

ECI2

COMPASS/GPS display



ECI2-REV. 1.0a 5-06-2005

For latest update: www.elproma.com/compass

Contents

| | | |
|--------|--------------------------------------|----|
| 1 | Introduction | 3 |
| 2 | Working | 3 |
| 2.1 | The display | 3 |
| 2.2 | Summary of operating functions | 3 |
| 2.2.1 | Button sound | 3 |
| 3 | Operating | 4 |
| 3.1 | Switching on | 4 |
| 3.2 | Main display | 4 |
| 3.3 | Backlight setting | 4 |
| 3.4 | Off Course Alarm | 4 |
| 3.5 | Select second line message | 4 |
| 4 | MENU | 5 |
| 4.1 | Menu functions: | 5 |
| 4.1.1 | Off Course Alarm (C1) | 5 |
| 4.1.2 | Damping (C2) | 5 |
| 4.1.3 | Key sound (C3) | 6 |
| 4.1.4 | Contrast (C4) | 6 |
| 4.1.5 | Baudrate (C5) | 6 |
| 4.1.6 | Calibration (C6) | 6 |
| 4.1.7 | Align (C7) | 7 |
| 4.1.8 | Variation (C8) | 7 |
| 4.1.9 | UTC offset (C9) | 7 |
| 4.1.10 | Unit select (C10) | 7 |
| 4.1.11 | Trip reset (C11) | 7 |
| 4.1.12 | GPS info (C12) | 7 |
| 4.1.13 | Exit menu | 7 |
| 4.1.14 | Setup menu | 8 |
| 5 | Installation | 9 |
| 5.1 | Mechanical | 9 |
| 5.2 | Connections | 9 |
| 6 | ECI2 Specifications | 10 |
| 6.1 | Hardware | 10 |
| 6.2 | NMEA0183 messages | 10 |
| 6.3 | NMEA0183 GPS messages | 11 |
| 6.3.1 | \$GPGSA | 11 |
| 6.3.2 | \$GPRMC | 11 |
| 6.4 | Bluetooth (optional) | 11 |
| 6.5 | NMEA2000 (optional) | 12 |
| 6.6 | Certifications | 12 |
| 7 | Overall dimensions | 13 |
| 7.1 | Drill pattern | 13 |
| 7.2 | Outside dimensions | 13 |
| 8 | Wiring diagrams | 14 |
| 8.1 | pin assignments | 14 |
| 8.2 | optional connections | 15 |
| 8.2.1 | Backlight | 15 |
| 8.2.2 | NMEA0183 echo | 15 |
| 8.2.3 | Alarm output | 15 |

1 Introduction

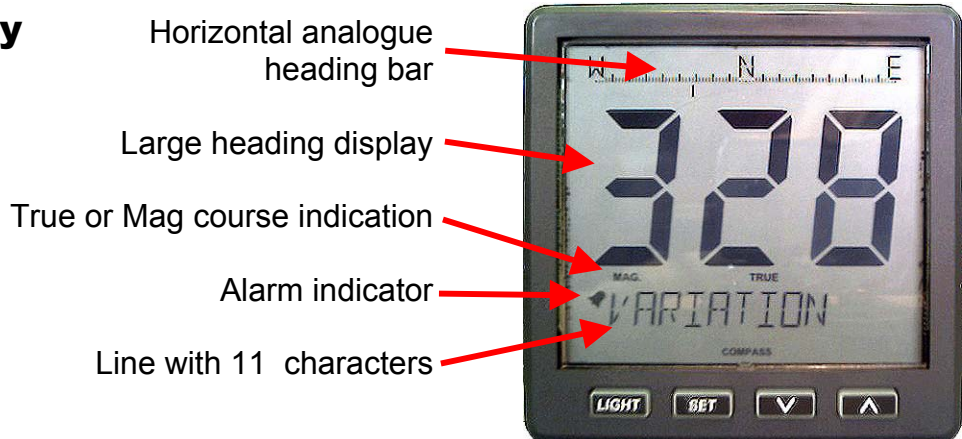
This manual contains information about the operation, calibration and installation of the Electronic Compass Indicator 'ECI2'.

