
Installation Manual

Marine Pro.

400E Series

DCU 410E – Engine Control Unit

RP 410E – Remote Panel



RP 410E



DCU 410E

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Installation Manual
for
Marine Pro 400E Series
~~~  
**DCU 410E – Engine Control Unit**  
**RP 410E – Remote Panel**

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| <b>Rev.</b> | <b>Date</b> | <b>Description</b>                                  |
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| 1.1         | 20.09.2016  | Updates for RP 410E                                 |
| 1.2         | 18.10.2016  | Added text; Mounting screws for IP-frame            |
| 1.3         | 25.09.2017  | Added installation notes released to Ethernet cable |

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## Document Information

### About this manual

This manual has been published primarily for professionals and qualified personnel.

The user of this material is assumed to have basic knowledge in marine systems, and must be able to carry out related electrical work.

Work on the low voltage circuit should only be carried out by qualified and experienced personnel. Installation or work on the shore power equipment *must only* be carried out by electricians authorized to work with such installations.

### Responsibilities

It is the *sole responsibility of the installer* to ensure that the installation work is carried out in a satisfactory manner, that it is operationally in good order, that the approved material and accessories are used and that the installation meet all applicable rules and regulations.

**Note!** Auto-Maskin continuously upgrades its products and reserves the right to make changes and improvements without prior notice.

All information in this manual is based upon information at the time of printing.

For updated information, please contact your local distributor.

### Ordering Information

The **Marine Pro** covers a wide range of compatible products within both the **200-** and **400 Series**. Please visit our web site for more information.

<http://auto-maskin.com/marine/>

## 400E Series Overview

### Typical Layout

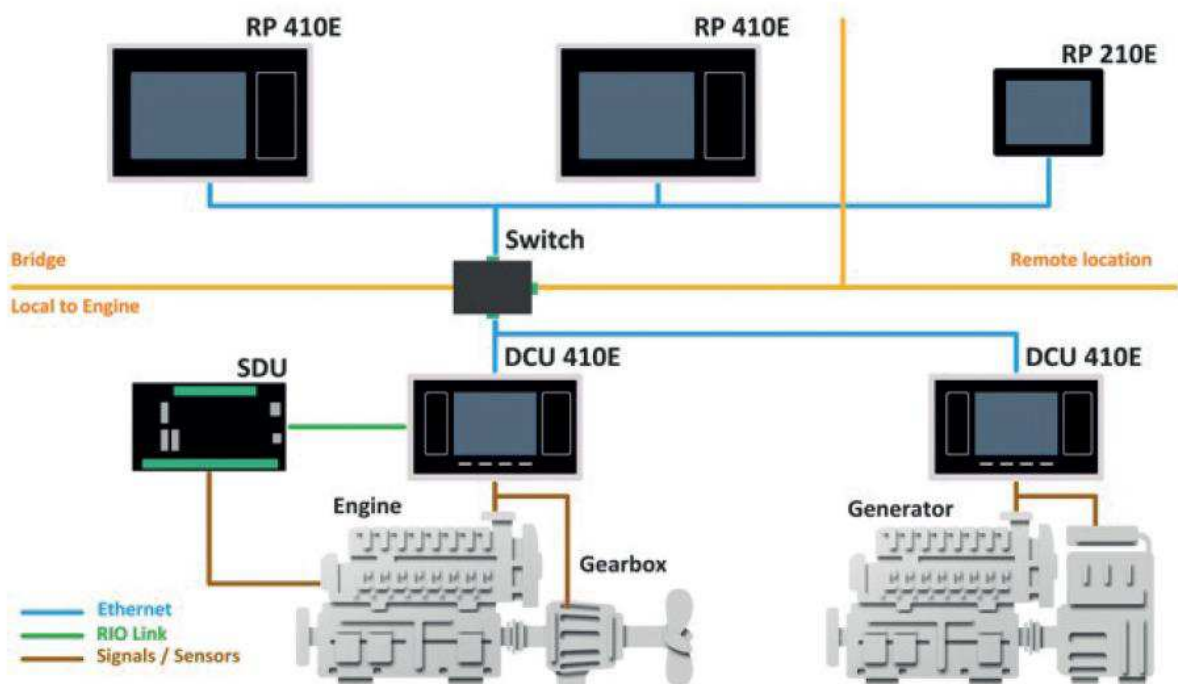
The following shows a typical layout.

The DCU 410E is the main building block in the 400 Series. It monitors and presents engine sensors and data. User interaction and commands is also controllable from this unit.

The RP remote panel can monitor and control everything in the DCU from a remote location. It has the same user interface configures automatically according to the DCU.

For classed installations the SDU safety unit is required.

RIO expansion units are available to extend the I/O capacity.



## Available units in the 400 Series

### DCU 410E Engine Control Unit

DCU 410E engine monitoring and control unit. One panel is required for each engine.

The DCU 410E has a colour screen and buttons for user interaction.

The DCU 410E is hereafter referred to as the “DCU”.

### SDU 404/410 Safety Unit

The SDU 404/410 (hereafter referred to as the “SDU”) is the safety unit, which is mandatory in a classed installation. It is completely self-contained and separate from the DCU.

The DCU communicates with the SDU on a link.

### RIO 410 I/O Expansion Unit

The RIO 410 (hereafter referred to as the “RIO”) is an expansion I/O unit. A maximum of four RIO units can be connected to any one DCU.

The DCU communicates with the RIO on a link, and when connected, the DCU automatically detects the unit and add it into its configuration.

### RIO 425 Generator Interface Unit

The RIO 425 is a generator interface unit. It is linked to the DCU, which will find it automatically.

