INSTALLATION MANUAL

Simrad GI51
Gyro Interface

[AB]

[20221594]

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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.

Document history

Rev. A	First issue
Rev. B	Updated to include new functions. Corrections/updates added to other pages .

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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Contents

1 INTRODUCTION

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 20.

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

Note! *If GI51 is used together with the AP20 or AP35/16, it must be configured as stand alone.*

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 16.

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.

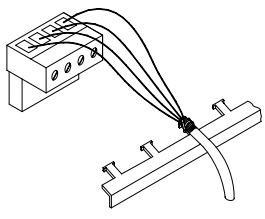
Make allowances for working area around the unit when routing or removing the cables.

Fasten the GI51 to the bulkhead. Refer mechanical drawing, page 20.

2.2 Cabling

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

Connect equipment according to the block diagram on page 6, and to ***Terminal description***, page 13 onwards.

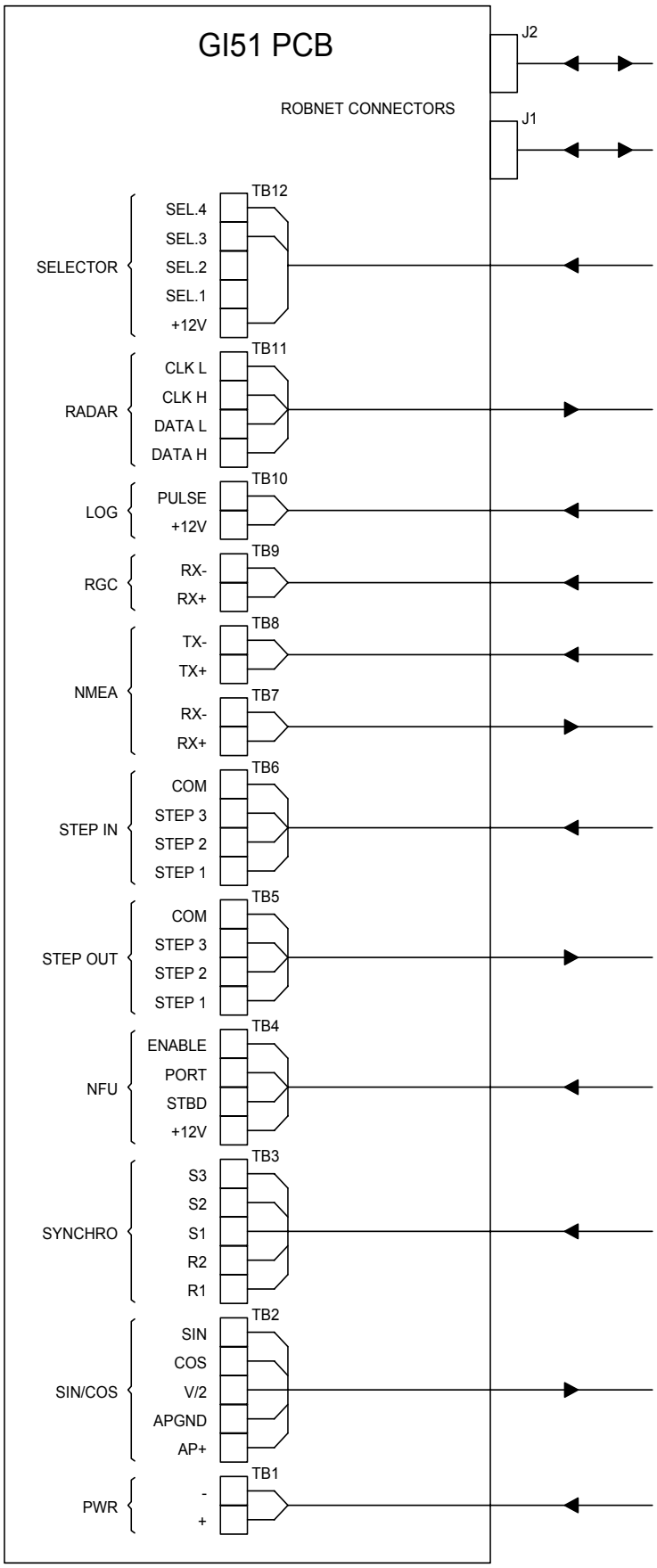


To make a good ground connection, strip about 1 cm (0.4”) off the cable’s insulation and pull the screen backwards to cover the insulation. Position the straps as shown in the figure. Tighten well to make sure the screen makes good contact.

