explained.

Topics

Battery handling

Operational time and service life of the sensor's NiCd battery depends on proper use and regular charging. Observe the following precautions, as these will have an influence on the battery performance.

- Observe the charging temperatures.
- Charge sensors regularly. Avoid draining the sensor battery completely before charging.
- Charge the sensor battery before storage, and at three-month intervals under long-term storage.
- Operational life may be initially reduced after long-term storage or charging for a long time.
- Sensors are not damaged by being left attached to a charger for several days. However, do not store the sensor for extended periods under charge.

We recommend that a wooden box is made to keep the sensor in a secure place during charging and storage. Make openings in the bottom to drain for sea water.

How to use the Simrad PI Charger

WARNING

Charging a sensor at sub zero temperature may develop explosive gases representing a potential danger. Simrad assumes no liability for improper charging, or the use of other chargers than those approved by us.

The Simrad PI Charger is an intelligent battery charger for fast and secure charging of all PS and PI sensors. The charger will automatically set up the correct charging current depending on the sensor type and the battery temperature. A “fuel meter” shows the status of the battery during the charge.

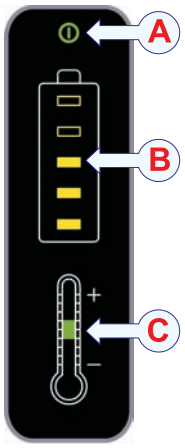
Even though the PI Charger is designed for fast charging of the PI sensors, it can also charge the PS sensors, but only at normal charge rate.

The charger communicates with the sensor at regular intervals. The fast charge cycle is controlled by data exchanged between the PI sensor and the charger. A series of safety mechanisms control the termination of the fast charging current.

Figure 24 The PI Charger set up to charge a PI sensor

The PS sensors do not communicate with the charger. A constant charge current of 58 mA is then set up by the charger regardless of the battery temperature.

Figure 25 Indicators



A *+12 to 32 Vdc connected*

B *Fuel meter*

The number of LEDs illuminated shows the current charging status. A complete charging cycle is indicated with all “full” battery. Charging is indicated as follows:

Fast flashing: Fast charging in progress

Slow flashing: Normal charging in progress

On/off every four seconds: Trickle charging in progress

C *Battery temperature indicators*

These indicators are used during fast charging of PI sensors.

Green: Battery temperature between +5 and +40°C. Fast charge is enabled.

Green and **Blue**: Battery temperature between 0 and +5°C. Fast charge is disabled, normal charge is used.

Green and **Red**: Battery temperature between +40 and +50°C. Fast charge disabled, normal charge is used.

Blue: Battery temperature is below 0°C. No charging takes place.

Red: Battery temperature is above +50°C. No charging takes place.

Observe these steps for daily operation of the charger.

1 Ensure that mounting materials on the sensor do not short circuit the charging lugs.

This may be ropes, wires, chains or other items that obstruct or short circuit the electrical connections between the charger and the sensor.

Note

The charging clamps on the battery charger cable must be properly secured onto the charging lugs with metal against metal!

2 Attach the charging clamps to the sensor as follows:

a Connect the **Red clamp** to the positive (+) fastening lug

b Connect the **Black clamp** to the negative (–) fastening lug

On every sensor the polarity of the fastening lugs are engraved on the sensor body using + and – characters.

3 When the charger is connected to the sensor, check the charger lamps.

Once connected, the charger will identify whether the sensor connected can be fast charged or not. This is shown by the yellow lamps. If the top lamp flashes rapidly, the sensor is fast charged.

If your sensor can be fast charged, the charger will also check the internal temperature of the sensor. The temperature is shown on the “thermometer” on the charger’s front panel. If you charge a sensor that can not be fast charged, this “thermometer” does not work.

4 Observe the charge times and temperature limitations!

Fast charge: The PI Charger will first recharge the sensor battery for approximately one hour to reach 70% battery capacity, then approximately three hours to reach 100% capacity. Once fully charged, a constant trickle charge will compensate for self discharging.

Note

Fast charging only applies to PI sensors!

Normal charge: The PI Charger will first recharge the sensor battery for 16 hours for full battery capacity. This mode applies for charging PI sensors outside specified temperature range, and for all PS sensors.

Charging must only take place within the specified temperature range. For best results, keep the ambient temperature between +10 and +25°C.

Note

Do not charge sensors in temperatures above +50°C or below 0°C!

How to use the Simrad PI MaxiCharger

WARNING

Charging a sensor at sub zero temperature may develop explosive gases representing a potential danger. Simrad assumes no liability for improper charging, or the use of other chargers than those approved by us.

The Simrad PI MaxiCharger is a plain battery charger to be used with the **L-Type** PI sensors. These following sensors can be charged:

Figure 26 Simrad PI MaxiCharger

- PI Spread
- PI Height
- PI SeineSounder
- PI Spread/Depth
- PI Remote/Depth
- PI Geometry

Do not use the PI MaxiCharger on any other PI or PS sensors than those listed here! The large charging current may damage the battery!

The charger is only equipped with a single indicator lamp, this lamp will however change colour to show the status of the charging process.

- **Yellow**: The charger is connected to 230 Vac, it has not been connected to the sensor, and it is ready for use.
- **Orange/Red**: The charger is connected to a sensor, and fast charging is in progress.
- **Green with short yellow flashes**: Top charging is in progress.
- **Green**: Trickle charging is in progress.

The charger is provided with a small booklet from the manufacturer (Mascot). Read this booklet before you put the charger to work!

Observe these steps for daily operation of the charger.

1 Connect the charger to 230 Vac, and check that the charger lamp is lit in yellow.

2 Ensure that mounting materials on the sensor do not short circuit the charging lugs.

This may be ropes, wires, chains or other items that obstruct or short circuit the electrical connections between the charger and the sensor.

Note

The charging clamps on the battery charger cable must be properly secured onto the charging lugs with metal against metal!

3 Attach the charging clamps to the sensor as follows:

   a Connect the **Red clamp** to the positive (+) fastening lug

   b Connect the **Black clamp** to the negative (–) fastening lug

   On every sensor the polarity of the fastening lugs are engraved on the sensor body using + and – characters.

4 When the charger is connected to the sensor, check the charger lamps.

   After a few seconds, the lamp on the charger will change from yellow to orange/red. This means that fast charging is in progress.

