Emission Monitoring System (EMS)

User Manual

Rev 1.8

Standard OnRoad System

DOCUMENT REVISION HISTORY

Revision No.	Revision Date	Revision Description
1.0	05 April 2020	Original document
1.1	24 July 2021	Multiple changes to the document
1.2	15 February 2021	Telematics module added, modular cable harness
1.3	10 September 2021	Multiple changes to the document
1.4	25 October 2021	Error 55 added
1.5	01 February 2022	Custom manual, customer specific
1.6	07 March 2022	Multiple changes to the document
1.7	06 December 2022	Battery connection fuse kit update
1.8	09 August 2023	Barcode added

TABLE OF CONTENTS

1. GENERAL

1.1. System description

MRS Emission monitoring system (MRS EMS) is a complete, standalone solution for monitoring the status of the diesel particles and diesel particulate filter. Its function is achieved through continuous measurement, display and logging of exhaust gas temperature, back pressure, engine speed (rpm) and NOx / O_2 (optionally).

The values received from the sensors are evaluated and compared with preconfigured settings to determine whether user intervention or maintenance is needed. For example, if the back pressure values become too high (indicating that the filter is clogged) or too low (indicating that the filter is damaged), the system will both alert the user with a visual and audible alarm and save the event in the logger memory.

Alarms generated by an event, together with the visual indications, remain active until the source (e.g., measured value) returns to normal levels. Audible notifications are switched off after the alarm is acknowledged by the user.

The driver can observe the system operation by checking if the exhaust system temperature is within optimal values for filter operation. If a back-pressure alarm is generated, the driver can raise the temperature of the exhaust gases by increasing the engine speed and therefore can initiate the system cleaning. When the back pressure is within the normal values again, visual warning will be turned off.

Additionally, the monitoring system can be connected to the PC software for online data monitoring, data examination or system programming.

For more information regarding the MRS EMS system and other solutions, please visit the official MRS website www.mrs-electronic.com.

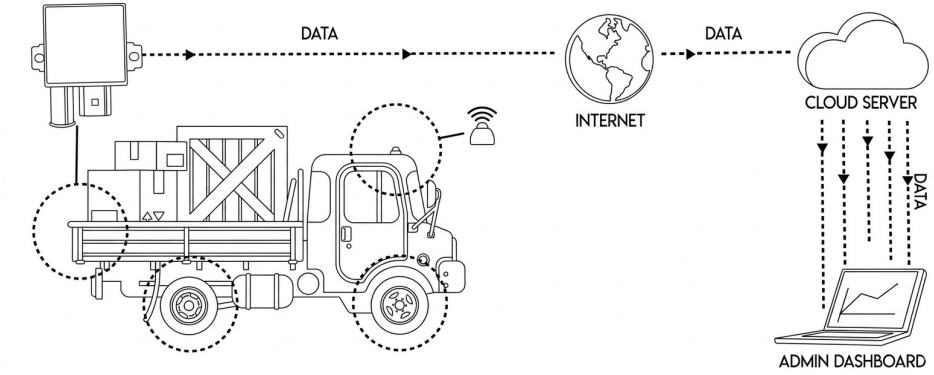


Figure 1.1. System overview

2. INSTALLATION

2.1. Unpacking the box

In the MRS EMS box you can find:

Nr.	Component name	Quantity
1	MRS LogBase 04	1 pc
2	MRS OnRoad Panelbox	1 pc
3	Pressure sensor connection kit (optional)	1 set
4	Temperature sensor connection kit	1 pc
5	Cable harness	1 set
6	Battery connection fuse kit	1 set
7	MRS Terminal connection interface (optional)	1 pc

Table 2.1. The components contained inside the box

Temperature sensor probe is included with the Cable harness!

2.2. System components

LogBase 04 has integrated pressure sensor, inputs for the temperature sensor probe and single I/O pin which can be used as frequency input (engine speed/rpm) or alarm output. It also has a CAN bus interface which is used to connect NOx sensor and OnRoad Panelbox or MRS Terminal software.

