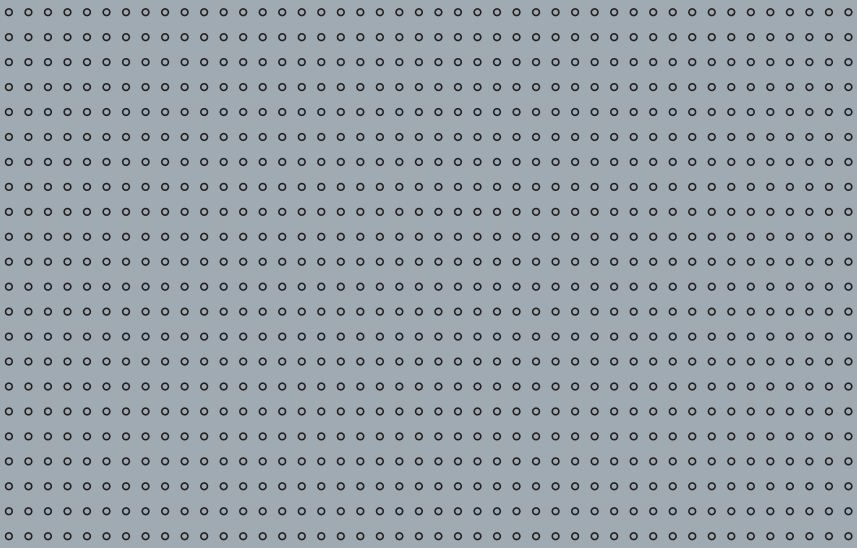
SIMRAD

Master the Elements

Manual

Simrad GI51
Gyro Interface

English Sw. 1.2



Installation Manual
GI51 Gyro Interface

This manual is to be used when installing the Simrad GI51 Gyro Interface.

Document revisions

Rev	Date	Written by	Checked by	Approved by
A	18.02.04		V.P./G.K./T.J./T.R.	T.R.
B	30.04.04		V.P./G.K./T.J.	T.J.
C	01.09.05		G.K.	G.K.
Cb	02.05.06	NG	G.K.	G.K.

Document history

Rev. A	First issue
Rev. B	Updated to include new functions. Corrections/updates added to other pages .
Rev. C	Updated for BSH approval. Applies to sw.rel. 1.2.xx.
Rev. Cb	Minor corrections to text, section 1.1, 3.2 (Pendulum ferry feature) and 7.3. A5 layout

To assist us in making improvements to this manual, we would welcome comments and constructive criticism. Please send all such - in writing to:

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Product compliance schemes

Electronic navigation equipment on boats and ships within the **European Common marked** (EC) are regulated by two main directives:

- Directive 89/336/EEC Electromagnetic Compatibility, "EMC directive"
  - This directive is applicable to more or less all boats, including leisure boats. Refer ***CE mark*** section below
- Council Directive 96/98/EC of 20 December 1996 on marine equipment, "Marine directive" or "MED"
  - This directive is valid for ships that come under international conventions such as LL66, Colreg, Marpol, and Solas. Refer ***Wheelmark*** section below

The **Marine directive** requirements include the requirements of the **EMC directive**, and a product which comply with the **Marine directive** is therefore automatically also in compliance with **EMC directive**.

CE mark

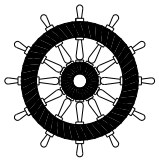
CE

The **CE** mark is placed on a product as the manufacturer's visual identifier that the product meets the requirements of relevant European Directives. The CE mark is mandatory for a wide range of products sold within or exported to the European market, and applies to all Electric- and Electronic equipment.

When the equipment is tested according to the requirements in the Directive 89/336/EEC, the CE marking is applied to the units to symbolize Simrad's Declaration of Conformity with the directive.

The CE declaration for any CE marked unit can be obtained from your Simrad distributor.

Wheelmark



0575/05

The Wheelmark symbol (Mark of Conformity) is an accreditation that is required for equipment placed on board ships for which safety certificates are issued by, or on behalf of, Member States of the European Union.

Before a wheelmark can be affixed to a product, an independent organization appointed by a European national authority (a Notified body) has to undertake conformity assessment, and test reports and a MED-B certificate have to be issued. These test reports and certificates have to be kept by the manufacturer.

The manufacturer is allowed to affix the Wheelmark symbol and issue a declaration of conformity only if the manufacturer also holds a relevant QA certificate (MED-D).

The wheelmark shall be followed by:

- the identification number of the notified body (Det Norske Veritas = 0575) which has performed the conformity assessment procedure
- the last two digits of the year in which the mark is affixed.