   When the battery in the sensor has reached 90% capacity the lamp will change from orange/red to green with short yellow flashes. This means that top charging is in progress.

   When the battery is fully charged, the lamp turns steady green. Trickle charging is now active. You can safely allow trickle charging for long periods of time.

How to use the Simrad PI MiniCharger

WARNING

Charging a sensor at sub zero temperature may develop explosive gases representing a potential danger. Simrad assumes no liability for improper charging, or the use of other chargers than those approved by us.

Figure 27 Simrad PI MiniCharger

The Simrad PI MiniCharger is a plain battery charger to be used with the **S-Type** PI sensors. These following sensors can be charged:

- PI Bottom Contact
- PI Catch
- PI Depth
- PI Temperature
- PI Remote (small version)
- PI Mini-R responder

You may charge the **L-Type** PI sensors too, but due to the small charge current, this will not be efficient.

The charger is only equipped with a single indicator lamp, this lamp will however change colour to show the status of the charging process.

- **Yellow**: The charger is connected to 230 Vac, it has not been connected to the sensor, and it is ready for use.
- **Orange/Red**: The charger is connected to a sensor, and fast charging is in progress.
- **Green with short yellow flashes**: Top charging is in progress.
- **Green**: Trickle charging is in progress.

The charger is provided with a small booklet from the manufacturer (Mascot). Read this booklet before you put the charger to work!

Observe these steps for daily operation of the charger.

1 Connect the charger to 230 Vac, and check that the charger lamp is lit in yellow.

2 Ensure that mounting materials on the sensor do not short circuit the charging lugs.

This may be ropes, wires, chains or other items that obstruct or short circuit the electrical connections between the charger and the sensor.

Note

The charging clamps on the battery charger cable must be properly secured onto the charging lugs with metal against metal!

3 Attach the charging clamps to the sensor as follows:

a Connect the **Red clamp** to the positive (+) fastening lug

b Connect the **Black clamp** to the negative (–) fastening lug

On every sensor the polarity of the fastening lugs are engraved on the sensor body using + and – characters.

4 When the charger is connected to the sensor, check the charger lamps.

After a few seconds, the lamp on the charger will change from yellow to orange/red. This means that fast charging is in progress.

When the battery in the sensor has reached 90% capacity the lamp will change from orange/red to green with short yellow flashes. This means that top charging is in progress.

When the battery is fully charged, the lamp turns steady green. Trickle charging is now active. You can safely allow trickle charging for long periods of time.

How to use the Simrad PS Charger

WARNING

Charging a sensor at sub zero temperature may develop explosive gases representing a potential danger. Simrad assumes no liability for improper charging, or the use of other chargers than those approved by us.

The Simrad PS Charger is an battery charger for secure charging of the PS and PI sensors. These following sensors can be charged:

- All PS Sensors
- PI Bottom Contact
- PI Catch
- PI Depth
- PI Temperature
- PI Remote (small version)

Figure 28 The PS Charger set up to charge a sensor

The Simrad PS Charger can only be used to charge the PI sensors listed here.

Even though the PS Charger is designed for charging the PS sensors, it can also charge the PI sensors, but only at normal charge rate.

If the charger lamp is illuminated, but the sensor lamp does not flash every four seconds, the battery is not being charged properly. Most likely, this is because the sensor was not switched off when the charger was connected. To correct this, charge the sensor for ten minutes, then disconnect the alligator clips. Use a small wire, and make contact between the water switch sensor and one of the fastening lugs. This will cause the sensor to flash its start-up code. If not, wash the sensor in fresh water to disengage the water switch.

Observe these steps for daily operation of the charger.

1 Connect the charger to 230 Vac or 115 Vac.

The AC voltage required by the charger is printed on the panel.

2 Ensure that mounting materials on the sensor do not short circuit the charging lugs.

This may be ropes, wires, chains or other items that obstruct or short circuit the electrical connections between the charger and the sensor.

Note

The charging clamps on the battery charger cable must be properly secured onto the charging lugs with metal against metal!

3 Attach the charging clamps to the sensor as follows:

a Connect the **Red clamp** to the positive (+) fastening lug

b Connect the **Black clamp** to the negative (–) fastening lug

On every sensor the polarity of the fastening lugs are engraved on the sensor body using + and – characters.

4 When the charger is connected to the sensor, check the charger lamps.

It will flash once every four seconds during charging.

5 Observe the charge times and temperature limitations!

You must expect ~16 hours for full battery capacity.

Charging must only take place within the specified temperature range. For best results, keep the ambient temperature between +10 and +25°C.

Note

Do not charge sensors in temperatures above +50°C or below 0°C!

Test procedures

If you wish to check the operation of a sensor before you attach it to the net, there are a few simple procedures you can do. These are not in any way accurate, but you can check that the battery has been fully charged, and that the sensor is switched on when the water switch is activated.

Topics

Simple test for all sensors

In order to do this test, you need the following equipment:

- A standard multimeter
- A short piece of wire

Observe the following steps:

1 Place the sensor on the deck.

2 Inspect the sensor for visual damage.

Check that there are no cracks in the sensor surface, and that the charger lugs are not damaged.

Note

If you fail to remove ropes, wires, chains or other items that obstruct or short circuit the electrical connections during charging, the lugs may be damages due to ...??

3 Ensure that mounting materials on the sensor do not short circuit the charging lugs.

This may be ropes, wires, chains or other items that obstruct or short circuit the electrical connections between the positive and negative charger lugs.

If the sensor surface is covered with an excessive layer of salt, this may also activate the sensor and cause the battery to run out. To fix this, wash the sensor with fresh water.

4 Use a multimeter, and check the voltage between the water switch and the negative charging lug.

If the sensor battery is fully charged, you will measure approximately 12 Vdc.

5 Use a multimeter, and check the current between the water switch and the negative charging lug.

If the sensor battery is fully charged, you will measure approximately 68 µA.

6 Use the short piece of wire, and hold it between the water switch and one of the charging lugs.

This will activate the sensor. If the sensor is operational, you will see that the internal lamp flashes. Single sensors will flash their identification status, while dual sensor will only give a single flash.

Checking sensors using the PI Configurator utility

Simrad has developed a dedicated computer utility to change the sensor configurations. By means of an ordinary desktop computer and a special interface unit you can do this job yourself.

You can also use the PI Configurator utility to verify that the sensor is operational.

The PI Configurator utility can be downloaded free of charge from www.simrad.com. It will run on all computers with operating systems Microsoft® XP® and Microsoft® 7.