Figure 2.1. MRS LogBase 04

OnRoad Panelbox is the user's communication interface that is used to communicate with the logger unit. Panelbox displays the online data, alarms the user, shows the system errors, and can be used to parametrize the system. It has 6 function keys and buzzer / light notification.

Figure 2.2. OnRoad Panelbox

Pressure sensor connection kit (optional) has all the necessary components to connect the pressure sensor with a filter. It is consisted of a stainless-steel pipe, ¼ NPT fitting, high temperature hose and moisture separator (optional).

Figure 2.3. Pressure sensor connection kit

Temperature sensor connection kit has all the necessary components to connect the temperature sensor with a filter. It is consisted of a ¼ NPT fitting and the temperature sensor itself is a part of the pre-connected cable harness.

Cable harness is a complete connection kit (wired and tested) that is used to connect LogBase 04 device to the EMS. Power supply and I/O are to be connected to corresponding outputs / supplies. Temperature sensor comes pre-attached. OnRoad Panelbox is connected via RJ45 connector.

Harness can be further extended using additional cable harness extensions, i.e. if a customer wants NOx or Connected Logger functionality.

Figure 2.4. Cable harness

Battery connection fuse kit has all the necessary components to connect the system to the battery and ignition and act as an overcurrent protection. The red fuse holder connects to the battery (KL30) with the 5 Amp fuse, and the black fuse holder connects to the ignition (KL15) with the 2 Amp fuse.

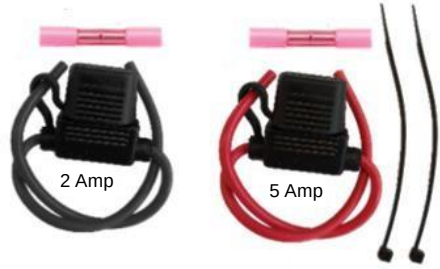


Figure 2.5. Battery connection fuse kit

MRS Terminal connection interface (optional) is used to connect the system to the MRS Terminal software running on a Windows PC. This adapter has 4 pin Deutsch connector from one side and DB9 connector on the other side. It is necessary to have a PCAN-USB adapter for this purpose.

Figure 2.6. MRS Terminal connection interface

2.3. Schematic overview

A schematic overview of the MRS EMS system and its components is given in the figure below:

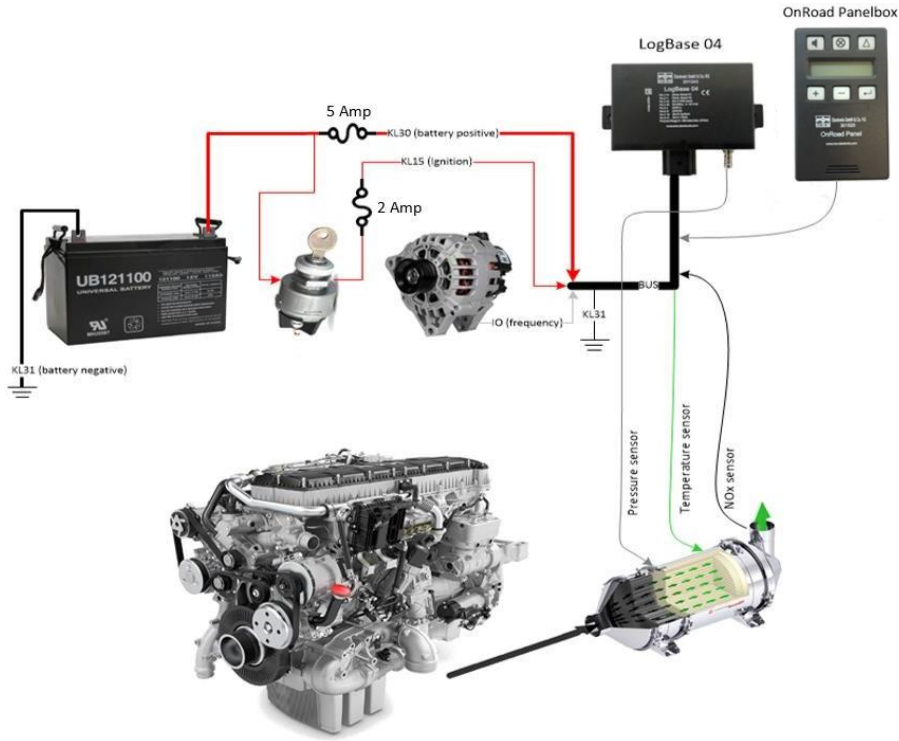


Figure 2.7. Schematic overview of the system installation

2.4. Installation instructions

IMPORTANT: DISCONNECT THE BATTERY PRIOR TO THE INSTALLATION!

