
User's Manual

DCU 305 R3
DCU 305 R3 LT

Diesel Engine Control Unit



Auto-Maskin

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Related articles

- DCU 305 R3 & R3 LT Communication Manual.
- DCU 305 R3 & R3 LT Installation Manual.
- Rudolf R3 User's Manual, English
- Rudolf R3 Configuration Software.

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 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 dealer or Auto-Maskin directly.

Assumptions

This document describes the DCU 305 R3. The unit can be used in Auxiliary or Propulsion installations.

The unit will 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 R3 & R3 LT

The *DCU 305 R3* 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*.

Each project is unique, which is why the DCU 305 R3 is customised using a configuration tool for Windows®, the *Rudolf R3* software.

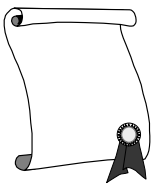
Different expansion cards exist to further enhance the possibilities and flexibility.

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

The DCU 305 R3 LT is identical to the DCU 305 R3 with the exception that the LT version do not have the CAN capability.

Certificates

The DCU 305 R3 is classified by the following classification societies.



Classification Society

Det norske Veritas, DnV

Lloyd's Register of Shipping, LR

Germanischer Lloyds, GL

Bureau Veritas, BV

Russian Maritime Register of Shipping, RS

Registro Italiano Navale, RINA

American Bureau of Shipping, ABS

China Classification Society

Other certificates and approvals may exist.

Please see www.auto-maskin.com for latest update.

Technical Specifications

Part	Value
Overall dimensions (1)	160 x 260 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% analogue inputs.*

Using the DCU 305 R3

The different views

The DCU 305 R3 has several screens or *views*.

These are:

- Menu view
- Instrument view
- Alarm list view
- Information view
- Event Log view
- CAN status/restart view.
- Diagnostic display view

Menu

To enter menu view, press the menu button.

- From the instrument view (main view) press menu button once to access the menu.
- From all other views, press the menu button once to exit to instrument view, then one more time to enter menu view.

Note: Green light in the menu button indicates that menu view is entered.

```

MENU
> INFORMATION
  EVENT LOG
  LAMP TEST
  CONTRAST INCREASE
  CONTRAST DECREASE
  LOCAL MODE
  RPM TEST
  CAN STATUS/RESTART
  SERVICE DONE
  DIAGNOSTIC DISPLAY
  EXIT
  
```

Table for DCU 305 R3 menu view – cursor at INFO view.

To enter the different views available from the menu, use the up- or down arrow button to place the cursor in front of the desired view, press menu button to select.

Instrument

The instrument view is the DCU 305 R3's main view. EXIT in the menu will always lead to instrument view.

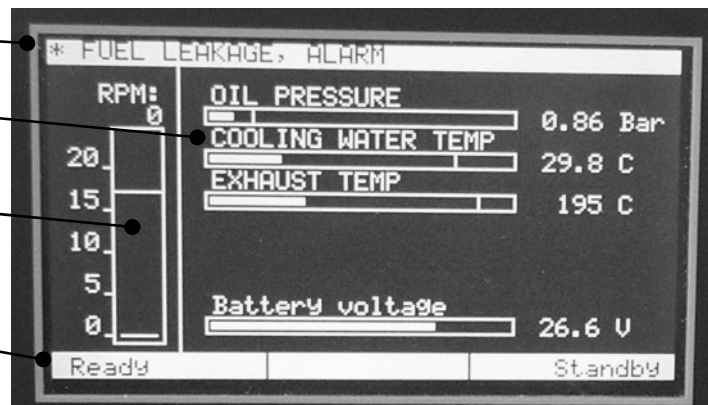
The RPM indicator and the battery voltage are always displayed. The bottom line is divided into three status fields.

The first alarm appears here

Analogue 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.

Analogue values

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

If the optional analogue card AK-6 is used, pressing the down arrow 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 horizontal line.