Note! *When a complete system (e.g. an autopilot system) is wheelmark approved, only the main unit(s) in the system wears the wheelmark symbol. This to avoid the misunderstanding that all optional units in a system retain their wheelmark approval even if they are installed in a not approved system. The type examination certificate (MED-B) for the wheelmarked system lists all optional equipment that is part of the wheelmark approval. The EC Declaration of Conformity do also show which units that are part of the approval.*

EU's official database (MarED Product Database) contains information about wheelmarked equipment. This database is found on:

http://www.mared.org/

The certificates and CE declarations for any wheel marked equipment can be obtained from your Simrad distributor.

Contents

1 INTRODUCTION

1.1 General

The GI51 is a multi purpose interface unit designed for converting various input signals to Robnet, sin/cos, stepper signal, NMEA 0183, and Clock Data output signals. Refer ***TECHNICAL SPECIFICATIONS***, page 17.

The GI51 may be used both in a Robnet system and as a stand-alone unit.

Note! *If GI51 is used together with AP16/25 autopilots, it must be configured as stand alone and use NMEA input. The same applies for AP35 autopilot when used with stepper- or geared synchro gyros.*

The unit has a pendulum ferry feature that will change the heading output by 180° on command when the unit is connected to Robnet. If not connected to Robnet, an optional GI51 function key is required to activate the pendulum ferry function. Refer ***PENDULUM FUNCTION KEY (Option)***, page 13.

1.2 GI51 type approvals

The GI51 is approved as part of a wheelmarked system according to certificates from the following Notification bodies:

Issuer:	MED	Product
DNV	B	AP50 Heading control system
BSH	B	AIS200 / Simrad AI80 Automatic Identification System

The certificates can be obtained from your Simrad distributor. DNV Certificates may be downloaded from the following site:

http://exchange.dnv.com/tari/

Note! *According to our Notification body (DNV) only the main unit(s) in a wheelmarked system shall wear the wheelmark symbol. GI51 does therefore not wear a separate wheelmark symbol, and the unit does not retain the approval if it is installed in a not wheelmark approved system.*

For more information about product compliance schemes, refer page v.

2 INSTALLATION

2.1 Mechanical installation

The GI51 should be mounted with regard to the environmental protection and temperature range of the unit, and should not be installed in area exposed for heavy vibrations.

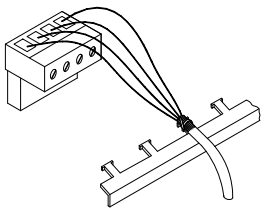
Make allowances for working area around the unit when routing or removing the cables.

Fasten the GI51 to the bulkhead. Refer mechanical drawing, page 17.

2.2 Cabling

All cable conductors are terminated in screw terminals on the GI51 pcb.

Connect equipment according to the block diagram on page 2, and to ***Terminal description***, page 10 onwards.