2.4.1. LogBase 04 installation

The LogBase 04 is to be vertically mounted (i.e., its connector positioned downwards), securely fixed and installed in a position protected against water, excessive heat, and mechanical shock.

The device has two mounting holes, one on each side, with the pressure connection and device connector being located next to each other.

The connector plug on the logger connects to the cable harness and has a security lock to prevent unwanted disconnection. To remove the connector from the plug, press the black locking tab firmly and pull connector from the plug.

Figure 2.8. LogBase 04 front panel connections

2.4.1.1. Pinout

LogBase 04 pinout is listed below:

Pin number	Pin description	Wire color
1	Temperature sensor P	(green)
2	Temperature sensor N	(white)
3	Input / Output or RPM	(white / black)
4	KL30 / B+	(red)
5	CAN L	(green)
6	CAN H	(white)
7	KL15 / Ignition switch	(red / black)
8	KL31 / Ground	(black)

Table 2.2. LogBase 04 pinout

2.4.2. OnRoad Panelbox

OnRoad Panelbox should be installed inside the driver's cabin and securely fixed. If necessary, it can be disassembled using a flat screwdriver. Pry the back side of the housing and use the screws to fix the back-side plastic to the appropriate location inside the driver's' cabin.

OnRoad Panelbox is connected to the cable harness via the RJ45 connector.

Figure 2.9. OnRoad Panelbox RJ45 connection

2.4.3. Pressure sensor

LogBase 04 uses an integrated pressure sensor which needs to be connected to the diesel particulate filter connection point using the pressure sensor connection kit. The connection between the sensor and the filter should be properly sealed and secured from excessive heat sources (e.g., nearby heated components).

To prevent build-up of condensate, connection should be made in the rising direction (i.e., pointing upwards). Minimum length between the filter and sensor should be 150 cm. The stainless-steel pipe should be inserted into the filter approx. 3 cm deep and connected using the provided ¼ NPT fitting.

Important: The stainless-steel pipe should not be cut to length but wound into multiple coils with the coils facing up (rising upwards). Any looping, twisting, or pinching of the high temperature hose is forbidden.

To prevent deposit build-ups which can cause the pressure probe to malfunction, a standard moisture separator (optional component) must be installed between the pressure probe and the stainless-steel pipe.

Stainless-steel pipe is then connected onto the high temperature hose which is ultimately connected to the MRS LogBase 04.

Figure 2.10. DPF pressure and temperature monitoring points for a ¼ NPT fittings

2.4.4. Temperature sensor

LogBase 04 uses a standard automotive grade K-Type sensor probe that comes as a part of the cable harness. The connection between LogBase 04 and filter should be properly secured from excessive heat sources (e.g., nearby heated components).

Temperature sensor probe should be inserted into the filter approx. 5 cm deep and connected using the provided ¼ NPT fitting. The sensor tip should be facing directly into the flowing exhaust gases. If this is not possible then the probe should be inserted deeper into the filter, while making sure that the filter is not damaged by it. The temperature sensor cable should be secured to the fixed components, and away from the heated ones.

Figure 2.11. Temperature sensor probe

2.4.5. Cable harness

IMPORTANT: DISCONNECT THE BATTERY PRIOR TO THE INSTALLATION!

When installing the cable harness, make sure that all the system components (sensors, display devices), as well as the power supply connections to the battery are made before connecting the LogBase 04 to its cable harness connector.

