

ECI1

COMPASS display



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1 Introduction

This manual contains information about the operation, calibration and installation of the Electronic Compass Indicator 'ECI1'.

The following information can be read from the ECI1 indicator:

- Heading on electronic compass rose
- Heading on 7 segment display
- True North or Magnetic North
- Damping
- Variation
- Alignment
- Off course alarm

1.1 Package contents

- ECI1
- 2 female 6-pole connectors
- 1 female 4-pole connectors
- Mounting seal
- 4 metal rings+ M4 screwnuts
- Drill Template
- Quickstart instruction leaflet

2 Working

2.1 The display

Electronic compass rose

Magnetic north indicator
(Mag.)

Alarm indicator

7-segment heading display

Buttons

Geographical north indicator
(True)



2.2 Summary of operating functions



The unit has four control buttons. These buttons have the following functions:

- **Light** : press the LIGHT button one or more times to change the backlight intensity or when in a menu this works as a reset button.
- **Set** : press the SET button to access the menu.
Use up/down keys to choose one of the menus and press SET to enter the menu. If you press the SET button for more than 2 seconds you will exit the menu.
- **Down** : on/off setting for the 'off course alarm' or when in a menu it works as a button to select a menu or change settings.
- **Up** : select 'true' or 'mag' north, when in a menu it works as a button to select a menu or change settings.

The function of a button is activated when the button is released, both UP and DOWN buttons have an automatic repeat function. The buttons have a timeout of 1 minute.

2.2.1 Button sound

On the release of a button you will hear a key sound.

This sound can be switched of in the menu 'Key Sound' (ST4).

3 Operating

3.1 Switching on

The instrument must be switched on with a separate switch (there is no ON/OFF switch on the instrument itself).

All segments will be shown for 2 seconds. Then four horizontal lines are displayed while the display is waiting for compass data.



3.2 Default view

In the default view the current compass heading is shown.



3.3 Backlight setting

The backlight has 7 settings:

- Level 1
- Level 2
- Level 3
- Level 4
- Level 5
- Remote
- Off

If the remote setting is chosen the brightness of the backlight will be set by a voltage applied to the backlight pin on the connector. See 'Connections' for pin information.



3.4 Off Course Alarm

While in the default view, press the down button to switch the alarm on or off.



Before you can use the alarm you have to set the values. These have to be set by entering the Course alarm menu (ST1). If the alarm is on, the alarm indicator is displayed.

3.5 Select magnetic or true north

While in the default view, press the up button to choose between mag. (magnetic) or true (geographical) north.



For true north indication, the variation has to be set first. This can be done in Variation menu (ST8).

4 MENU

4.1 Menu functions:

To access the menu you have to press the SET button. Every time the Up/Down button is pressed the next/previous menu item is shown, press SET to enter the menu.

- Course alarm St 1
- Damping St 2
- Display layout St 3
- Key sound St 4
- Contrast St 5
- Calibration St 6
- Align compass St 7
- Variation St 8
- Close menu

4.1.1 Off course alarm (ST1)

The Off Course Alarm can be set for a certain course to steer by and a separate boundary on both sides of the course. The buzzer inside the unit will beep when the course is out of the boundary.

- Press SET in the default view to enter the menu, press SET again to enter the Course Alarm Menu (ST1).
Use the up/down buttons to set the preferred course.
- Press SET and enter the Portside alarm boundary with the up/down buttons.
This can be set from 2 to 45 degrees difference.
- Press SET and enter the Starboard alarm boundary with the up/down buttons.
This can be set from 2 to 45 degrees difference.

If the "Set course" is 246, the "Limit portside" set to 3 and the "Limit starboard" is set to 2, then the alarm will sound if the course change is smaller than $246-3 = 243$ and if the course is higher than $246+2 = 248$ degrees.

Use the down button in the default view to set the Alarm ON/OFF (see 3.4).

4.1.2 Damping (ST2)

Damping allows the user to change the damping level as conditions change. The damping controls the averaging period over which the heading is displayed. Damping does not make the compass less accurate, only slower. Damping levels can be set from Off and 1 up to 7. In normal conditions level 2 is used.

