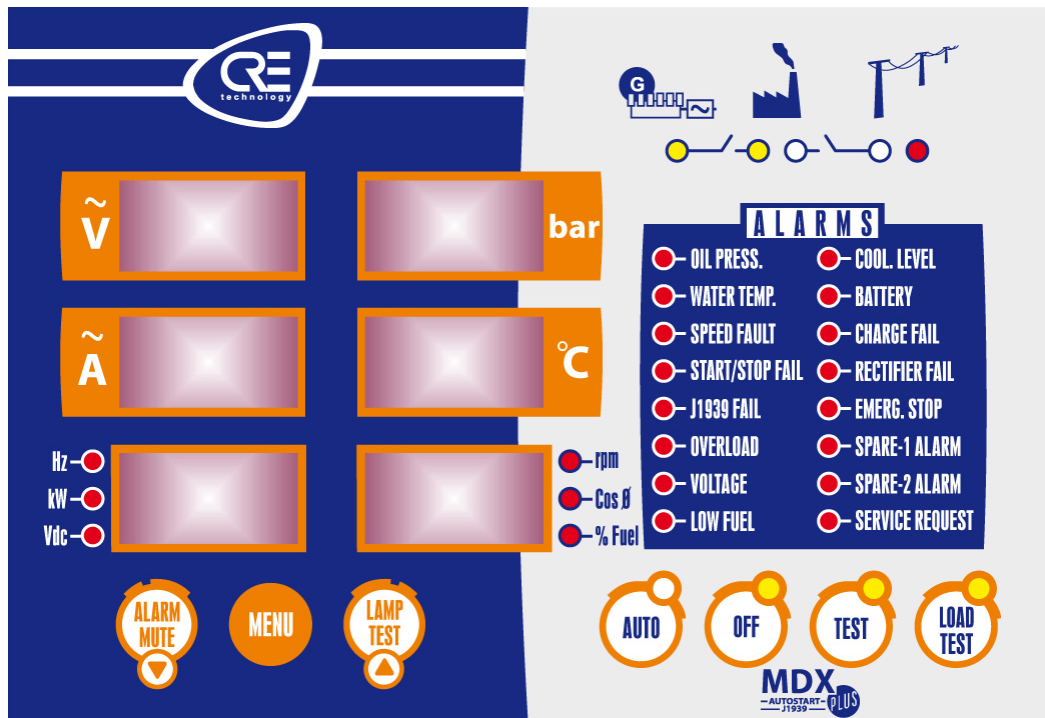




MDX PLUS J1939

December 2009



Automatic Mains Failure and Remote Start Unit

CRE Technology believes that all information provided herein is correct and reliable and reserves the right to update at any time. CRE Technology does not assume any responsibility for its use. E & O E.

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You can download this documentation and the different documentation relating to MDX PLUS J1939 on our web site: <http://www.cretechnology.com/> .

| | |
|---|--|
|  | <p>NOTE: Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Apply all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage. Contact your CRE distributor for course training.</p> |
|---|--|

The unit conforms to the EU directives
-2006/95/EC (low voltage)
-2004/108/EC (electro-magnetic compatibility)
Norms of reference:
EN 61010 (safety requirements)
EN 61326 (EMC requirements)

The CE mark indicates that this product complies with the European requirements for safety, health environmental and customer protection.

Features

| | |
|--|--|
| Automatic mains failure Engine control Generator protection Built in alarms and warning, J1939 engine monitoring and control port 3 phase mains voltage inputs 3 phase genset voltage inputs 3 phase genset CT inputs Engine oil pressure measurement Engine coolant temperature measurement Fuel level measurement Genset active power measurement Genset power factor measurement Engine rpm display Periodic maintenance request indicator Daily / weekly / monthly exerciser Engine hours counter Event logging with date and time stamp Statistical counters Battery backed-up real time clock Weekly operation schedule programs 197 programmable parameters All parameters field adjustable | RS-232 serial port Free MS-Windows Remote monitoring SW: -local, LAN, IP and modem connection -monitoring, download of parameters -networking via modems GSM-SMS sending in case of alarm Modem call in case of alarm MODBUS communication LED displays Configurable analogue inputs: 3 Configurable digital inputs: 8 Configurable relay outputs: 2 Total relay outputs: 6 Output expansion capability Remote Start operation available Mains simulation input Engine Idle speed control Survives cranking dropouts Sealed front panel Plug-in connection system for easy replacement Small dimensions (190x135x48mm) Low cost |
|--|--|

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1 Installation

1.1 Introduction to the Control Panel

The unit is a control and protection panel used in gensets. It shows the measured values on its displays. The unit is designed to provide user friendliness for both the installer and the user. Programming is usually unnecessary, as the factory settings have been carefully selected to fit most applications. However programmable parameters allow the complete control over the generating set. Programmed parameters are stored in a Non Volatile Memory and thus all information is retained even in the event of complete loss of power.

The measured parameters are:

| | |
|----------------------------------|----------------------|
| Mains voltage phase R to neutral | Gen current phase V |
| Mains voltage phase S to neutral | Gen current phase W |
| Mains voltage phase T to neutral | Gen frequency |
| Mains voltage phase R-S | Engine speed (rpm) |
| Mains voltage phase S-T | Gen total KW |
| Mains voltage phase T-R | Gen total cos Φ |
| Gen voltage phase U to neutral | Battery voltage, |
| Gen voltage phase V to neutral | Coolant temperature |
| Gen voltage phase W to neutral | Oil pressure |
| Gen voltage phase U-V | Fuel level |
| Gen voltage phase V-W | Gen frequency |
| Gen voltage phase W-U | |
| Gen current phase U | |

1.2 Mounting the unit

The unit is designed for panel mounting. The user should not be able to access parts of the unit other than the front panel.

Mount the unit on a flat, vertical surface. The unit fits into an opening of 116x86 millimeters. Before mounting, remove the retaining steel spring and connectors from the unit, then pass the unit through the mounting opening. The unit will be maintained in its position by the steel spring.



Engine body must be grounded for correct operation of the unit, otherwise incorrect voltage and frequency measurements may occur.

The output of the current transformers shall be 5 Amperes. The input current rating of the current transformers may be selected as needed (between 10/5 and 9000/5 amps). Current transformer outputs shall be connected by separate cable pairs from each transformer, to related inputs. Never use common terminals or grounding. The power rating of the transformer should be at least 5 VA. It is recommended to use 1% precision transformers.

If analogue senders (e.g. temperature or oil pressure) are connected to the unit, it is not possible to use auxiliary displays, otherwise the unit may be destroyed. If temperature or oil pressure displays are already present on the generator control panel, do not connect the senders to the unit. The unit is factory programmed for VDO type senders. However different types of senders are selectable via programming menu. Please check the programming section.

The programmable digital inputs are compatible with both '**normally open**' and '**normally closed**' contacts, switching either to **BAT-** or **BAT+**.

The charge alternator connection terminal provides also the excitation current, thus it is not necessary to use an external charge lamp.

1.3 Wiring the unit



WARNING: THE UNIT IS NOT FUSED.

Use external fuses for

Mains phases: R-S-T

Generator phase: U

Battery positive: BAT (+).

Install the fuses as near as possible to the unit in a place easily accessible for the user.

The fuse rating should be 6 Amps.



WARNING: ELECTRICITY CAN KILL

ALWAYS disconnect the power BEFORE connecting the unit.



ALWAYS remove the plug connectors when inserting wires with a screwdriver.

ALWAYS refer to the National Wiring Regulations when conducting installation.

An appropriate and readily accessible set of disconnection devices (e.g. automatic fuses) MUST be provided as part of the installation.

The disconnection device must NOT be fitted in a flexible cord.

The building mains supply MUST incorporate appropriate short-circuit backup protection (e.g. a fuse or circuit breaker) of High Breaking Capacity (HBC, at least 1500A).

Use cables of adequate current carrying capacity (at least 0.75mm²) and temperature range.

2 Inputs and outputs

RS-232 SERIAL PORT: This connector provides serial data input and output for various purposes like remote monitoring and remote programming.

EXTENSION CONNECTOR: This connector is intended for the connection to output extension modules. The optional relay extension module provides 8 programmable 16A relay outputs. The unit allows the use of up to 2 I/O extension modules.

| Term | Function | Technical data | Description |
|------|-----------------------------|-----------------------------------|---|
| 1 | GENERATOR CONTACTOR | Relay output, 16A-AC | This output provides energy to the generator contactor. If the generator phases do not have acceptable voltage or frequency values, the generator contactor will be de-energized. In order to provide extra security, the normally closed contact of the mains contactor should be serially connected to this output. |
| 2 | U | Generator phase inputs, 0-300V-AC | Connect the generator phases to these inputs. The generator phase voltages upper and lower limits are programmable. |
| 3 | V | | |
| 4 | W | | |
| 5 | GENERATOR NEUTRAL | Input, 0-300V-AC | Neutral terminal for the generator phases. |
| 6 | MAINS NEUTRAL | Input, 0-300V-AC | Neutral terminal for the mains phases. |
| 7 | T | Mains phase inputs, 0-300V-AC | Connect the mains phases to these inputs. The mains voltages upper and lower limits are programmable. |
| 8 | S | | |
| 9 | R | | |
| 10 | MAINS CONTACTOR | Relay output, 16A-AC | This output provides energy to the mains contactor. If the mains phases do not have acceptable voltages, the mains contactor will be de-energized. In order to provide extra security, the normally closed contact of the generator contactor should be serially connected to this output. |
| 11 | GROUND | 0 VDC | Power supply negative connection. |
| 12 | BATTERY POSITIVE | +12 or 24VDC | The positive terminal of the DC Supply shall be connected to this terminal. The unit operates on both 12V and 24V battery systems. |
| 13 | FUEL LEVEL SENDER | Input, 0-5000 ohms | Analogue fuel level sender connection. Do not connect the sender to other devices. The input is programmed VDO type senders. |
| 14 | OIL PRESSURE SENDER | Input, 0-5000 ohms | Analogue oil pressure sender connection. Do not connect the sender to other devices. The input has programmable characteristics and connects to any kind of sender. |
| 15 | COOLANT TEMP. SENDER | Input, 0-5000 ohms | Analogue high temperature sender connection. Do not connect the sender to other devices. The input has programmable characteristics and connects to any kind of sender. |
| 16 | CHARGE | Input and output | Connect the charge alternator's D+ terminal to this terminal. This terminal will supply the excitation current and measure the voltage of the charge alternator. |

| Term | Function | Technical data | Description |
|------|-----------------------|-----------------------------------|--|
| 17 | RELAY-2 (ALARM RELAY) | Output 10A/28VDC | This relay has programmable function, selectable from a list. |
| 18 | RELAY-1 (STOP RELAY) | Output 10A/28VDC | This relay has programmable function, selectable from a list. |
| 19 | CRANK RELAY | Output 10A/28VDC | This relay controls the engine cranking. |
| 20 | FUEL RELAY | Output 10A/28VDC | This relay is used for fuel solenoid control. It is internally connected to terminal 16 for supplying the charge alternator's excitation current. |
| 21 | EMERGENCY STOP | Digital inputs | These inputs have programmable characteristics selected via the program menu. Each input may be driven by a ' normally closed ' or ' normally open ' contact, switching either battery+ or battery- . The effect of the switch is also selectable from a list. See PROGRAMMING section for more details. |
| 22 | SPARE-2 | | |
| 23 | PROGRAM LOCK | | |
| 24 | SPARE-1 | | |
| 25 | COOLANT LEVEL | | |
| 26 | HIGH TEMP | | |
| 27 | LOW OIL PRESSURE | | |
| 28 | RECTIFIER FAIL | | |
| 29 | CURR_U+ | Current transformer inputs, 5A-AC | Connect the generator current transformer terminals to these inputs. Do not connect the same current transformer to other instruments otherwise a unit fault will occur. Connect each terminal of the transformer to the unit's related terminal. Do not use common terminals. Do not use grounding. Correct polarity of connection is vital. If the measured power is negative, then change the polarity of each 3 current transformers. The rating of the transformers should be the same for each of the 3 phases. The secondary winding rating shall be 5 Amperes. (For ex. 200/5 Amps). |
| 30 | CURR_U- | | |
| 31 | CURR_V+ | | |
| 32 | CURR_V- | | |
| 33 | CURR_W+ | | |
| 34 | CURR_W- | | |
| 37 | J1939 + (CAN-H) | Digital communication port | Connect the J1939 port of an electronic engine to these terminals. The 120 ohm terminating resistors are inside the unit. Please do not connect external resistors. Use a twisted cable pair or coaxial cable for best results. |
| 38 | J1939 - (CAN-L) | | |

