User's Manual

Diesel Engine Control Unit

AUTO-MASKIN A/S
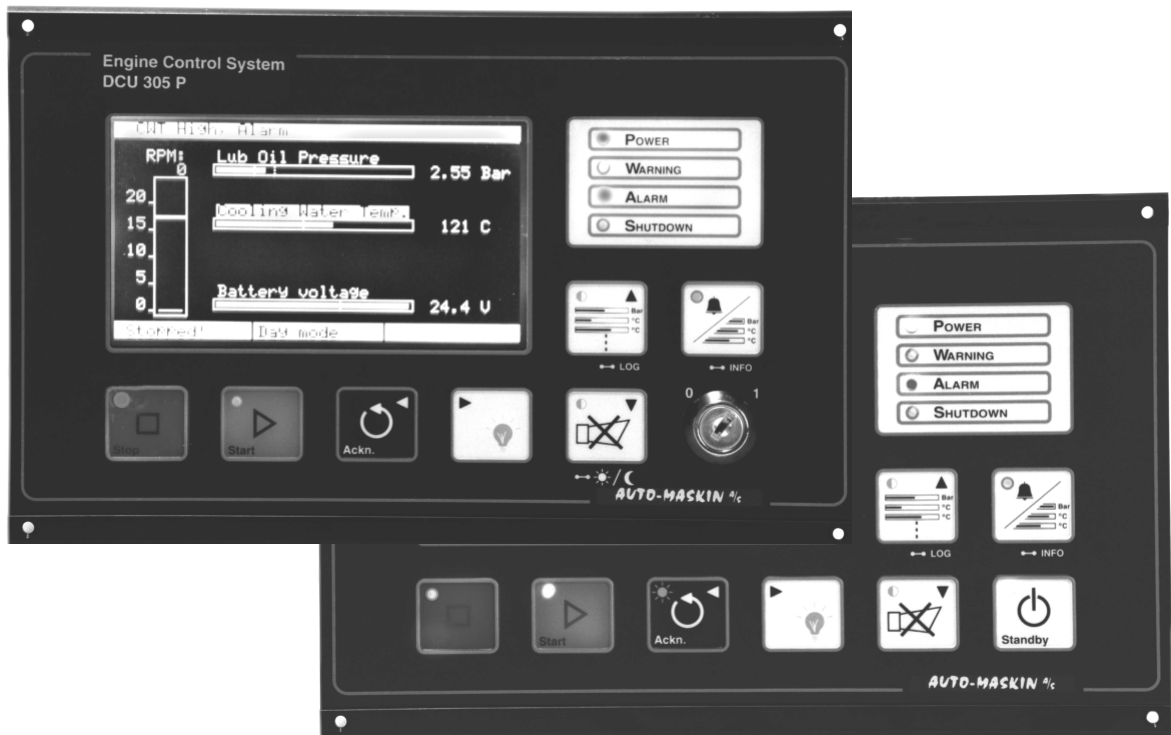
Contents

Document information

Document revisions

Revision	Update
March 2001	Created
October 2002	Installation issues moved to the document *DCU 305 R2 Installation Manual.*

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Related articles

- DCU 305 R2 Communication User's Manual. Article 06324.
- DCU 305 R2 Installation Manual. Article 06325.
- Rudolf R2 User's Manual, English. Article 09326.
- Rudolf R2 Configuration Software. Article 75270.

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Introduction

About this manual

This manual has been published primarily for professionals and qualified personnel. A person using this material is assumed to have basic knowledge in marine systems, and be able to carry out related electrical work.

Work on the boats low-tension circuit should only be carried out by qualified and experienced persons. Installation or work on the shore power equipment *must only* be carried out by electricians authorised to work with such installations.

It is the sole responsibility of the installer to ensure that the installation work is carried out in a satisfactorily 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 dealer or Auto-Maskin directly.