When connected, a new page is made available on the DCU – and on the remote panel RP 410E – that displays generator parameters such as phase voltages, phase currents, frequency, power, efficiency factor (Cos phi), etc.

### RIO 412 Exhaust Monitoring Unit

The RIO 412 is a compact unit with 20 thermocouple channels. Each cylinder’s thermocouple is connected to a predefined channel on the unit.

The DCU automatically detects the unit, and adds a new page with exhaust temperature data, such as individual cylinder temperature, average temperature, etc.

### RP 410E Remote Panel Unit

The RP 410E (hereafter referred to as the “RP”) is the remote panel for the DCU.

One RP can monitor and control a maximum of eight DCU engine units, and there can be an unlimited number of RP units in the network. Each RP can monitor the same engine, or it can monitor separate engines.

The RP communicates with the DCU via Ethernet.

**Note!** For redundant Ethernet connection, *managed* Ethernet switches must be used.

## Precautions in Classed Systems

### Requirements

*In a classed and type approved installation, the following is required:*

The DCU requires:

- Separate power supplies to its primary and secondary supply inputs.
- An engine speed sensor connected to the DCU. This can be physical, or from the J1939 CAN bus.

The SDU 404/410 Safety Unit requires:

- Minimum one engine speed sensor connected to the SDU.
- Must be supplied by an alternative supply to the DCU primary supply.

### Certification

All modules in the **400 Series** are certified by major classification societies.

Certificates can be obtained from the Auto-Maskin website, or from your local distributor.

## Installation

### Location

The DCU is normally located in the engine room due to the number of cables and wires from the engine sensors and to reduce electrical noise levels, which might else result from long cable stretches.

The RP is normally located remotely from the Engine and has a limited amount of connections.

Both the DCU and the RP should be mounted for optimal viewing angle and the user should have easy access to panel buttons.

The DCU may be mounted on the engines supporting structure provided shock absorbers are used either between the structure and the engine, or between the structure and the DCU. The DCU shall not be mounted directly onto the engine due to vibrations.

The DCU should be mounted so that easy access to the cable connections at the back is ensured. This might for instance be accomplished by mounting it in a cabinet with a hinged front panel.

### Measurements and Weight

|                                                                 | DCU 410E                             |        |       | RP 410E |        |       |
|-----------------------------------------------------------------|--------------------------------------|--------|-------|---------|--------|-------|
|                                                                 | Width                                | Height | Depth | Width   | Height | Depth |
| Size [mm]                                                       | 260                                  | 160    | 50    | 320     | 220    | 56    |
| Cutout [mm]<br><small>2 mm added to actual measurements</small> | 242                                  | 142    | -     | 302     | 184    | -     |
| Weight [kg]                                                     | 1.3                                  |        |       | 2.1     |        |       |
| Mounting holes                                                  | Corner holes are 7 mm from the edges |        |       |         |        |       |

### Mounting Frame

The unit comes with an IP-56 graded Mounting Frame. In order to avoid issues after installation it is important to use this frame and follow the mounting instructions.

For mounting into a normal thin metal plate use short length (12 mm) 3M screws. For mounting into a thick plate use longer screws.

### General

To protect against Electromagnetic interference (EMI), we recommend that all cables are shielded.

**Note!** The screen of all cables shall be connected to ground/hull, NOT to 0V! Some cables shall be kept as separate from other signals as possible – for instance the pickup signal. Others can be in a shielded multi-cable.

**Note!** Connect shield at one end only.

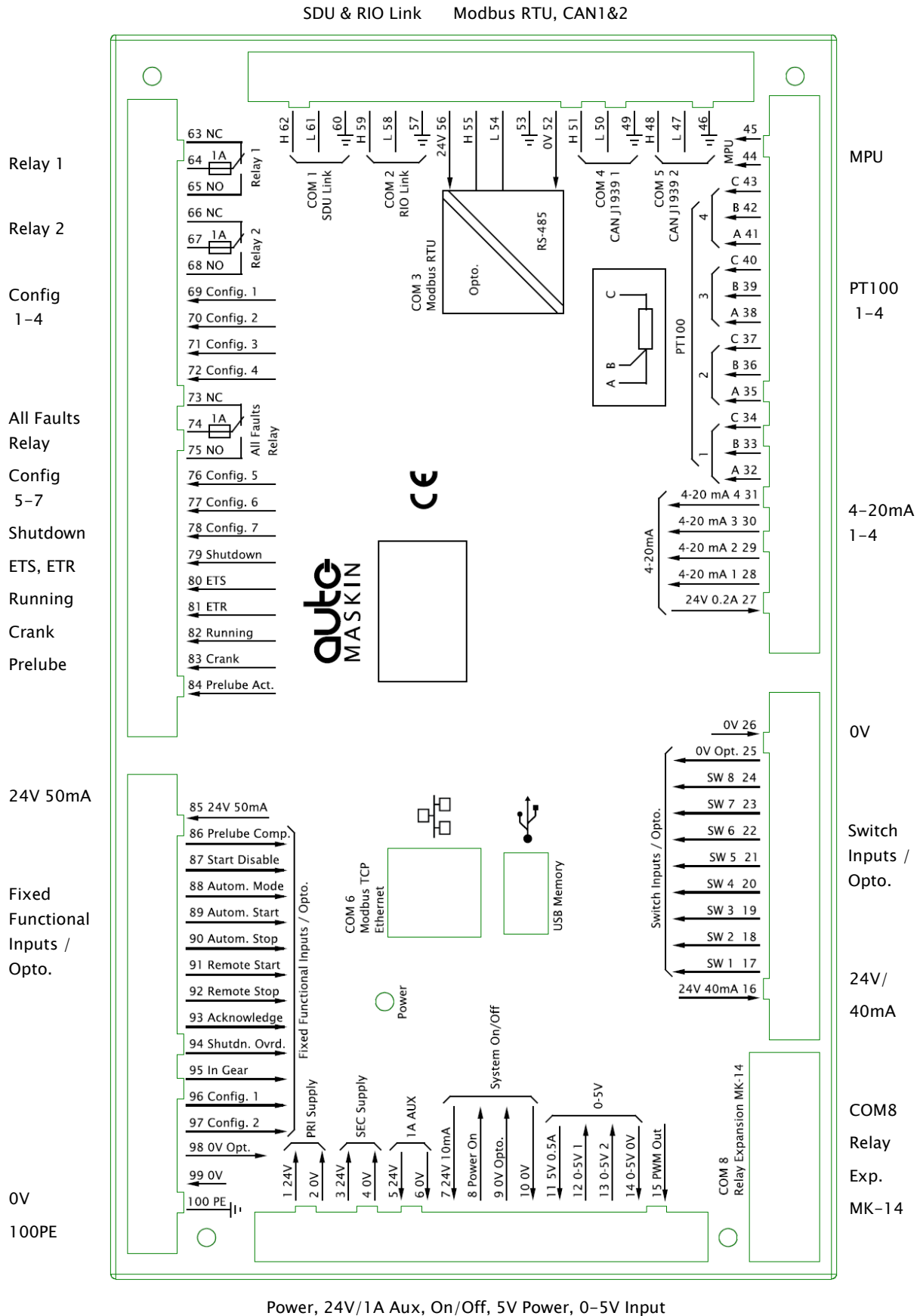
### Grounding

**Note!** Always keep ground and 0V separated!

In marine installations, ground and 0V volt should not be connected together. In a ship installation, the hull is the “ground” whilst the battery minus is the 0V.



## DCU Rear Lid Layout



## DCU Wire Terminal Layout Overview

| <b>Power supply inputs / auxiliary power output</b> |                                      |     |
|-----------------------------------------------------|--------------------------------------|-----|
| 1                                                   | +24VDC Primary Supply                | In  |
| 2                                                   | 0V Primary Supply                    | In  |
| 3                                                   | +24VDC Secondary Supply (Redundant)  | In  |
| 4                                                   | 0V Secondary Supply                  | In  |
| 5                                                   | 24VDC Supply Out, 1A                 | Out |
| 6                                                   | 0V Supply Out                        | Out |
| <b>System On / Off</b>                              |                                      |     |
| 7                                                   | +24VDC 0.2A Supply for Power On      | Out |
| 8                                                   | Power On 24VDC                       | In  |
| 9                                                   | 0V Opto Supply for Power On          | Out |
| 10                                                  | 0V Supply for Power On               | In  |
| <b>0 - 5V</b>                                       |                                      |     |
| 11                                                  | 5V, 0.5A                             | Out |
| 12                                                  | 0 - 5V 1                             | In  |