Table 1 - Inputs and outputs

3 Displays

3.1 LED displays

The unit has 31 LEDs, divided in 4 groups:

- Group_1:** Operating mode: This group indicates the genset function.
- Group_2:** Mimic diagram: This group indicates the current status of the mains and genset voltages and contactors.
- Group_3:** Warnings and alarms: This group indicates the existence of abnormal conditions encountered during operation.
- Group_4:** Unit: This group indicates the unit of the value displayed in the bottom display.

| Function | Color | Description |
|------------------------|--------|--|
| MAINS ON | Green | The LED will turn on when all 3 mains phase voltages are within the limits. |
| MAINS OFF | Red | The LED will turn on when at least one of the mains phase voltages is outside limits. |
| GENERATOR | Yellow | The LED will turn on when all 3 generator phase voltages are within the programmed limits. |
| LOAD GENERATOR | Yellow | It turns on when the generator contactor is activated. |
| LOAD MAINS | Green | It turns on when the mains contactor is activated. |
| LOAD TEST | Yellow | It turns on when the related operation mode is selected. One of these LEDs is always on and indicates which operation mode is selected. If the operation of the genset is disabled by the weekly operation schedule , then the AUTO led will flash. |
| TEST | Yellow | |
| OFF | Yellow | |
| AUTO | Green | |
| SERVICE REQUEST | Red | Engine periodic maintenance request indicator. It turns on when the preset engine hours or time duration after previous service has elapsed. |
| ALARM GROUP | Red | If a fault condition resulting to the engine shutdown has occurred, the related alarm led turns on steadily. If a warning condition has occurred, the related led flashes. The alarms work on a first occurring basis. The occurrence of a fault will disable other faults of lower or equal priority. |
| UNIT GROUP | Red | This group indicates the unit of the value displayed in the bottom displays. Different values may be scrolled by pressing the MENU key. |

Table 2 - LED Displays

3.2 Digital displays

The unit has 6 seven segment displays. They show:

- Measured parameters,
- Service counters,
- Statistical counters,
- Software version,
- Event records,
- J1939 engine fault codes,
- Program parameters.

The navigation between different screens in a group is made with the **MENU** button. Holding the **MENU** button pressed for 1 second makes the display to switch to the next group.

VOLTAGE DISPLAY: This display shows:

- phase R voltage if the load is on mains
- Phase U voltage if the load is on the genset

By pressing the MENU key, below values may be displayed:

- (R-S-T) mains phase to neutral voltages
- (U-V-W) generator phase to neutral voltages
- (RS-ST-TR) mains phase to phase voltages
- (UV-VW-WU) generator phase to phase voltages

If the service counters group is displayed, then this display will show the counter name.
In programming mode it displays **(PGM)**.

CURRENT DISPLAY: This display will show the current values measured using the current transformers. Using the programming menu, current transformers within the range of 10/5A to 9000/5A may be programmed.
In programming mode it displays the program number.

OIL PRESSURE DISPLAY: This display will show the oil pressure value measured using the sender.

TEMPERATURE DISPLAY: This display will show the coolant temperature value measured from the sender.

MULTIFUNCTION DISPLAY (LEFT/UPPER): By pressing the MENU key below values may read:

- generator frequency (Hz)
- generator active power (KW)
- battery voltage (V-DC),

In programming mode it displays the program value.

MULTIFUNCTION DISPLAY (RIGHT/LOWER): By pressing the MENU key below values may read:

- engine speed (rpm)
- generator $\cos\Phi$
- fuel level (%)

DISPLAY SUMMARY

| GROUP | CONTENT |
|--------------------------|--|
| Measured parameters | Voltages: R-S-T-U-V-W-RS-ST-TR-UV-VW-WU Currents: A1-A2-A3 Oil pressure, coolant temperature, fuel level, battery voltage Engine speed, genset frequency, genset active power, genset power factor |
| Statistics | Engine hours run, Engine hours to service, Time to service, Date-time, Software version. |
| J1939 engine fault codes | Maximum 8 fault codes can be displayed. Each fault code is represented by an SPN-FMI pair. If the SPN number is 0, it means that there is no failure. The meaning of the fault codes is given in the engine manufacturers user manual. Please review chapter 7 of this manual for a general list of fault codes. |
| Event records | The records of last 32 events are displayed. Each event record consists of date-time information and the event code. For more details please review chapter 10 of this manual. |

Table 3 - Display summary

4 Alarms and warnings

Alarms indicate an abnormal situation in the generating set are divided into 3 priority levels:

ALARMS: These are the most important fault conditions and cause:

The related alarm led to be on steadily,

The genset contactor to be released immediately,

The engine to be stopped immediately,

The **Horn, Alarm, Alarm+Load_dump** and **Alarm+Load_dump+Warning** relays output to operate, (if selected via programming menu)

LOAD_DUMPS: These fault conditions cause:

The related alarm led to be on steadily,

The genset contactor to be released immediately,

The engine to be stopped after Cooldown period,

The **Horn, Alarm+Load_dump** and **Alarm+Load_dump+Warning** relays output to operate, (if selected via programming menu)

WARNINGS: These conditions cause:

The related alarm led to flash,

The **Horn** and **Alarm+Load_dump+Warning** relay outputs to operate, (if selected via programming menu)

If the ALARM MUTE button is pressed, the Horn relay output will be deactivated; however the existing alarms will persist and disable the operation of the genset.

Alarms operate in a first occurring basis:

-If an alarm or load_dump is present, following alarms, load_dumps and warnings will not be accepted,

-If a warning is present, following warnings will not be accepted.

Alarms may be of LATCHING type following programming. For latching alarms, even if the alarm condition is removed, the alarms will stay on and disable the operation of the genset. The existing **alarms may be canceled** by pressing one of the operating mode buttons (**LOAD TEST / TEST / OFF / AUTO**).

Most of the alarms have programmable trip levels. See the programming chapter for adjustable alarm limits.

LOW OIL PRESSURE: Set if a signal is detected at the Low Oil Pressure Switch input or the oil pressure value measured from the sender is below the programmed limit. **Warning (P_015)** and **alarm (P_016)** limits are separately programmable for the oil pressure sender input. This fault will be monitored with holdoff timer (**P_023**) delay after the engine is running. Also if the oil pressure switch is open at the beginning of a start attempt, then the engine will not be started and the oil pressure led will flash. When the oil pressure switch closes normal operation will be resumed.

HIGH TEMPERATURE: Set if a signal is detected at the High Temperature Switch input or the coolant temperature value measured from the sender is above the programmed limit. **Warning (P_017)** and **alarm (P_018)** limits are separately programmable for the temperature sender input.

SPEED: Set if the generator frequency is outside programmed limits (overspeed/Underspeed). This fault will be monitored with holdoff timer (**P_023**) delay after the engine is running. Different low and high limits for warning and alarm are separately programmable. (P_008/P_009/P_010/P_011)

START FAIL (alarm): Set if the engine is not running after programmed number of start attempts. (**P_035**)

STOP FAIL (warning): Set if the engine has not stopped before the expiration of the **Stop Timer (P_034)**.

OVERLOAD: Set if at least one of the genset phase currents goes over the **Overcurrent Limit (P_002)** or if the genset power (KW) supplied to the load goes over the **Excess Power (P_003)** limit for **Overcurrent / Excess Power Timer (P_24)**. If the currents and power goes below the limits before expiration of the timer then no alarm will be set.

VOLTAGE: Set if any of the generator phase voltages goes outside programmed limits (P_006/P_007). This fault will be monitored with holdoff timer (**P_023**) delay after the engine is running.

LOW FUEL: Set when the fuel level falls below 10%.

COOLANT LEVEL: Set when a signal is detected from the coolant level switch input.

BATTERY: Set if the battery voltage goes outside programmed limits. During engine cranking this fault is not monitored. Warning level for low battery voltage (P_012) and both warning (P_013) and alarm (P_014) levels for high battery voltage are programmable.

CHARGE: Set if a charge alternator failure (or broken belt) occurs. This fault condition may result to a **warning** or **alarm** following programming. (P_038)

RECTIFIER FAIL: Set if a signal is detected at the rectifier fail input. This input is only monitored when mains voltages are present.

EMERGENCY STOP: Set if a signal is detected at the emergency stop input.

SPARE-1 / SPARE-2: Set if a signal is detected from the related spare fault input.

ECU FAIL (warning): Set when an engine fault code is received from the ECU of the electronic engine. This fault will not cause an engine stop. If necessary, the engine will be stopped by the ECU.

ECU FAIL (alarm): Set if no information has been received during 3 seconds from the ECU of the electronic engine. This fault condition is only controlled if fuel is on.

5 Modes of operation

The modes of operation are selected by pushing the front panel keys. Changing the operation mode while the genset is running will result to a behavior suitable for the new operating mode. For example, if the LOAD TEST mode is selected when genset is running at TEST mode, then the genset will take the load.

OFF: In this mode, the mains contactor will be energized if mains phase voltages are within the programmed limits. The engine will be stopped.

AUTO: It is used for genset and mains automatic transfer. If at least one of the mains phase voltages is outside limits (P_004/P_005), the mains contactor will be deactivated.

The diesel will be started for programmed times (P_035) after the wait period (P_0026). When the engine runs, the crank relay will be immediately deactivated. The engine will run without load during engine heating period (P_029). After this, if alternator phase voltages and frequency are within limits, then the unit will wait for the generator contactor period (P_032) and the generator contactor will be energized.

When all the mains phase voltages are within the limits, the engine will continue to run for the mains waiting period (P_030). At the end of this period the generator contactor is deactivated and the mains contactor will be energized. If a cooling period is given (P_031), the generator will continue to run during cooling period. At the end of the period, the fuel solenoid will be de-energized and the diesel will stop. The unit will be ready for the next mains failure.

If the operation of the genset is disabled by the **weekly schedule**, then the **AUTO** led will flash, and the operation of the genset will be as in the **OFF** mode.

TEST: It is used to test the generator when the mains are on, or keep the generator running in the emergency backup mode (P_041). The operation of the generator is similar to the AUTO mode, but the mains contactor will not be deactivated if the mains are not off. If the mains are off, mains contactor will be deactivated and the generator contactor will be activated. When the mains are on again, a changeover to the mains will be made, but the engine will be kept running unless another mode is selected. To stop the engine, select **AUTO** or **OFF** mode.

LOAD TEST: It is used to test the genset under load. Once this mode is selected, the engine will run and the load will be transferred to the genset. The genset will feed the load indefinitely unless another mode is selected.

6 Other features

6.1 Remote start operation

The unit offers the possibility of **REMOTE START** mode of operation. If the program parameter **P_042** is set to **1** then the unit will enter to the Remote Start operation. The Remote Start signal should be connected to the **SPARE_2 (35)** input.

The REMOTE START signal may be a NO or NC contact, switching to either battery positive or battery negative. These selections are made using programming menu.

It is also necessary to set the program parameter **P_139** to **3** in order to prevent the alarms generated from this input.