You can run the PI Configurator utility on the same computer as the PI50, but both programs must not run simultaneously.

If you do not require frequent configurations, you can contact you local dealer for assistance.

Checking depth sensors

Observe this procedure to do a simple operational check of depth sensors.

1 Observe the general test procedure for all sensors.

→ *Simple test for all sensors* on page 99

2 Attach a solid rope to one of the charging lugs of the sensor.

3 Lower the sensor into the water from the aft deck.

You must lower them to 3 to 5 meters depth before they are activated.

4 Verify that the PI50 reads the depth information from the sensor.

Checking bottom, catch and rip sensors

Observe this procedure to do a simple operational check of bottom, catch and rip sensors.

1 Observe the general test procedure for all sensors.
→ *Simple test for all sensors* on page 99
2 Attach a solid rope to one of the charging lugs of the sensor.
3 Lower the sensor into the water from the aft deck.
You must lower them to 3 to 5 meters depth before they are activated.
4 Verify that the PI50 reads the depth information from the sensor.
5 Hoist the sensor.
6 Unscrew the wire assembly.
7 Lower the sensor back into the water.
8 Verify that the status information from the sensor has changed.

Checking the SeineSounder

Observe this procedure to do a simple operational check of the PI SeineSounder.

1 Observe the general test procedure for all sensors.
→ *Simple test for all sensors* on page 99
2 Check that one of the water switch screws is properly inserted.
If the sensor is lowered into the water with the water switch screw missing, the sensor will be switched off after just a few minutes.
- **Short screw**: Height and depth operation
- **Long screw**: SeineSounder and depth operation

Sensor start-up identification

If you use a short piece of wire to short the sensor's water switch and a charging lug the sensor will be activated. The sensor will then flash its individual LED identification codes.

This will not happen if the sensor is connected to a battery charger.

The identification code for single sensors is provided as follows:

1 One long flash: It has a duration of approximately 1 second.
2 One start flash: This signals that the first digit of the channel number is next.
3 None, one, two or three short flashes: The number of short flashes signifies the first digit of the programmed channel number.
4 A second start flash: This signals that the second digit of the channel number is next.
5 None to nine short flashes: The number of short flashes signifies the second digit of the programmed channel number.

Observe the following steps:

1 Use a short piece of wire to short the sensor's water switch and a charging lug.

2 Observe that the internal LED flashes the activation code.

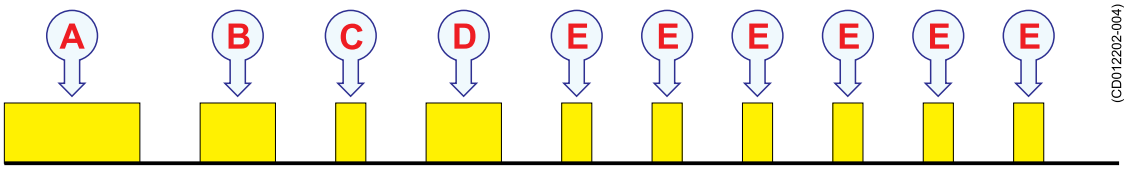
Note

Single sensors will flash the identification code as described here.

Dual sensors will only give a single flash to acknowledge the activation.

Examples:

Figure 29 Show channel, example; Channel #16 at start-up



A *A one second "long flash"*

B *A start "flash"*

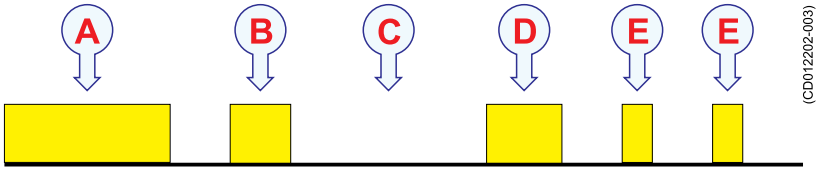
C *One "quick flash" (first digit of 16 is 1)*

D *A start "flash"*

E *Six "quick flashes" (second digit of 16 is 6)*

Normal operation starts.

Figure 30 Show channel, example; Channel #2 at start-up



A *A one second "long flash"*

B *A start "flash"*

C *No short flashes (first digit of 02 is 0)*

D *A start "flash"*

E *Two short flashes (second digit of 02 is 2)*

Normal operation starts.

Telegram formats

All telegram formats used to provide interface telegrams to and from the Simrad PI50 are described in detail.

Topics

About the NMEA telegram format

The Simrad PI50 can send and receive information to and from several different peripherals. All transmissions take place as **telegrams** with data sentences. Each telegram has a defined format and length.

The **NMEA 0183** standard is the most common protocol used to receive and transmit data to and from peripheral sensors. A parametric sentence structure is used for all NMEA data. The sentence start with a “$” delimiter, and represent the majority of approved sentences defined by the standard. This sentence structure, with delimited and defined data files, is the preferred method for conveying information.

For more information about the NMEA standard, the format and the data sentences, refer to their official publications. Their document *NMEA 1083 - Standard for interfacing marine electronic devices* explains the formats in detail. The document can be obtained from http://www.nmea.org.

Topics

About NMEA

The *National Marine Electronics Association (NMEA)* has defined communication standards for maritime electronic equipment, and the PI50 echo sounder conforms to these standards. The most common standard is *NMEA 0183*, and the National Marine Electronics Association describes it as follows:

> The NMEA 0183 Interface Standard defines electrical signal requirements, data transmission protocol and time, and specific sentence formats for a 4800 baud serial data bus. Each bus may have only one talker but many listeners.
>
> — *National Marine Electronics Association*

For more information about the National Marine Electronics Association and the NMEA 0183 standard, refer to the organization’s web site at http://www.nmea.org.

Telegrams

To move information between two electronic units, the data are collected in **telegrams**. The content (protocol) of each telegram is defined by the NMEA standard, and several telegram types exist to allow different type of data to be distributed.

The phrase **datagram** is also frequently used about this communication method.

Unless you wish to write your own software, you do not need to know how these telegrams are designed. However, whenever you set up equipment interfaces, you need to ensure that each system on your communication line is set up to send and receive the same telegram. The standard allows one system to send data (a “talker") and several

others to receive data simultaneously ("listeners") on the same line. Therefore, you must ensure that all products receiving data on a communication line is set up to receive the same telegram(s) that the transmitting product provides.