| 13                                                  | 0 - 5V 2                             | In  |
| 14                                                  | 0 - 5V 0V                            | Out |
| <b>PWM Output</b>                                   |                                      |     |
| 15                                                  | PWM Out                              | Out |
| <b>Switch Inputs Channels (8 channels)</b>          |                                      |     |
| 16                                                  | +24VDC 0.2A Supply for Switch Inputs | Out |
| 17                                                  | #1 Switch Input 24V                  | In  |
| 18                                                  | #2 Switch Input 24V                  | In  |
| 19                                                  | #3 Switch Input 24V                  | In  |
| 20                                                  | #4 Switch Input 24V                  | In  |
| 21                                                  | #5 Switch Input 24V                  | In  |
| 22                                                  | #6 Switch Input 24V                  | In  |
| 23                                                  | #7 Switch Input 24V                  | In  |
| 24                                                  | #8 Switch Input 24V                  | In  |
| 25                                                  | 0V Opt. For Switch Input             | In  |

| 26                                        | 0V For Switch Input                    | Out |
|-------------------------------------------|----------------------------------------|-----|
| <b>4-20 mA Inputs (4 channels)</b>        |                                        |     |
| 27                                        | +24VDC 0.2A Supply for 4-20 mA Sensors | Out |
| 28                                        | #1 4-20 mA Input                       | In  |
| 29                                        | #2 4-20 mA Input                       | In  |
| 30                                        | #3 4-20 mA Input                       | In  |
| 31                                        | #4 4-20 mA Input                       | In  |
| <b>PT100 inputs (4 channels)</b>          |                                        |     |
| 32                                        | #1 PT100 A                             | In  |
| 33                                        | #1 PT100 B                             | In  |
| 34                                        | #1 PT100 C                             | In  |
| 35                                        | #2 PT100 A                             | In  |
| 36                                        | #2 PT100 B                             | In  |
| 37                                        | #2 PT100 C                             | In  |
| 38                                        | #3 PT100 A                             | In  |
| 39                                        | #3 PT100 B                             | In  |
| 40                                        | #3 PT100 C                             | In  |
| 41                                        | #4 PT100 A                             | In  |
| 42                                        | #4 PT100 B                             | In  |
| 43                                        | #4 PT100 C                             | In  |
| <b>Pickup input (tacho / speed input)</b> |                                        |     |
| 44                                        | #1 Pickup A                            | In  |
| 45                                        | #1 Pickup B                            | In  |
| <b>CAN J1939#2 interface (COM 5)</b>      |                                        |     |
| 46                                        | #1 CAN J1939#2 Shield                  | -   |
| 47                                        | #1 CAN J1939#2 L                       | -   |
| 48                                        | #1 CAN J1939#2 H                       | -   |
| <b>CAN J1939#1 interface (COM 4)</b>      |                                        |     |
| 49                                        | #1 CAN J1939 Shield                    | -   |
| 50                                        | #1 CAN J1939 L                         | -   |
| 51                                        | #1 CAN J1939 H                         | -   |
| <b>MODBUS RTU (COM 3)</b>                 |                                        |     |
| 52                                        | Modbus 0V                              | In  |
| 53                                        | Modbus Shield                          | -   |
| 54                                        | Modbus L                               | -   |

|                                             |                                     |     |
|---------------------------------------------|-------------------------------------|-----|
| 55                                          | Modbus H                            | -   |
| 56                                          | Modbus +24VDC Supply                | In  |
| <b>RIO 410 Remote I/O Interface (COM 2)</b> |                                     |     |
| 57                                          | RIO 410 Remote I/O Interface Shield | -   |
| 58                                          | RIO 410 Remote I/O Interface L      | -   |
| 59                                          | RIO 410 Remote I/O Interface H      | -   |
| <b>SDU Safety Module Interface (COM 1)</b>  |                                     |     |
| 60                                          | SDU Safety Module Interface Shield  | -   |
| 61                                          | SDU Safety Module Interface L       | -   |
| 62                                          | SDU Safety Module Interface H       | -   |
| <b>Configurable Relays</b>                  |                                     |     |
| 63                                          | #1 Configurable Relay NC            | Out |
| 64                                          | #1 Configurable Relay C             | Out |
| 65                                          | #1 Configurable Relay NO            | Out |
| 66                                          | #2 Configurable Relay NC            | Out |