In this mode the mains phases are not monitored. If the REMOTE START signal is present then the mains will be supposed to fail, inversely if the REMOTE START signal is absent, then mains voltages will be supposed to be present. The front panels mimic diagram's mains LEDs will reflect the status of the REMOTE START input.

6.2 Sender type selection

The unit has the ability to adapt to any type of oil pressure and temperature senders. The commonly used standard sender characteristics are recorded in memory and selectable from a list. However non standard senders may also be used by entering their characteristics to the table.

Oil Pressure Sender Type Selection:

The oil pressure sender is selected using parameter P_019. The selectable sender types are:

0: The sender characteristics are defined in table using parameters P_151 to P_162.

1: VDO 0-7 bars (10-180 ohms)

2: VDO 0-10 bars (10-180 ohms)

3: DATCON 0-7 bars (240-33 ohms)

4: DATCON 0-10 bars (240-33 ohms)

5: DATCON 0-7 bars (0-90 ohms)

6: DATCON 0-10 bars (0-90 ohms)

7: DATCON 0-7 bars (75-10 ohms)

Temperature Sender Selection:

The temperature sender is selected using parameter P_020. The selectable sender types are:

0: The sender characteristics are defined in table using parameters P_163 to P_174.

1: VDO

2: DATCON DAH type

3: DATCON DAL type

Fuel Level Sender Selection:

The fuel level sender input is factory set for VDO 0-100% (10-180 ohms) and not adjustable.

6.3 Engine heating operation

Especially on engine without a body heater, or with a failing one, it may be desired that the genset should not take the load before reaching a suitable temperature. The unit offers 2 different ways of engine heating.

1. Timer controlled heating:

This operation mode is selected when the parameter **P_037** is set to **0**. In this mode, the engine will run during parameter **P_029**, and then the genset will take the load.

2. Timer and temperature controlled heating:

This operation mode is selected when the parameter **P_037** is set to **1**. In this mode, at first the engine will run during parameter **P_029**, then it will continue to run until the measured coolant temperature reaches the limit defined in parameter **P_022**. When the requested temperature is reached, the load will be transferred to the genset. This operation mode may be used as a backup to the engine body heater. If the engine body is warm the heating will be skipped.

6.4 Engine idle operation

It may be required that the engine runs at the idle speed for a programmed duration for heating. The idle operation duration is adjusted with the parameter **P_055**. The idle speed will be set by the governor control unit of the engine.

Any of the spare relay outputs may be assigned as **IDLE output** using program parameters **P_085/P_086**. Also relays on an extension module may be assigned to this function.

6.5 Engine block heater

The unit is able to provide a relay output in order to drive the block heater resistor.

The temperature reference is the coolant temperature measured from the the analog sender input.

The block heater relay function may be assigned to spare relays using program parameters **P_085/P_086**. Also relays on an extension module may be assigned to this function.

The engine body temperature limit is adjusted using the parameter **P_022**. The same parameter is used for engine heating operation.

The relay will become active if the body temperature falls to 4 degrees below the limit set by **P_022**. It turns off when the body temperature exceeds **P_022**.

6.6 Fuel pump control

The unit is able to provide a relay output in order to drive the fuel pump motor. The fuel pump is used in order to transfer fuel from the large capacity main tank (if exists) to the genset daily tank which is generally integrated in the chassis and has a limited capacity.

The fuel level reference is measured through the analog fuel level sender. When the measured fuel level falls to 25 % the fuel pump relay output will operate. When the fuel level reaches 75 % the relay will turn off. Thus the chassis fuel tank level will be always kept between $\frac{1}{4}$ and $\frac{3}{4}$.

The fuel pump relay function may be assigned to spare relays using program parameters **P_085/P_086**. Also relays on an extension module may be assigned to this function.

6.7 Mains simulation

The unit offers an optional **SIMULATE MAINS** signal input. If the program parameter **P_050** is set to **1** then the **SPARE_2 (35)** input will be used for mains simulation.

It is also necessary to set the program parameter **P_139** to **3** in order to prevent any alarm generated from this input.

The **SIMULATE MAINS** signal may be a NO or NC contact, switching to either battery positive or battery negative. These selections are made using the programming menu.

If the program parameter **P_050** is set to **1** and the input signal is active, the mains phases are not monitored and supposed to be inside limits. This will prevent the genset from starting even in case of a mains failure. If the genset is running when the signal is applied, then usual Mains Waiting and Cooldown cycles will be performed before engine stop. When the **SIMULATE MAINS** signal is present, the front panels mimic diagram's mains LEDs will reflect the mains voltages as present.

When the signal is passive, the unit will revert to normal operation and monitor the mains voltage status.



The **REMOTE START** operation overrides **SIMULATE MAINS** operation. When both parameters **P_042** and **P_050** are set then **REMOTE START** operation mode is performed.

6.8 Dual Genset intermittent operation

Dual genset intermittent operation consists of regular switching of the load between 2 gensets. The use of 2 gensets instead of one is due either to safety purposes in case of a genset failure or to a continuous operation requesting service stops.

The running period for each genset is adjustable between 0 and 144 hours using parameter **P_047**. If the time is adjusted as 0 hours, it will be actually set to 2 minutes for faster testing purpose.

A flashing relay output function is provided, based on the parameter P_047. Each time the period programmed using P_047 elapses, the relay output will change position.

The flashing relay function may be assigned to spare relays using program parameters **P_085/P_086**. Also relays on an extension module may be assigned to this function.


The dual genset intermittent operation uses also the **Mains Simulation** feature. Please review chapter **6.7** for a detailed explanation of this feature.

Please contact CRE Technology for a complete application manual.

6.9 Service request display

This led is designed to help the periodic maintenance of the genset to be made consistently.

The periodic maintenance is basically carried out after a given engine hours (for example 200 hours), but even if this amount of engine hours is not fulfilled, it is performed after a given time limit (for example 12 months).

| | |
|--|--|
|  | The SERVICE REQUEST led has no effect on the genset operation. |
|--|--|

The unit has both programmable engine hours and maintenance time limit. The engine hours is programmable with 50-hour steps (**P_044**), the time limit is programmable between with 1 month steps (**P_045**). If any of the programmed values is zero, this means that the parameter will not be used. For example a maintenance period of 0 months indicates that the unit will request maintenance only based on engine hours, there will be no time limit. If the engine hours is also selected as 0 hours this will mean that the SERVICE REQUEST display will be inoperative.

When the engine hours **OR** the time limit is over, the **SERVICE REQUEST** led (red) will start to flash and the service request relay function will be active.

The service request relay function may be assigned to spare relays using program parameters **P_085/P_086**. Also relays on an extension module may be assigned to this function.

To turn off the led, and reset the service period, press together the ALARM MUTE and LAMP TEST keys for 5 seconds. The upper display will show “SER”.

The remaining engine hours and the remaining time limit are kept stored in a non-volatile memory and are not modified by power supply failures.

The remaining time and engine hours to service may be checked via the statistics menu selected by pressing the **MENU** key for **1 second**.

For the engine hours, the first display will show “**Hts**” (hours to service). The second display will show the first 3 digits of the engine hours to service and the third display the last 3 digits.

For the time, the first display will show “**tts**” (time to service). The second display will show the first 3 digits of days to service and the third display the last 3 digits.

6.10 Engine hour meter

The unit features a non-erasable incremental engine hour meter. The hour meter information is kept in a non-volatile memory and is not modified by power supply failures.

The engine hours may be displayed via the statistics menu selected by pressing the **MENU** key for **1 second**.

When the MENU key is pressed the display will show “**EnH**” (engine hours). When the MENU key is released it will show the first 3 digits of the engine hours. When the MENU key is pressed again, the display will show “**EnH**” (engine hours). When the MENU key is released it will show the last 3 digits of the engine hours.

6.11 Date and time display

The date & time display is provided for verification. The date & time display is selected by pressing the MENU button twice after the statistics group is selected by holding the MENU button pressed.

6.12 Software version display

Some additional features are installed within consecutive software releases. In order to be sure of the validity of the status of the unit, the software version needs to be known.

The software version display is selected by pressing 3 times the MENU button after the statistics group is selected by holding the MENU button pressed.

The software version consists of 2 numbers. The first number represents the operation software version and the second number represents the J1939 software version.

6.13 Modem connection

The unit is capable of making modem calls in case of alarm, as well as answering modem calls made from a remote location. **GSM** modems as well as classic cable network (**PSTN**) modems are acceptable.

If the modem is connected to the unit, the program parameter **P_043** should be set to 1, otherwise faulty operation may occur. If the parameters P_043 or P_056 are different from zero, the local PC connection will not work.

A maximum of 2 telephone numbers can be defined for outgoing modem calls. In case of alarm, the unit will attempt to reach control centers associated with each number. In case of modem connection failure, the call will be repeated up to 30 times with 2 minute intervals.



If SMS message sending is enabled, then only the first telephone number will be used for modem calls.

Telephone numbers can only be entered from the PC. They cannot be entered from the front panel.

Advised modems are CRE Technology types which are powered up from the same DC battery voltage than the unit. Most of other desktop modems with standard AT commands are also usable, but it is the user's responsibility to provide an uninterrupted AC supply source to the modem. The necessary modem cable will be supplied by CRE Technology.

Modem calls are always terminated by the central RAINBOW software. However the unit does not allow connection durations exceeding 2 minutes, and hangs up the modem when this period expires.

The PC program used for remote monitoring and programming is the same RAINBOW software used for RS-232 connection.

Please note that the modem operation is also compatible with the MODBUS communication. Thus the unit can initiate and receive calls to/from a MODBUS master station. Please review chapter_8 for more details on MODBUS communication.

6.14 SMS message sending

The GSM SMS message sending is activated by setting the program parameter **P_056=1**. When the GSM SMS mode is activated, the PC connection will not work. If a local PC connection is necessary, the parameters **P_043** and **P_056** should be set to 0.

When a fault condition occurs, the unit will compose an SMS message and will send it to the second phone number. The telephone number can only be entered from the PC. It cannot be entered from the front panel. The maximum number of alarms transmitted in a SMS message is 6. This limitation is due to the maximum length of an SMS message which is 160 characters.

A sample GSM SMS message is given below:

| |
|---|
| <pre>A60xxx <SITE-ID> STOP :LOW OIL PR. STOP :HIGH TEMP. STOP :EMERG.STOP STOP :COOL.LEVEL WARNING :ECU WARN. END OF ALARM LIST</pre> |
|---|

Table 4 - SMS message sample

The first line of the message carries information about the unit type and the site identity string. This string can only be entered from the PC. It cannot be entered from the front panel. This line is intended for the correct identification of the genset.

Each following line will give one fault information. The message will always be terminated by the “**END OF ALARM LIST**” string.

When the message is sent, the existing alarms will be masked, causing the audible alarm relay to release and preventing more GSM SMS messages. Any new upcoming alarm will result in a new GSM SMS message. The new message will indicate all existing alarms, even masked ones.

The necessary GSM modem cable will be supplied by CRE Technology. This is the same cable as cable modems.

6.15 Remote monitoring and programming

Thanks to its standard serial RS-232 port, the unit offers the remote monitoring and programming feature. The remote monitoring and programming PC software is called RAINBOW and is available from your distributor.

The modem and SMS modes are not compatible with the local PC connection. Program parameters **P_043** and **P_056** should be set to 0 before connection.

The RAINBOW software allows the visualization and recording of all measured parameters. The recorded parameters may then be analyzed graphically and printed. The software also allows the programming of the unit and the storage of the program parameters to PC or the downloading of stored parameters from PC to the unit.