Assumptions

This document describes the DCU 305 R2 A and the DCU 305 R2 P. The DCU 305 R2 P is the Propulsion unit version. Operation of the propulsion unit is similar to operation of the DCU 305 R2 A.

The two units will commonly be referred to as the *Control Unit*.

When referring to voltages, always assume DC-voltages. When referring to AC-voltages it will be mentioned explicit.

About the DCU 305 R2

The *DCU 305 R2* is an electronic control unit for control and monitoring of diesel engines used as propulsion engines or gensets.

Switches and senders from the engines are connected to the control unit on the wire terminal card *RK-66 R2*.

Each project is unique, which is why the DCU 305 R2 is customised using a configuration tool for Windows®, the *Rudolf R2* software.

Different expansion cards exist to further enhance the possibilities and flexibility.

Communication is built-in and ready for use towards slave panels on the bridge.

Certificates

The DCU 305 R2 is classified by the following classification societies with their respective certificate number as follows:
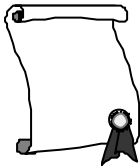
Classification Society	Certificate Number
Det norske Veritas, DnV	A-7403, A-7404, A-7998
Lloyd's Register of Shipping, LR	01/00050, SWC 0100001
Germanischer Lloyds, GL	42 526 – 02 HH
Bureau Veritas, BV	10747/A0 BV
Russian Maritime Register of Shipping, RS	01.013.262
Registro Italiano Navale, RINA	MAC/38901CS1
American Bureau of Shipping, ABS	02-OS-8785-PTA

Other certificates and approvals may exist.
Please contact Auto-Maskin for latest update.

Technical Specifications

Part	Value	
Overall dimensions (1)	160 x 250 x 35 mm (H x W x D)	
Cut-out dimensions	146 x 230 mm (H x W)	
Supply voltage (2)	24V smoothed, (20 – 35V DC)	
Power consumption (3)	500mA/12W @24V DC	
Weight	Control unit:	1250g
Protection level	Front panel:	IP54
	Back panel:	IP30
Ambient temperature	During operation:	0-70°C
	Storage:	-20-70°C
Air humidity	During operation:	<90%
	Storage:	Dry
Analog alarm latency	Built-in channels:	~ 1 sec
	Expansion card AK-6:	~ 5 sec
RK-66 relay rating	120VAC	1A
	24VDC	1A

Notes

(1)   *The cables on the backpanel add to the overall depth.*

(2)   *LCD backlight disappears if primary supply is below 18 volts, and reappears when primary supply is above 20 volts.*

(3)   *Display brightness full, 5 x 50% analog inputs.*

AUTO-MASKIN A/s

Using the DCU 305 R2

The different views

The DCU 305 R2 has several screens or *views*.

These are: Instrument view, Alarm list view, Information view and Event Log view.
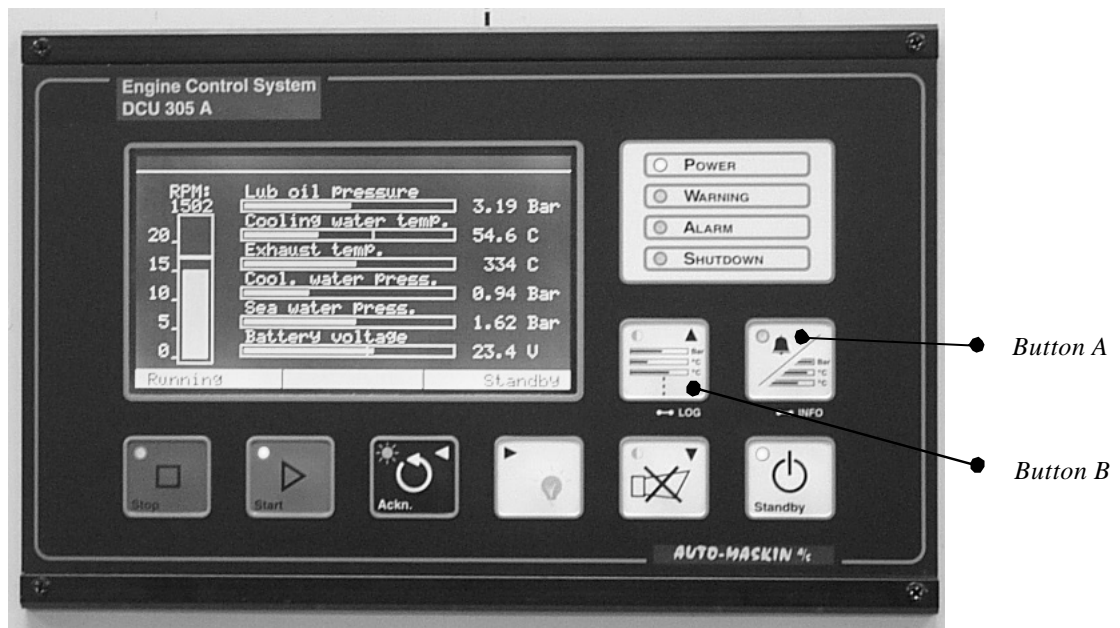