| 67                                          | #2 Configurable Relay C             | Out |
| 68                                          | #2 Configurable Relay NO            | Out |
| <b>Configurable 24VDC Outputs</b>           |                                     |     |
| 69                                          | #1 Configurable Output 24VDC        | Out |
| 70                                          | #2 Configurable Output 24VDC        | Out |
| 71                                          | #3 Configurable Output 24VDC        | Out |
| 72                                          | #4 Configurable Output 24VDC        | Out |
| <b>Common Alarm Relay</b>                   |                                     |     |
| 73                                          | Common Alarm Relay NC               | Out |
| 74                                          | Common Alarm Relay C                | Out |
| 75                                          | Common Alarm Relay NO               | Out |
| <b>Configurable 24VDC Outputs</b>           |                                     |     |
| 76                                          | #5 Configurable Output 24VDC        | Out |
| 77                                          | #6 Configurable Output 24VDC        | Out |
| 78                                          | #7 Configurable Output 24VDC        | Out |
| <b>Fixed 24VDC Outputs</b>                  |                                     |     |
| 79                                          | Energize to Shutdown 24VDC          | Out |
| 80                                          | Energize to Stop (ETS) 24VDC        | Out |
| 81                                          | Energize to Run (ETR) 24VDC         | Out |

|                                                  |                                                                   |        |
|--------------------------------------------------|-------------------------------------------------------------------|--------|
| 82                                               | Engine Running 24VDC                                              | Out    |
| 83                                               | Crank (Start) 24VDC                                               | Out    |
| 84                                               | Prelube Activation 24VDC                                          | Out    |
| <b>Fixed 24VDC Inputs</b>                        |                                                                   |        |
| 85                                               | +24VDC Supply for Fixed Functional Inputs                         | Out    |
| 86                                               | Prelube Complete 24VDC switch input                               | In     |
| 87                                               | Start Disabled 24VDC switch input                                 | In     |
| 88                                               | Automatic Mode 24VDC switch input                                 | In     |
| 89                                               | Automatic Start (PMS) 24VDC switch input                          | In     |
| 90                                               | Automatic Stop (PMS) 24VDC switch input                           | In     |
| 91                                               | Remote Start 24VDC switch input                                   | In     |
| 92                                               | Remote Stop 24VDC switch input                                    | In     |
| 93                                               | Remote Acknowledge/Silence Alarm 24VDC switch input               | In     |
| 94                                               | Shutdown Override 24VDC switch input (engine protection override) | In     |
| 95                                               | In Gear 24VDC switch input                                        | In     |
| 96                                               | #1 Configurable Input 24VDC switch input                          | In     |
| 97                                               | #2 Configurable Input 24VDC switch input                          | In     |
| 98                                               | 0V Opto For Fixed Functional Inputs                               | In     |
| 99                                               | 0V For Fixed Functional Inputs                                    | In     |
| <b>Ground (PE)</b>                               |                                                                   |        |
| 100                                              | Ground                                                            | -      |
| <b>MODBUS/TCP Ethernet (COM 6)</b>               |                                                                   |        |
| COM 6                                            | RJ45 Ethernet port                                                | In/Out |
| <b>MK-14 Relay Expansion Module Link (COM 8)</b> |                                                                   |        |
| COM 8                                            | DSUB-15                                                           | In/Out |
| <b>USB Memory</b>                                |                                                                   |        |
| USB                                              | USB Memory Interface                                              | In/Out |

## DCU Electrical Connections

### Primary Power Supply [1 – 2]

The DCU is designed to run on 24VDC supply voltage.

**Note!** Make sure the primary supply power is sourced directly from the battery, NOT from the starter of the engine, as the voltage drop over the latter is significantly higher.

### Power Supply Requirements

- Valid full functionality range: 18–32VDC.
- Minimum capacity: 5A

**Note!** There are fixed low battery voltage alarm setpoints. For the primary supply, these are at 21V and 18V. For the Secondary supply, the setpoint is at 20V.

All these alarms are delayed.

Use a twisted pair wire to minimize the effect of noise on the supply cables. Connect the cables straight from the battery (and NOT the starter engine) and keep the cable as short as possible.