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

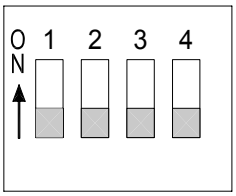
The following dip-switches have to be set correctly:

- 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 settings for the switch is irrelevant.
- SW1-4 can be used for test and trouble shooting (ref. page 17). When the switch is set to ON, the heading at all outputs will jump in circles in a sequence of 45° each 10 sec.
- 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 to determine the internal gain for high voltage 50-100V ref. (L/L or low voltage, 26V ref., 11.8V L/L synchros. OFF sets the gain for high voltage level (others), ON sets the gain for low voltage, 26V/11.8 V L/L.

All switches are factory set to OFF.

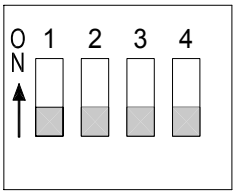
For location of the dip-switches, refer to ***Component location***, page 12.

SW1



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	Normal	Heading test

SW2



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

2.4 Interface setup procedure

When a compass is connected to the GI51 via Robnet, it is required to configure the compass in the autopilot Interface Setup Menu.

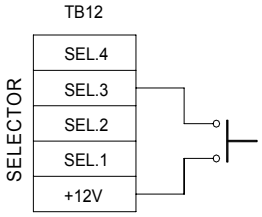
Note! *For AP50 the gyro type has to be selected under the "GI-menu" shown in the Interface menu.*

The procedure to access the Interface Setup Menu is detailed in the respective autopilot manual.

If more than one compass is connected to a GI51, operating as "stand alone", the input compass will be selected at power on in the following order: Synchro (1.priority) → Step → RGC → NMEA.

2.5 Offset adjustment

Without Robnet connection to GI51, heading offset adjustment is required after power on. This can be done either by a proprietary NMEA data (ref. page 22) or by an external switch connected between the SEL 3 and +12V.



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 2 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 will give large heading changes!*

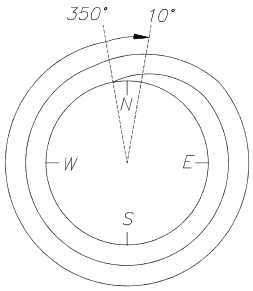
2.6 Calibration

For other types of synchro voltages, it is recommended to perform a heading calibration to obtain the maximum heading accuracy. Calibration can be performed by either turning the vessel, slew the compass or rotating the synchro. As the internal gain is related to synchro voltage, dip switch SW2-2 is used to select “high reference voltage” (50-100V) or “lo reference voltage” (26V). See page 7. Note that no calibration is required for geared synchros. The calibration may be omitted if reduced accuracy (1-2°) can be accepted.

When connected to a Simrad autopilot, the calibration is started from the autopilot (Robnet). It will be confirmed and read in the autopilot (confirmed or failed). The GI51 is factory calibrated for Simrad RGC50/10/11 type gyro with 1:1 synchro. Note that RGC11 and 1:1 synchro is NOT standard but optional. See autopilot manual for more info.

When compasses are connected to GI51 as “stand alone” and calibration may become difficult or impractical due to vessel size, port condition etc, a separate dip switch (SW2-2) function is included to avoid the calibration. See Dip switch settings, page 7.

Note! *For a 1:1 synchro, minor errors may be present, therefore a calibration when the vessel is out at the open sea is recommended. Use the following procedure:*



1 Connect the power to the GI51.

2 Make some 360 degrees turns within 10 minutes from power-on. Normally the compass becomes calibrated within passing north three times. The heading sensor should now be calibrated. The green CPU Running LED changes from flashing to constant on for about 7 seconds, indicating that the calibration is accepted.

Note! *If you have access to a computer with the appropriate NMEA interface, you can perform a calibration procedure using the proprietary sentences as listed in page 22.*

2.7 Initial heading and heading change test

This section describes how to verify that the heading read-out from the GI51 is following the correct direction of change along with the gyro. In some cases, it may be encountered that the autopilot heading read-out is different from the gyro heading. Two possibilities of error may exist:

1 Compass read-out on the autopilot is different from the gyro card read-out, but the heading difference is a constant on all headings. This condition can be correct by simply dialing in the correct heading value from the Seatrial Menu item called Compass Offset, presented directly after the Compass Calibration menu item, from the Seatrial Settings Menu.