For PCs without a serial port, below USB to serial adapters are tested and approved :

DIGITUS USB 2.0 TO RS-232 ADAPTER (PRODUCT CODE: DA70146 REV 1.1)

DIGITUS USB 1.1 TO RS-232 ADAPTER (PRODUCT CODE: DA70145 REV 1.1)

FLEXY USB 1.1 TO SERIAL ADAPTER (PRODUCT CODE BF-810)

CASECOM USB TO SERIAL CONVERTER (MODEL: RS-01)

The necessary PC connection cable will be supplied by CRE Technology.

6.16 Exerciser

The unit offers automatic exerciser operation. The exercise operation may be done on a daily, weekly or monthly basis.

The start day and time of the exercise is programmable as well as its duration. The exercise may be done with or without load following programming.

The program parameters related to the exerciser are:

P_175: Exercise start day and hour

P_176: Exercise duration

P_177: Exercise off_load/on_load

P_178: Daily / Weekly / Monthly Exercise

Please refer to the programming section for a more detailed description of the above parameters.

When the start day and hour of exercise has come, the unit will automatically switch to either **TEST** or **LOAD TEST** mode. The engine will run and if the on_load exercise is selected then the load will be transferred to the genset.

If a mains failure occurs during the off-load exercise, the load will not be transferred to the genset unless the **Emergency Backup Operation** is allowed by setting the parameter **P_041** to 1. Thus it is highly recommended that the Emergency Backup mode enabled with off-load exerciser.

At the end of the exercise duration, the unit will switch back to the initial mode of operation.

If any of the mode selection keys are pressed during exercise, then the exercise will be ended.

Using the daily exercise mode, the unit may feed the load from the genset during predefined hours of the day. This operation may be used in high tariff periods of the day.

6.17 Return to factory settings

In order to resume to the factory set parameter values:

-hold pressed the **OFF** and **ALARM MUTE** buttons for 5 seconds, “**res**” will be displayed

-press and hold pressed the **ALARM MUTE** button for 5 seconds, factory set values will be reprogrammed to the parameter memory. Displays may flash during the operation.

It is not possible to revert back to the user parameters.

6.18 Gas engine fuel solenoid control

The unit provides a special function for the fuel solenoid control of a gas engine.

The fuel solenoid of a gas engine is different from a diesel engine. It should be opened after the cranking has been started and should be closed between crank cycles. The delay between the crank start and solenoid opening is adjusted using the parameter **P_60**.

The gas engine fuel solenoid relay function may be assigned to spare relays using value **(54)** in spare relay parameters (**P_085** and **P_086**). Also relays on an extension module may be assigned to this function.

7 J1939 Engine monitoring and control port

The unit offers a special J1939 port in order to communicate with electronic engines controlled by an **ECU** (electronic control unit).

The J1939 port consists of 2 terminals which are **J1939+** and **J1939-**. The connection between the unit and the engine should be made with either a twisted cable pair or a coaxial cable. If a coaxial cable is used, the external conductor should be grounded at one end only.

The **120 ohms** termination resistor is included inside the unit. Please do not connect external resistor.

The J1939 port is activated by setting the parameter **P_051=1**. The engine type should be selected using parameter **P_052**. The list of available engines is given at the programming section. Please contact CRE Technology for the most current list of engines.

If the J1939 port is enabled (**P_51=1**) then the **oil pressure**, the **coolant temperature** and the **engine speed** information are picked up from the **ECU** unit. Other available measurements of the engine are not displayed by the unit, but they are available for PC and MODBUS communications. Please check the chapter 8 for more details.

When the fuel output is active, if no information is received from the ECU during last 3 seconds, then the unit will give a **ECU FAIL** alarm and stop the engine. This feature prevents uncontrolled engine operation.

The **fault conditions of an electronic engine** are considered by the unit as **warnings** and do not cause engine stop. The engine is supposed protected by the ECU which will stop it when necessary.

The electronic engine **fault codes** are displayed on the unit as **SPN-FMI** pairs. A maximum of 8 fault codes can be displayed.

The fault code group is displayed by holding pressed the MENU button after the statistics screen has been reached. If there is no failure, no number will be displayed. The complete list of fault codes is given in the engine manufacturer's user manual.

Below is a basic list of fault conditions (x denotes any FMI)

| SPN | FMI | DESCRIPTION |
|-----|-----|---|
| 94 | x | Fuel filter restriction Ffuel pressure sensor fail |
| 98 | x | Low oil level High oil level Oil level sensor fail |
| 100 | x | Low oil pressure Oil pressure sensor fail |
| 102 | x | High boost pressure Turbo outlet pressure sensor fail |
| 105 | x | Intake manifold temp high Intake manifold temp sensor fail |
| 107 | x | Air filter restriction Air filter sensor fail |
| 108 | x | Atmospheric pressure sensor fail |
| 110 | x | High coolant temperature Coolant temperature sensor fail |
| 111 | x | Low coolant level Coolant level sensor fail |
| 164 | x | High injector activation pressure Injector activation pressure sensor fail |
| 168 | x | Battery voltage failure |
| 172 | x | High inlet air temperature High inlet manifold air temperature |

| | | |
|------|---|---|
| | | Inlet manifold air temperature sensor fail |
| 174 | x | High fuel temperature Fuel temperature sensor fail |
| 175 | x | High oil temperature Oil temperature sensor fail |
| 190 | x | Overspeed Speed sensor loss of signal Speed sensor mechanical failure |
| 228 | x | Timing calibration required |
| 234 | x | Incorrect ecm software |
| 620 | x | ECU internal +5V fail |
| 629 | x | ECU hardware fail |
| 651 | x | Injector cylinder #1 fault |
| 652 | x | Injector cylinder #2 fault |
| 653 | x | Injector cylinder #3 fault |
| 654 | x | Injector cylinder #4 fault |
| 655 | x | Injector cylinder #5 fault |
| 656 | x | Injector cylinder #6 fault |
| 657 | x | Injector cylinder #7 fault |
| 657 | x | Injector cylinder #8 fault |
| 678 | x | ECU internal power supply fail |
| 723 | x | Secondary engine speed sensor fail |
| 1108 | x | Critical override enabled |
| 1111 | x | Check configuration parameters |
| 2000 | x | ECU failure |

Table 5 - J1939 fault conditions

Below is a basic list of FMI codes.

Please be aware that these codes may differ slightly depending on the engine brand and model.

| FMI | DESCRIPTION |
|------------|--|
| 0 | Value too high" Valid data, but above the normal working range |
| 1 | "Value too low" Valid data, but below the normal working range |
| 2 | "Faulty data" Intermittent or faulty data or Short circuit to battery voltage, injector high voltage side |
| 3 | "Electrical fault" Abnormally high voltage or short circuit to battery voltage, injector low voltage side |
| 4 | "Electrical fault" Abnormally low voltage or short circuit to battery negative, injector low voltage or high voltage side |
| 5 | "Electrical fault" Abnormally low current or open circuit |
| 6 | "Electrical fault" Abnormally high current or short circuit to battery negative |
| 7 | "Mechanical fault" Faulty response from mechanical system |
| 8 | "Mechanical or electrical fault" Abnormal frequency |
| 9 | "Communication fault" Abnormal updating rate or Open circuit in injector circuit |
| 10 | "Mechanical or electrical fault" Abnormally large variations |
| 11 | "Unknown fault" Unidentified fault |
| 12 | "Component fault" Faulty unit or component |
| 13 | "Faulty calibration" Calibration values outside the limits |
| 14 | "Unknown fault" Special instructions |
| 15 | Data valid but above normal operating range - least severe level |
| 16 | Data valid but above normal operating range - moderately severe level |
| 17 | Data valid but below normal operating range - least severe level |
| 18 | Data valid but below normal operating range - moderately severe level |
| 19 | Received network data in error |
| 20 | not used (reserved) |
| 21 | not used (reserved) |
| 22 | not used (reserved) |

| | |
|----|---------------------|
| 23 | not used (reserved) |
| 24 | not used (reserved) |
| 25 | not used (reserved) |
| 26 | not used (reserved) |
| 27 | not used (reserved) |
| 28 | not used (reserved) |
| 29 | not used (reserved) |
| 30 | not used (reserved) |
| 31 | Condition exist |

Table 6 - FMI codes

8 Modbus communication

The unit offers the possibility of MODBUS communication via its RS232 serial port.

The connection to the MODBUS master may be done in 3 ways:

- 1) RS232 connection using directly the RS232 port provided.
- 2) RS422/485 connection using external RS422/485 converter.
- 3) Modem connection using external modem.

The MODBUS mode is activated by assigning a controller address to the unit using parameter **P_057**. The possible address range is 1 to 144. Setting the address 0 will **disable** the MODBUS mode and allow communication under RAINBOW protocol.

The MODBUS properties of the unit are:

- Data transfer mode: RTU
- Serial data: 9600 bps, 8 bit data, no parity, 1 bit stop
- Supported functions:
 - Function 3 (Read multiple registers)
 - Function 6 (Write single register)

Detailed description about the MODBUS protocol is found in the document “**Modicon Modbus Protocol Reference Guide**”. The web address is: www.modbus.org/docs/PI_MBUS_300.pdf

Below is a limited shortlist of readable registers. For the detailed **Modbus Application Manual** and a complete list of registers please contact CRE Technology.

| ADDRESS (hex) | R / W | DATA SIZE | COEFFICIENT | DESCRIPTION |
|---------------|-------|-----------|-------------|--|
| 0000 | R | 16bit | x1 | Phase R voltage |
| 0001 | R | 16bit | x1 | Phase S voltage |
| 0002 | R | 16bit | x1 | Phase T voltage |
| 0003 | R | 16bit | x1 | Phase U voltage |
| 0004 | R | 16bit | x1 | Phase V voltage |
| 0005 | R | 16bit | x1 | Phase W voltage |
| 0006 | R | 16bit | x1 | Phase U current |
| 0007 | R | 16bit | x1 | Phase V current |
| 0008 | R | 16bit | x1 | Phase W current |
| 000C | R | 16bit | x1 | Phase RS voltage |
| 000D | R | 16bit | x1 | Phase ST voltage |
| 000E | R | 16bit | x1 | Phase TR voltage |
| 000F | R | 16bit | x1 | Phase UV voltage |
| 0010 | R | 16bit | x1 | Phase VW voltage |
| 0011 | R | 16bit | x1 | Phase WU voltage |
| 0012 | R | 16bit | x10 | Mains frequency |
| 0013 | R | 16bit | x10 | Genset frequency |
| 0016-0017 | R | 32bit | x256 | Genset active power: this 24 bit signed register holds the genset active power multiplied by 256. Least significant 16 bits are in the register 0016h. Most significant 8 bits are in the LSB of the register 0017h. |
| 0018 | R | 8bit | x100 | Power factor multiplied by 100 (signed byte). Negative values indicate a capacitive power factor. |
| 002A | R | 16bit | x0.1 | Engine speed (rpm) |
| 002B | R | 16bit | x10 | Oil pressure multiplied in bars. |
| 002C | R | 16bit | x1 | Coolant temperature in degrees C. |
| 002D | R | 16bit | x1 | Fuel level as % |
| 002F | R | 16bit | x10 | Battery voltage |
| 003D | R | 8bit | - | Operating mode bit_4: auto mode bit_5: off mode bit_6: test mode bit_7: load test mode |

9 Weekly operation schedule

In most applications, the genset is requested to operate only in working hours. Thanks to the weekly program feature unwanted operation of the genset may be prohibited.

The unit has one programmable turn-on/turn-off time pairs for each day of week. These programmable parameters allow the genset to operate automatically only in allowed time limits.

The weekly operation schedule is **only active in AUTO** mode. In other modes it will not affect the genset operation.

In **AUTO** mode, if the operation of the genset is disabled by the weekly schedule, then **the AUTO led will flash** (instead of a steady on state).