The following information can be read from the ECI2 indicator:

- Heading on analogue heading bar
- 3x7 segment display with selectable heading (GPS, magnetic, true or drift)
- 11 character display with selectable message (time, date, coordinates, etc.)

2 Working

2.1 The display



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 time to change the backlight or when in a menu this works as a reset button.
- Set : press the set button one or more times to access the menu and if you press the 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 decrease values or settings and message select .
- Up : select 'true' , 'mag' , 'GPS' or 'drift' or when in a menu it works as a button to increase values or settings and message select.

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 min.

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'.

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 segment will show for a short time.

After this four horizontal lines are displayed while the display is waiting for compass data.



3.2 Main display

The main display can show Mag. heading, True heading, GPS heading or Drift. Press the right arrow button 2

seconds to change the view



3.3 Backlight setting

The backlight has 5 settings:

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



If the External setting is chosen the brightness of the backlight will be set by a voltage applied to the backlight pin on the connector. See '9 Wiring diagrams' for pin information.

3.4 Off Course Alarm

While in the default view, press the down button for 2 seconds to switch the alarm on, press again to switch off.



Before you can use the alarm you have to set the values. These have to be set by entering the CourseAlarm menu (SET button).

If the alarm is on, the alarm indicator is displayed and both boundaries are shown on the bottom line.

3.5 Select second line message

While in the default view, press the up button to choose the message which will be shown on the bottom line.

You can choose between:

1. Time
2. Date
3. Latitude
4. Longitude
5. GPS speed
6. Trip
7. Log
8. GPS course

4 MENU

4.1 Menu functions:

To access the menu you have to press the SET button. Use the arrow buttons to select the next menu item.

- CourseAlarm C1
- Damping C2
- Key Sound C3
- Contrast C4
- Baudrate C5
- Calibration C6
- Align C7
- Variation C8
- UTC Offset C9
- Unit select C10
- Trip reset C11
- GPS info C12
- Exit menu C13

4.1.1 Off Course Alarm (C1)

The Off Course Alarm can be set for a certain course to steer by and a separate boundary on both sides of the course.

- Press SET in the default view to enter the menu.
- Press SET again to enter the CourseAlarm menu.
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.

To exit the menu press the SET button for 2 seconds.

Example: Set course=246, Portside=3 and Starboard=2:

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.

Press the down button more than 2 seconds in the default view to set the Alarm ON/OFF (see 3.4).

4.1.2 Damping (C2)

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 to 7. In normal conditions level 2 is used.

- Press SET in the default view to enter the menu. Use the up/down buttons to select the Damping menu (C2).
- Press SET to enter the Damping menu.
Use the up/down buttons to set the value. This can be set from Off to 7.

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

4.1.3 Key sound (C3)

- Press SET in the default view to enter the menu. Use the up/down buttons to select the Key Sound menu (C3).
- Press SET to enter the Key Sound menu.
Use the up/down buttons to select ON or OFF.

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

4.1.4 Contrast (C4)

The display of the ECI2 can be adjusted for different viewing angles.

- Press SET in the default view to enter the menu. Use the up/down buttons to select the Contrast menu (C4).
- Press SET to enter the Contrast menu.
Use the up/down buttons to select the contrast level.

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

4.1.5 Baudrate (C5)

The ECI2 has auto baudrate detect. This menu can be used to send a preferred baudrate to the connected compass (ECS1/3).

- Press SET in the default view to enter the menu. Use the up/down buttons to select the Baudrate menu (C5).
- Press SET to enter the Baudrate menu (C5).
Use the up/down buttons to select the baudrate.

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

4.1.6 Calibration (C6)

This Calibration menu can only be used to calibrate the ECS1 or ECS3 compass. Two options are available, Automatic or manual. See the ECS1/3 manual for explanation.

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 slow speed. Then select calibrate/manual 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 max. 4 minutes. When the calibration was successful the display shows Done and a short beep will be heard. Circles may be clockwise or counter clockwise.

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.

The ECI2 compass display now shows if the calibration was done or not.