Standard NMEA 0183 communication parameters

The communication parameters defined for **NMEA 0183** are:

- **Baudrate**: 4800 bits per second
- **Data bits**: 8
- **Parity**: None
- **Stop bits**: One

Some instruments will also offer other parameters and/or choices.

Sentence structure

The following provides a summary explanation of the approved parametric sentence structure.

`$aaccc,c—c*hh<CR><LF>`

1 **"$"**: *Start of sentence* (Hex: 24).

2 **aaccc**: *Address field*. The first two characters (**aa**) identifies the *Talker ID*, while the last three characters are the *Sentence formatter* mnemonic code identifying the data type and the string format of the successive fields.

3 **","**: *Field delimiter* (Hex: 2C). This character starts each field except the address and checksum fields. If it is followed by a null field, it is all that remains to indicate no data in the field.

4 **c—c**: *Data sentence block*. This is a series of data fields containing all the data to be transmitted. The data field sentence is fixed and identified by the *Sentence formatter* in the address field. Data fields may be of variable lengths, and they are preceded by the *Field delimiter*.

5 **"*"**: *Checksum delimiter* (Hex: 2A). This delimiter follows the last field of the sentence, and indicates that the following two alphanumerical characters contain the checksum.

6 **hh**: *Checksum*

7 **<CR><LF>**: *Terminates sentence*

Proprietary telegrams

In some proprietary telegrams received from other Kongsberg Maritime equipment, the **$** character is replaced by the **@** character. The checksum field may then not be in use.

Specification of NMEA telegrams

All standard NMEA telegrams supported by the PI50 are specified here. The information is extracted from the original NMEA specifications. If additional details about the individual telegram formats are required, see the original source file.

Topics

DBS Depth below surface

This telegram provides the current depth. The telegram is no longer recommended for use in new designs.

It is often replaced by the **DPT** telegram.

Format

```
$--DBS,x.x,f,y.y,M,z.z,F*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **DBS** = telegram identifier

3 **x.x,f** = depth below surface in feet

4 **y.y,M** = depth below surface in meters

5 **z.z,F** = depth below surface in fathoms

GLL Geographical position latitude/longitude

This telegram is used to transfer latitude and longitude of vessel position, time of position fix and status from a global positioning system (GPS).

Format

```
$--GLL,llll.ll,a,yyyyy.yy,a,
hhmmss.ss,A,a*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **GLL** = telegram identifier.

3 **llll.ll,a** = latitude north/south, position in degrees, minutes and hundredths. Characters **N** (North) or **S** (South) identifies the bearing.

4 **yyyyy.yy,a** = longitude east/west, position in degrees, minutes and hundredths. Characters **W** (West) or **E** (East) identifies the bearing.

5 **hhmmss.ss** = coordinated universal time (UTC) of position.

6 **A** = status, characters **A** (data valid) or **V** (data not valid) are used.

7 **a** = mode indicator.

GGA Global positioning system fix data

This telegram contains time, position and fix related data from a global positioning system (GPS).

Format

```
$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,
x,zz,d.d,a.a,M,g.g,M,r.r,cccc*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **GGA** = telegram identifier

3 **hhmmss.ss** = coordinated universal time (UTC) of position

4 **llll.ll,a** = latitude north/south, position in degrees, minutes and hundredths. Characters **N** (North) or **S** (South) identifies the bearing.

5 **yyyyy.yy,a** = longitude east/west, position in degrees, minutes and hundredths. Characters **W** (West) or **E** (East) identifies the bearing.

6 **x** = GPS quality indicator (refer to the NMEA standard for further details)

7 **zz** = number of satellites in use, 00 to 12, may be different from the number in view

8 **d.d** = horizontal dilution of precision

9 **a.a,M** = altitude related to mean sea level (geoid) in meters

10 **g.g,M** = geoidal separation in meters

11 **r.r** = age of differential GPS data

12 **cccc** = differential reference station identification, 0000 to 1023

HDG Heading, deviation and variation

This telegram contains the heading from a magnetic sensor, which if corrected for deviation will produce magnetic heading, which if offset by variation will provide true heading.

Format

```
$--HDG,x.x,z.z,a,r.r,a*hh<CR><LF>
```

Heading conversions

To obtain magnetic heading: Add easterly deviation (E) to magnetic sensor reading, or subtract westerly deviation (W) from magnetic sensor reading.

To obtain true heading: Add easterly variation (E) to magnetic heading, or subtract westerly variation (W) from magnetic heading.

Format description

1 – – = talker identifier

2 **HDG** = telegram identifier

3 **x.x** = magnetic sensor heading, degrees

4 **z.z,a** = magnetic deviation, degrees east/west

5 **r.r,a** = magnetic variation, degrees east/west

HDM Heading, magnetic

This telegram contains vessel heading in degrees magnetic. The telegram is no longer recommended for use in new designs.

It is often replaced by the **HDG** telegram.

Format

```
$--HDM,x.x,M*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **HDM** = telegram identifier

3 **x.x** = heading in degrees, magnetic

HDT Heading, true

This telegram is used to transfer heading information from a gyro.

Format

```
$--HDT,x.x,T*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **HDT** = telegram identifier

3 **x.x,T** = heading, degrees true

RMC Recommended minimum specific GNSS data

This telegram contains time, date, position, course and speed data provided by a global navigation satellite system (GNSS) receiver.

Format

```
$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,
x.x,z.z,ddmmyy,r.r,a,a*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **RMC** = telegram identifier

3 **hhmmss.ss** = coordinated universal time (UTC) of position fix

4 **A** = status, characters **A** (data valid) or **V** (Navigation receiver warning) are used.

5 **llll.ll,a** = latitude nort/south. Characters **N** (North) or **S** (South) identifies the bearing.

6 **yyyyy.yy.a** = longitude east/west. Characters **E** (East) or **W** (West) identifies the bearing.

7 **x.x** = speed over ground, knots

8 **z.z** = course over ground, degrees true

9 **ddmmyy** = date

10 **r.r,a** = magnetic variation, degrees east/west. Characters **E** (East) or **W** (West) identifies the bearing.

11 **a** = mode indicator

VHW Water speed and heading

This telegram contains the compass heading to which the vessel points and the speed of the vessel relative to the water.