- Press *Button A* to toggle between *Instrument view* and *Alarm List* view.

- Press *Button B* to toggle between the two[1] instrument views.

- Press and hold (~1 second) *button A* to get the *Information* view.

- Press and hold (~1 second) *button B* to get the *Event Log* view.

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[1] The second *Instrument View* is available if any of the analog channels 6-11 has been enabled.

Instrument

The instrument view is the DCU 305 R2 main view.

The RPM indicator and the battery voltage are always displayed. The bottom line is divided into three status fields.

The first alarm appears here

Analog bars and values

RPM with overspeed indication

Status fields
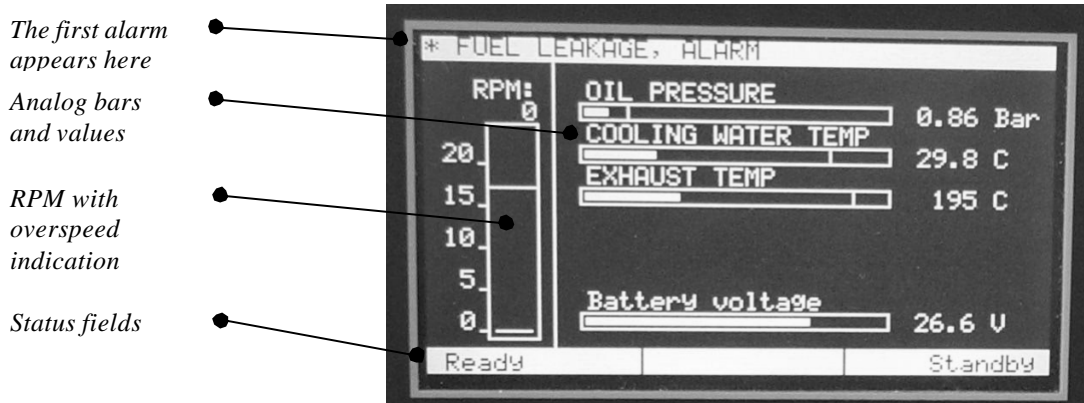
Instrument view

Alarms

The top line is reserved for alarms. The first alarm that occurs will appear here. Even though more alarms may appear, the first one will not be replaced until it is acknowledged.

Analog values

Depending on how many of the five analog sensors are activated, zero to max five horisontal analog bars are displayed, plus the battery voltage indicator, which is always present.

If the optional analog card AK-6 is used, pressing the B-button will reveal the next six channels.

RPM indicator

To the left of the screen is the speed indicator bar, with the actual RPM showing at the top of the bar. The overspeed setpoint is marked with a double horisontal line.

Status fields

The bottom line of the screen is divided into three fields.