Each turn-on/turn-off time is defined in 10 minute steps. These parameters are defined in the parameters P_071 to P_084. On the display, the parameters are shown with 3 digits, the first 2 digit are the hour and the last digit is the first digit of the minutes. For example 19.3 will mean 19:30.

Unused programs should be set to 24.0.

An example setup may be as follows:

P_071: 07.0 (Monday morning 07:00 turn on)
P_072: 18.0 (Monday evening 18:00 turn off)
P_073: 07.0 (Tuesday morning 07:00 turn on)
P_074: 18.0 (Tuesday evening 18:00 turn off)
P_075: 07.0 (Wednesday morning 07:00 turn on)
P_076: 18.0 (Wednesday evening 18:00 turn off)
P_077: 07.0 (Thursday morning 07:00 turn on)
P_078: 18.0 (Thursday evening 18:00 turn off)
P_079: 07.0 (Friday morning 07:00 turn on)
P_080: 18.0 (Friday evening 18:00 turn off)
P_081: 07.0 (Saturday morning 07:00 turn on)
P_082: 13.3 (Saturday noon 13:30 turn off)
P_083: 24.0 (Sunday no turn on time, last operation mode continues)
P_084: 24.0 (Sunday no turn off time, last operation mode continues)

If the same time is used for turn on and turn off, then it will be considered as a turn-on time.

The unit has a battery backed-up precision real time clock circuit. The real time clock circuit will continue its operation even in power failures. The real time clock is precisely trimmed using the program parameter **P_046**. For more details check the programming section.

10 Event logging

The unit keeps records of the last 32 events in order to supply information for the service personal.

The events are recorded with a date and time stamp. The date and time information comes from the internal battery backed-up real time clock circuit of the unit. The real time clock circuit will continue its operation even in power failures. The real time clock is precisely trimmed using the program parameter **P_046**. For more details check the programming section.

The events are stored in a circular memory. This means that a new coming event will erase the oldest recorded event.

In order to view the event records please hold pressed the MENU button when the J1939 alarms are visualized. The latest event record will be displayed. Each depression of the MENU button will cause the previous record to come to the display. After the oldest record, the last record will be displayed again.

The event sources are:

- Genset on load,
- Genset off load,
- Alarms,
- Warnings.

A sample event record is as follows:

```
19 06 07
14 37 128
```

The first line: The date as date-month-year (19 June 2007)

The second line: hour-minute-event_code (14:37 Genset on load)

EVENT LIST

- | | |
|----------------------------------|--------------------------------------|
| 00: STOP- low oil pressure | 18: ALARM-low coolant level |
| 01: STOP- high temp | 19: ALARM -rectifier fail |
| 02: STOP- low coolant level | 20: ALARM -emergency stop |
| 03: STOP- rectifier fail | 21: ALARM -spare_1 |
| 04: STOP- emergency stop | 22: ALARM-spare_2 |
| 05: STOP- spare_1 | 23: ALARM -low fuel level |
| 06: STOP- spare_2 | 24: ALARM -low oil pressure measured |
| 07: STOP- fuel level | 25: ALARM -high temp measured |
| 08: STOP- low oil press measured | 26: ALARM -under/over speed |
| 09: STOP- high temp measured | 27: ALARM -fail to stop |
| 10: STOP- over/under speed | 28: ALARM - charge fail |
| 11: STOP- fail to start | 29: ALARM -low battery voltage |
| 12: STOP- charge fail | 30: ALARM -(not used) |
| 13: STOP - overload | 31: ALARM -high battery voltage |
| 14: STOP- genset voltage fail | 32: STOP: J1939 Ecu alarm |
| 15: STOP- high battery voltage | 48: ALARM: J1939 Ecu engine failure |
| 16: ALARM -low oil pressure | 128: Genset on load |
| 17: ALARM -high temp | 129: Genset off load |

11 Statistical counters

The unit provides a set of non resettable incremental counters for statistical purposes.

The counters consist of:

- total engine cranks,
- total genset runs,
- total genset on load.

These counters are kept in a non-volatile memory and are not affected from power failures.

The statistical counters are only displayed on the PC screen using the remote monitoring and programming software. They cannot be displayed on the unit.

12 Maintenance



DO NOT OPEN THE UNIT
There are NO serviceable parts inside the unit.

Wipe the unit, if necessary with a soft damp cloth. Do not use chemical agents

13 Programming

The program mode is used to program the timers, operational limits and the configuration of the unit.

To **enter the program mode**, press the **MENU** button for 5 seconds. The program mode is only allowed if the **PROGRAM LOCK** input is left open. If this input is tied to **GROUND**, the program value modification will be disabled to prevent unauthorized intervention. It is advised to keep the **PROGRAM LOCK** input tied to **GROUND**.

The program mode will not affect the operation of the unit. Thus programs may be modified anytime, even while the genset is running.

When the program mode is entered, the upper display will show “**PGM**”. The central display will show the program parameter number and the lower/right display the program parameter value. The first program number is “**000**”

Each depression of the **MENU** key will cause the display to switch to the next program parameter. If the **MENU** key is hold pressed the program numbers will increase by steps of 10. After the last parameter, the display switches back to the first parameter. The displayed parameter value may be increased or decreased using “**▲**” and “**▼**” keys. If these keys are hold pressed, the program value will be increased/decreased by steps of 10.

Program parameters are kept in a non-volatile memory and are not affected from power failures.

To **exit the program mode** press one of the mode selection keys. If no button is pressed during 1 minute the program mode will be cancelled automatically.

Programs are designed in 2 groups as **user programs** and **factory settings**. The factory settings are accessible only to the genset manufacturer.

| Pgm | Definition | Unit | Std Val | Description |
|-----|-----------------------------------|------|---------|---|
| 0 | Current Transformer Primary | A | 500 | This is the rated value of current transformers. All transformers must have the same rating. The secondary of the transformer will be 5 Amps. For values over 990A use 10% of the value. These values will be displayed as K-Amperes. (for ex. 1.85KA) Values under 100A may be used by multiplying with 10 in order to enable the current display with 0.1A precision. (for ex: 35.7A) |
| 1 | Current Transformer Decimal Point | | 0 | This parameter determines the display range of current and active power: 0: 000-999 1: 0.00-9.99 2: 00.0-99.9 |
| 2 | Overcurrent Limit | A | 500 | If the current goes above this limit, during the period defined in P_024 an OVERLOAD alarm will be generated. Enter this information with the same format as parameter P_000. If this parameter is set to 0, then the overcurrent checking will be disabled. |
| 3 | Excess Power Limit | KW | 350 | If the active power goes above this limit, during the period defined in P_024 an OVERLOAD alarm will be generated. Enter this information with the same format as parameter P_000. If this parameter is set to 0, then the excess power checking will be disabled. |
| 4 | Mains Voltage Low Limit | V | 170 | If one of the mains phases goes under this limit, it means that the mains are off and it starts the transfer to the genset in AUTO and |

| | | | | |
|----|------------------------------|-----|------|--|
| | | | | TEST modes. |
| 5 | Mains Voltage High Limit | V | 270 | If one of the mains phases goes over this limit, it means that the mains are off and it starts the transfer to the genset in AUTO and TEST modes. |
| 6 | Gen. Voltage Low Limit | V | 180 | If one of the generator phase voltages goes under this limit when feeding the load, this will generate a VOLTAGE alarm and the engine will stop. |
| 7 | Gen. Voltage High Limit | V | 270 | If one of the generator phase voltages goes over this limit when feeding the load, this will generate a VOLTAGE alarm and the engine will stop. |
| 8 | Low Freq. Alarm | Hz | 30 | If the genset frequency goes under this limit, a SPEED alarm will be generated and the engine will stop. This alarm will be monitored after delay defined in P_023 when the engine runs. |
| 9 | Low Freq. Warning | Hz | 40 | If the genset frequency goes under this limit, a SPEED warning will be generated. This warning will be monitored after delay defined in P_023 when the engine runs. |
| 10 | High Freq. Warning | Hz | 54 | If the genset frequency goes over this limit, a SPEED warning will be generated. This warning will be monitored after delay defined in P_023 when the engine runs. |
| 11 | High Freq. Alarm | Hz | 57 | If the genset frequency goes over this limit, a SPEED alarm will be generated and the engine will stop. This alarm will be monitored after delay defined in P_023 when the engine runs. |
| 12 | Low Battery Voltage Warning | V | 9.0 | If the battery voltage falls below this limit, this will generate a BATTERY warning. |
| 13 | High Battery Voltage Warning | V | 31.0 | If the battery voltage goes over this limit, this will generate a BATTERY warning. |
| 14 | High Battery Voltage Alarm | V | 33.0 | If the battery voltage goes over this limit, this will generate a BATTERY alarm and the engine will stop. |
| 15 | Low Oil Pressure Warning | Bar | 1.5 | If the oil pressure measured from the analog input falls below this limit, this will generate an OIL PRESSURE warning. This input will be monitored after delay defined in P_023 when the engine runs. |
| 16 | Low Oil Pressure Alarm | Bar | 1.0 | If the oil pressure measured from the analog input falls below this limit, this will generate an OIL PRESSURE alarm. This input will be monitored after delay defined in P_023 when the engine runs. |
| 17 | High Temperature Warning | °C | 90 | If the coolant temperature measured from the analog input goes over this limit, this will generate a HIGH TEMP. warning. |
| 18 | High Temperature Alarm | °C | 98 | If the coolant temperature measured from the analog input goes over this limit, this will generate a HIGH TEMP. alarm and the engine will stop. |
| 19 | Oil pressure sender type | - | 1 | This parameter selects the oil pressure sender type. 0: Non standard sender. The sender characteristics are defined in table using parameters P_131 to P_142. 1: VDO 0-7 bars (10-180 ohms) 2: VDO 0-10 bars (10-180 ohms) 3: DATCON 0-7 bars (240-33 ohms) 4: DATCON 0-10 bars (240-33 ohms) 5: DATCON 0-7 bars (0-90 ohms) |

| | | | | |
|----|---|-----|-----|---|
| | | | | 6: DATCON 0-10 bars (0-90 ohms) 7: DATCON 0-7 bars (75-10 ohms) |
| 20 | Temperature sender type | - | 1 | This parameter selects the temperature sender type: 0: The sender characteristics are defined in table using parameters P_143 to P_154. 1: VDO 2: DATCON DAH type 3: DATCON DAL type |
| 21 | Hysteresis Voltage | V | 8 | This parameter provides the mains and genset voltage limits with a hysteresis feature in order to prevent faulty decisions. For example, when the mains are present, the mains voltage low limit will be used as the programmed low limit P_004 . When the mains fail, the low limit will be used as P_004+P_021 . It is advised to set this value to 8 volts. |
| 22 | Engine Heating Temperature | °C | 50 | If it is requested that the engine runs without load until reaching a certain temperature, this parameter defines the temperature. |
| 23 | Holdoff timer | sec | 8 | This parameter defines delay after the engine runs and before the fault monitoring is enabled. |
| 24 | Overcurrent / Excess Power / FrequencyTimer | sec | 3 | This is the period between the current or active power goes out of the limits (P_002/P_003) and OVERLOAD alarms occurs. This is also the period between the frequency goes out of the limits (P_008/P_011) and SPEED FAULT alarm occurs. |
| 25 | Wait before Fuel | min | 0 | This is the time between the mains fails and the fuel solenoid turns on before starting the genset. It prevents unwanted genset operation in battery backed-up loads. |
| 26 | Preheat timer | sec | 1 | This is the time after the fuel solenoid is energized and before the genset is started. During this period the PREHEAT relay output is energized (if defined by programming) |
| 27 | Start Timer | sec | 6 | This is the maximum start period. Starting will be automatically cancelled if the genset fires before the timer. |
| 28 | Wait between Starts | sec | 10 | This is the waiting period between two start attempts. |
| 29 | Engine Heating Timer | sec | 3 | This is the period used for engine heating following the program parameter P_037 . |
| 30 | Mains Waiting Timer | min | 0.5 | This is the time between the mains voltages entered within the limits and the generator contactor is deactivated. |
| 31 | Cooling Timer | min | 1.0 | This is the period that the generator runs for cooling purpose after the load is transferred to mains. |
| 32 | Generator Contactor Timer | sec | 1 | This is the period after the mains contactor has been deactivated and before the generator contactor has been activated. |
| 33 | Mains Contactor Timer | sec | 1 | This is the period after the generator contactor has been deactivated and before the mains contactor has been activated. |
| 34 | Stop Timer | sec | 10 | This is the maximum time duration for the engine to stop. During this period the STOP relay output is energized (if defined by programming). If the genset has not stopped after this period, a STOP FAIL alarm will occur. |