Format

```
$--VHW,x.x,T,x.x,M,x.x,N,x.x,K*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **VHW** = telegram identifier

3 **x.x,T** = heading, degrees true

4 **x.x,M** = heading, degrees magnetic

5 **x.x,N** = speed relative to water, knots, resolution 0.1

6 **x.x,K** = speed relative to water, km/hr, resolution 0.1

VTG Course over ground & ground speed

This telegram contains the actual course and speed relative to the ground.

Format

```
$--VTG,x.x,T,y.y,M,z.z,N,g.g,K,a*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **VTG** = telegram identifier

3 **x.x,T** = course over ground, degrees true

4 **y.y,M** = course over ground, degrees magnetic

5 **z.z,N** = speed over ground, knots, resolution 0.1

6 **g.g,K** = speed over ground, km/hr, resolution 0.1

7 **a** = mode indicator

VLW Dual ground/water distance

This telegram contains the distance travelled relative to the water and over the ground.

Format

```
$--VLW,x.x,N,y.y,N,z.z,N,g.g,N*hh<CR><LF>
```

Format description

1 – – = talker identifier

2 **VLW** = telegram identifier

3 **x.x,N** = total cumulative water distance, nautical miles.

4 **y.y,N** = water distance since reset, nautical miles.

5 **z.z,N** = total cumulative ground distance, nautical miles.

6 **g.g,N** = ground distance since reset, nautical miles.

Proprietary telegrams and formats

All proprietary telegram formats supported by the PI50 are specified here. All formats are created by Simrad for use in own products.

Topics

DBS Depth of trawl below surface

This proprietary Simrad telegram contains the depth of the trawl sensor.

Format

```
@IIDBS,,,x.x,M,,<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **DBS** = telegram identifier

3 **x.x,M** = depth in meters (0 to 2000)

HFB Trawl headrope to footrope and bottom

This proprietary Simrad telegram contains the distance from the headrope to the footrope, and from the footrope to the bottom.

Format

```
@IIHFB,x.x,M,y.y,M<CR><LF>
```

Format description

1 **II** = talker identifier (mandatory)

2 **HFB** = telegram identifier

3 **x.x,M** = distance from headrope to footrope, meters

4 **y.y, M** = distance from footrope to bottom, meters

PSIMP-D1 PI Sensor data

This proprietary Simrad telegram contains the type and configuration of PS and PI sensors used by the external PI catch monitoring system.

Note

This description is not complete. For further information, contact Simrad.

Format