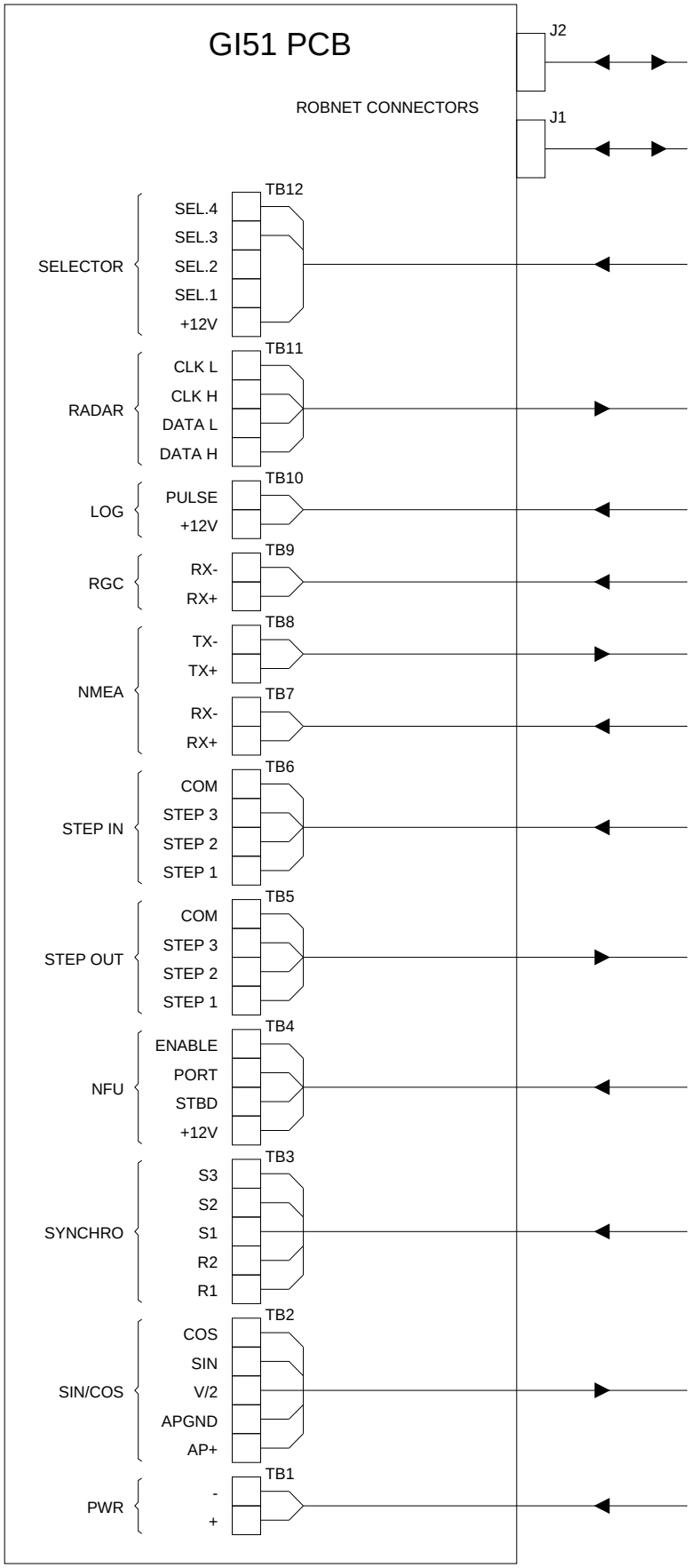


To make a good ground connection, strip about 1 cm (0.4”) off the cable’s insulation and pull the screen backwards to cover the insulation. Position the straps as shown in the figure. Tighten well to make sure the screen makes good contact.

This will also avoid vibration causing the cables to loose connection.

Note! *Be careful not to drop screen cuts over the components!*

GI51 Block diagram



2.3 Dip switch settings

The following dip-switches have to be set correctly:

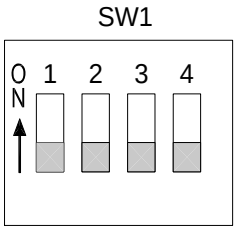
- SW1-1 and SW1-2 determine the gearing ratio for synchro input. For 1:1 synchro or if synchro is not used, both are set to OFF.
- SW1-3 determines the format of the clk/data heading signal to the radar. If the unit is powered by the Robnet, the format is set from the autopilot control unit. Hence the switch is not used and the setting of the switch is irrelevant.
- SW1-4 is used to start a calibration (ref. section 2.6). It can also be used for test and trouble shooting (ref. page 14). Five seconds after setting the switch to ON, the heading at all outputs will jump in circles in a sequence of 45° each 10 sec.

Note! *Before activating heading jumps, make sure it will not cause any harm (ship running on automatic pilot etc).*

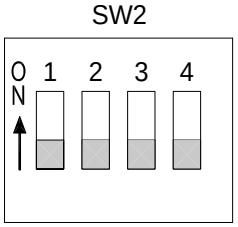
- SW2-1 set to OFF gives NMEA and Robnet speed output from the pulse log input. If set to ON, speed will be taken from the longitudinal water speed field of VBW (1.priority) or VHW (2.priority) of the NMEA input.
- SW2-2 is used for 1:1 synchro to determine the internal gain for high voltage 50-110V ref., 20-90V L/L or low voltage, 26V ref., 11.8V L/L synchros. OFF sets the gain for high voltage level, ON sets the gain for low voltage level.

All switches are factory set to OFF.

For location of the dip-switches, refer to ***Component location***, page 9.



Switch no.	Position/Function	
	OFF	ON
SW1-1	Synchro 1:1	Synchro 90:1
SW1-2	Synchro 1:1	Synchro 360:1
SW1-3	Simrad clk/data (Stand-alone)	Furuno clk/data (Stand-alone)
SW1-4	Calibration	Heading test



Switch no.	Position/Function	
	OFF	ON
SW2-1	Pulse log	NMEA log
SW2-2	Others	26V Ref., 11.8V L/L
SW2-3	Spare	Spare
SW2-4	Spare	Spare

2.4 Compass selection and interface setup

As several compasses may be connected to GI51 at the same time, one of these has to be defined as source for the heading output on the Robnet, NMEA, step, radar and sin/cos port.

When GI51 is connected to a Simrad autopilot via Robnet, compass signal type has to be set at installation in the autopilot interface menu. Steering and monitor compass is then selected in the user setup menu (refer autopilot manual).

As stand alone unit, the compass in use is automatically selected at power-on in the following order:

Synchro (1st priority) → Step → RGC → NMEA

2.5 Heading offset adjustment and alignment

For a synchro type gyro compass, offset adjustment is normally done once during installation. Before making a correction, make sure that offset is not caused by wires connected in the wrong order (ref. section 2.7).