- The leftmost field gives engine status such as "Cranking", "Running", "Stopping", etc.

- The middle field gives signals such as "Start command", "Delayed stop", etc. plus "Day Mode" or "Night Mode" in the propulsion version (DCU 305 R2 P).

- The rightmost field gives info such as "Manual", "Standby", etc.

Alarm List

The *Alarm List* view gives a list of all connected sensors and whether or not they are in the Alarm state. To access the Alarm List – press the A-button.

In addition to the alarm-channels defined in the configuration tool, any triggered built-in alarms will also appear in this list.

No alarm

Acknowledged alarm

Unacknowledged alarm
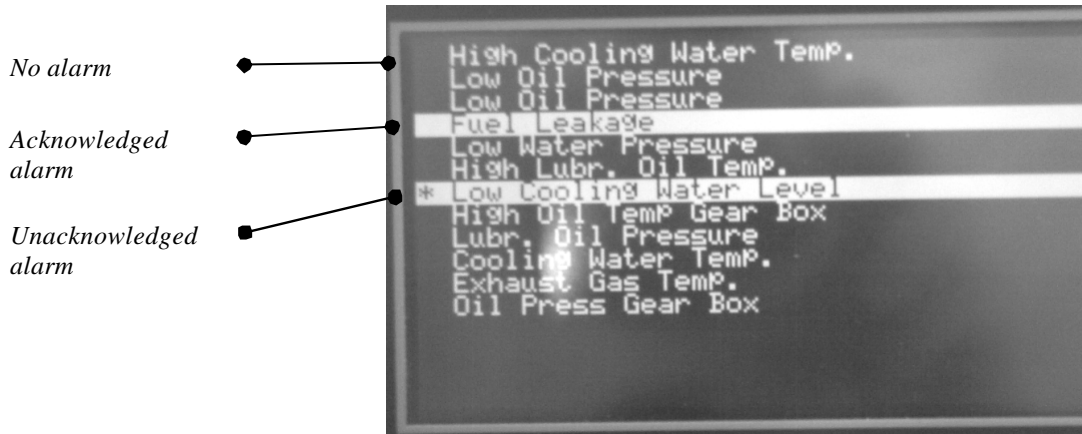
Alarm list

In the above sample picture, there are two alarms.

The alarm "Fuel leakage" is acknowledged. The alarm "Low cooling water level" is not acknowledged.

In general:

- An inverted line (black text on a white background) means the alarm is activated.

- The toggling asterisk and plus sign (*/+) in front of a line means the alarm is activated and not yet acknowledged.
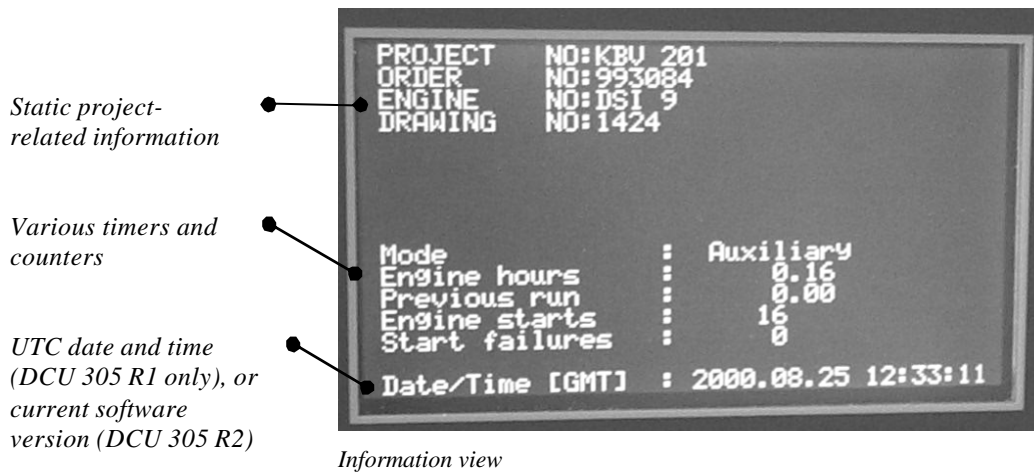
Note: In the Alarm list view, pressing the Acknowledge button will acknowledge *all* the alarms simultaneously.