```
$PSIMP,D1,tt,dd,M,U,SNo,MNo,C,V,CR,Q,
In,SL,NL,G,Cb,error*chksum<CR><LF>
```

Format description

1 **PS** = Talker identifier (mandatory)

2 **IMP** = Telegram identifier

3 **D1** = Sentence specifier

4 **tt** = Time of day

5 **dd** = Current date

6 **M** = Measurement type:

- D = Depth
- T = Temperature
- C = Catch
- B = Bottom
- N = No sensor
- M = Marker

7 **U** = unit, always in SI units

- M = depth and distance measurements
- C = temperature measurements

8 **SNo** = Sensor number

9 **MNo** = Measurement number

10 **C** = channel; the number (1 to 30) of the communication channel for the current data source

11 **V** = value; the magnitude of the current sensor measurement

12 **Cr** = change rate; the rate of change for the current measurement, or time counter for bottom and catch sensors

13 **Q** = quality:

14 **In** = interference:

- 0 = No interference
- 1 = Interference detected

15 **SL** = signal level – the signal level of the telemetry pulse, measured in dB

16 **NL** = noise level – the average noise level of the current channel, measured in dB

17 **G** = the current gain; 0, 20 or 40 dB.

18 **Cb** = cable quality:

- 0 = cable is not connected
- 1 = cable is OK
- 2 = a short circuit, or the hydrophone current is too large

19 **error** = error detected – 0 when no error is detected, a number >0 indicates an error condition

20 **chksum** = The checksum field consists of a "*" and two hex digits representing the exclusive OR of all characters between, but not including, the "$" and "*" characters

Appendix A
General safety rules

WARNING

The Simrad PI50 operates on 230 Vac 50/60 Hz. This voltage is lethal!

The following safety precautions must be followed at all times during installation and maintenance work

- Always switch off all power before installation or maintenance.

  Use the main circuit breaker, and label the breaker with a warning sign that informs others that maintenance or installation work is being carried out on the system.
- Do not open the rack or cabinet doors while in rough seas. It may swing open suddenly and cause damage or injury.
- For safety reasons during troubleshooting on the equipment with power ON, two persons must always be present.
- Read and understand the applicable first aid instructions for electric shock.
- Whenever maintenance is carried out, it is essential that a first aid kit is available, and that the maintenance personnel are familiar with the first aid instructions for electrical shock.
- The various parts of the system may be heavy. Make sure that the appropriate tools and certified lifting equipment are available, and that the personnel are trained in installation and maintenance work.

Appendix B Equipment handling

This section provides the basic rules for transportation, storage and handling of units. In this context, a unit may be any large or small part of the system. It can be supplied as part of the initial delivery, or as a spare part.

Topics

Transportation

Unless otherwise stated in the accompanying documentation, electronic, electro-mechanical and mechanical units supplied by Kongsberg Maritime can be transported using all methods approved for delicate equipment; (by road, rail, air or sea). The units are to be transported in accordance with general or specific instructions for the appropriate unit(s), using pallets, transport cases, or carton boxes as appropriate.

Note

Special local restrictions concerning air transportation may be applied to units containing certain types of batteries. These units must be checked properly, and the regulations must be investigated by the packer/shipper before the unit is dispatched.

All local transportation must be carried out according to the same specifications as for the initial delivery. In general, all units must be handled with care.

The carton or case containing the unit must be kept dry at all times, and must be sheltered from the weather. It must not be subjected to shocks, excessive vibration or other rough handling. The carton or case will normally be marked with text or symbols indicating which way it is to be placed. Follow any instructions given, and ensure the case is always placed with its “top” uppermost.

The carton or case must not be used for any purpose for which it was not intended (step, table, etc.), and in the absence of other information, no other cartons or cases must be stacked on top of it.

Lifting

A heavy crate will normally be marked with its weight, and the weights of other cartons or crates will normally be entered on the packing list.

- You must always check the weight of a crate before you attempt to lift it.
- You must always use lifting apparatus that is approved and certified for the load.

Heavy units may be equipped with lifting lugs for transportation by crane within the workshop or installation area. Before you use a crane:

- You must check the applicable weight certificate for the crane.
- You must check the security of the lifting lugs.

Ensure that all available lifting lugs are used. Ensure the unit remains under control during the operation to avoid damage to the unit, equipment or personnel.

Heavy units may be transported using a forklift truck. Special attention must then be paid to the position of the unit’s centre of gravity. The units must be properly secured to the truck.

Storage prior to installation or use

When a system, a unit or a spare part has been delivered to the customer, it may be subject to long time storage prior to installation and use. During this storage period, certain specifications must be met. The equipment must be preserved and stored in such a way that it does not constitute any danger to health, environment or personal injury.

1 The equipment must be stored in its original transportation crate.

2 Ensure that the units are clearly separated in the shelves and that each unit is easily identifiable.

3 The crate must not be used for any purpose for which it was not intended (eg. work platform etc.).

4 The crates must not be placed on top of each other, unless specific markings permit this.

5 The crates must not be placed directly on a dirt-floor.

6 Do not open the crate for inspection unless special circumstances permit so.

- "Special circumstances" may be suspected damage to the crate and its content, or inspections by civil authorities.
- If any units are damaged, prepare an inspection report stating the condition of the unit and actions taken. Describe the damage and collect photographic evidence if possible. Re-preserve the equipment.
- If the units are not damaged, check the humidity absorbing material. If required, dry or replace the bags, then re-pack the unit(s) according to the packing instructions.

7 If the crate has been opened, make sure that is it closed and sealed after the inspection. Use the original packing material as far as possible.

8 The storage room/area must be dry, with a non-condensing atmosphere. It must be free from corrosive agents.

9 The storage area's mean temperature must not be lower than -30° C, and not warmer than +70° C. If other limitations apply, the crates will be marked accordingly.

10 The crate must not be exposed to moisture from fluid leakages.

11 The crate must not be exposed to direct sunlight or excessive warmth from heaters.

12 The crate must not be subjected to excessive shock and vibration.

13 If the unit contains normal batteries, these may have been disconnected/isolated before the unit was packed. These must only be reconnected before the installation starts. Units containing batteries are marked.

Caution

Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.

Inspection

An inspection must be carried out immediately after the unit(s) have arrived at their destination.

1. Check all wooden or cardboard boxes, plastic bags and pallets for physical damage. Look for signs of dropping, immersion in water or other mishandling.
2. If damage is detected externally, you will have to open the packaging to check the contents. Request a representative of the carrier to be present while the carton is opened, so any transportation damage can be identified.
3. If any units are damaged, prepare an inspection report stating the condition of the unit and actions taken. Describe the damage and collect photographic evidence if possible. Send the inspection report to Kongsberg Maritime as soon as possible.
4. If the units are not damaged, check the humidity absorbing material. If required, dry or replace the bags, then re-pack the unit(s) according to the packing instructions.

Unpacking

General unpacking procedure

Normal precautions for the handling, transportation and storage of fragile electronic equipment must be undertaken.

Note

If the unit is not to be prepared for immediate use, you may consider storing it unopened in its original packing material. However, it may be useful to open the case to check its contents for damage and retrieve any accompanying documentation.

Do not use a knife to open cardboard cartons - the contents may lie close to the surface, and may be damaged by the blade.

1. Check the carton before opening it to ensure it shows no signs of dropping, immersion in water or other mishandling. If the carton shows signs of such damage, refer to the paragraph covering Inspection on receipt.
2. Place the carton on a stable work bench or on the floor with the top of the carton uppermost.
3. In the absence of other instructions, always open the top of the carton first. The contents will normally have been lowered into the carton from above, so this will usually be the easiest route to follow. Care must be used when opening the carton to ensure the contents are not damaged. Do not use a knife to open cardboard cartons
4. If the carton has been closed using staples, remove the staples from the carton as you open it. This will reduce the possibilities of scratch injury to yourself and damage to the contents.