The red wire (logger power supply) of the cable harness must be connected to the battery connector by using the red fuse holder with the 5 amp fuse from the fuse kit. The red/black wire (ignition signal) must be connected to the ignition by using the black fuse holder with the 2 amp fuse from the fuse kit. The black wire (ground connection) must be connected to the chassis. The white / black wire (RPM input) should be connected to the W terminal of the alternator or similar RPM sensing output. If the Input/Output, i.e., RPM, wire is left unconnected, make sure it is properly insulated to avoid unwanted short circuit connections. If the cables are extended by the customer, the customer is responsible for the correct selection of the cable diameter and fuse protection.

After all the above connections are made, connect the battery connectors to the battery itself, power up the vehicle, and check if the EMS system is powered up and running.

Cable harness itself is modular and therefor makes the installation easier.

2.5. Initial setup

Initial setup (i.e., configuration) of the system needs to be performed after all the previously mentioned installation steps are done for it to function properly.

For the system to log the data correctly, the time / date should be set. Also, if the engine speed is monitored, alternator frequency factor should be set.

Important: If the device is not connected to the power supply for more than 10 days, the time / date should be set again after the system is powered up. Otherwise, the data will not be logged correctly.

Default system settings are listed below. Check to make sure whether they are appropriate for your system, and, if not, adjust them accordingly. Instructions on how to configure the system with the OnRoad Panelbox are available in the next chapter.

Parameter name	Parameter value
L(L) - Lower pressure limit	15 mbar
L(U) - Upper pressure limit	150 mbar
T(L) - Lower temperature limit	150°C
T(U) - Upper temperature limit	750°C
FRQ /10 -	Off
M	10 sec

Table 2.3. Default parameter values

3. OPERATING THE SYSTEM

3.1. OnRoad Panelbox

OnRoad Panelbox is used to display parameters of the DPF monitoring system but can also be used to define system parameters.

3.1.1. Buttons

The OnRoad Panelbox has 6 buttons with backlight and buzzer. The buttons are placed as 3 buttons above the display, and 3 buttons below it. Functional description for each button is given below:

Button	Function description
🔈	Audible alarm acknowledge
⊗	Visual alarm acknowledge
△	SPECIAL programs only
+	Scroll UP
-	Scroll DOWN
↵	Confirm / edit settings

Table 3.1. Buttons functionality description

3.1.2. Operating modes

While the EMS system is powered up and running, the OnRoad Panelbox is in standard operating mode. It displays monitored values (pressure, temperature, etc.) and informs the user with audible and visual alarms when the system or filter needs user or maintenance attention. However, if there is need to change one or more system parameters, the maintenance mode of the OnRoad device can be used.

3.1.2.1. Standard mode (with menu overview)

In the standard operating mode, buttons (+) and (-) are used to scroll through the menu, showing current system parameters. It is not possible to make any changes to system parameters in this mode. If an alarm is shown, it can be acknowledged using the corresponding button (audible, visual acknowledge). In case of a fault or error, the error message will be shown along with the error number. A list of alarm codes is given in the Alarm codes section of this manual.

91˚C		Current filter temperature
76 mbar		Current filter back pressure
800 rpm	off	Current engine speed
ERROR: 21		System error

Table 3.2. Normal operating mode menu

3.1.2.2. Maintenance mode (with menu overview)

To change the system's operating parameters, maintenance mode needs to be accessed.

Maintenance mode is entered by simultaneously pressing all 3 top row buttons for 2 sec. If maintenance mode is accessed successfully, message UNLOCKED is shown on the screen.

To exit maintenance mode simultaneously press 3 top row buttons for 2 sec. Message LOCKED will be displayed on the screen.

91˚C		Current filter temperature
76 mbar		Current filter back pressure
800 rpm	off	Current engine speed
SETUP		Setup menu, system parameters

Table 3.3. Maintenance mode menu

Maintenance mode is scrolled through using the (+) and (-) buttons, and each sub-menu is accessed using the ↵button. Maintenance sub-menus are described in the following section.

3.1.3. Logger configuration (maintenance mode)

3.1.3.1. Temperature settings

While in maintenance mode of the OnRoad device, temperature settings can be accessed within the main menu using the ↵button. Inside this menu the user can set lower and upper temperature limits.