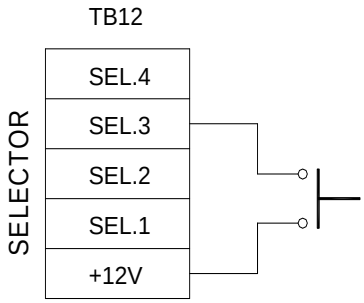
When connected to a Simrad autopilot via Robnet, offset adjustment is done in the autopilot Seatrial menu. When connected to a Seatex AI80, offset adjustment is done at the operator panel. For stand alone unit, offset is adjusted as described further down.

A gyro compass with step or geared synchro will require heading alignment after power-on and after a fault on the compass signal to GI51.

When connected to a Simrad autopilot via Robnet or Seatex AI80, alignment is prompted for on the display of the operator panel.

Note! *Before alignment is commenced, there will be no NMEA HDT output (only proprietary NMEA data).*

As stand alone unit both installation offset and alignment can be done either by proprietary NMEA data (ref page 19) or by an external switch connected between **SEL 3** and **+12V** terminals on TB12.



The switch must be a potentional free pulse type. When pressing and holding the switch, the heading will increase or decrease, depending of last direction control.

The heading will increase in a slow rate for the first 3 degrees, but change to high rate for as long as the switch is depressed. By making a quick double press and keep the last press, the direction is reversed and started with low rate. Single presses on the switch changes the heading by one tenth of a degree.

The switch should be mounted in a location for convenient operation.

Note! *Make sure that the switch is mounted on a protected area to avoid unintended operation that may give large heading changes!*

2.6 Calibration of 1:1 synchro interface

Compasses using geared synchro do not need any calibration. For compasses with1:1 synchro, GI51 is factory calibrated for:

- 26V 400Hz ref. voltage, 11.8V L/L type synchro signal (used by S.G. Brown model A,B,M,S, Meridian, SGB-100, Robertson SKR82)
- 90V 400Hz ref. voltage 70V L/L used by Simrad RGC50 and RGC10

The factory calibration is selected by dip switch SW2-2 (refer section 2.3).

If components of the GI51 synchro interface or the flash memory are replaced by repair, calibration is necessary. This requires a full turn of the synchro shaft. For a compass that can be slewed, or a ship in water where it can make a full turn, calibration may be done on-site. Otherwise it has to be done in a workshop. Calibration requires a 360° turn of the compass synchro within 30 minutes and can be started as follows:

- If connected to a Simrad autopilot via Robnet, calibration is started from the autopilot Seatrial menu
- If you have access to a computer with appropriate NMEA interface, calibration may be performed with proprietary sentences as listed in page 19
- By flipping the dip switch SW1-4 ON/OFF

During calibration, the green CPU Running LED will flash at appr. 4 Hz which is 4 times the normal rate.

2.7 Initial heading and heading change test

If the heading read-out from GI51 has a fixed offset or is not following the synchro signal from the gyro compass correctly, this section gives you some guidelines to locate the fault. First of all make sure that the dip switches are set correctly for gearing and synchro voltage (ref. page 4).

Problem	Recommended action	
	1:1 synchro	Geared synchro
Compass and GI51 output is counting in opposite direction	Interchange S1 and S3. For a compass that can be slewed (compass card turned), S1 - S3 can be located as follows: slew the compass to 000°, disconnect S1 - S2 - S3. The 2 wires between which approx. 0 V AC is measured are S1 - S3.	
Compass differs approximately 120° or 240° from GI51 output	Move S1 to S2, S2 to S3 and S3 to S1.	
Compass differs approximately 180° from GI51 output	Interchange R1 and R2.	
Compass differs approximately +/-60° from GI51 output	Corrected by a combination of swapping R1 and R2 for 180° shift and different sequence of S1 – S2 – S3 connections for 120° shift to obtain the required 60° correction (180° – 120°). Note that swapping two phases only gives change of direction!	
Constant difference of some degrees between compass and GI51 output for all headings	Adjust offset as described in sec 2.5.	