Use at least 2.5mm<sup>2</sup> wires for the power supply.

### Secondary Power Supply [3 – 4]

It is recommended that the secondary supply is connected to a redundant power supply to ensure sufficient supply voltage upon cranking the engine.

Without a separate secondary supply, a crank can result in a reboot of the DCU. However if only one supply is available, connect this to Primary only. Do not parallel this into the Secondary Power Supply connectors.

Remember also to disable 'Secondary Power Fail Warning' in the configuration for Miscellaneous Events.

### Power Supplies in General [1 – 4]

#### Mandatory straps when not using opto-coupling

The DCU support opto-coupled inputs on several of its terminals.

When this capability is not used, the following straps must be inserted.

| Purpose                  | Strap        | Comment                                                                                                   |
|--------------------------|--------------|-----------------------------------------------------------------------------------------------------------|
| Power the DCU            | 7-8 and 9-10 | Disconnect jumper 7-8 to set the DCU into System Off mode.                                                |
| Activate Switch Inputs   | 25-26        | Disconnect this jumper if an external 24V supply (not terminal 16) is used to activate the switch inputs. |
| Activate Fixed Functions | 98-99        | Disconnect this jumper if an external 24V supply (not terminal 85) is used to activate the functions.     |

## Supply Selection

The DCU internal circuitry is sourced from either the primary OR the secondary supply.

The primary supply has priority over the secondary supply. If the primary supply voltage drops below 18V, the DCU will immediately switch over and use the secondary supply, but only if the secondary supply is above 20V.

The primary supply is selected over the secondary supply when the primary supply voltage again rises above 18V. There is a two second delay when switching from secondary to primary supply.

The DCU will run equally well – with full functionality – on the secondary supply.

All voltage levels are +/- 5%.

## Power Supply Low Alarms

The active supply (the supply currently feeding the DCU) is monitored. This is normally the primary supply.

- If the supply falls below 21V+30sec, this is indicated with an amber alarm.
- If the supply falls below 18V+30sec, this is indicated with a red alarm.

## Auxiliary Power Output [5 – 6]

The Auxiliary Power Output is intended to drive auxiliary instruments, relays, Ethernet switches, etc. that should be powered together with the DCU.

The Auxiliary supply is secured with an automatic fuse.

## System On/Off [7 – 10]

The DCU has a System On/Off function. System On is the normal mode of operation.

In System Off mode, the DCU internal circuitry is still active, but it acts as powered off.

## Normal operation

To power the DCU for normal operation, connect a strap between terminals 7–8 and another strap between terminals 9–10.

The DCU is now always on.

## System Off

To set the DCU in System Off mode, remove the strap between terminals 7–8.

The 24VDC supply at terminal 7 is secured with a 50mA automatic fuse.

## System On

To activate the DCU, connect terminals 7–8 again. The DCU is immediately ready for use.

## External supply

Alternatively, this function can be activated with an external 24V supply. In this case, do not connect any jumpers, and do not use terminals 7 and 10.

To activate the DCU (System On), connect a 24V supply to terminal 8, and the 0V to terminal 9.

## 5V Power Output [11]

This 5V Power Output is a general purpose supply for maximum 0.5A load and Short-Circuit protection.

## 0 - 5V Input Channel #1 [12]

This is a general purpose 0 - 5V Voltage Measurement Input.

## 0 - 5V Input Channel #2 [13]

This is a general purpose 0 - 5V Voltage Measurement Input.

## 0 - 5V 0V Reference [14]

This is the 0V reference for 0 - 5V input channel #1 and #2.

## PWM Out [15]

Reserved for future use.

## Switch Input Channels [16 – 26]

There are eight configurable switch input channels which can be used to detect the status of switches in the installation.

The state of each channel is controlled by the voltage between the +24V switch input terminal (terminals 17-24) and the +0V opto terminal (terminal 25) as follows:

- 0 - 2V = logic "0"
- 8 - 32V = logic "1"
- 2 - 8V = undefined, avoid this area.

Further switch input details

- Overvoltage protection: 40 VDC
- Not connected = 0V (47 kohm pull-down).

The 24VDC on terminal 16 shall be used for the switch input supply. It is secured with a 200 mA automatic fuse.

## Normal Use

Terminals 25 and 26 *shall* be strapped. Terminals 17 - 24 connected to 24V (terminal 16) through external switches.

## Opto-coupled Use

Terminals 25 and 26 shall *not* be strapped.

External voltage input between terminals 17 - 24 (+24V) and terminal 25 (0V opto) is electrically isolated from the DCU by the means of integrated opto-coupled devices.

## 4-20 mA Input Channels [27 – 31]

There are four configurable 4-20 mA analogue sensor inputs.

If the signal is out of range, a warning will be displayed. Out of range is defined as:

- <2 mA (broken)
- >22 mA (short)

Update rate: 2Hz

## PT100 Input Channels [32 – 43]

There are four PT100 input channels. The channels support PT100 sensors with two or three wires.

**Note!** If connecting a two-wire PT100 sensor, then strap the two wire terminals A and B at the DCU end. If the signal is out of range, a warning will be displayed. Out of range is defined as:

- <90 ohm (short)
- >390 ohm (broken)

Update rate: 2 Hz

## Magnetic Pickup (Speed) Sensor [44 – 45]

Connect the magnetic pickup to terminals 44 and 45. Please verify that the signal strength is between 4–32 Vpp.

**Note!** The signal waveform shall be a sinusoidal shape, not a square.

Use a 2x 0.5 mm<sup>2</sup> (minimum) twisted pair cable.