- Press SET in the default view to enter menu. Press the up/down buttons to select the Damping menu (ST2), press SET to enter the Damping menu.
Use the up/down buttons to change the value.
 - Press SET short to enter the selected value or
 - Press the Light button to reset the value to default (2) or
 - Keep SET pressed for two seconds to exit to the default view.

4.1.3 Layout (ST3)

There are three different layouts for the compass rose.

- Press SET in the default view to enter the menu. Press the up/down buttons to select the Layout menu (ST3), press SET to enter the Layout menu.
- Use the up/down buttons to select a layout. A part of the selected layout is shown in the compass rose text field.
 - Press SET short to enter the selected value or
 - Press the Light button to reset the value to default (1) or
 - Keep SET pressed for two seconds to exit to the default view.

Example: press SET -> ST1 Course alarm
 press up 2X -> ST3 Display Layout
 press SET -> Layout 1= N NE E
 press Up/Down -> Layout 2= N | E
 press SET 2 seconds -> Default Display (1)



Layout 1



Layout 2



Layout 3

4.1.4 Key sound (ST4)

Press SET and use the up button to select the ST4 menu. Press SET to enter the menu and now you can choose ON or OFF by pressing the up/down buttons.

- Press SET short to enter the selected value or
- Press the Light button to reset the value to default (ON) or
- Keep SET pressed for two seconds to exit to the default view.

4.1.5 Contrast (ST5)

Press SET and use the up button to select the ST5 menu. Press SET to enter the menu and now you can choose a value between 0 to 9 by pressing the up/down buttons.

- Press SET short and press the up/down buttons to select a contrast.
- Press the Light button to reset the value to default (0) or
- Keep SET pressed for two seconds to exit to the default view.

4.1.6 Calibration (ST6)

This Calibration menu can only be used in combination with the LCS, ECS1 or ECS3 compass.

Press SET and use the up button to select the ST6 menu. Press SET to enter the menu and now you can choose Auto or Manual by pressing the up/down buttons.

4.1.6.1 Automatic calibration

The ECS compass has an automatic calibration procedure. Default "Auto Calibration" is "ON". The compass will calibrate itself everytime two full circles at a constant speed have been made within 1 to maximum 4 minutes per circle.

You can switch this function OFF and use the manual calibration command.

4.1.6.2 Manual calibration for ECI1/2 owners

If you own an ECI1 or ECI2 display then you can do the following to start calibration:

To calibrate the ECS1/3 compass you need a calm day and a clear area. Start turning your boat in a large circle at a constant speed. Then select calibrate in the menu and press up and down buttons together for two seconds. Now the display shows the heading and 'In process'. The time to complete the circle (full 360°) should be at least 1 up to maximum 4 minutes. When the calibration was successful the display shows "Done" and a short beep will be heard. Circles may be clockwise or counterclockwise.

If the circle was not in between the time limits, the old calibration is restored and you can see on the display if the circle was too fast or too slow.

Example: -Start turning the boat in a large circle
 -goto menu Calibration and select manual calibration, press SET
 -press up and down together for 2 seconds -> In process
 -now continue the circle and wait for the ECI1 to beep.

The display now shows if the calibration was done or not.

4.1.7 Align (ST7)

Alignment error adjustment should be done by taking a couple of known runs from a chart and compare the magnetic heading with the mag. heading shown on the display. The difference can be compensated by setting the Align value.

- Press SET and up/down to select the Align menu (ST7). Press SET to enter the menu. Use the up/down buttons to set the offset. This can be set in steps of 0.1° up to +/- 99°.

To exit the menu press SET once or keep SET pressed for two seconds to exit to the default view.

4.1.8 Variation (ST8)

The Variation can be set to compensate the magnetic heading so that the display shows the geographical (True) heading.

- Press SET and up/down to select the Variation menu (ST8). Press SET to enter the menu. Use the up/down buttons to set the offset. This can be set in steps of 0.1° up to +/- 45°.

To exit the menu press SET once or keep SET pressed for two seconds to exit to the default view.