| | | | | |
|----|-----------------------------------|-------|-------|---|
| 35 | Start Attempts | - | 3 | This is the maximum number of start attempts. |
| 36 | Horn Timer | sec | 10 | This is the period during which the HORN relay is active. If the period is set to 0, this will mean that the period is unlimited. |
| 37 | Engine Heating Type | - | 0 | This parameter defines the engine heating method. The genset will not take the load before engine heating is completed. 0: engine is heated during the period defined by the Engine Heating Timer (P_029) . 1: engine is heated until the coolant temperature reaches the temperature defined by Engine Heating Temperature (P_022) and at least during the period defined by the Engine Heating Timer (P_029) . |
| 38 | Charge input alarm | - | 0 | 0: The charge input generates CHARGE warning, and does not stop the engine. 1: The charge input generates CHARGE alarm, and stops the engine. |
| 39 | Genset L-L Voltages | - | 0 | 0: Display genset Line to Neutral voltages, 1: Display genset Line to Line voltages. |
| 40 | Mains L-L Voltages | - | 0 | 0: Display mains Line to Neutral voltages, 1: Display mains Line to Line voltages. |
| 41 | Emergency Backup Operation | - | 0 | 0: In TEST mode, the load will not be transferred to the genset even if the mains fail. 1: In TEST mode, the load will be transferred to the genset if the mains fail. |
| 42 | Remote Start Operation | - | 0 | 0: Not REMOTE START mode, the engine runs when the mains fail. 1: REMOTE START mode, the unit does not monitor mains voltages, the engine runs when a signal from the REMOTE START (22) comes. |
| 43 | Modem Connection | - | 0 | 0: No modem connection, the serial port is connected to PC 1: Modem connected. |
| 44 | Maintenance Period (Engine Hours) | hours | 200 | The SERVICE REQUEST led indicator will turn on after this quantity of engine hours from the last service. If the period is set to '0' no SERVICE REQUEST will be generated depending on engine hours. |
| 45 | Maintenance Period (Months) | month | 6 | The SERVICE REQUEST led indicator will turn on after this amount of time from the last service. If the period is set to '0' no SERVICE REQUEST will be indicated depending on time |
| 46 | Real Time Clock trimming | - | 0 | This parameter is intended to trim precisely the real time clock speed. Values from 0 to 63 speed up the clock with 0.25sec/day steps. Values from 127 to 64 slow down the clock with 0.25sec/day steps. |
| 47 | Flahing relay timer | hours | 0-144 | This parameter defines the max genset running time used in dual genset systems. After the engine runs during this period, the relay will change position. |
| 48 | Password | - | 0-999 | This is the password used in the manual start version of the unit. It has no effect on AMF models. |
| 49 | Low Fuel Warning | - | 0 | 0: Low Fuel causes engine shutdown. 1: Low Fuel causes warning. |
| 50 | Simulate mains | - | 1 | 0: The spare_2 input has normal function 1: The spare_2 input simulates mains. |
| 51 | J1939 enable | - | 0 | 0: The J1939 port is ignored. 1: The analog measurements (oil, temp, rpm) |

| | | | | |
|----|----------------------------|-----|----|---|
| | | | | are picked_up from the ECU. If the ECU communication is lost, then the engine will be stopped. |
| 52 | J1939 engine brand/type | - | 0 | 00: CATERPILLAR 16: CUMMINS 32: DETROIT DIESEL 48: DEUTZ 64: JOHN DEERE 80: PERKINS 96: VOLVO (with CIU unit) 97: VOLVO (without CIU unit) Other values: undefined engine. Do not use. |
| 53 | Intermittent alarm output | - | 1 | 0: continuous 1: intermittent |
| 54 | Alternator number of poles | - | 1 | 0: single pole 1: double pole |
| 55 | Idle timer | sec | 0 | When the engine runs, the Idle output relay function will be active during this timer. |
| 56 | SMS enable | - | 0 | 0: SMS not enabled 1: SMS enabled The telephone number used for SMS sending is programmed using the RAINBOW program. |
| 57 | MODBUS controller address | - | 0 | 0: RAINBOW communication protocol. 1-144: MODBUS communication. This parameter is also the MODBUS controller address of the unit. |
| 58 | Engine speed adjust | % | 50 | This parameter adjusts the speed of an ECU controlled engine by +/- 8%. |
| 59 | GPRS Modem calls | - | 0 | 0: standard modem calls 1: GPRS modem calls |
| 60 | Gas engine solenoid delay | sec | 5 | The gas solenoid of the gas engine will be opened after this delay during cranking |
| 61 | Not used | | | |
| 62 | Not used | | | |
| 63 | Not used | | | |
| 64 | Not used | | | |
| 65 | Not used | | | |
| 66 | Not used | | | |
| 67 | Not used | | | |
| 68 | Not used | | | |
| 69 | Not used | | | |
| 70 | Not used | | | |

Table 7 – Programs

The parameters from P_071 to P_0847 program the weekly operation schedule feature. For each day of week, one turn_on time and one turn_off time are provided. Times are defined with 10 minute steps and are shown in the 3 digit display as the hours and the first digit of the minutes. If no operation is needed for a certain day of week, then the related time will be defined as 24.0; thus the last definition will continue to be valid. For example if the turn_on and turn_off times for Sunday are given as 24.0 then the unit will not operate automatically from Saturday turn_off time to Monday turn_on time. If the AUTO mode is disabled by the weekly operation schedule, then the AUTO led will flash, otherwise it is steadily on.

| Pgm | Definition | Unit | Std | Description |
|------------|--------------------|-------------|------------|--------------------|
| 71 | Monday turn_on | - | 24.0 | |
| 72 | Monday turn_off | - | 24.0 | |
| 73 | Tuesday turn_on | - | 24.0 | |
| 74 | Tuesday turn_off | - | 24.0 | |
| 75 | Wednesday turn_on | - | 24.0 | |
| 76 | Wednesday turn_off | - | 24.0 | |
| 77 | Thursday turn_on | - | 24.0 | |

| | | | | |
|----|-------------------|---|------|--|
| 78 | Thursday turn_off | - | 24.0 | |
| 79 | Friday turn_on | - | 24.0 | |
| 80 | Friday turn_off | - | 24.0 | |
| 81 | Saturday turn_on | - | 24.0 | |
| 82 | Saturday turn_off | - | 24.0 | |
| 83 | Sunday turn_on | - | 24.0 | |
| 84 | Sunday turn_off | - | 24.0 | |

Table 8 - Weekly operation schedule

The parameters from P_085 to P_102 define the functions of relay outputs. The unit has 6 relay outputs and 2 of them have programmable functions. The fixed function relays are Fuel, Start, Mains Contactor and Generator Contactor.

The relays may be extended up to 22 using **Relay Extension Modules**. RELAY-1 and RELAY-2 with programmable functions are inside the unit. Other relays are in the optional Extension Modules.

The function of a programmable relay output may be selected from the below list.

RELAY FUNCTION LIST

| Pgm | Description | Std |
|-----|------------------------------------|-----|
| 85 | RELAY-1 function (term 17 - ALARM) | 01 |
| 86 | RELAY-2 function (term 18 - STOP) | 03 |
| 87 | RELAY-3 function | 16 |
| 88 | RELAY-4 function | 17 |
| 89 | RELAY-5 function | 18 |
| 90 | RELAY-6 function | 19 |
| 91 | RELAY-7 function | 20 |
| 92 | RELAY-8 function | 21 |
| 93 | RELAY-9 function | 22 |
| 94 | RELAY-10 function | 23 |
| 95 | RELAY-11 function | 24 |
| 96 | RELAY-12 function | 25 |
| 97 | RELAY-13 function | 26 |
| 98 | RELAY-14 function | 27 |
| 99 | RELAY-15 function | 28 |
| 100 | RELAY-16 function | 29 |
| 101 | RELAY-17 function | 30 |
| 102 | RELAY-18 function | 31 |

| | | | |
|----|----------------------------------|----|-------------------------------|
| 00 | Fuel | 32 | Oil switch warning |
| 01 | Horn | 33 | Temp switch warn. |
| 02 | Start | 34 | Level switch warn. |
| 03 | Stop | 35 | Rectifier warning |
| 04 | Gen. Contactor | 36 | Emerg Stop warn. |
| 05 | mains Contactor | 37 | Spare-1 warning |
| 06 | Choke | 38 | Spare-2 warning |
| 07 | Preheat | 39 | - |
| 08 | Shutdown alarm | 40 | Oil sender warning |
| 09 | Shutdown or load_dump alarm | 41 | Temp sender warn. |
| 10 | Shutdown or load_dump or warning | 42 | Speed warning |
| 11 | Automatic ready | 43 | Stop Fail warning |
| 12 | Week. on time | 44 | Charge warning |
| 13 | Exerciser on | 45 | Battery low warning |
| 14 | Load_dump alarm | 46 | - |
| 15 | - | 47 | Battery high warn. |
| 16 | Oil switch alarm | 48 | Mains fail |
| 17 | Temp switch alarm | 49 | Block heater |
| 18 | Level switch alarm | 50 | Service request |
| 19 | Rectifier alarm | 51 | J1939 ECU warning |
| 20 | Emerg.Stop alarm | 52 | J1939 ECU shutdown |
| 21 | Spare-1 Alarm | 53 | Flashing relay |
| 22 | Spare-2 Alarm | 54 | Gas engine gas solenoid relay |
| 23 | - | 55 | Fuel pump |
| 24 | Oil sender alarm | 56 | Mains phase order fail |
| 25 | Temp sender alarm | 57 | Genset phase order fail |
| 26 | Speed alarm | 58 | Idle speed |
| 27 | Start fail alarm | 59 | - |
| 28 | Charge alarm | 60 | - |
| 29 | Overload alarm | 61 | - |
| 30 | Voltage alarm | 62 | - |
| 31 | Battery High alarm | 63 | - |

Table 9 - Relay functions

Parameters from P_103 to P_150 program the functions of the digital inputs. The programmable properties of digital inputs are:

- action to be taken upon arrival of the fault signal (alarm, warning, etc...),
- when the fault monitoring will be enabled,
- latching of the fault signal,
- contact type (NO/NC)
- switching (bat+, bat-)
- response delay

LOW OIL PRESSURE SWITCH INPUT

| Pgm | Description | Std | |
|-----|------------------|-----|--|
| 103 | Operation | 0 | 0: Alarm (the engine stops and horn relay operates) 2: Warning (the horn relay operates) 3: No operation |
| 104 | Fault monitoring | 1 | 0: Always 1: After holdoff timer 2: When mains present |
| 105 | Latching | 1 | 0: Non latching 1: Latching |
| 106 | Contact type | 0 | 0: Normally open 1: Normally closed |
| 107 | Switching | 0 | 0: Battery negative 1: Battery positive |
| 108 | Response delay | 0 | 0: No delay 1: Delayed (4sec) |