5. If a wooden crate has been closed using screws, always remove them using a screwdriver. Do not attempt to prise the lid off with a crowbar or similar.

6 Once the carton is open, carefully remove all loose packing and insulation material. Check for manuals and other documents that may have been added to the carton during packing, and put these to one side. Check also for special tools, door keys etc.

Unpacking electronic and electromechanical units

Electronic and electromechanical units will normally be wrapped in a clear plastic bag. Lift the unit, in its bag, out of the carton and place it in a stable position on the floor/work bench.

Inspect the unit for damage before opening the plastic bag.

Note

Beware of the dangers of Electro-Static Discharge (ESD) both to yourself and to the equipment, when handling electronic units and components.

*Cables must **never** be used as carrying handles or lifting points.*

Do not break the seal to open a circuit board package before the board is to be used. If the board package is returned to the manufacturer with the seal broken, the contents will be assumed to have been used and the customer will be billed accordingly.

Assuming all is well, open the bag and remove the unit.

Open the unit and check inside. Remove any packing and desiccant material that may be inside.

Unpacking mechanical units

Mechanical units may be heavy. Using a suitably certified lifting apparatus, lift the unit out of the crate and place it in a stable position on the floor/work bench.

Inspect the unit for damage and remove any packing material that may be inside the unit.

Unpacking transducers

Transducers may be supplied mounted to a hull unit (if any), or packed separately. Crates are normally identified by the order number and the serial number.

The transducer face must be protected by a rigid, padded cover (e.g. a wooden box lined with foam rubber) all the time it is exposed to the risk of physical damage.

Caution

Once transducer is unpacked, great care must be taken to ensure that transducer body and cabling is not exposed to any mechanical stress.

Storage after unpacking

The unit must whenever possible be stored in its original transportation crate until ready for installation. The crate must not be used for any purpose for which it was not intended (eg. work platform etc.).

Once unpacked, the equipment must be kept in a dry, non condensing atmosphere, free from corrosive agents and isolated from sources of vibration.

Note

Do not break the seal to open a circuit board package before the board is to be used. If the board package is returned to the manufacturers with the seal broken, the contents will be assumed to have been used and the customer will be billed accordingly.

The unit must be installed in its intended operating position as soon as possible after unpacking. If the unit contains normal batteries, these may have been disconnected/isolated before the unit was packed. These must then be reconnected during the installation procedure. Units containing batteries are marked.

Note

Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.

Storage after use

If a unit is removed from its operating location and placed into storage, it must be properly cleaned and prepared before packing.

Cleaning cabinets

If a cabinet has been exposed to salt atmosphere while it was in use, it must be thoroughly cleaned both internally and externally to prevent corrosion.

1 Wipe the cabinet externally using a damp cloth and a little detergent. Do not use excessive amounts of water as the unit may not be water tight. On completion, dry the unit thoroughly.

2 All surfaces must be inspected for signs of corrosion, flaking/bubbling paint, stains etc. Damaged or suspect areas must be cleaned, prepared and preserved using the correct preservation mediums for the unit. The mediums to be used will usually be defined in the units' maintenance manual.

3 Open the unit, and using a vacuum cleaner, remove all dust etc. from the unit. Great care must be taken to ensure the circuit boards and modules are not damaged in the process.

Mechanical units

If a mechanical unit may has been exposed to a salt atmosphere while it was in use, it must be thoroughly cleaned both internally and externally to prevent corrosion.

1. If the construction materials and type of unit permits, wash the unit using a high-pressure hose and copious amounts of fresh water. Examples are the lower parts of hull units (outside the hull) or subsea units
2. Ensure that all traces of mud and marine growth are removed. Use a wooden or plastic scraper to remove persistent growth, barnacles etc. On completion, dry the unit thoroughly.

   Caution

   Do not use a high pressure hose in the vicinity of cables or transducers. Do not use sharp or metal tools on a transducer face.

3. If the materials or type of unit prevents the use of a high-pressure hose, wipe the unit using a cloth dampened with water containing a little detergent. Examples are the upper parts of hull units (inside the hull) and hydraulic systems
4. Do not use excessive amounts of water as some components on the unit may not be water tight. Wipe off the detergent with a damp cloth, then dry the unit thoroughly.
5. All surfaces must be inspected for signs of corrosion, flaking/bubbling paint, stains etc. Damaged or suspect areas must be cleaned, prepared and preserved using the correct preservation mediums. The mediums to be used will normally be defined in the unit's maintenance manual.

Cables

Wipe clean all exposed cables, and check for damage. If a cable shows signs of wear or ageing, contact Kongsberg Maritime for advice.

Internal batteries

If the unit contains batteries, these may discharge slowly during storage. If the unit is to be stored for an extended period, disconnect or remove all internal batteries.

A suitable piece of insulating material can be placed between the battery and the electrical contacts to prevent electrical discharge. The battery can then remain in the unit, reducing the risk of it being misplaced during the storage period.

Caution

Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.

Dehumidifier

Place a suitably sized bag of desiccant material (silica gel or similar) into the unit to keep the electronic components as dry as possible.

Coatings

Spray the unit externally with a corrosion inhibitor (e.g. a light oil) before packing.

Re-packaging

Whenever possible, the unit must be stored and transported in its original packing material and/or crate. In the event that this material is not available, proceed as follows:

- Small units must be protected from damp by being placed within a plastic bag at least 0.15 mm thick. An appropriate quantity of desiccant material should be placed inside this bag, and the bag sealed. The sealed unit must then be placed in an appropriate carton or crate, and supported in the container by appropriate shock-absorbing insulation (polystyrene foam chips etc.).
- Large units must be placed in a suitable cardboard box or wooden crate. The unit must be protected against physical damage by means of shock-absorbing insulation mats. The box must be clearly marked with its contents, and must be stored in a dry and dust-free area.

Temperature protection

If the unit must be protected against extremes of temperature, the carton/crate must be lined on all walls, base and lid with 5 cm thick polyurethane or polystyrene foam. These units will be identified as delicate in the applicable documentation.

The package must then be clearly marked:

Must not be transported or stored in temperatures below -5 degrees Celsius.

Other units can normally be stored in temperatures between -30° C and +70° C, refer to the system's technical specifications for details.

Note

Unless otherwise specified, transducers must not be stored in temperatures below -20° C and above +55° C.

Circuit board handling and packaging

Circuit boards are delicate items. They may work year after year in an advanced product, but then fail due to a small spark of static electricity. For this reason, it is very important that they are properly handled and protected during shipping.

Beware of ESD!

When you handle electronic circuit boards, you must beware of the dangers of electrostatic discharge (ESD), both to yourself and to the equipment. In order to ensure safe transport and storage, circuit boards and other electronic units will always be wrapped in a clear plastic protective bag, and the bag will be sealed. See also section *Electro-Static Discharge (ESD)* on page 125.

Unpacking and handling circuit boards

Observe the following steps to unpack a circuit board.

1. Wherever possible, prepare a suitable workbench. It must have an approved conductive service mat, and it must be connected directly to a reliable earth point via its earthing cord. You must wear a wristband in direct contact with the skin, and the wristband must be connected to the service mat.
2. Lift the circuit board, in its protective bag, out of the carton and place it in a stable position on the a floor/work bench.
3. Inspect the unit for damage before you open the plastic bag.
4. Do not break the seal to open a circuit board package before the board shall to be used. If the board package is returned with the seal broken, we will assume that the content has been used, and we will bill you accordingly.
5. Assuming all is well, open the bag and remove the unit.
6. Take out and keep the documentation. You will need it if the circuit board shall be returned to us. Also, remove any packing and desiccant material that may be inside.
7. Keep the protective plastic bag for future use.

Unpacking on board the vessel

When you are working on board a vessel, an “approved conductive service mat” is often far away. As you still need to unpack circuit boards, make sure that you do it in the instrument room, or at another location where you have a steel deck. Keep far away from the bridge or any other rooms with wall-to-wall carpets! If possible, bring a wristband and ground yourself.