4.1.9 Error messages

No data input : The ECI has not received data for more than 5 seconds,
 Please check the connections

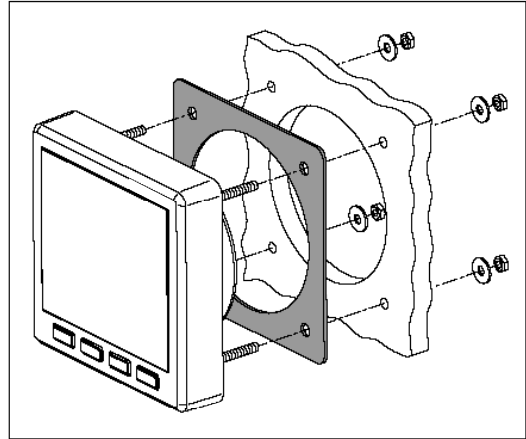
No response : No response after send a command:

- Check the connections or another not fully compatible compass is connected.

5 Installation

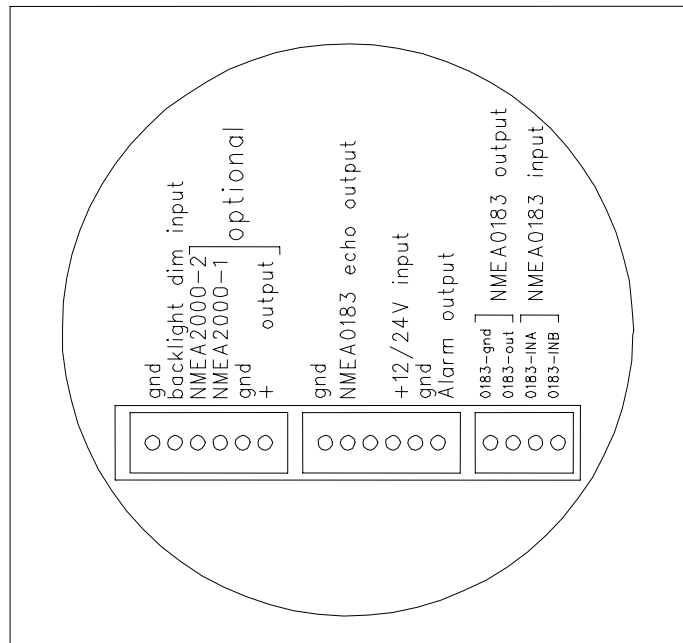
5.1 Mechanical

For dimension see chapter 7.
Using the template provided, cut out openings in the instrument panel or bulkhead. Attach the meter using the 4 threaded rods and nuts provided.
Ensure that the seal fits correctly between the meter and the panel or bulkhead.



5.2 Connections

For wiring diagram see chapter 8.
Connect the cable from the compass sensor as shown in the diagram. If you need to cut and rejoin the cable be sure to connect colour to colour.
The EC11 indicator is suitable for both 12 and 24 Volt DC.
Connect the power supply as per diagram.
See chapter 8 for the optional connections.



6 ECI1 Specifications

6.1 Hardware

Resolution 0.5 deg.

Adjustable backlight : 5 brightness levels, off and external input

Reverse battery protection

Interface options :

- NMEA 0183 (Standard)
- NMEA 2000 (Optional)
- Bluetooth (Class 1)

The interface options are not user installable.

Power supply :	40mA @ 12V, 20mA @ 24V
Backlight current max. :	40mA (extra)
Bluetooth current max. :	100mA (extra)
NMEA2000 current max. :	100mA (extra)
Operating temp. range :	-20 to +70 °C
Dimensions :	110 x 110 x (24,5 + 31,5mm)
Weatherproof Sealed:	according to IP66
Alarm Output:	Open collector, max. 100mA

6.2 NMEA0183 messages

The ECI1 uses standard NMEA0183 messages but also some special calibration commands and messages.

Receive standard message:

\$HCHDG,X.X,Y.Y,v,Z.Z,Q*CC<13><10>

\$HCHDT,X.X,T*CC<13><10>

X.X = compass heading

Y.Y,v = not used

Z.Z = variation

Q = variation available (a) or invalid (v)

T = True heading

CC = Checksum field

<13> = carriage return

<10> = line feed

Checksum = The checksum is the last field in a message and follows the checksum delimiter character “*”. The checksum is the 8-bit exclusive OR (no start or stop bits) of all characters in the message, including “,” delimiters, between but not including the “\$” and the “*” delimiters.