Table 10 - Oil pressure input

HIGH TEMPERATURE SWITCH INPUT

| Pgm | Description | Std | |
|-----|------------------|-----|--|
| 109 | Operation | 0 | 0: Alarm (the engine stops and horn relay operates) 2: Warning (the horn relay operates) 3: No operation |
| 110 | Fault monitoring | 0 | 0: Always 1: After holdoff timer 2: When mains present |
| 111 | Latching | 1 | 0: Non latching 1: Latching |
| 112 | Contact type | 0 | 0: Normally open 1: Normally closed |
| 113 | Switching | 0 | 0: Battery negative 1: Battery positive |
| 114 | Response delay | 0 | 0: No delay 1: Delayed (4sec) |

Table 11 - Temperature input

COOLANT LEVEL SWITCH INPUT

| Pgm | Description | Std | |
|-----|------------------|-----|--|
| 115 | Operation | 0 | 0: Alarm (the engine stops and horn relay operates) 2: Warning (the horn relay operates) 3: No operation |
| 116 | Fault monitoring | 0 | 0: Always 1: After holdoff timer 2: When mains present |
| 117 | Latching | 0 | 0: Non latching 1: Latching |
| 118 | Contact type | 0 | 0: Normally open 1: Normally closed |
| 119 | Switching | 0 | 0: Battery negative 1: Battery positive |
| 120 | Response delay | 1 | 0: No delay 1: Delayed (4sec) |

Table 12 - Coolant level input

RECTIFIER FAIL INPUT

| Pgm | Description | Std | |
|------------|--------------------|------------|--|
| 121 | Operation | 2 | 0: Alarm (the engine stops and horn relay operates)) 2: Warning (the horn relay operates) 3: No operation |
| 122 | Fault monitoring | 2 | 0: Always 1: After holdoff timer 2: When mains present |
| 123 | Latching | 1 | 0: Non latching 1: Latching |
| 124 | Contact type | 0 | 0: Normally open 1: Normally closed |
| 125 | Switching | 0 | 0: Battery negative 1: Battery positive |
| 126 | Response delay | 1 | 0: No delay 1: Delayed (4sec) |

Table 13 - Rectifier input

EMERGENCY STOP INPUT

| Pgm | Description | Std | |
|------------|--------------------|------------|--|
| 127 | Operation | 0 | 0: Alarm (the engine stops and horn relay operates)) 2: Warning (the horn relay operates) 3: No operation |
| 128 | Fault monitoring | 0 | 0: Always 1: After holdoff timer 2: When mains present |
| 129 | Latching | 0 | 0: Non latching 1: Latching |
| 130 | Contact type | 0 | 0: Normally open 1: Normally closed |
| 131 | Switching | 0 | 0: Battery negative 1: Battery positive |
| 132 | Response delay | 0 | 0: No delay 1: Delayed (4sec) |

Table 14 - Emergency stop input

SPARE-1 FAULT INPUT

| Pgm | Description | Std | |
|------------|--------------------|------------|--|
| 133 | Operation | 0 | 0: Alarm (the engine stops and horn relay operates)) 2: Warning (the horn relay operates) 3: No operation |
| 134 | Fault monitoring | 0 | 0: Always 1: After holdoff timer 2: When mains present |
| 135 | Latching | 0 | 0: Non latching 1: Latching |
| 136 | Contact type | 0 | 0: Normally open 1: Normally closed |
| 137 | Switching | 0 | 0: Battery negative 1: Battery positive |
| 138 | Response delay | 0 | 0: No delay 1: Delayed (4sec) |

Table 15 - Spare 1 input

SPARE-2 FAULT INPUT

| Pgm | Description | Std | |
|------------|--------------------|------------|---|
| 139 | Operation | 2 | 0: Alarm (the engine stops and horn relay operates) 2: Warning (the horn relay operates) 3: No operation |
| 140 | Fault monitoring | 0 | 0: Always 1: After holdoff timer 2: When mains present |
| 141 | Latching | 0 | 0: Non latching 1: Latching |
| 142 | Contact type | 0 | 0: Normally open 1: Normally closed |
| 143 | Switching | 0 | 0: Battery negative 1: Battery positive |
| 144 | Response delay | 0 | 0: No delay 1: Delayed (4sec) |

Table 16 - Spare 2 input

LOW FUEL LEVEL INPUT

| Pgm | Description | Std | |
|------------|--------------------|------------|---|
| 145 | Operation | 3 | 0: Alarm (the engine stops and horn relay operates) 2: Warning (the horn relay operates) 3: No operation |
| 146 | Fault monitoring | 0 | 0: Always 1: After holdoff timer 2: When mains present |
| 147 | Latching | 0 | 0: Non latching 1: Latching |
| 148 | Contact type | 0 | 0: Normally open 1: Normally closed |
| 149 | Switching | 0 | 0: Battery negative 1: Battery positive |
| 150 | Response delay | 0 | 0: No delay 1: Delayed (4sec) |

Table 17 - Fuel level input

Parameters from P_151 to P_162 define the ohm-bar characteristics of the oil pressure sender. The sender characteristics will be defined using maximum 6 points. The values should be entered in the increasing order of ohm values. For unused points, ohm values should be entered as 0. An example table is given below. The sensor characteristics used in this table are:

0.0 bar.....10 ohm
 2.0 bar.....52 ohm
 4.0 bar.....90 ohm
 7.0 bar.....140 ohm
 8.0 bar.....156 ohm
 10.0 bar.....184 ohm

| Pgm | Description | Unit | Value |
|-----|------------------|------|-------|
| 151 | Point_1 resistor | ohm | 10 |
| 152 | Point_1 pressure | bar | 0.0 |
| 153 | Point_2 resistor | ohm | 52 |
| 154 | Point_2 pressure | Bar | 2.0 |
| 155 | Point_3 resistor | Ohm | 90 |
| 156 | Point_3 pressure | Bar | 4.0 |
| 157 | Point_4 resistor | Ohm | 140 |
| 158 | Point_4 pressure | Bar | 8.0 |
| 159 | Point_5 resistor | Ohm | 156 |
| 160 | Point_5 pressure | Bar | 8.0 |
| 161 | Point_6 resistor | Ohm | 184 |
| 162 | Point_6 pressure | bar | 10.0 |

Table 18 - Analogue pressure readings

Parameters from P_163 to P_174 define the ohm-degrees characteristics of the temperature sender. The sender characteristics will be defined using maximum 6 points. The values should be entered in the increasing order of ohm values. For unused points, ohm values should be entered as 0. An example table is given below. The sensor characteristics used in this table are:

38°C.....342 ohms
 82 °C.....71 ohms
 104 °C.....40 ohms
 121 °C.....30 ohms

| Pgm | Description | Unit | Value |
|-----|---------------------|------|-------|
| 163 | Point_1 resistor | ohm | 30 |
| 164 | Point_1 temperature | °C | 121 |
| 165 | Point_2 resistor | ohm | 40 |
| 166 | Point_2 temperature | °C | 104 |
| 167 | Point_3 resistor | ohm | 71 |
| 168 | Point_3 temperature | °C | 82 |
| 169 | Point_4 resistor | ohm | 342 |
| 170 | Point_4 temperature | °C | 38 |
| 171 | Point_5 resistor | ohm | 0 |
| 172 | Point_5 temperature | °C | 0 |
| 173 | Point_6 resistor | ohm | 0 |
| 174 | Point_6 temperature | °C | 0 |

Table 19 - Analogue temperature readings

The parameters from P_175 to P_178 define the exerciser operation.

| Pgm | Definition | Unit | Std Val | Description |
|-----|-----------------------------------|------|---------|---|
| 175 | Exercise start day and hour | - | 168 | <p>This parameter defines the start day and hour of the exerciser.</p> <p>Values higher or equal to 168 mean that the exerciser is off.</p> <p>The exercise may be selected to start at the beginning of the any hour of the week. The parameter value is the hour count of the start time.</p> <p>Examples:</p> <ul style="list-style-type: none"> 0 = exercise starts at Monday 00:00 1 = exercise starts at Monday 01:00 8 = exercise starts at Monday 08:00 24 = exercise starts at Tuesday 00:00 167 = exercise starts at Sunday 23:00 168 = exerciser off <p>If a daily exercise is selected with parameter P_158=0, then the day information is don't care and the exercise will be performed every day regardless of the day selection.</p> <p>If the monthly exercise is selected with parameter P_158=2 then the exercise will be performed during the first 7 days of each month at the programmed day and hour.</p> |
| 176 | Exercise duration | min. | 10 | This parameter defines the exercise duration and programmed in 10 minute steps up to 24 hours. |
| 177 | Exercise off_load/on_load | - | 0 | If this parameter is set to 0 the genset will not feed the load during exercise. If it is set to 1, then the load will be transferred to the genset during the exercise. |
| 178 | Daily / Weekly / Monthly Exercise | - | 1 | <p>0: exercise every day (the exercise will be performed every day regardless of the day selection with parameter P_155).</p> <p>1: exercise once per week</p> <p>2: exercise once per month (the exercise will be performed during the first 7 days of each month at the programmed day and hour).</p> |

Table 20 - Exerciser parameters

The parameters from P_179 to P_184 adjust the date and time.

| Pgm | Definition | Unit | Std Val | Description |
|-----|------------|------|---------|---|
| 179 | Year | - | 00-99 | Last two digits of the current year. |
| 180 | Month | - | 01-12 | Current month. |
| 181 | Date | - | 01-31 | Current day of the month. |
| 182 | Day | - | 0-6 | Current day of the week.(0=Monday, 1=Tuesday, 2=Wednesday, 3=Thursday 4=Friday, 5=Saturday, 6=Sunday) |
| 183 | Hour | - | 00-23 | Current hour of the day. |
| 184 | Minute | - | 00-59 | Current minute of the hour. |

Table 21 - Date and time

The parameters from P_185 to P_196 adjust calibration parameters. During calibration, measurements to be calibrated are also visualized.

| Pgm | Definition | Unit | Std Val | Description |
|------------|-----------------------------|-------------|----------------|---|
| 185 | Phase R calibration | - | 760 | Phase R measurement calibration. |
| 186 | Phase S calibration | - | 760 | Phase S measurement calibration. |
| 187 | Phase T calibration | - | 760 | Phase T measurement calibration. |
| 188 | Phase U calibration | - | 760 | Phase U measurement calibration. |
| 189 | Phase V calibration | - | 760 | Phase V measurement calibration. |
| 190 | Phase W calibration | - | 760 | Phase W measurement calibration. |
| 191 | Current A1 calibration | - | 6360 | Phase A1 current measurement calibration. |
| 192 | Current A1 calibration | - | 6360 | Phase A2 current measurement calibration. |
| 193 | Current A1 calibration | - | 6360 | Phase A3 current measurement calibration. |
| 194 | Active power calibration | - | 14800 | Total active power measurement calibration. |
| 195 | Power factor calibration | - | 172 | Power factor measurement calibration. |
| 196 | Battery voltage calibration | - | 139 | Battery voltage measurement calibration. |

Table 22 - Calibration parameters

14 Troubleshooting

The genset operates while AC mains are OK or continues to operate after AC mains are OK:

- Check engine body grounding.
- AC mains voltages may be outside programmed limits, measure the phase voltages.
- Check the AC voltage readings by pressing the MENU button.
- Upper and lower limits of the mains voltages may be too tight. Check the parameters P_004 and P_005. Standard values are 170/270 volts.
- The hysteresis voltage may be given to excessive. Check the parameter P_021, the standard value is 8 volts.

AC voltages or frequency displayed on the unit are not correct:

- Check engine body grounding, it is necessary.
- The error margin of the unit is +/- 3 volts.
- If there are faulty measurements only when the engine is running, there may be a faulty charging alternator or voltage regulator on the engine. Disconnect the charging alternator connection of the engine and check if the error is removed.
- If there are faulty measurements only when mains are present, then the battery charger may be failed. Turn off the rectifier fuse and check.