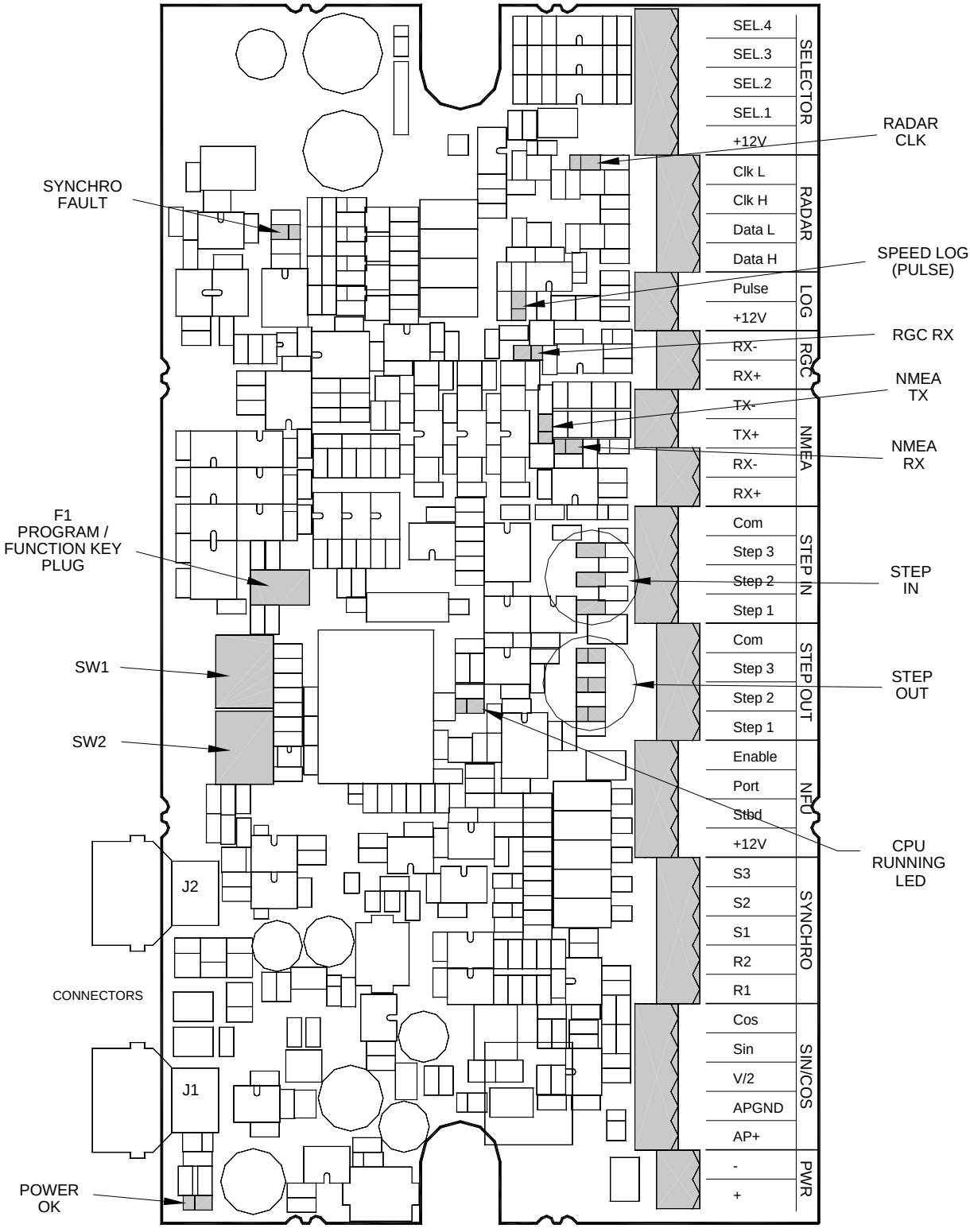
2.8 S9 Steering lever

The S9 Steering Lever can be added to an autopilot system to provide remote non-follow up steering capability. The S9 is designed to be mounted in weather exposed locations. If it is installed in such location, it is recommended to insure that the cable entry glands are properly tightened. In addition silicone sealant should be added around cable to ensure water protection.

As the mode selection by the Enable signal is based on a pulse, it is recommended that only one S9 lever is used. This because the mode selection switch is fixed levels, not pulsed. If several NFU levers are required, the S35 lever is recommended.

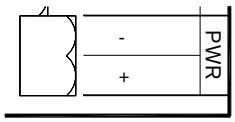
3 GI51 PCB

3.1 Component location



3.2 Terminal description

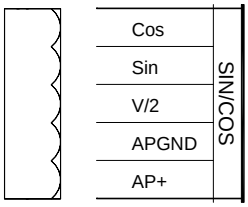
TB1, Power



Used for power connection when GI51 is not powered by Robnet.

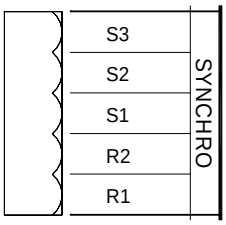
When power is connected to TB1 in a Robnet system, GI51 will continue to output gyro heading even if the autopilot is turned OFF.