Special commands:

\$IIELP,CAL,ECS,STRT*CC<13><10>	// Start calibration command
\$IIELP,CAL,ECS,STOP*CC<13><10>	// Stop calibration command
\$IIELP,CAL,ECS,AUTO*CC<13><10>	// Auto calibration command
\$IIELP,CAL,ECS,MANU*CC<13><10>	// Disable auto calibration command
\$IIELP,CAL,ECS,VARI,X.X*CC<13><10>	// Variation value command
\$IIELP,CAL,ECS,ALIG,X.X*CC<13><10>	// Align value command
\$IIELP,CAL,ECS,SFWR*CC<13><10>	// Software version command

Response message:

```

$IIELP,CAL,ECS,DONE*CC<13><10> // message "Done"
$IIELP,CAL,ECS,FAST*CC<13><10> // message "Fast"
$IIELP,CAL,ECS,SLOW*CC<13><10> // message "Slow"
$IIELP,CAL,ECS,STRT*CC<13><10> // message "Start"
$IIELP,CAL,ECS,STOP*CC<13><10> // message "Stop"
$IIELP,CAL,ECS,SFWR,X.X,Y,Z*CC<13><10> // X.X: Software version.
                                     Y:1=ECS1; 2=ECS2; 3=ECS3; 4=LCS
                                     Z:   1=NMEA0183;
                                           2=NMEA2000
                                           3=Bluetooth

```

6.3 Bluetooth (optional)

Class-1 compliant: Up to 100 meter range (free field)
 Antenna: Integrated
 Carrier frequency : 2402Mhz to 2480Mhz
 Output power: 14dBm typ.
 Messages: NMEA0183 format (see 7.2)

6.4 NMEA2000 (optional)

Update rate :	10 cycles per second		
PGN 126208 :	Request/ Command/ Acknowledgment Group function		
PGN 59392 :	Acknowledgment		
PGN 59904 :	Request		
PGN 60160 :	Transport Protocol, Data Transfer		
PGN 60416 :	Transport Protocol, Connection Management		
PGN 60928 :	Address Claim		
PGN 126996 :	Product information		
PGN 126464 :	Transmit/ Receive PGN List Group Function		
PGN 127250 :	1. SID Sequence ID	INT8 unsigned	
	2. Heading Sensor Reading	INT16 unsigned	
	3. Deviation	INT16 signed	Not used
	4. Variation	INT16 unsigned	
	5. Heading sensor reference	2 bits	0=True 1=Magnetic 2=Error 3=NULL
	6. Reserved bits	variable	

6.5 Certifications

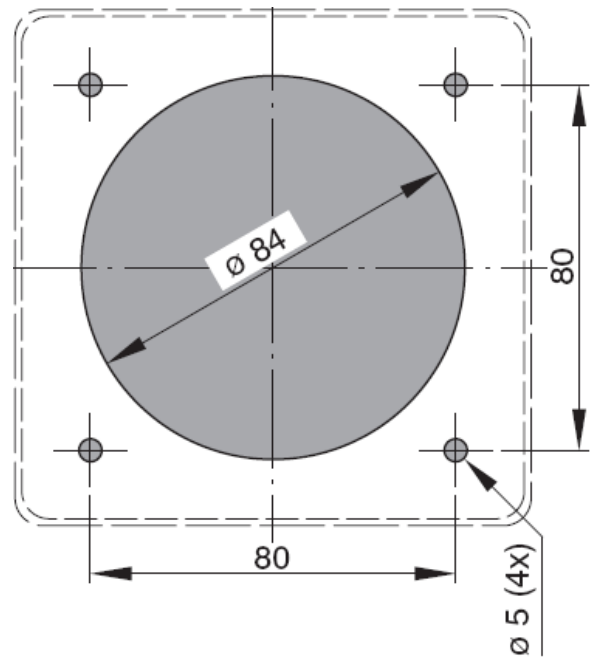
Maritime Navigational and Radiocommunication
 Equipment & Systems : according to IEC 60945
 EMC : Conducted/Radiated Emmission : according to IEC 60945-9
 Conducted/Radiated Immunity : according to IEC 60945-10
 Safety : Dangerous voltage, etc. : according to IEC 60945-12