4.1.7 Align (C7)

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 EC12. The difference can be compensated by setting the Align value.

- Press SET in the default view to enter the menu. Use the up/down buttons to select the Align menu (C7).
- Press SET to enter the Align 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 to move back to the main menu or keep SET pressed for two seconds to exit to the default view.

4.1.8 Variation (C8)

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

- Press SET in the default view to enter the menu. Use the up/down buttons to select the Variation menu (C8).
- Press SET to enter the Variation menu.
Use the up/down buttons to set the variation. This can be set in steps of 0.1° up to +/- 45°.

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

Use the up button in the default view to select True or Mag. Display (see 3.5).

4.1.9 UTC offset (C9)

- Press SET in the default view to enter the menu. Use the up/down buttons to select the UTC offset menu (C9).
- Press SET to enter the UTC offset menu.
Use the up/down buttons to set the time offset. This can be set in hours.

4.1.10 Unit select (C10)

- Press SET in the default view to enter the menu. Use the up/down buttons to select the Unit select menu (C9).
- Press SET to enter the Unit select menu.
Use the up/down buttons to select Km or Miles.

4.1.11 Trip reset (C11)

- Press SET in the default view to enter the menu. Use the up/down buttons to select the Trip reset menu (C9).
- Press SET to enter the trip reset menu. Use the up/down buttons to select Yes or No and press SET.

4.1.12 GPS info (C12)

Select this menu to view the number of used GPS satellites.

4.1.13 Exit menu

Press set to go back to the main display view.

4.1.14 Setup menu

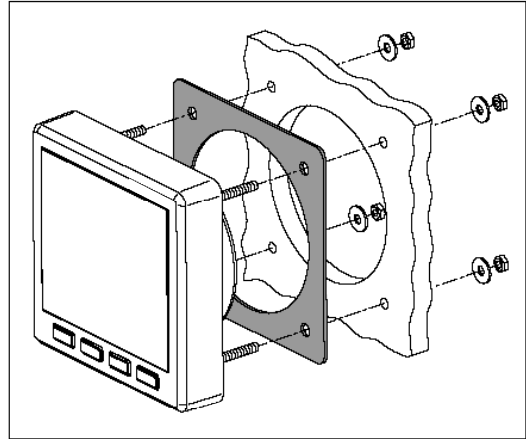
This menu can be accessed when the SET button is pressed during power on.

- 1) Display info, software version, unit type and interface
- 2) Compass info, software version, unit type and interface
- 3) Display reset, reset the ECI2 to factory defaults, except for the log.
- 4) Compass reset, reset the ECS1/3 to factory defaults
- 5) All segments on to check for faulty segments
- 6) Demo mode

5 Installation

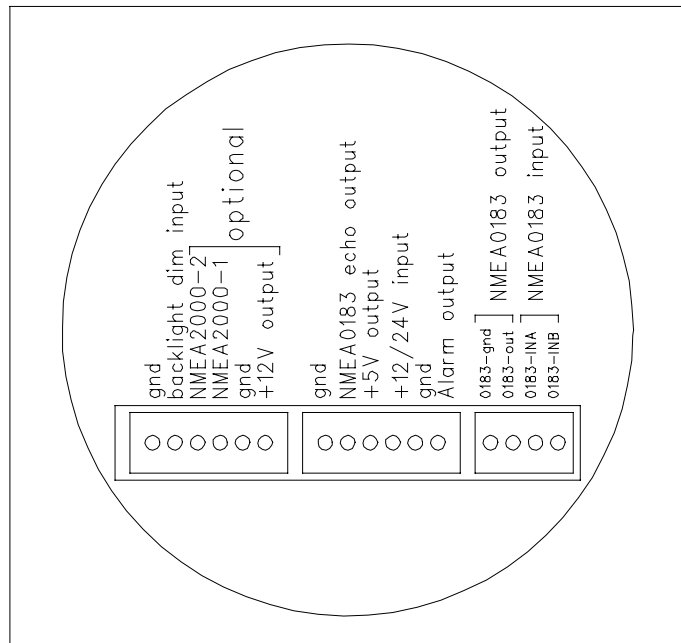
5.1 Mechanical

For dimension see chapter 8.
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 sits correctly between the meter and the panel or bulkhead.