Information

The top half of the picture displays static user information, such as project no. engine serial no. generator serial no. service telephone number, etc.

This information is entered using the configuration tool Rudolf.

In addition, some functions are accessed from within this view, i.e. you must be in this view to access the function.

Static project-related information

Various timers and counters

UTC date and time (DCU 305 R1 only), or current software version (DCU 305 R2)

Information view

The bottom half of the picture displays various timers and counters.

The Operation Mode is listed, along with the following counters:

- Engine hours (0-65535 hours)
- Previous running hours ("trip" counter)
- Engine starts (0-65535 successful starts)
- Start failures (0-65535 start failures)

The current software version is displayed at the bottom line.

All events are timestamped with running hours, with 0.01 hours resolution. 0.01 hours equals 36 seconds.

After two minutes in the INFO view, the control unit automatically returns to the Instrument view.

Event Log

All alarms and most events are timestamped with the running hour meter, and stored internally. The log cannot be erased by the user.

- The logbook stores ~500 events. After the ~500th event, the oldest event will disappear.

- The last *configuration* (or change of configuration) will not be erased.

- To view the log, press and hold the B-button. For button explanation, see page 6.

- View the log as you read a logbook: The last occurrence is at the bottom of the screen.

- To view earlier (older) events, press the Up arrow (▲) and to view newer events, press the Down arrow (▼).

Press the A-button once to exit the Event Log.

Built-in Alarms

The control unit has a number of internal alarms. These are always displayed in the language selected by Rudolf.

The following is a list of the most important built-in alarms.

Alarm text	Comment
Low battery voltage	Low voltage at the start battery.
	The alarm is interlocked during starting (cranking) and stopping.
Secondary battery low voltage	Low voltage at the secondary battery source.
Overspeed	Engine running faster than the overspeed setpoint.
Engine Stopped	Engine stopped for no known reason.
Engine failed to stop	60 seconds after issuing the stop command, the engine has still not stopped.
Start Failure	Engine failed to start after the last start attempt.
Pickup failure	Unable to read the pickup signal while engine is running.
Output circuit overload	Short circuit in one of the +24V outputs terminals 41-44.
	The outputs are secured with a fuse that makes an automatic reset. Remove the overload to correct the problem.
Analog sensor failure [7]	Detailed information on which analog channel that is below 2mA. Here channel 7.
Broken wire [T7 T9]	Detailed information on which terminal experiences the broken wire. Here terminals 7 and 9.

Buttons

Stop button

Press and hold the red button labelled *Stop* until stop is activated.

Note: To avoid erroneous operation, the stop button must be pressed 0.5 seconds before stop is activated. Releasing the button before 0.5 seconds does not activate the stop sequence.

The control unit stops the genset by pulling the stop solenoid.

When the engine speed is below 5rpm, the stop solenoid is released after 7 seconds.

The red LED in the stop button indicates the control unit is pulling the stop solenoid.

Start button

Manual start is done with the green button labelled *Start*. Press and hold the button until the engine has started. The starter engine is discontinued when the engine has started.

A running engine is indicated by the green LED in the Start button and the text *Running* in the leftmost status field. The rpm-meter will indicate the engine speed.

Note: The starter engine is excluded when the control unit indicates that the engine is running.

Standby & Manual mode button

The *Standby* button is a toggle button, meaning that for every other keypress, the unit is set to Standby or Manual.

Note: A green LED in the Standby button indicates that the unit is set to Standby.

The rightmost Status field also indicates the chosen mode by displaying either "Standby" or "Manual".