2 If there is a difference of approximately 120° or 240° between the master compass heading and the autopilot/repeaters when the NMEA signal is used, S1 - S2 - S3 and R1 - R2 connections between the master compass and GI51 need to be changed. Use one of the alternatives listed below.

If the compass can be slewed (heading changed) use the procedure in Alternative 1. If it is not possible to slew the compass, Alternative 2 should be used:

Alternative 1

- Disconnect S1 - S2 - S3 from GI51 TB3.
- Slew the master compass to 000°.
- Use a multimeter and measure the AC voltage (0 - 90V range) between S1 - S2 - S3 on the disconnected wires.
- Locate the two phases where the voltage is approx. 0 volt. These are the S1 and S3 lines. Connect S1 - S3 – S2 accordingly.
- If the change in heading is in the same direction for the master compass and the repeaters, but a constant 180° offset is present, the R1 and R2 lines need to be interchanged. (This does not reverse the rotation).
- Rotate the master compass to make the heading increase. If the repeater heading decreases, the S1 and S3 lines need to be interchanged.

Alternative 2

- The sequence of connections S1-S2-S3, R1 and R2 may be wrong. Reversing two phases will change the direction. Swapping S1 to S2, S2 to S3 and S3 to S1 will change the response by 120° or 240°. Interchanging R1-R2 will change the heading by 180°.

If only a constant small error should occur, loosen the fixing screws for the synchro transmitter and adjust by moving the synchro transmitter for correct heading output from the GI51.