5.2 Connections

For wiring diagram see chapter 9.
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 EC12 indicator is suitable for both 12 and 24 Volt DC.
Connect the power supply as per diagram.
See chapter 9 for various extra connection possibilities.



6 ECI2 Specifications

6.1 Hardware

Resolution 1 degree.

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 ECI2 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>

X.X = compass heading.

Y.Y,v = not used

Z.Z = variation

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

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 calibration commands:

\$IIELP,CAL,ECT,STRT*CC<13><10> // Start calibration command

\$IIELP,CAL,ECT,STOP*CC<13><10> // Stop calibration command

\$IIELP,CAL,ECT,DONE*CC<13><10> // Receive message “Done”

\$IIELP,CAL,ECT,FAST*CC<13><10> // Receive message “Fast”

\$IIELP,CAL,ECT,SLOW*CC<13><10> // Receive message “Slow”

\$IIELP,CAL,ECT,BUSY*CC<13><10> // Receive message “Busy”

6.3 NMEA0183 GPS messages

6.3.1 \$GPGSA

This message transfers DOP and active satellites information. The \$GPGSA message structure is shown below:

| Field | Format | Min chars | Max chars | Notes |
|--------------------|-----------|-----------|-----------|---|
| Message ID | \$GPGSA | 6 | 6 | GSA protocol header. |
| Mode | Char | 1 | 1 | M Manual, forced to operate in selected mode. A Automatic switching between modes. |
| Mode | Int | 1 | 1 | 1 Fix not available. 2 2D position fix. 3 3D position fix. |
| Satellites Used | Int | 2 | 2 | SV on channel 1. |
| Satellites Used | Int | 2 | 2 | SV on channel 2. |
| ... | . | .. | .. | .. |
| Satellites Used | Int | 2 | 2 | SV on channel 12. |
| PDOP | Float | 1.1 | 3.1 | |
| HDOP | Float | 1.1 | 3.1 | |
| VDOP | Float | 1.1 | 3.1 | |
| Checksum | *xx | 0 | 3 | 2 digits |
| Message terminator | <CR> <LF> | 2 | 2 | ASCII 13, ASCII 10 |

6.3.2 \$GPRMC

This message transfers recommended minimum specific GNSS data. The \$GPRMC message format is shown below.

| Field | Format | Min chars | Max chars | Notes |
|--------------------|------------|-----------|-----------|----------------------------------|
| Message ID | \$GPRMC | 6 | 6 | RMC protocol header. |
| UTC Time | hhmmss.sss | 1,2,2.1 | 2,2,2.3 | Fix time to 1ms accuracy. |
| Status | char | 1 | 1 | A Data Valid. V Data invalid. |
| Latitude | Float | 1,2.1 | 3,2.4 | Degrees * 100 + minutes. |
| N/S Indicator | Char | 1 | 1 | N=north or S=south. |
| Longitude | Float | 1,2.1 | 3,2.4 | Degrees * 100 + minutes. |
| E/W indicator | Char | 1 | 1 | E=east or W=west. |
| Speed over ground | Float | 1,1 | 5.3 | Speed over ground in knots. |
| Course over ground | Float | 1.1 | 3.2 | Course over ground in degrees. |
| Date | ddmmyy | 2,2,2 | 2,2,2 | Current date. |
| Magnetic variation | Blank | (0) | (0) | Not used. |
| E/W indicator | Blank | (0) | (0) | Not used. |
| Mode | Char | 1 | 1 | A Autonomous |
| Checksum | *xx | (0) 3 | 3 | 2 digits. |
| Message terminator | <CR> <LF> | 2 | 2 | ASCII 13, ASCII 10. |

6.4 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)