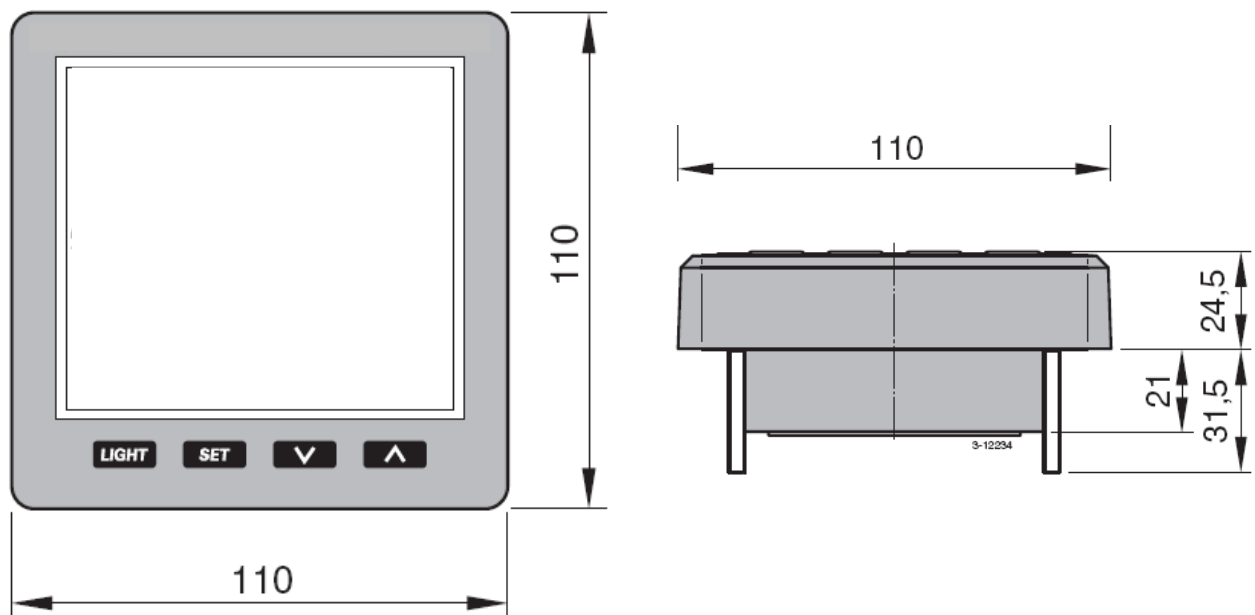
7 Overall dimensions

7.1 Drill pattern

(included on separate sheet)