Status fields

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

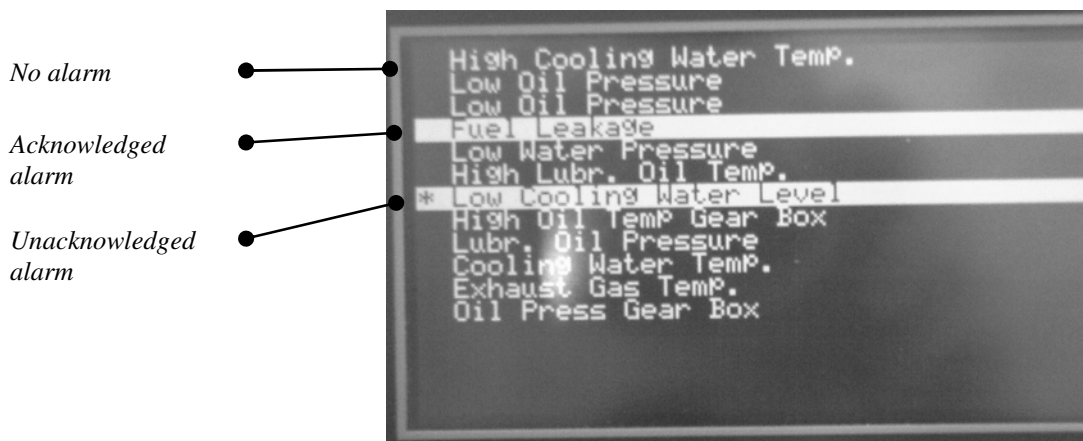
- The leftmost field gives engine status such as “Cranking”, “Running”, “Stopping”, etc.
- The middle field gives signals such as “Start command”, “Delayed stop”, etc.
- The rightmost field gives info such as “Manual”, “Standby”, etc.

Alarm List

To access the Alarm List – press the alarm list button.

The *Alarm List* view gives a list of all connected sensors with alarm limits and whether or not they are in the Alarm state.

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



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.

Press the menu-button once to exit the Alarm List.

Information

To access the Information view – select INFORMATION in the menu.

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.

Static project-related information

Various timers and counters

Current software version (DCU 305 R3)



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)
- Communication msg. Counter
- Fuel consumption/ Average consumption – if chosen in the Rudolf® configuration tool.

The current software and hardware version is displayed at the bottom line.

All events are time stamped 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.

Press the menu-button once to exit the Information view.

Event Log

To access the Event Log – Select EVENT LOG in the menu.

All alarms and most events are time stamped 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 the menu-button. For button explanation, see page 14.
- 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 menu-button once to exit the Event Log.

CAN Status/Restart

Used for debugging only.

Diagnostic Display

Diagnostics is displayed according to SAE J1939-71. A complete list of all diagnostic messages is found on www.sae.org.

All active diagnostics messages are shown in the Diagnostic Display view. The digit code for SPN and FMI's are shown together with the belonging Diagnostic Message Text. When no SPN and FMI's are active, the screen is empty.

DIAGNOSTIC DISPLAY 1 FAULT	
1>SPN	91 FMI: 8
Throttle signal.	
Invalid or Abnormal signal, or Fault.	

Example: DCU 305 R3 Diagnostic Display view – 1 Diagnose is active.

The menu options

The menu is accessed by pressing the menu button.

```

MENU
> INFORMATION
  EVENT LOG
  LAMP TEST
  CONTRAST INCREASE
  CONTRAST DECREASE
  LOCAL MODE
  RPM TEST
  CAN STATUS/RESTART
  SERVICE DONE
  DIAGNOSTIC DISPLAY
  EXIT
  
```

DCU 305 R3 menu view – cursor at INFORMATION.

To enter the different views or functions from the menu, use the up- or down arrow button to place the cursor in front of the desired view, press menu button to select.

Accessing views

Four different views can be accessed from the menu. These are:

- Information view described on page 9.
- Event log view described on page 10.
- CAN status/restart view described on page 10.
- Diagnostic display view described on page 10

Lamp test

Press the **menu** button to access the menu view. Use **up** or **down** buttons to place the cursor in front of LAMP TEST. Press the **menu** button. Twelve LEDs should be lit for as long as the **menu** button is pressed.