6.5 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 | |

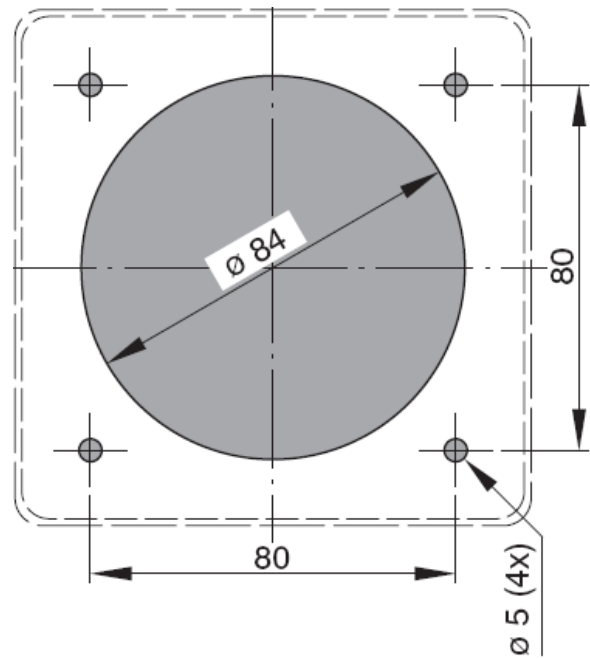
6.6 Certifications

| | |
|--|---------------------------|
| 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 |

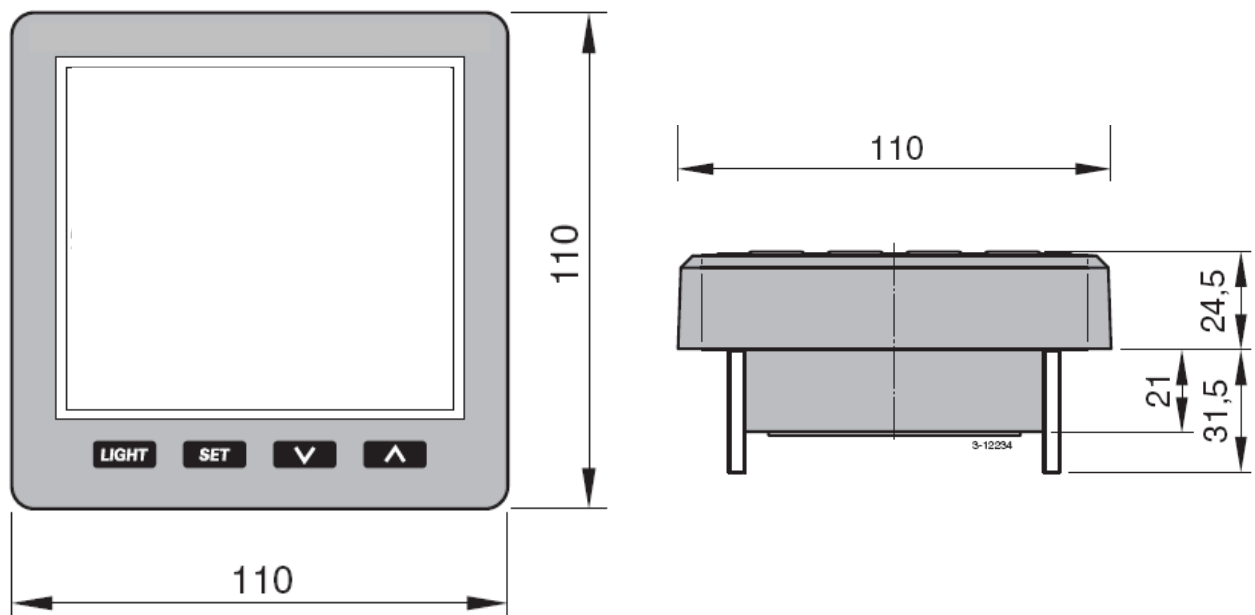
7 Overall dimensions

7.1 Drill pattern

(included on separate sheet)