91˚C		While displaying current temperature, press ↵ to edit
T(L): 70˚C	E: T(L)= 70˚C	Lower temperature limit, press ↵ to edit
T(U): 750˚C	E: T(U)= 750˚C	Upper temperature limit, press ↵ to edit
[< -]		Exit menu, press ↵ to exit

Table 3.4. Temperature settings menu

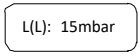
3.1.3.2. Pressure settings

While in maintenance mode of the OnRoad device, pressure settings can be accessed within the main menu using the ↵button. Inside this menu you can set lower and upper pressure limits, reference pressure, tolerance range and reference engine speed.

76 mbar		While displaying current pressure, press ↵to edit
L(L): 15mbar	E: L(L)= 15mbar	Lower pressure limit, press ↵to edit
L(U): 250mbar	E: L(U)= 250mbar	Upper pressure limit, press ↵to edit
-80.. 80rpm L(R): 0mbar		Reference pressure, press ↵to edit
ΔP_REF: 30%	E:ΔP_REF: 30%	Pressure tolerance range, press ↵to edit
F_REF: 0rpm	E:F_REF= 0rpm	Reference engine speed
[< -]		Exit menu, press ↵to exit

Table 3.5. Pressure settings menu

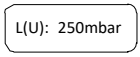
3.1.3.2.1. Lower pressure limit



If the back pressure is lower than the value of lower pressure limit for period longer than 10 sec, alarm will be activated. If the back pressure returns to the normal value for period longer than 10sec, alarm will be deactivated.

To signal the low-pressure alarm, **ERROR 35** code is shown on the screen.

3.1.3.2.2. Upper pressure limit

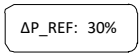


If the back pressure is higher than the value of the upper pressure limit for period longer than 10 sec, alarm will be activated. If the back pressure returns to the normal value for period longer than 10 sec, alarm will be deactivated.

To signal the high-pressure alarm, **ERROR 36** is shown on the screen.

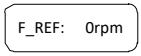
Note: The alarm light might turn on even while the system and filter are in normal operating condition, usually when the driver accelerates the vehicle. This is normal behaviour, and driver's attention isn't required.

3.1.3.2.3. Pressure tolerance range



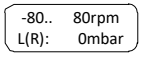
This number represents the acceptable tolerance of the reference pressure (shown in %). This value should be entered with special attention.

3.1.3.2.4. Reference engine speed



This number represents the desired engine speed to be used for setting up the reference pressure.

3.1.3.2.5. Reference pressure



IMPORTANT: please enter alternator frequency factor before setting up reference pressure

Reference pressure is the reference value for the Filter Check function. It should be set for newly installed systems or after the filter is changed. The reference pressure is set while system has no load, at reference engine speed (check F_REF: value). Steps for setting the reference pressure are shown below:

1200.. 1680 L(R)	Required engine speed is from “1200” to “1680” rpm, press ↵ for the test. Keep the engine speed within specified range for 5 sec. If speed wasn’t within specified range, measuring will be repeated.
1200.. 1680 L(R):	Measurement was successful and values are stored, press ↵ to exit Example: at 1500rpm, reference pressure of unloaded system is 85 mbar
1200.. 1680 L(R):	The reference pressure is now displayed in the menu

Table 3.6. Setting up the reference pressure

3.1.3.3. Filter check

FILTER CHECK

The filter check function is used to check if there is any damage made to the filter so it can be repaired or replaced. To perform a filter check, set the engine rpm to the reference engine speed and keep it for a period of 5 sec. The pressure value shown thereafter must be within the pressure tolerance range, or an error message will be shown.

3.1.3.4. Setup

The Setup menu is used for system parameterization and can be accessed from the main menu while in maintenance mode using the ↵button.

FRQ/10: OFF	Alternator frequency factor, press ↵ to edit
M: 10sec	Data saving to the memory period, press ↵ to edit
Time: 09:50:30 Date: 05.11.19	Time and date, press ↵ to edit
P030/4 L201/20 21.02.20 / 440611	Program version / Serial No, press ↵ to enter
SYS_VALUES	Online data values, press ↵ to enter
[< -]	Exit menu, press ↵ to exit

Table 3.7. Setup menu (maintenance mode)

3.1.3.4.1. Alternator frequency factor

FRQ/10: OFF

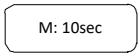
IMPORTANT: When setting the alternator frequency factor (*aff*), enter also the first decimal place for greater accuracy. In other words, if the *aff* = 36, the value you enter is 360 (*aff* x 10).