Standby mode

▪ The control unit will initiate the automatic start sequence when receiving the Blackout Signal on terminal 34.

▪ It starts the engine (with the number of start attempts configured) and then waits for the Delayed Stop signal to initiate automatic stop.

Manual mode

- The control unit will *not* automatically start the genset when receiving the Blackout Signal on terminal 34.

Note: Manual Start and Stop is always possible using the Start and Stop buttons directly, regardless of Standby and Manual mode settings.

Acknowledge (Reset) button

In case of alarms, a press on the acknowledge button, labelled *Ackn.*, will reset the alarm(s).

At the same time, the buzzer will be silenced.

In the Alarm List view, *Ackn* will reset all alarms, whereas in the Instrument view, *Ackn* will reset the alarm in the top of the screen only.

Instrument view

- The alarm displayed at the top of the picture will be acknowledged.

- If there are more alarms, these will take the place of the acknowledged one, and will be the next to be reset.

Alarm List view

- All alarms can be seen and all alarms are acknowledged simultaneously by pressing the Ackn. button.

Buzzer Off button

Press the *Buzzer Off* button to silence the built-in buzzer signal that is activated when an alarm occurs.

The alarm that activated the buzzer remains active until acknowledged with *Ackn*.

Lamptest button

Press the *Lamptest* button to illuminate all LED's on the frontpanel of the DCU 305 R2. Eight LEDs should be lit. The LCD might flash once.

Keyswitch

The DCU 305 R2 **P** propulsion unit has a keyswitch in the frontpanel. The switch powers the control unit ON and OFF.

Note that this applies to the DCU 305 R2 P propulsion unit only.

The DCU 305 R2 **P** only, has a key-switch that powers the control unit.

The key may be removed in either position. If removed in the OFF position, the panel can be powered externally.

Local Mode

It is possible to set the control panel in LOCAL mode. In this mode, none of the start, stop, reset, etc. commands will work, neither on communication, nor on terminal inputs.

To access LOCAL mode, first enter INFO-view, and then press and hold *Buzzer Off* for two seconds until a *beep* is heard.

The unit is now in LOCAL mode and the bottom right status field will indicate "LOCAL".

To leave LOCAL mode, repeat the above button sequence.

Adjusting the LCD screen

The control unit uses a graphical Liquid Crystal Display.

The optical performance of the display changes with temperature, light conditions and age.

There is a built-in compensation for temperature changes. Still, from time to time, it may be necessary to adjust the display.

Automatic Backlight Shutoff

To preserve LCD lifetime, the display automatically shuts off after the configured amount of time, if no action has been observed in that period.

The display turns on again at any keypress, or if an event occurs in the system, for instance an alarm.

Contrast

Contrast is automatically compensated with temperature.

If however the display seems dim or unclear, it may be necessary to adjust it. This is done by pressing and holding the Lamptest button and then pressing the Up- or Down arrow, ▲ / ▼ .

The Up arrow gives a lighter display (less contrast); the Down arrow gives a darker display (more contrast).

The new setting is automatically stored in internal memory, and stays resident regardless of future power loss.

Brightness

It is possible to change between ½ and full LCD backlight intensity.

This is done by pressing and holding the *Lamptest* button, and then pressing the *Ackn.* button. Each press on the *Ackn.* button now toggles between ½ and full backlight intensity.

This setting is NOT stored. After a power loss, the control unit starts with full light intensity again.

Day / Night mode

In the DCU 305 R2 P propulsion unit only, *day* or *night* light conditions can be selected.

Pressing the *Buzzer Off* button for ~1 second toggles the selection. The middle status field will indicate the selection with the text "Day" or "Night".

Day mode

This is the standard operation mode. LCD backlight is on and LEDs are on. Timeout for the LCD backlight is as configured.

Night mode

In no-alarm situations, LCD backlight is off and LEDs are off.

If a Warning condition occurs, only the Warning LED will flash. The LCD will remain dark.