7.2 Outside dimensions



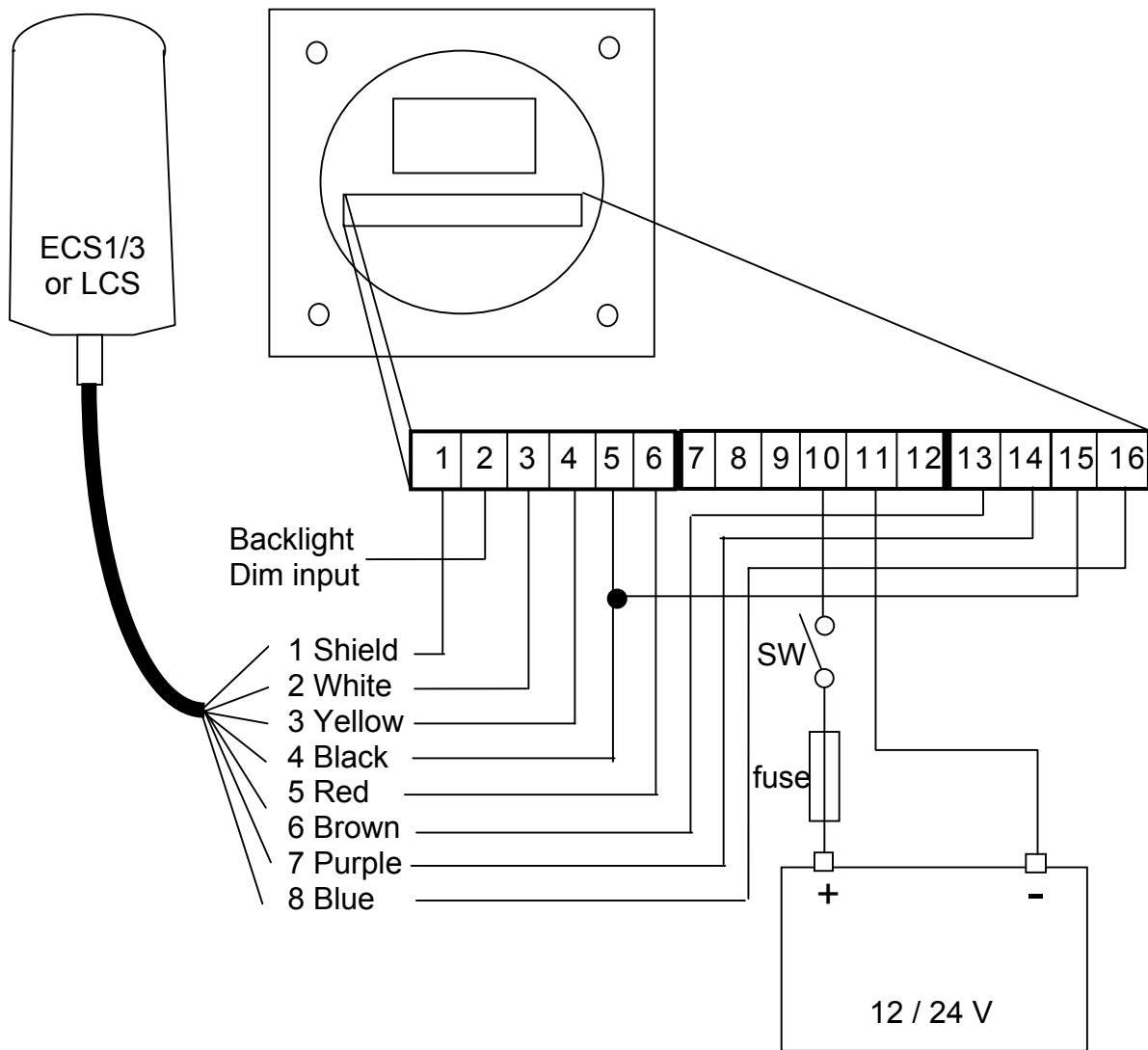
8 Wiring diagrams

8.1 pin assignments

- 1 GND shield
- 2 Backlight dim input (0 to 12V or 0 to 24V, autosense)
- 3 NMEA2000-2 (optional)
- 4 NMEA2000-1 (optional)
- 5 GND
- 6 +12V/+24V Compass power output

- 7 GND
- 8 NMEA0183 echo of NMEA input (pin 15 and 16)
- 9 Not used
- 10 +12V/+24V Battery power input (use power switch and 500mA fuse)**
- 11 Battery GND**
- 12 Alarm output (max. 100mA open collector)

- 13 NMEA0183-gnd } OUTPUT
- 14 NMEA0183-out } OUTPUT
- 15 NMEA0183-INA } INPUT
- 16 NMEA0183-INB } INPUT



8.2 optional connections

8.2.1 Backlight

The backlight input is an autosense input which means that the applied voltage is relative to the battery voltage. If the battery voltage is 12V the backlight setting is maximum when the applied voltage to pin 2 is 12V. If the battery voltage is 24V and the applied voltage to pin 2 is 12V the brightness will be dimmed.

PIN 2 Backlight dim input (0 to 12V or 0 to 24V, autosense)

8.2.2 NMEA0183 echo

The NMEA echo pin is used for connecting other devices who also need the NMEA messages from the compass sensor.

PIN 8 NMEA0183 output, in combination with GND pin 7

8.2.3 Alarm output

The Alarm output is used for connecting an external warning device such as a buzzer. If more than 100 mA is needed a small relay should be used.

PIN 12 Alarm output, in combination with the battery + pin

8.3 Service menu

To enter the service menu you have to press SET when you switch the power on.

8.3.1 Display info

Press set to view: Display type, interface, software version.

8.3.2 Compass info

Press set to view: Compass type, interface, software version.

8.3.1 Display reset

Press SET to reset the display to factory settings.

8.3.2 Compass reset

Press SET to reset the compass to factory settings.

8.3.2 Close menu

To exit the service menu press SET.