Number of revolutions per minute (rpm) is measured as the number of pulses per minute on the alternator / generator. Depending of the alternator it could output 4 – 8 pulses per revolution. If you don't know the alternator frequency factor (from alternator model) you could calculate it. To calculate alternator frequency factor, you need to know the diameter of the crankshaft V-belt pulley and the alternator V-belt pulley, and then calculate it using the following formula:

$$aff = \frac{d_1}{d_2} x\, p$$

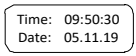
aff = alternator frequency factor
d_1 – diameter of the crankshaft V-belt pulley
d_2 - diameter of the alternator V-belt pulley
p – alternator number of pulses per revolution

3.1.3.4.2. Data saving period



This number represents the interval time (in seconds) for saving data in the logger memory. For the default value of *M = 10sec*, the logger will save its measured data every 10 sec. The value of *M* can be set from 1 to 250 sec.

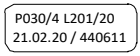
3.1.3.4.3. Time and date



IMPORTANT: The time & date settings are crucial for the logging of data so they must be entered correctly. Except in the case of daylight savings time (i.e. ± 1 hour), a change of the date and time parameters, renders all data logged until that point invalid, i.e. it becomes inaccessible.

The data logged needs to be uncorrupted in any case, especially if DPF is malfunctioning (inside warranty period) the data logged could be used as the evidence for the DPF distributor.

3.1.3.4.4. Program version / Serial No



In this section, the user can see some important data relating to the system itself, i.e. hardware and software versions of both the LogBase 04 and the OnRoad Panelbox, the installation date, and the serial number of the logger.

- Top left: Panel software version
- Top right: Logger software version
- Bottom left: installation date
- Bottom right: LogBase 04 serial number

Installation date is automatically set. LogBase 04 needs to operate for more than 8 hours for installation date to be set.

This way we make sure that logged data are uncorrupted and can be used as evidence, if DPF fails for example.

3.1.3.4.5. Online data values

In this section, the user can see measured values (pressure, temperature, rpm) simultaneously.

4. ALARM CODES

Error number	Problem explanation / solution
Error 11	One of the keys on the Panel has jammed Solution: press the keys (if necessary, repeatedly) until the fault is corrected.
Error 12	Check the display for damages
Error 21	No communication between the LogBase 04 and Panel Solution: check CAN bus connection
Error 22	12C-Bus/Pointer Search Solution: please contact your distributor if error repeats
Error 23	Parameterization incorrect/unreadable Solution: please contact your distributor if error repeats
Error 31	Break in the pressure hose or pressure pipes, or damage to the filter Solution: check the pressure connection and look for the filter damage. If problem were not detected, please contact your distributor
Error 32	No pressure 10 minutes after the ignition has been switched on Solution: (1) Engine is not running → Switch on engine (2) Faulty connection or pressure pipe blocked → Reconnect and secure pressure pipe or clean out pressure hose as per maintenance instructions.
Error 33	Temperature unchanged 10 minutes after the ignition is switched on Solution: make sure engine is running and temperature sensor probe is still correctly attached to the filter.
Error 34	Damaged temperature-sensor probe T1 Solution: replace the cable harness with the new one.
Error 35	Back pressure too low (Serious error!) Solution: filter cannot function anymore
Error 36	Back pressure too high Solution: raise the exhaust-gas temperature by increasing the engine load in an appropriate manner or start regeneration procedures. Important note: Do not allow the engine to overheat!
Error 37	RPM input connection to alternator loss Solution: if the engine is running, check the connection between LogBase 04 and alternator
Error 38	Filter check produces unsatisfactory result Solution: return the filter to the factory to have it checked or replaced. Confirm the error with ↵button
Error 41	Measured Data cannot be recorded Solution: please contact your distributor
Error 42	Memory Error Solution: data structure is damaged, please contact your distributor
Error 51	The date could not be verified and logged Solution: repeat the procedure. If error is still present, please contact your distributor
Error 52	Time could not be verified and logged Solution: repeat the procedure. If error is still present, please contact your distributor
Error 55	Temperature too high

Table 4.1. List of alarm codes

5. MAINTENANCE

It is necessary to perform regular maintenance for the system to function properly. The components requiring regular maintenance are the temperature sensor and the pressure sensor's connection kit.