Adjusting contrast

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.

If the display seems dim or unclear, adjust the display as follows:

- Use the **up-** or **down** arrow button to place the cursor in front of CONTRAST+ for brighter or CONTRAST- for darker display.
- Press the **menu** button numerous times until desired contrast on the display is obtained.

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

Note: 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.

Local mode

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

- To access LOCAL mode, first enter **menu** view, and then press the **up-** or **down** button until the cursor is placed in front of LOCAL MODE.
- Press the **menu** button to activate local mode.

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

To leave LOCAL mode, repeat the above button sequence.

RPM 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).

From the menu view, follow these steps to enter the RPM-test mode:

- Use the **up-** or **down** arrow-button to place the cursor in front of RPM TEST
- Press the **menu** button once to activate RPM test

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

Note: The test automatically times out after 4 minutes.

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

Service Done

Several service intervals can be activated by using the Rudolf R3 configuration tool. The Service Done feature resets the service interval warning.

Note: Refer to the Rudolf User’s manual for more information about on how to use the service intervals function.

The 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 automatic start attempt.
Pickup failure	Unable to read the pickup signal while engine is running.

Alarm text	Comment
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.
Analogue 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.

Frontpanel Buttons



Stop button

Press and hold the red button labelled STOP until stop is activated. When the red LED by the button is lit, then the stop sequence 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 of the LCD. 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 *Acknowledge*, will reset the alarm(s).

At the same time, the buzzer will be silenced.

In the Alarm List view, *Acknowledge* will reset all alarms, whereas in the Instrument view, *Acknowledge* 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 *Acknowledge* button.



Menu button

The menu button has three functions:

Menu

- Accessing the menu view. When entering the menu, the cursor will always point at EXIT in the menu. By pressing the menu button one more time, the display will return to the instrument view (main view).

Enter

- When green light in the menu button is lit, it is possible to select the different options in the menu.

Exit

- A yellow light is lit in the menu button when the display shows info view, event log view or alarm list view. When pressing the menu button the display will escape to instrument view (main view)



Alarm list button

Pressing the alarm list button will display the alarm list. By pressing the alarm list button a second time, the display will escape to instrument view.



Up- and down arrow button

Use the up and down arrow buttons to:

- See more available information in a view
- Select an option in the menu

Buzzer off – any button

When a new shutdown or alarm occurs the buzzer will be activated. The buzzer can be silenced by pushing any button. The alarm or shutdown condition will still be unacknowledged as long as the acknowledge button is not pushed.

Note: The original function for each button is still active when using any button for silencing the buzzer. I.e. when using the stop button to silence to buzzer, stop will be activated as well.

Communication

The information from sensors and switches connected to the DCU 305 R3 can be remotely monitored by utilising the built-in communication channel.

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

The DCU 305 R3 supports the CAN J1939 standard for interface between Engine ECM and DCU 305.

When connected, all data available on the DCU 305 R3 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 R3 has the *Comli* and *modbus* 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 ID-number is also displayed in the info view.

The document *DCU 305 R3 Communication Manual* includes the complete list of available signals and their address. Please refer to this document when communicating towards the control panel.

In addition the DCU 305 R3 has the J1939 CAN-bus communication protocol built-in. On the DCU 305 R3 port P10 is dedicated to CAN communication. For further description, please see installation manual for DCU 305 R3.

Port P3

The DCU 305 R3 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

Port P10:

The DCU 305 R3 has a 9-pin D-SUB male connector at port P10, outlined as follows:

Pin #	Description
2	CAN-L
7	CAN-H

Multidrop communication

Several DCU 305 R3 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 ICPCON RS232/RS485 unit, must be connected close to the communication port P3 of each DCU 305 R3 unit.

We recommend using a twisted pair cable with two pairs of at least 0.22 mm², 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.

- Connect the configuration software to the DCU 305 R3 using the Rudolf cable.
- In the configuration software, select Communication – Retrieve Log...

Wait while the log is uploaded into the PC.