**Note!** The pickup cable shall be shielded to ground in the pickup end. Do NOT connect shield to 0V.

Range: 0.1–10 kHz

## CAN J1939#2 Interface (COM 5) [46 – 48]

This is a communication interface for remote panels or equipment.

The CAN interface is able to communicate all signals available in the DCU.

- Terminal 46 – CAN J1939#2 Shield
- Terminal 46 – CAN J1939#2 Low
- Terminal 46 – CAN J1939#2 High

## CAN J1939 Interface (COM 4) [49 – 51]

Engine J1939 CAN bus interface for connection to the engine ECM, electronic control module.

- Terminal 49 – CAN Shield
- Terminal 50 – CAN Low

- Terminal 51 – CAN High

## MODBUS RTU, RS-485 (COM 3) [52 – 56]

The MODBUS RTU may be connected either with common 0V or electrically isolated with an optocoupler.

- Terminal 53 – Shield
- Terminal 54 – Low
- Terminal 55 – High

## Not Optoisolated Communication

Supply the Modbus section from the DCU as follows:

- Terminal 56 to terminal 5 (24V)
- Terminal 52 to terminal 6 (0V)

## Optoisolated Communication

This requires the supply from the remote equipment to be supplied into the DCU terminals

- Terminal 56 (24V)
- Terminal 52 (0V)

## RIO 410 Link (COM 2) [57 – 59]

This is the link for the optional RIO 410 Remote I/O units. A maximum of four RIO units can be connected.

- Terminal 57 – Shield
- Terminal 58 – Low
- Terminal 59 – High

## SDU Link (COM 1) [60 – 62]

This is the link to the SDU 404/410 Safety Module.

- Terminal 60 – Shield
- Terminal 61 – Low

- Terminal 62 – High

## Configurable Relays [63 – 68]

There are two configurable relays on the DCU, Relay 1 and Relay 2. Each relay may be enabled or disabled.

If enabled, operation is controlled by selecting one of the many possible events available through the configuration web server.

The relay contact centre tap is secured with a 1A automatic fuse.

For additional configurable relays, see the section about the optional MK-14 unit.

## Configurable 24VDC Outputs [69 - 72, 76 - 78]

There are seven configurable 24V outputs on the DCU, Config 1 to Config 7. Each output may be enabled or disabled.

If enabled, operation is controlled by selecting one of the many possible events available through the configuration.

## Common Alarm Relay [73 – 75]

The relay is activated in a normal situation, and releases for any alarm.

The centre tap is secured with a 1A fuse.

## Shutdown Output [79]

The shutdown output activates when the DCU activates an automatic engine safety shutdown.

It does not activate for a normal engine stop.

## ETS – Energize to Stop [80]

The ETS activates on a normal engine stop or an automatic engine safety shutdown.

The signal stays activated a few seconds after the engine has stopped.

## ETR – Energize to Run [81]

The ETR activates when the DCU is about to start the engine. It stays activated as long as the engine is running.

The ETR deactivates on any stop command.

## Running [82]

This output activates when the engine is running. This is normally when the engine has reached the running setpoint, typically set at 400 rpm.

The output deactivates at any stop command.

## Crank [83]

The output activates to engage the engine starter. It is disabled on a running engine.

## Prelube Act. [84]

The Prelube Activation signal activates if the DCU is configured to prelube the engine prior to a start.



## 24V Supply for Fixed Function Inputs [85]

Use this 24V supply output to power all the inputs in the wire terminal range 86 to 97.

## Prelube Comp. [86]

If the DCU is configured to perform a prelube cycle until the sensed oil pressure is above a certain setpoint (provided by the prelube equipment), then the DCU will not continue onto the crank cycle until this signal appears.

## Start Disable [87]

If activated, the DCU is inhibited to perform any start attempts.

## Automatic Mode [88]

In Automatic Mode, the DCU will perform automatic start attempts if an automatic start signal is applied to terminal 89.

In this mode, the DCU will also react to an automatic stop signal on terminal 90.

## Automatic Start [89]

Apply this signal to start the engine according to the DCU start configuration.

Note that this terminal input is disabled if Automatic Mode [88] is inactive. This signal has to be applied until a running state is achieved.

## Automatic Stop [90]

Apply this signal to stop the engine according to the DCU stop configuration.

Note that this terminal input is disabled if Automatic Mode [88] is inactive. This signal has to be applied until a stopped state is achieved.

## Remote Start /Stop [91 – 92]

Apply a signal to either of these inputs to activate the function.

The Remote Start and Remote Stop works always, and independent of the Automatic Mode setting [88].

## Acknowledge [93]

The remote Acknowledge input acknowledges all new (unacknowledged) alarms.

## Shutdown Ovr. [94]

The Shutdown Override (SO) input disables all DCU shutdowns (automatic stop), but not the SDU shutdowns!

**Note!** In future firmware 2.11, the SO input to the DCU will also set the SDU 410 in shutdown override mode.

**Note!** In systems where there is an SDU connected to the DCU, make sure to activate Shutdown Override on the DCU and on the SDU. In reality, the SDU will signal SO to the DCU.

- On the DCU, the SO is activated with a 24V signal to terminal 94.

- On the SDU, the SO is activated by closing a switch over terminals 50 and 51. Note that the switch requires a 10k resistor connected across it.

**Note!** On the SDU, note that some channels may be configured to disregard Shutdown Override mode. Consult the SDU configuration section to verify this.