5.1. Temperature sensor maintenance

MAINTENANCE PERIOD: Once a year / every 100,000 km

The temperature sensor must be inspected for damage, removed from the filter, and cleaned to remove oil, grease and residue. Afterwards, the probe is to be reinserted as instructed in par 2.4.4.

5.2. Pressure sensor connection kit maintenance

MAINTENANCE PERIOD: Once a year / every 100,000 km / ERROR 31 or 32 shown

The pressure sensor connection kit must be inspected for damage, disconnected from the filter, and cleaned to remove oil, grease, and residue. First, loosen the fitting connecting the pipe to the filter, remove all cable ties and disassemble the rest of the system. Perform the cleaning process and reassemble the system as instructed in par 2.4.3.

6. TROUBLESHOOTING

6.1. Symptoms and solutions

If you notice any unexpected system operation, first check the section Alarm codes, par 4. If you are still having issues, please follow the procedures listed below:

Symptom	Procedure / solution
Panel / LogBase 04 does not work	- check if engine is running - check the connection between Panel and LogBase 04 - check for the blown fuse - check the battery connection - check the system connections
Pressure sensor issues	- check if engine is running - check if the pressure sensor connection hose is damaged, clogged or has the water residue inside sensor
Temperature sensor issues	- check if engine is running - check if temperature sensor is securely attached - check if the temperature sensor is damaged, bent, broken, etc - check the temperature sensor connections
RPM issues	- check if the engine is running - if Panel displays off rpm, check if alternator factor is set up - check the RPM connection - check the alternator / generator for malfunction

Table 6.1. Troubleshooting symptoms and solutions

If you are still having the problems, please contact your distributor.

7. TECHNICAL SPECIFICATIONS

7.1. MRS LogBase 04

TECHNICAL DATA	
Housing	Waterproof cast, Plastic housing
Connector	8 pin Molex 2x4 Dual Row
Housing dimensions	130 x 87,5 x 36 mm (incl. tabs and connector)
Weight	230 g
Environmental protection	Up to IP68
Operating voltage	9 – 32 V
Overvoltage protection	≥ 33 V
Quiescent current	60 µA (12 V), 110 µA (24V)
Operating current	Up to 100mA

7.2. MRS OnRoad Panelbox

TECHNICAL DATA	
Housing	Plastic housing
Connector	RJ 45
Housing dimensions	106 x 65 x 35 mm
Weight	100 g
Environmental protection	IP44
Operating voltage	9 – 32 V
Overvoltage protection	≥ 33 V

7.3. Temperature sensor probe

TECHNICAL DATA	
Version	Stainless steel curved protection tube
Thermocouple	NiCr-Ni, type K according to DIN EN 60584, class 1
Outside material	Inconel 600, W.-Nr. 2.4816
Sensor diameter	3 mm
Probe length	40 mm
Protection tube - ***material*** - ***diameter*** - ***type*** - ***leg length***	Stainless steel W.-Nr. 1.4571 6 mm right angle bent; laser marked logo 80 mm
Protection spring	Stainless steel tension spring
Heat shrink tube	shrink 20 mm under tension spring
Connection cable	5000 mm flexible silicone thermocouple cable, 2 x 0.5 mm² Teflon insulated wires
Protection	water and oil resistant

7.4. Pressure sensor

TECHNICAL DATA	
Version	internal mounted sensor
Relative pressure range	0 – 600 mbar
Relative pressure max	3 bar
Output voltage	0.5 – 4.5 V
Input voltage	4.5 – 5.5 V
Protection	IP 65

7.5. Cable harness

TECHNICAL DATA	
Material	FLRY-B wires insulated with corrugated protection hose
Operating temperature	from -40°C to 105°C
Protection	good resistance to ozone, aging, acids and friction
Flammability	Self-extinguishing within 30 seconds

8. TECHNICAL SUPPORT

If you require our technical support, please feel free to reach us using the following:

E-mail	support@mrs-electronic.com
Website	www.mrs-electronic.com
Address	MRS ELECTRONIC GmbH & Co. KG Klaus-Gutsch-Str. 7 DE-78628 Rottweil Germany

9. TERMS OF USE

For details regarding Terms of use please refer to the MRS website (**www.mrs-electronic.com**).