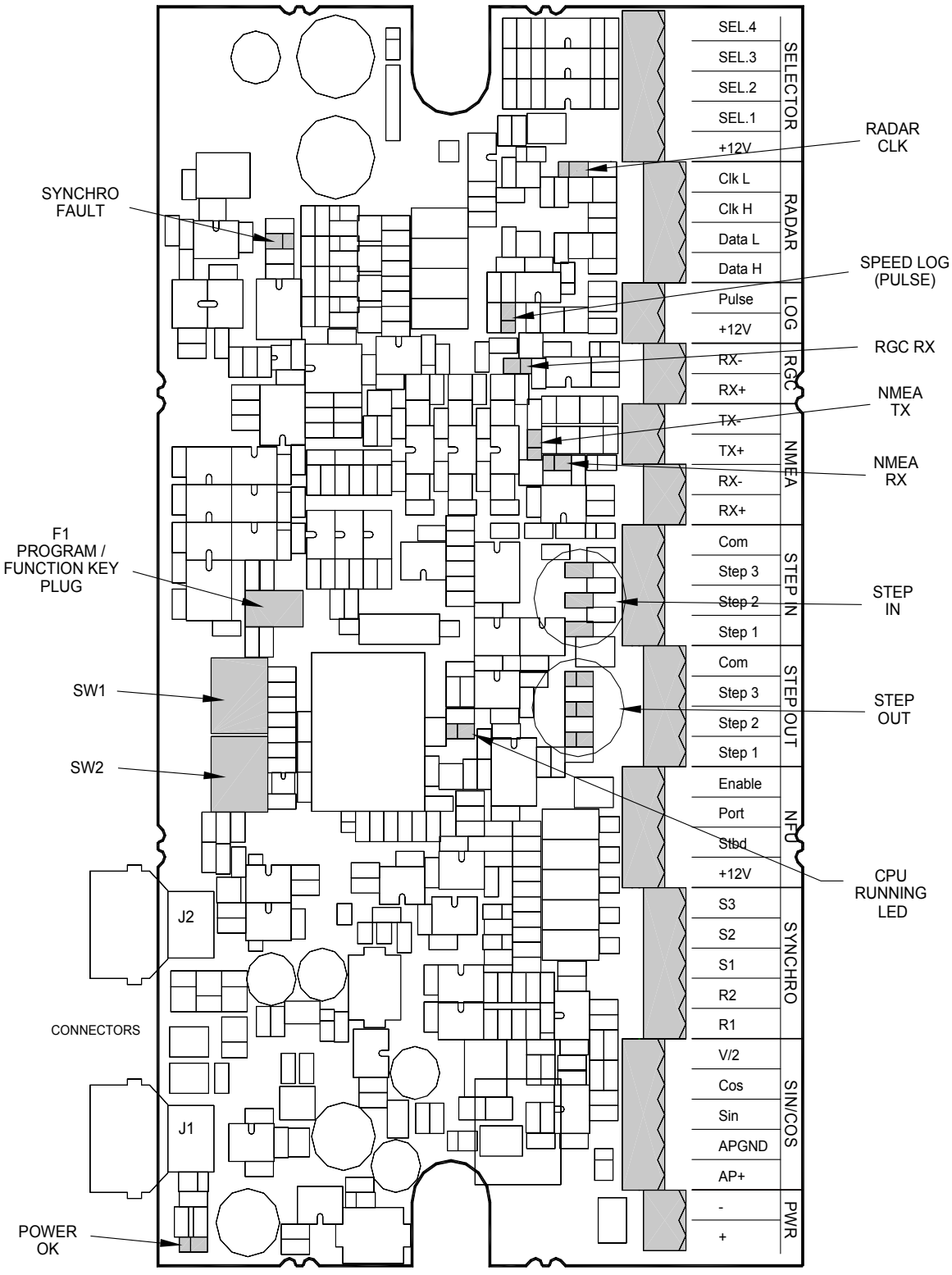
2.8 S9 Steering lever

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.

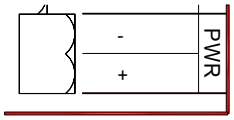
3 GI51 PCB

3.1 Component location



3.2 Terminal description

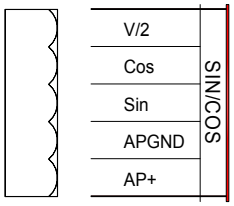
TB1, Power



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

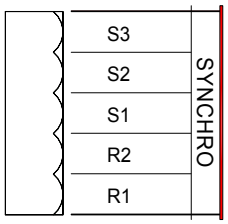
When power is connected to TB1 in a Robnet system, GI51 will continue to output gyro heading even if the autopilot is turned OFF.

TB2, Sin/Cos Out



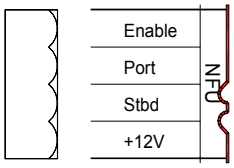
Used for heading output to certain models of Simrad autopilots (AP200 series, AP45, AP9).

TB3, Synchro In



Used for connecting gyro compasses with synchro output. Refer ***Dip switch settings***, page 7 for signal specification.

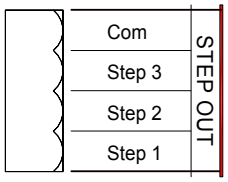
TB4, NFU



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.

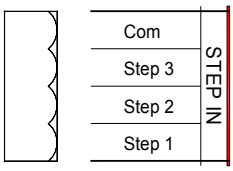
TB5, Step Out



Used for operating heading repeaters with step input.

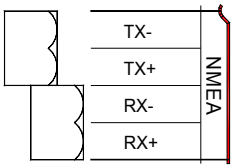
Note! *Step signals only for electronic interface, not for step motors! See TECHNICAL SPECIFICATIONS, page 20.*

TB6, Step In



Used when connecting a gyro compass with stepper output.

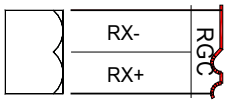
TB7 and TB8, NMEA



NMEA signals from compass or speed log with serial output should be connected to RX- and RX+. Refer Dip switch settings for speed, page 7.

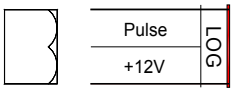
Output heading from active steering compass and speed from log in the GI51 is available on TX- and TX+.

TB9, RGC proprietary



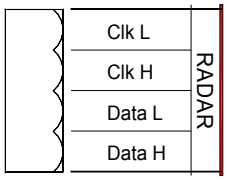
Used for reading serial data (9600 baud) from gyro compass (RGC11, RGC12).

TB10, LOG



Used for connecting speed log with 200p/NM. Refer ***Dip switch settings***, page 7.

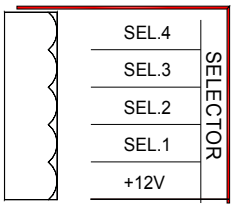
TB11, Radar



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 7.

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.

Offset heading adjustment

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 pulse switch between TB12, +12V and SEL 3. 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.

Pendulum ferry feature

Based on reading an external potential free switch connected to this terminal, GI51 will change the heading output 180° on command for both the steering compass and monitor compass (if installed).