7.2 Outside dimensions



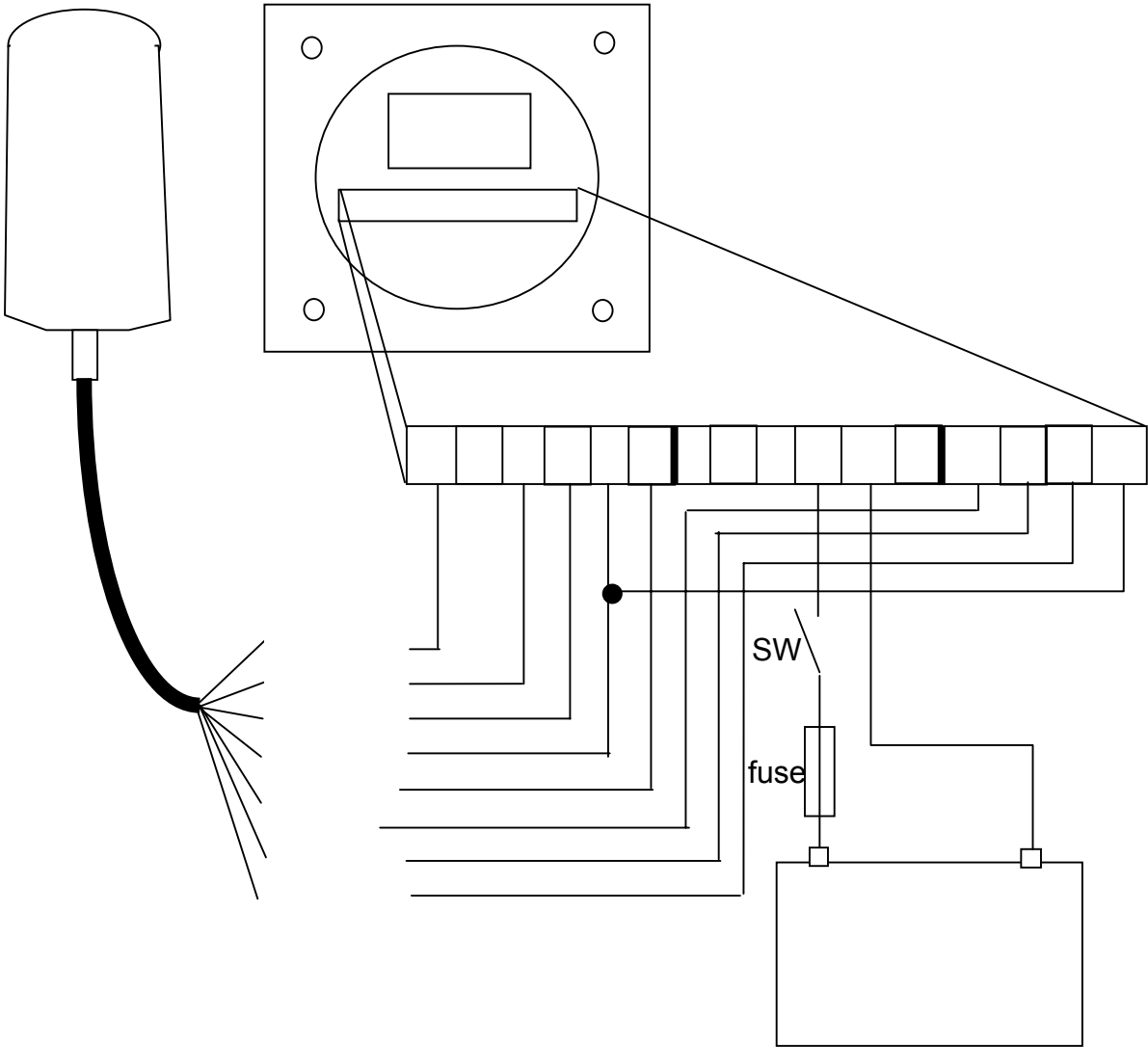
8 Wiring diagrams

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 Compass power output (max 50mA)

- 7 GND
- 8 NMEA0183 echo of NMEA input (pin 15 and 16)
- 9 +5V output (max. 20mA)
- 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 max. backlight is setting is on 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

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

Specifications are subject to change without notice.
Please check www.elproma.com/compass for the most recent documentation.