10. SAFETY AND INSTALLATION INFORMATION

It is essential to fully read and understand the instructions before working with the device.
Please note and comply with the operating instructions and the information in the device datasheet, see www.mrs-electronic.com

Staff qualification: Only staff with the appropriate qualification can work on this device or in its proximity.

SAFETY

WARNING! Danger as a result of a malfunction of the entire system.

Unforeseen reactions or malfunctions of the entire system may jeopardize the safety of people or the machine.

- Ensure that the device is equipped with the correct software and that the wiring and settings on the hardware are appropriate.

WARNING! Danger as a result of unprotected moving components.

Unforeseen dangers may occur from the entire system during commissioning or maintenance.

- Switch the entire system off before carrying out any work and prevent it from unintentionally switching back on.
- Before putting the device into operation, ensure that the entire system and parts of the system are safe.

The device should never be connected or separated under load or voltage.

CAUTION! Risk of burns from the housing.

The temperature of the device housing may be elevated.

- Do not touch the housing and let all system components cool before working on the system.

PROPER USE

The device is used to control or switch one or more electrical systems or sub-systems in motor vehicles and machines and may only be used for this purpose. The device may only be used in an industrial settings.

WARNING! Danger caused by incorrect use.

The device is only intended for use in motor vehicles and machines.

- Use in safety-related system parts for personal protection is not permitted.
- Do not use the device in areas where there is a risk of explosion.

Correct use:

- operating the device within the operating areas specified and approved in the associated data sheet.
- strict compliance with these instructions and no other actions which may jeopardize the safety of individuals or the functionality of the device.

Obligations of the manufacturer of entire systems

It is necessary to ensure that only functional devices are used. If devices fail or malfunction, they must be replaced immediately.

System development, installation and commissioning of the electrical systems may only be carried out by trained and experienced staff who are sufficiently familiar with the handling of the components used and the entire system.

It is necessary to ensure that the wiring and programming of the device does not lead to safety-related malfunctions of the entire system in the event of a failure or a malfunction. System behavior of this type can lead to a danger to life or high levels of material damage.

The manufacturer of the entire system is responsible for the correct connection of the entire periphery (e.g. cable cross sections, correct selection/connection of sensors/actuators).

Opening the device, making changes to the device and carrying out repairs are all prohibited. Changes or repairs made to the cabling can lead to dangerous malfunctions. Repairs may only be carried out by MRS.

Installation

The installation location must be selected so the device is exposed to as low a mechanical and thermal load as possible. The device may not be exposed to any chemical loads.

Install the device in such a manner that the plugs are pointing downwards. This means condensation can flow off the device. Single seals on the cables/leads must be used to ensure that no water gets into the device.

COMMISSIONING

Commissioning can be done only by the qualified staff. This may only occur when the status of the entire system corresponds to the applicable guidelines and regulations.

FAULT CORRECTION AND MAINTENANCE

NOTE: **The device is maintenance-free and may not be opened.**

- If the device has damage to the housing, latches, seals or flat plugs, it must be taken out of operation.

Fault correction and cleaning work may only be carried out with the power turned off. Remove the device to correct faults and to clean it.

Check the integrity of the housing and all flat plugs, connections and pins for mechanical damage, damage caused by overheating, insulation damage and corrosion. In the event of faulty switching, check the software, switches and settings.

Do not clean the device with high pressure cleaners or steam jets. Do not use aggressive solvents or abrasive substances.

Subject to change following technical developments.

MRS ELECTRONIC GmbH & Co. KG

Klaus-Gutsch-Str. 7
DE-78628 Rottweil

www.mrs-electronic.com