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

4 PENDULUM FUNCTION KEY (Option)

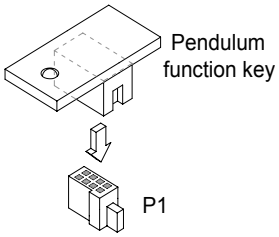
If GI51 not is connected to Robnet, an optional Pendulum function key (part no. 20213815) has to be installed to activate the pendulum function. When this key is installed, GI51 will change the heading output by 180° based on signal from a potential free closing contact between TB12, Sel 4 and +12V on the GI51 pcb. Refer page 15.

A LED is visible through the whole 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 12.



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 12.

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. 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 2. If all output indicators operate ok, check cabling for missing output signal. 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 operate ok, check compass status. 5. If LED(s) for selected input compass indicate missing signal, check input cabling. 6. 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).

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 to ***Component location***, page 12.

LED NO.	COLOUR	INDICATION
D1	Green	CPU running indicator. Flashes with apr. 1Hz when the processor is running.
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.)

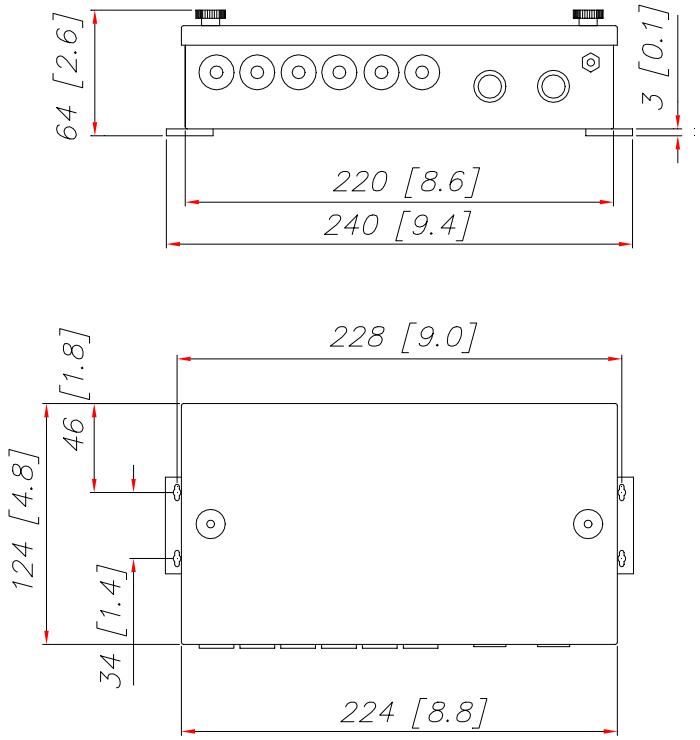
Temperature range:

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

Storage:.....–30 to +80 °C (–22 to +176 °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

Load: .....Maximum 20 mA

7.3 Interface

Input

Synchro 1:1, 90:1, 360:1.....26 - 115V, 400Hz ext exit, +/-0.5° accuracy

Synchro 90:1, 360:1..... 50 - 60V, 50 - 60Hz ext exit, +/-0.5° accuracy

Step, 6 step/°, max rate 40°/sec: .....20-70V, common high or common low, low <= 7V

NMEA183 heading and speed..HDT, HDG, HDM, VBW, VHW

RGC11 serial heading.....9600 baud

RGC12 serial heading.....9600 baud

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

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).....0-5V DC

Step 6 step/°, max rate 20°/sec: ..... 24V DC, 20mA

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

NMEA183

- Heading ..... HEHDT/HEHDG, 10Hz
- Speed and heading:.....HEVHW (PSIMVHW if unaligned geared synchro or step), 1Hz
- Rate of turn:..... TIROT if rate input according to IMO A.526 (13)
- .....AGROT (autopilot system) or IIROT (stand alone) if calculated from heading

Robnet (AP35, AP50).....Heading T & M, speed, NFU

Other serial output/input

Input data:

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

Heading offset adjust: $PSTOK,,,nnn.n,<CR><LF>

nnn.n=offset angle 0 – 360

Output data:

Status: $PSTOC,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)

Data transmission:

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

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01.03.04

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

Some importers represent only specific market segments according to the following codes:
Professional:
Coastal and Fishery market
Recreational:
Leisure market

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