TB2, Sin/Cos Out



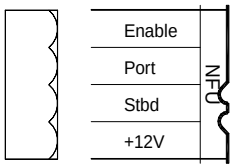
Used for heading output to certain models of Simrad autopilots (AP200 series, AP45, AP9).

TB3, Synchro In



Used for connecting gyro compasses with synchro output. Refer ***Dip switch settings***, page 4 for signal specification.

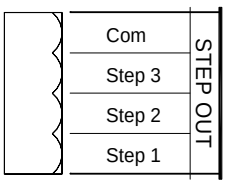
TB4, NFU



Used for connecting a remote Non Follow Up lever. Rudder command or course change will be sent to the autopilot via Robnet.

Simrad S9 lever also enables remote auto/NFU mode switching.

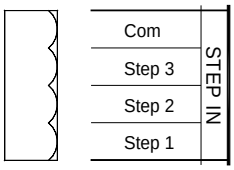
TB5, Step Out



Used for operating heading repeaters with step input.

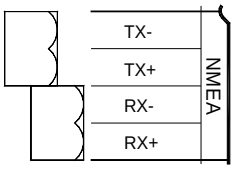
Note! *Step signals only for electronic interface, not for step motors! See **TECHNICAL SPECIFICATIONS**, page 17.*

TB6, Step In



Used when connecting a gyro compass with stepper output.

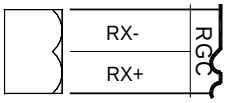
TB7 and TB8, NMEA



NMEA signals from compass or speed log with serial output should be connected to RX- and RX+. Refer Dip switch settings for speed, page 4.

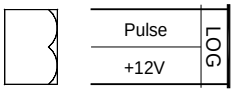
Output heading from active steering compass and speed from log in the GI51 is available on TX- and TX+.

TB9, RGC proprietary



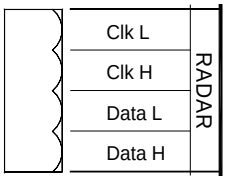
Used for reading serial data (9600 baud) from gyro compass (RGC11, RGC12).

TB10, LOG



Used for connecting speed log with 200p/NM. Refer ***Dip switch settings***, page 4.

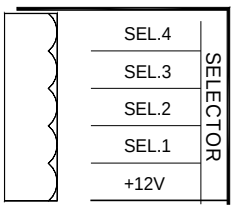
TB11, Radar



Data and Clock output signal to Radar.

Simrad or Furuno format is selected via Robnet, or set by dip switch SW1 if GI51 not is connected to Robnet. Refer ***Dip switch settings***, page 4.

TB12, Selector



The selector lines option on TB12 are used both for heading offset adjustment and for the optional pendulum function key as described below.

Heading offset adjustment and alignment

Offset of initial heading will be required when a step or geared synchro is connected in a stand-alone system. The function is obtained by connecting a potential free pulse switch between the **+12V** and **SEL.3** terminals on TB12. When pressing and holding the switch, the heading will increase or decrease, depending of last direction control. Refer page 9.

Pendulum ferry feature

Based on reading an external potential free switch connected to this terminal, GI51 will change the heading output 180° for both the selected steering and monitor compass connected to GI51 or the NMEA or HS-port of the autopilot J50 Junction Unit.

The switch is connected between +12V and SEL.4.

Note! *This function will not apply for the rate compass RFC35R and RC25 and compasses connected to the NI300X autopilot interface.*

Note! *Pendulum function key as described in section 4 may be required.*

4 PENDULUM FUNCTION KEY (Option)

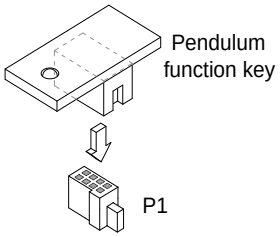
If GI51 is connected as stand alone, an optional Pendulum function key (part no. 20213815) has to be installed to activate the pendulum function. When this key is installed, GI51 will change the heading output by 180° based on signal from a potential free closing contact between TB12, Sel 4 and +12V on the GI51 pcb. Refer page 12.

A LED is visible through the hole on the key. The LED has the following indication:

- No light: true heading output
- Intermediate flashing:heading is changed 180°

Use the following procedure to install the pendulum key:

1. Remove power from the GI51 unit.
2. Open the unit and locate P1 on the pcb. Refer ***Component location***, page 9.



3. Carefully insert the pendulum function key into P1. Observe the guiding slot as indicated on the figure.
4. Press carefully until the key is properly inserted.

5 TROUBLE SHOOTING

For location of the LEDs, refer to ***Component location***, page 9.