Returning a circuit board

If you wish to return a circuit board to us, observe the following rules.

Note

Failure to follow these rules may result in unserviceable circuit boards.

1. Place the circuit board to be returned in the same protective plastic bag as you originally received it in - or a protective bag of similar ESD protection quality.

2 DO NOT use standard plastic bags, such as commercial bubble wrap.

3 Fill in all the necessary information on the applicable documentation and place it inside the bag.

4 Seal the bag.

5 Place the circuit board in a suitable carton, and secure it for shipping.

Electro-Static Discharge (ESD)

What is ESD?

Electro-Static Discharge (ESD) is the transfer of an electrostatic charge between two bodies at different electrostatic levels, caused either by direct contact or induction by an electrostatic field. The passing of a charge through an electronic device can cause localised overheating, and it can also "puncture" insulating layers within the structure of the device. This may deposit a conductive residue of the vaporised metal on the device, and thus create a short circuit. This may result in a catastrophic failure, or degraded performance of the device.

ESD protection

Sensitive electronic circuit boards must be transported and stored in protective packing bags. The circuit boards must not be transported or stored close to strong electrostatic, electro-magnetic or radioactive fields.

If it is necessary to open and touch the circuit board inside the protective bag, then the following precautions must be taken:

1 The working area must be covered by an approved conductive service mat that has a resistance of between 50 kΩ and 2 MΩ, and is connected directly to a reliable earth point via its earthing cord.

2 The service personnel involved must wear a wristband in direct contact with the skin, connected to the service mat.

3 Printed circuit boards must be placed on the conductive service mat during installation, maintenance etc.

4 If, for any reason, it is necessary to move the circuit board from the conductive service mat, it must be placed in an approved antistatic transportation container (e.g. static shielding bag) before transportation.

5 During installation and servicing, all electrical equipment (soldering irons, test equipment etc.) must be earthed.

Disposal

At the end of the product lifetime, all Kongsberg Maritime products must be disposed in an environmental friendly way.

All electrical and electronic components must be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or local authorities. The correct disposal and separate collection of your old appliance will help prevent potential negative consequences for the environment and human health. This is a precondition for reuse and recycling of used electrical and electronic equipment. For more detailed information about disposal of your old appliance, please contact your local authorities or waste disposal service.

All disposal of mechanical, electromechanical, electronic and chemical waste – including all types of batteries – must thus be disposed of according to national and international rules and regulations. Observe the relevant Waste Electronical and Electronic Equipment (WEEE) regulations.

Kongsberg Maritime offers a product recycling service. This is described on http://www.km.kongsberg.com **→Products →Services →Product recycling**.

Appendix C Basic cable requirements

This chapter provides general information related to the installation of system cables.

Topics

Cable trays

All permanently installed cables associated with the system must be supported and protected along their entire lengths using conduits and/or cable trays. The only exception to this rule is over the final short distance (maximum. 0,5 meters) as the cables run into the cabinets/units to which they are connected. These short service loops are to allow the cabinets to move on their shock mounts, and to allow maintenance and repair.

- Wherever possible, cable trays must be straight, accessible and placed so as to avoid possible contamination by condensation and dripping liquids (oil, etc.). They must be installed away from sources of heat, and must be protected against physical damage. Suitable shields must be provided where cables are installed in the vicinity of heat sources.
- Unless it is absolutely unavoidable, cables should not be installed across the vessel's expansion joints. If the situation is unavoidable, a loop of cable having a length proportional to the possible expansion of the joint must be provided. The minimum internal radius of the loop must be at least twelve times the external diameter of the cable.
- Where a service requires duplicate supply lines, the cables must follow separate paths through the vessel whenever possible.
- Signal cables must not be installed in the same cable tray or conduit as high-power cables.
- Cables containing insulation materials with different maximum-rated conductor temperatures should not be bunched together (that is, in a common clip, gland, conduit or duct). When this is impractical, the cables must be carefully arranged such that the maximum temperature expected in any cable in the group is within the specifications of the lowest-rated cable.
- Cables with protective coverings which may damage other cables should not be grouped with other cables.
- Cables having a copper sheath or braiding must be installed in such a way that galvanic corrosion by contact with other metals is prevented.
- To allow for future expansion of the system, all cables should be allocated spare conductor pairs. Also, space within the vessel should be set aside for the installation of extra cables.

Radio Frequency interference

All cables that are to be permanently installed within 9 m (30 ft) of any source of Radio Frequency (RF) interference such as a transmitter aerial system or radio transmitters, must, unless shielded by a metal deck or bulkhead, be adequately screened by sheathing, braiding or other suitable material. In such a situation flexible cables should be screened wherever possible.

It is important that cables, other than those supplying services to the equipment installed in a radio room, are not installed through a radio room, high power switch gear or other potential sources of interference. Cables which must pass through a radio room must be screened by a continuous metal conduit or trunking which must be bonded to the screening of the radio room at its points of entry and exit.

Physical protection

Cables exposed to the risk of physical damage must be enclosed in a steel conduit or protected by a metal casing unless the cable's covering (e.g. armour or sheath) is sufficient to protect it from the damage risk.

Cables exposed to an exceptional risk of mechanical damage (for example in holds, storage-spaces and cargo-spaces) must be protected by a suitable casing or conduit, even when armoured, if the cable covering does not guarantee sufficient protection for the cables.

Metallic materials used for the physical protection of cables must be suitably protected against corrosion.

Grounding

All metallic cable coverings (armour, metallic sheathing etc.) must be electrically connected to the vessel's hull at both ends except in the case of final sub-circuits where they should be connected at the supply end only.

Grounding connections should be made using a conductor which has a cross-sectional area appropriate for the current rating of the cable, or with a metal clamp which grips the metallic covering of the cable and is bonded to the hull of the vessel. These cable coverings may also be grounded by means of glands specially intended for this purpose and designed to ensure a good ground connection. The glands used must be firmly attached to, and in good electrical contact with, a metal structure grounded in accordance with these recommendations.

Electrical continuity must be ensured along the entire length of all cable coverings, particularly at joints and splices. In no case should the shielding of cables be used as the only means of grounding cables or units.

Metallic casings, pipes and conduits must be grounded, and when fitted with joints these must be mechanically and electrically grounded locally.

Cable connections

All cable connections are shown on the applicable cable plan and interconnection diagrams.

Where the cable plan shows cable connections outside an equipment box outline, the connections are to be made to a plug or socket which matches the plug or socket on that particular item of equipment.

Where two cables are connected in series via a junction box or terminal block, the screens of both cables must be connected together but not grounded.

Cable terminations

Care must be taken to ensure that the correct terminations are used for all cable conductors, especially those that are to be connected to terminal blocks. In this case, crimped sleeve-terminations must be fitted to prevent the conductor core from fraying and making a bad connection with the terminal block. It is also of the utmost importance that where crimped terminations are used, the correct size of crimp and crimping tool are used. In addition, each cable conductor must have a minimum of 15 cm slack (service loop) left before its termination is fitted.

Cable identification

Cable identification codes corresponding to the cable number shown in the cable plan must be attached to each of the external cables. These identification codes should be positioned on the cable in such a way that they are readily visible after all panels have been fitted. In addition, each cable conductor should be marked with the terminal board number or socket to which it is connected.

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