Phase-to-Phase AC voltages are not correct although Phase to Neutral voltages are correct:

- Incorrect phase order. Please connect phase voltages in the correct order.

KW and cos Φ readings are negative although the Amp readings are correct:

- The current transformer is connected with reverse polarity. Change the CT polarity.



Short circuit the outputs of unused Current Transformers.

When the AC mains fails the unit energizes the fuel solenoid, but does not start and OIL PRESSURE led flashes:

- The unit is not supplied with battery (-) voltage at the oil pressure input.
- Oil pressure switch not connected.
 - Oil pressure switch connection wire cut.
 - Oil pressure switch faulty.
 - Oil pressure switch closes too lately. If oil pressure switch closes, the unit will start. Optionally oil pressure switch may be replaced.

The engine does not run after the first start attempt, then the unit does not start again and OIL PRESSURE led flashes:

- The oil pressure switch closes very lately. As the unit senses an oil pressure, it does not start. When oil pressure switch closes the unit will start. Optionally the oil pressure switch may be replaced.

When the AC mains fails, the engine starts to run but the unit gives START FAIL alarm and then the engine stops:

-The generator phase voltage is not connected to the unit. Measure the AC voltage between terminals U and Generator Neutral at the rear of the unit while the engine is running. A fuse protecting the generator phases may be failed. A misconnection may be occurred. If everything is OK, turn all the fuses off, and then turn all the fuses on, starting from the DC supply fuse. Then test the unit again.

The unit is late to remove engine cranking:

-The generator voltage rises lately. Also the generator remnant voltage is below 20 volts. The unit removes starting with the generator frequency, and needs at least 20 volts to measure the frequency. If this situation is to be avoided, the only solution is to add an auxiliary relay. The coil of the relay will be between BATTERY (-) and charging alternator D+ terminal. The normally closed contact of the relay will be connected serially to the unit's START output. So the starting will also be removed when the D+ pulls to battery positive.

The unit is inoperative:

Measure the DC-supply voltage between terminals 11 and 12 at the rear of the unit. If OK, turn all the fuses off, then turn all the fuses on, starting from the DC supply fuse. Then test the unit again.

Programming mode cannot be entered:

The program lock input disables programming mode entry. Disconnect the program lock input from battery negative before modification. Do not forget to make this connection again to prevent unauthorized program modifications.

Some program parameters are skipped:

These parameters are reserved for factory setting and cannot be modified.

AUTO led flashes and the genset does not run when mains fail:

The unit is in Weekly Schedule OFF time. Please check date and time setting of the unit. Please check also Weekly Schedule programs (parameters P_071 to P_084).

15 Technical specifications

Alternator voltage: 0 to 300 V-AC (Ph-N)

Alternator frequency: 0-100 Hz.

Mains voltage: 0 to 300 V-AC (Ph-N)
0 to 520 V-AC (Ph-Ph)

Mains frequency: 0-100 Hz.

DC Supply range: 9.0 V_{DC} to 30.0 V_{DC}

Cranking dropouts: survives 0 V for 100ms

Typical stand-by current consumption: 150 mA_{DC}.

Maximum current consumption: 600 mA_{DC}.

Generator/mains contactor outputs: 16 A @ 250 V_{AC}.

DC relay outputs: 10A @ 28 V_{DC}.

Max. current for each terminal: 10 A_{RMS}.

Charge alternator excitation current: min 150 mA_{DC} @ 10 to 30 V_{DC}.

Current inputs: from current transformers, .../5A. Max load 0.7VA per phase.

Digital inputs: input voltage 0 - 30 V_{DC}. Internally connected to battery positive via 4700 ohm resistor.

Analog inputs: Resistor input 0 to 5000 ohms connected to the battery negative. Sources 10 mA when closed to battery negative.

Measurement category: CAT II

Air category: Pollution degree II

Communication port: RS-232. 9600 bauds, no parity, 1 stop bit.

Operating temperature range: -20°C to +70°C (-4 °F to +158 °F)

Storage temperature range: - 40°C to +80°C (-40 °F to +176 °F)

Maximum humidity: 95%, non-condensing

IP protection: IP65 from front panel, IP30 from the rear

Dimensions: 202x148x48mm (WxHxD)

Mounting opening dimensions: 176 x 121mm minimum.

Weight: 460 g (approx.)

Case material: High temperature, self extinguishing ABS (UL94-V0, 100 °C)

16 Wiring diagram

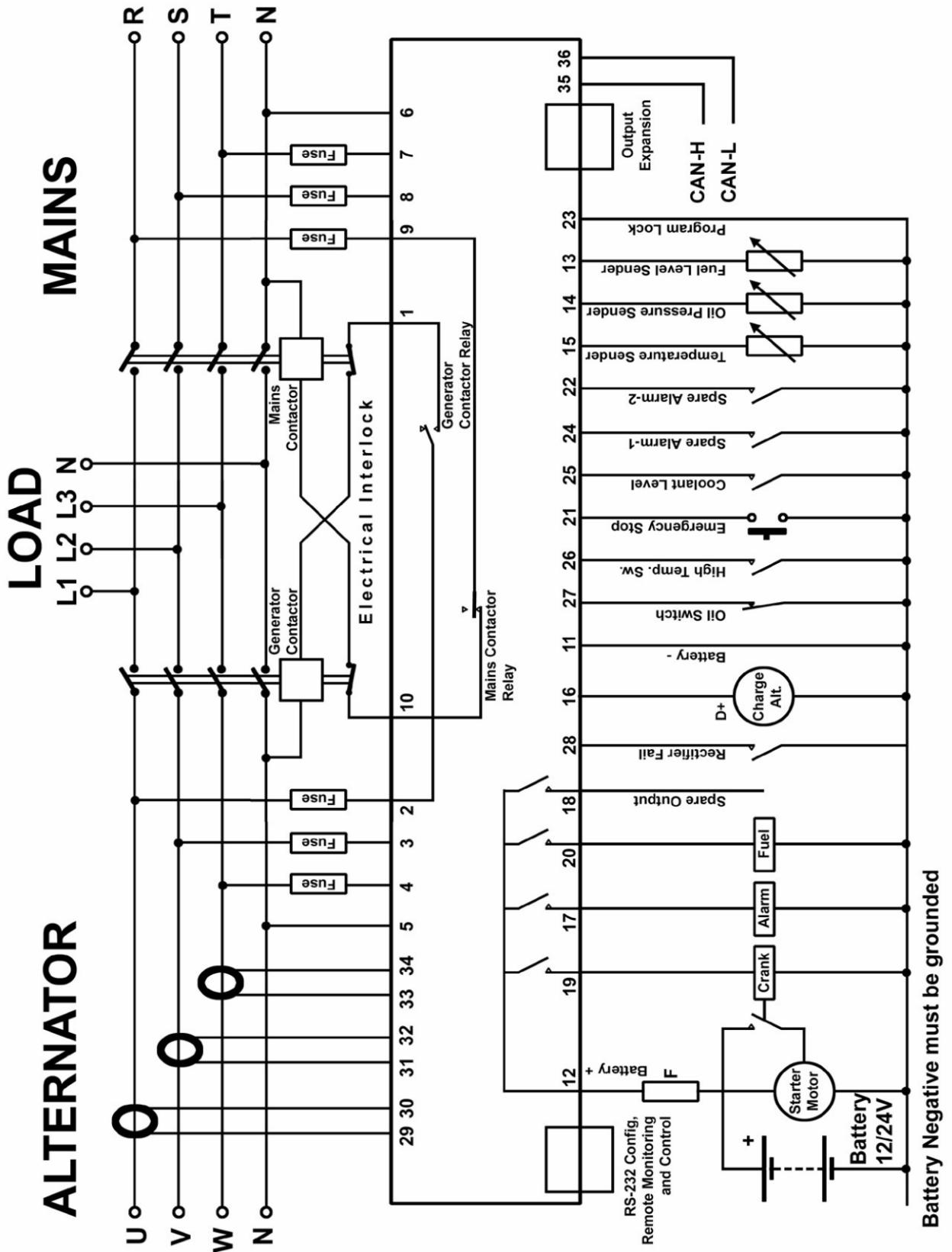


Figure 1 - Wiring diagram

17 Company Information

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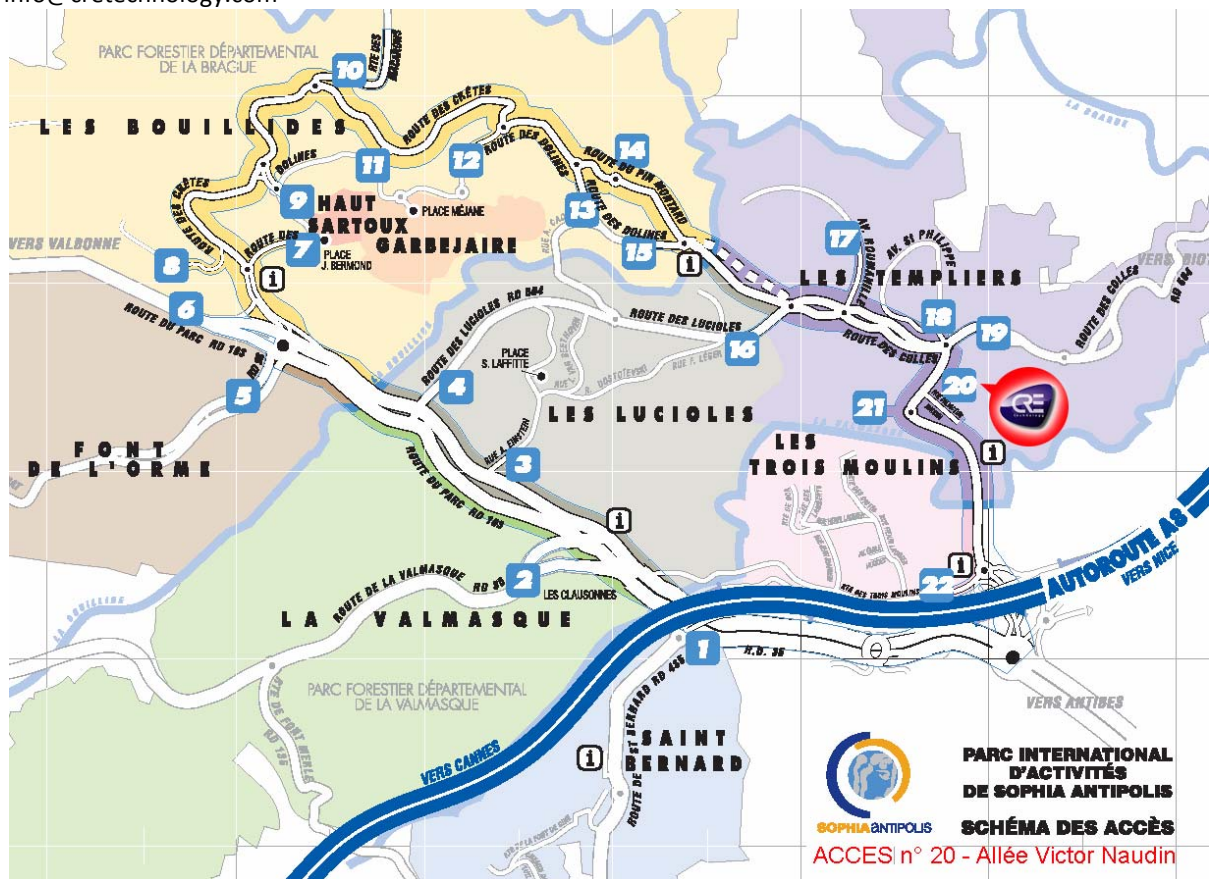


Figure 2 - Access to CRE Technology in Sophia Antipolis.

You can find a full list of our worldwide distributors on our web site, www.cretechnology.com tab "DISTRIBUTORS"