SYMPTOM	CORRECTIVE ACTION
The unit is inoperative.	1. Check that the POWER OK LED is lit. 2. Check that the CPU RUNNING LED is alternating at 1Hz.
No compass output.	1. With step or geared synchro input, check that offset adjustment has been done after power-on or compass signal error. Refer page 6. 2. Check LED indicator(s) for all heading outputs. Note that whenever the selected input compass is unreliable (signal missing, invalid flag received etc), GI51 will: - Turn on all 3 LEDs for step out - Set sin/cos to zero - Stop clk/data output - Transmit invalid flag and empty heading field in NMEA output 3. If output indicators show missing or invalid input (all 3 LEDs for step out is lit etc), check LED(s) for selected input compass. 4. If LED(s) for selected input compass indicate missing signal, check input cabling and compass status. 5. For synchro input, check the Synchro Fault LED which will be lit if the reference or any of the phases are missing. Also check correct setting of DIP switches (no output if both SW1-1 and SW1-2 are ON). 6. If all inputs are OK, output can be checked by setting switch SW1-4 to ON (ref. page 4).

SYMPTOM	CORRECTIVE ACTION
No speed output	1. Check LED indicator for Speed Log input or NMEA RX (depending upon which signal that is selected by DIP switch SW2-1). 2. Check LED for NMEA input. 3. If input signal is missing, check cabling or status of speed log. 4. If input signal is ok, check cabling for output signal

Note! *If pulses from the speed log fail to appear, the speed will decrease towards zero during the next half minute before the speed output is stopped.*

5.1 LED indicators

Several LED indicators are used to indicate correct status for power and input/output signals.

For location of the LEDs, refer ***Component location***, page 9.

LED NO.	COLOR	INDICATION
D1	Green	CPU running indicator. Flashes with 1Hz when the processor is running and with 4Hz when synchro calibration is enabled.
D103	Green	Power polarity indication. Green light when polarity is correct.
D400	Green	Step out indicators. Flashes with Step Out signal.
D401		
D401		
D603	Green	NMEA In indicator. Flashes with NMEA In signal.
D602	Green	NMEA Out indicator. Flashes with NMEA Out signal.
D1000	Green	Step In indicators. Flashes with Step In signal.
D1001		
D1002		
D1301	Green	RGC proprietary indicator. Flashes with RGC proprietary signal.
D1600	Red	Synchro fault indicator. Will be lit if any signal is lost or if no synchro is connected.

6 SPARE PARTS

PART NO.	DESCRIPTION
20213773	GI51 Gyro Interface
20213278	GI51 board
20213815	GI51 Pendulum key

7 TECHNICAL SPECIFICATIONS

7.1 Hardware

Dimensions: ..... See figure below

Weight: ..... 0.8 kg (1.8 lbs.)

Material: ..... Epoxy coated aluminum

Environmental Protection: IP44

Safe distance to magnetic compass: ..... 0.2 m (0.7 ft.)

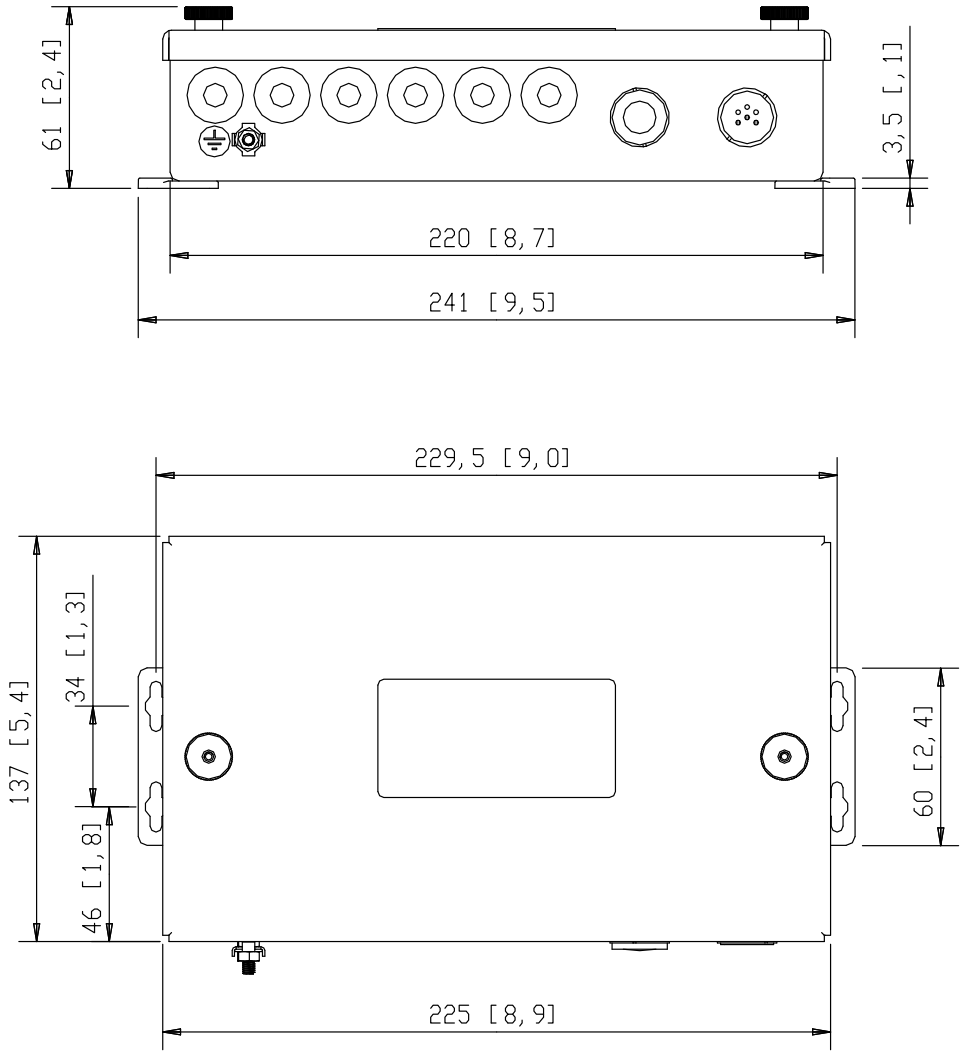
Temperature range:

Operation: ..... –25 to +55°C (–13 to +130°F)

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

Cable inlets ..... Rubber glands for cable diameter 10-14mm

Mounting: ..... Bulkhead mount



7.2 Supply

Supply voltage:..... 12, 24 or 32V DC +30%/-10% or Robnet (26-42V DC

Power consumption:..... 2.4 W

7.3 Interface

Input

Synchro 1:1, ROT max 20°/sec.....26 - 115V, 400Hz ref, 11.8-90V L/L, +/-0.5° accuracy

Synchro 90:1, 360:1, ROT max 12°/sec.....50 - 110V, 50 - 60Hz ref, 20-90V L/L, +/-0.5° accuracy

Step, 6 step/°, ROT max 20°/sec:.20-70V+40%, common high or common low

IEC61162-1 / NMEA0183:

Heading:..... HDT, HDG, HDM, VHW

Water speed: ..... VBW, VHW

Rate of turn: ..... ROT

Note 1 *All talker identifiers accepted.*

Note 2 *VBW, only longitudinal water speed in knots and status are used.*

Note 3 *VHW, water speed in km/h is ignored.*

RGC11 serial heading ..... 9600 baud

RGC12 serial heading and rate of turn..... 9600 baud

Speed log 200 p/NM .....Pot. free contact, 20mA max

NFU with mode sel. (S9)..... Pot. free contacts

Robnet .....Heading (steering comp., T or M), Radar interf. type

Selector..... Pendulum function offset adjustment

Output

Analog sin/cos (AP45) ..... $^{V}/_{2}$ +/- 2.5V DC

Externally supplied AP + (12V DC + 30% / -10%)
with ref. $^{V}/_{2}$ = 2.5V DC

Step 6 step/°, negative comm.,
max rate 20°/sec: ..... Repeater supply voltage, 20mA max

Simrad (Anritsu)/Furuno clk
/data for 2 radars..... 0-5V, 40Hz, 20mA max

Robnet (AP50 only) ..... Heading T & M, water speed, NFU

IEC61162-1 / NMEA183:

Heading (10Hz) ..... HEHDT/HCHDG

Speed and heading (10Hz): ..... HEVHW/HCVHW
PSIMVHW (1Hz) if unaligned geared synchro or step

Rate of turn (1Hz):..... xxROT

Note *Talker ident (xx) will be the same as for ROT input. If talker ident is "TI" data is according to IMO A.526 (13).*

If ROT is calculated from compass heading, talker ident is AG (GI connected to autopilot) or II (stand alone).

Other serial output / input

Input data:

Calibration start command: ..... $PSTOC<CR><LF>

Heading offset adjust:.....$PSTOK,,,nnn.n,<CR><LF>
$PSIME,HDT,nnn.n<CR><LF>
nnn.n = offset angle 0 – 360 (PSTOK)
or new true heading (PSIME)

Output data:

Status: $PSTOK,R<CR><LF>
equal to calibration running

$PSTOK,C<CR><LF>
equal to calibration completed, or not running (as presented before start calibration)

$PSTOK,F<CR><LF>
equal to calibration failed (time out)

Heading offset: $PSTOK,,,nnn.n,<CR><LF>
upon response to PSTOK heading offset input

Data transmission:

Baud rate:	4800
Data bits:	8
Parity:	None
Stop bits:	1

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SIMRAD

Master the Elements