**Note!** Overspeed will always be enabled, even in Shutdown Override mode. This is true for the DCU and the SDU.

In Shutdown Override mode, if a shutdown channel is activated, the DCU will indicate this with an alarm instead of activating a shutdown.

The DCU will also display a “SO” symbol in the status bar (top right) when Shutdown Override mode is active.

## In Gear [95]

When In Gear is signalled, the DCU will prohibit start (crank) attempts.

## Configurable Inputs [96 – 97]

These two channels are configurable and set from the web server.

Connect the inputs to 24V to activate the configured function.

## Shield (Grounding) [100]

Connect this terminal to shield. Please note that 0V and shield shall be separated.

**Note!** Keep this wire as short as possible, and at least 1.5mm<sup>2</sup>.

Terminals 46, 49, 53, 57, 60 and 100 are all ground connections, internally connected to ground, and should *not* be connected to 0V.

## Other Communication Interfaces

### Ethernet MODBUS/TCP (COM 6)

The DCU connects to a LAN (Local Area Network) or directly to a PC through a standard CAT-5 network cable connected to the RJ45 port (COM 6).

The IP setting of the DCU and/or the local PC's need to be set in order to access the DCU configuration from a PC.

**Note!** Do not bend the Ethernet cable or pull the cable sideways more than necessary during installation.

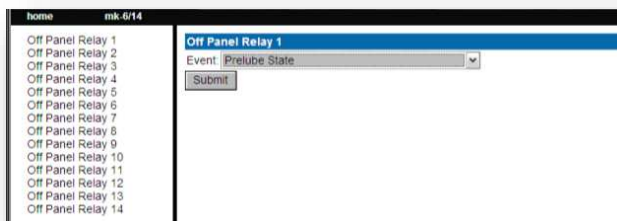
Use a strain relief for the cable making the cable length no more than 50 cm between the connector and the strain relief.

The DCU has a built in DHCP server for use in single PC configuration. See Configuration Manual for further information.

## MK-14 Relay Expansion Link (COM 8)

Connect the 15-pin DSUB-connector from the MK-14 optional relay expansion module.

The function to be present at each relay channel is configured in the DCU web server. Select Home - MK-14.



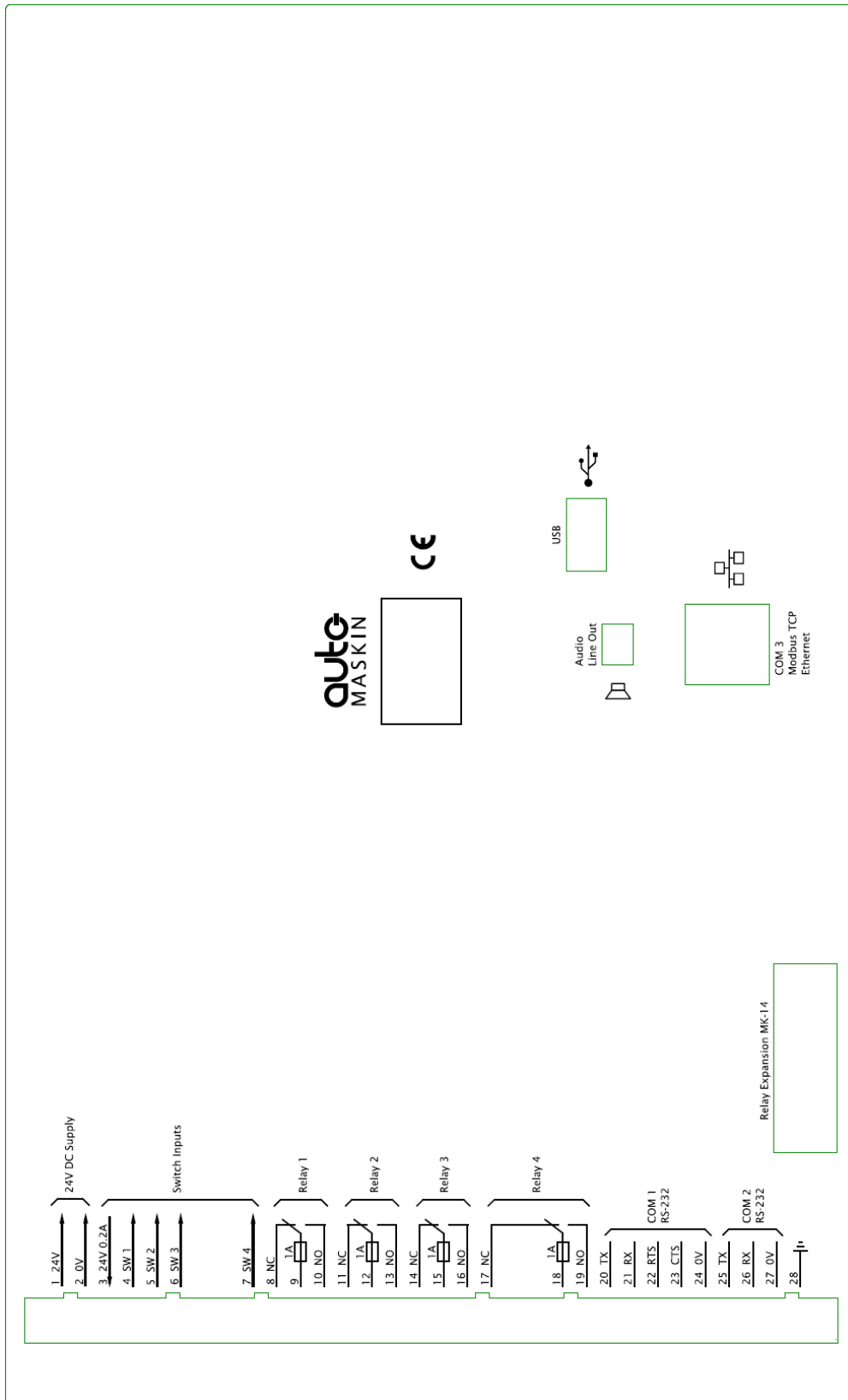
## USB Memory Interface

This interface is for USB memory stick only. It has two main functions:

- Load/Save a configuration file
- Load a firmware file

It can also be used to load a new firmware file to any connected RP 410E remote panel.