In an Alarm or Shutdown situation, the LCD backlight is set to half bright and LEDs are powered.

The LCD and LEDs turns off 5 seconds after the acknowledge button is pressed.

Overspeed test

This section describes how to enter the RPM-test mode. In test mode, the Overspeed Setpoint (typically 1725 rpm) is reduced to Nominal Setpoint (typically 1500 rpm).

Routine

Follow these steps to enter the RPM-test mode:

- Enter the Information view by pressing Info (top right button) for 2 seconds.
- In the Information view, press and hold *Lamptest* for 10 seconds – until a beep is heard.

The Overspeed Setpoint is now reduced to the Nominal Setpoint. The bottom left status field displays "RPM TEST " to indicate and remind of this.

In Propulsion systems, the overspeed setpoint is reduced to the Max Speed setpoint.

Note: The test automatically times out after 4 minutes. To leave the test earlier, press *Lamptest* once in the Info view.

It is not possible to enter the RPM TEST mode unless the control unit is in the Ready state.

Communication

The information from sensors and switches connected to the DCU 305 R2 can be remotely monitored by utilising the built-in communication channel.

Any common supervision system like Factory Link®, InTouch®, etc. that supports the Comli or Modbus protocol can be used.

When connected, all data available on the DCU 305 R2 display is available in the supervision system. In addition, commands such as Start, Stop and Acknowledge can be done.

Protocol and pin-configuration

The DCU 305 R2 has the *Comli* communication protocol built-in. It communicates at 9600 baud on its RS232 communication port, P3.

In order to communicate, the control units ID-number must be known. This ID-number may be any number in the range 1-239. The printout documentation from Rudolf includes the ID-number.

The document *DCU 305 R2 Communication User's Manual* includes the complete list of available signals and their address. Please refer to this document when communicating towards the control panel.

The DCU 305 R2 has a 9-pin D-SUB male connector at port P3, outlined as follows:

Pin #	Description
2	RxD
3	TxD
4	DTR
5	SG
7	RTS
8	CTS

Multidrop communication

Several DCU 305 R2 units may be connected together in what is known as a *multidrop* network.

For this to work correctly, each of the connected units must have its unique ID-number in the range 1-239. This is done using the parameter program Rudolf.

Further, the multidrop net must be an RS-485 net. This means that RS-232/RS-485 converter units, for instance the Phoenix PSM-ME-RS232/RS485 unit, must be connected close to the communication port of each DCU 305 R2 unit.

We recommend using a twisted pair cable with two pairs of at least 0.22 mm^2, and capacity lower than 60pF/m.

Please contact your dealer or Auto-Maskin for correct dip setting and cabling of these units in a network.

Retrieve the log to a PC

The built-in event log in the control unit can be retrieved with simple means.

Note: These functions are built into Rudolf. With Rudolf, this is not necessary. In Rudolf, select Communication – Retrieve Log.

The PC (or Mac™) laptop needs a standard terminal program. These come bundled with Windows®, with names such as *Terminal*, *Hyperterm* or similar.

Connect and set up communication parameters

Locate and start the terminal program as described above, and adjust the communication parameters as follows:

- 9600 baud
- 8 databits
- 1 stopbit
- Odd parity

Connect the Rudolf™ cable or use a cable with the following outline:

Laptop	Control Unit
9 pin female D-SUB	9 pin female D-SUB
2	3
3	2
5	5

Functions

When the cable is connected and the communication parameters of the terminal-program are adjusted, proceed here.

Note: The syntax is <ESC> + <Character>.

The <ESC> key must be followed by an UPPERCASE <character> within 3 seconds.

The following functions are available:

Function	Press
Retrieve the complete log with timestamped events. The log is uploaded with the last event first.	<ESC> + L
Retrieve all counters (running hours, etc)	<ESC> + C
Retrieve information (text that describes the installation/project)	<ESC> + I

The uploaded information can be stored on your laptop for future reference.