## RP Rear Lid Layout



USB

Audio  
Line Out

COM 3,  
Modbus  
TCP  
Ethernet

Relay

Exp.

MK-14

Power, Switch Inputs, Relay 1, Relay 2, Relay 3, Relay 4, COM1, COM2, C-GND

## RP Wire Terminal Layout Overview

| Power supply inputs / auxiliary power output |                                      |     |
|----------------------------------------------|--------------------------------------|-----|
| 1                                            | +24VDC Primary Supply                | In  |
| 2                                            | 0V Primary Supply                    | In  |
| Switch Inputs Channels (4 channels)          |                                      |     |
| 3                                            | +24VDC 0.2A Supply for Switch Inputs | Out |
| 4                                            | #1 Switch Input 24V                  | In  |
| 5                                            | #2 Switch Input 24V                  | In  |
| 6                                            | #3 Switch Input 24V                  | In  |
| 7                                            | #4 Switch Input 24V                  | In  |
| Configurable Relays                          |                                      |     |
| 8                                            | #1 Configurable Relay NC             | Out |
| 9                                            | #1 Configurable Relay C              | Out |
| 10                                           | #1 Configurable Relay NO             | Out |
| 11                                           | #2 Configurable Relay NC             | Out |
| 12                                           | #2 Configurable Relay C              | Out |
| 13                                           | #2 Configurable Relay NO             | Out |
| 14                                           | #3 Configurable Relay NC             | Out |
| 15                                           | #3 Configurable Relay C              | Out |
| 16                                           | #3 Configurable Relay NO             | Out |
| 17                                           | #4 Configurable Relay NC             | Out |

| 18                                | #4 Configurable Relay C  | Out    |
|-----------------------------------|--------------------------|--------|
| 19                                | #4 Configurable Relay NO | Out    |
| RS-232 (COM 1)                    |                          |        |
| 20                                | TX                       | -      |
| 21                                | RX                       | -      |
| 22                                | RTS                      | -      |
| 23                                | CTS                      | -      |
| 24                                | 0V                       | -      |
| RS-232 (COM 2)                    |                          |        |
| 25                                | TX                       | -      |
| 26                                | RX                       | -      |
| 27                                | 0V                       | -      |
| Ground (PE)                       |                          |        |
| 100                               | Ground                   | -      |
| MODBUS/TCP Ethernet (COM 3)       |                          |        |
| COM 3                             | RJ45 Ethernet port       | In/Out |
| MK-14 Relay Expansion Module Link |                          |        |
| COM 8                             | DSUB-15                  | In/Out |
| USB Memory                        |                          |        |
| USB                               | USB Memory Interface     | In/Out |
| Audio                             |                          |        |
| ALO                               | Audio Line Out (Speaker) | Out    |

## RP Electrical Connections

A minimum installation requires only power supply to terminals 1-2, and an Ethernet cable to the DCU.

### Power Supply [1 – 2]

The RP is designed to run on 24VDC supply voltage.

### Power Supply Requirements

- Valid full functionality range: 18–32VDC.
  - Minimum capacity: 2A
- Use a twisted pair wire to minimize the effect of noise on the supply cables. Connect the cables straight from the battery (and NOT the starter engine) and keep the cable as short as possible.

Use at least 0.5mm<sup>2</sup> wires for the power supply.

### Power Supply Low Alarms

There are fixed low battery voltage alarm setpoints.

All these alarms are delayed.

- If the supply falls below 21V+30sec, this is indicated with an amber alarm.
- If the supply falls below 18V+30sec, this is indicated with a red alarm.

### Switch Input Channels [3 – 7]

There are four configurable switch input channels which can be used to detect the status of switches in the installation.

The state of each channel is controlled by the voltage between the +24V switch input terminal (terminals 4-7) and the 0V terminal (terminal 2) as follows:

- 0 – 2V = logic “0”
- 8 – 32V = logic “1”
- 2 – 8V = undefined, avoid this area.

Further switch input details

- Overvoltage protection: 40 VDC
- Not connected = 0V (47 kohm pull-down).

The 24VDC on terminal 3 shall be used for the switch input supply. It is secured with a 200 mA automatic fuse.

### Configurable Relays [8 – 19]

There are four configurable relays on the RP, Relay 1, 2, 3 and 4. Each relay may be enabled or disabled.

If enabled, operation is controlled by selecting one of the many possible events available through the configuration web server.

The relay contact centre tap is secured with a 1A automatic fuse.

For additional configurable relays, see the section about the optional MK-14 unit.

## COM 1/ RS-232 [20 – 24]

General purpose RS-232 Port with RTS and CTS support.

## COM 2/ RS-232 [25 – 27]

General purpose RS-232 Port.

## Shield (Grounding) [28]

Connect this terminal to shield. Please note that 0V and shield shall be separated.

## First Power-On

### Preparations

### Installation

Install the RP according to guidelines and suggestions.

### Connections

Connect power according to guidelines and suggestions.

### First Power-On Wizard

The RP will display a *first power-on wizard* at the first power up after delivery, or after a factory reset of the panel.

See the Configuration Manual for how to set up the device in your environment.