



## **EAOM-9 Automatic Transfer Switch Controller with Metering, 96x96 DIN Size**

- Protection, control and metering
- Automatic engine start/stop and load transfer
- Automatic shutdown on fault condition
- LED status and fault indication
- Simple push-button controlled operation
- Manual, automatic and test mode control
- Two user-configurable inputs
- One user-configurable output
- Fully programmable
- RS-232 communication port
- Standard modem communication
  
- Monitors
  - Mains voltages (Phase-Phase, Phase-Neutral)*
  - Alternator voltage and frequency*
  - Battery voltage*
  - Engine running time*
  - Exercise time*
  
- Controls
 

<ul style="list-style-type: none"> <li><i>Engine fuel supply or engine stopping</i></li> <li><i>Starter motor</i></li> <li><i>Automatic generator start</i></li> <li><i>Load transfer on mains failure</i></li> </ul>	<ul style="list-style-type: none"> <li><i>Load transfer to mains</i></li> <li><i>Preheat</i></li> <li><i>External alarm horn</i></li> </ul>
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- Fail Monitoring
 

<ul style="list-style-type: none"> <li><i>Engine start</i></li> <li><i>Mains voltage</i></li> <li><i>Alternator voltage and frequency</i></li> <li><i>Engine speed</i></li> <li><i>Charging generator</i></li> </ul>	<ul style="list-style-type: none"> <li><i>Engine temperature</i></li> <li><i>Oil pressure</i></li> <li><i>Emergency stop</i></li> <li><i>Low battery voltage</i></li> <li><i>Scheduled maintenance due</i></li> </ul>
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- Programming using the buttons and display on the front panel or RS-232 communication port, using PC based software.

## ABOUT INSTRUCTION MANUAL

Instruction manual of EAOM-9 consists of two main sections. Explanation of these sections are below. Also, there is another section which include technical specifications of the device. All titles and page numbers in instruction manual are in “**CONTENTS**” section. User can reach to any title with section number.

### Installation:

In this section, physical dimensions of the device, panel mounting, electrical wiring, module mounting to the device, physical and electrical installation of the device to the system are explained.

### Operation and Parameters:

In this section, user interface of the device, how to access to the parameters, description of the parameters are explained.

Also in these sections, there are warnings to prevent serious injury while doing the physical and electrical mounting or using the device.

Explanation of the symbols which are used in these sections are given below.



This symbol is used for safety warnings. User must pay attention to these warnings.



This symbol is used to determine the dangerous situations as a result of an electric shock. User must pay attention to these warnings definitely.



This symbol is used to determine the important notes about functions and usage of the device.



This symbol is used for VDC



This symbol is used for VAC

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## **EU DECLARATION OF CONFORMITY**

**Manufacturer Company Name** : Emko Elektronik A.S.

**Manufacturer Company Address:** DOSAB, Karanfil Sokak, No:6, 16369 Bursa, Turkiye

**The manufacturer hereby declares that the product conforms to the following standards and conditions.**

**Product Name** : Electrical control equipment for generating sets

**Model Number** : EAOM-9

**Type Number** : EAOM-9

**Product Category** : Electrical equipment for measurement, control and laboratory use

**Conforms to the following directives :**

**EMC** : BS EN 50081-2, EMC Generic Emission Standard for industrial equipment  
BS EN 50082-2, EMC Generic Immunity Standard for industrial equipment

**Electrical Safety** : EN 61010-1, Safety Requirements for electrical equipment for measurement, control and laboratory use

## 1. PREFACE

The EAOM-9 provides for automatic transfer of a load from mains to generator in the event of a mains supply failure. Intended for unattended operation, it is able to detect failure of any phase of the mains and to start and switch over to a generator if the mains voltage goes outside pre-set limits. Both automatic and manual control is possible. A test mode is also available which allows the generator to be run without taking the load.

The unit monitors generator operation and gives warning of any faults that are detected, by LED indicators. The unit monitors:

- Engine start
- Mains voltage
- Alternator voltage and frequency
- Engine speed
- Charging generator
- Engine temperature
- Oil pressure
- Emergency stop
- Low battery voltage
- Scheduled maintenance due

It controls:

- Engine fuel supply or engine stopping
- Starter motor
- Automatic generator start
- Load transfer on mains failure
- Load transfer to mains
- Preheat
- External alarm horn

EAOM-9 features a four-digit, seven-segment LED display, providing extensive monitoring of unit and generator parameters, including:

- Mains voltages (Phase-Phase, Phase-Neutral)
- Alternator voltage and frequency
- Battery voltage
- Engine running time
- Exercise time
- Error Indication
- Program Parameters

The unit is extensively programmable through the front panel, with password protection on two levels. Operational parameters can also be monitored and controlled from a PC via a built-in RS-232 port.

If the engine fails to start on the first attempt, further attempts are made up to a programmed number of times or until successful.

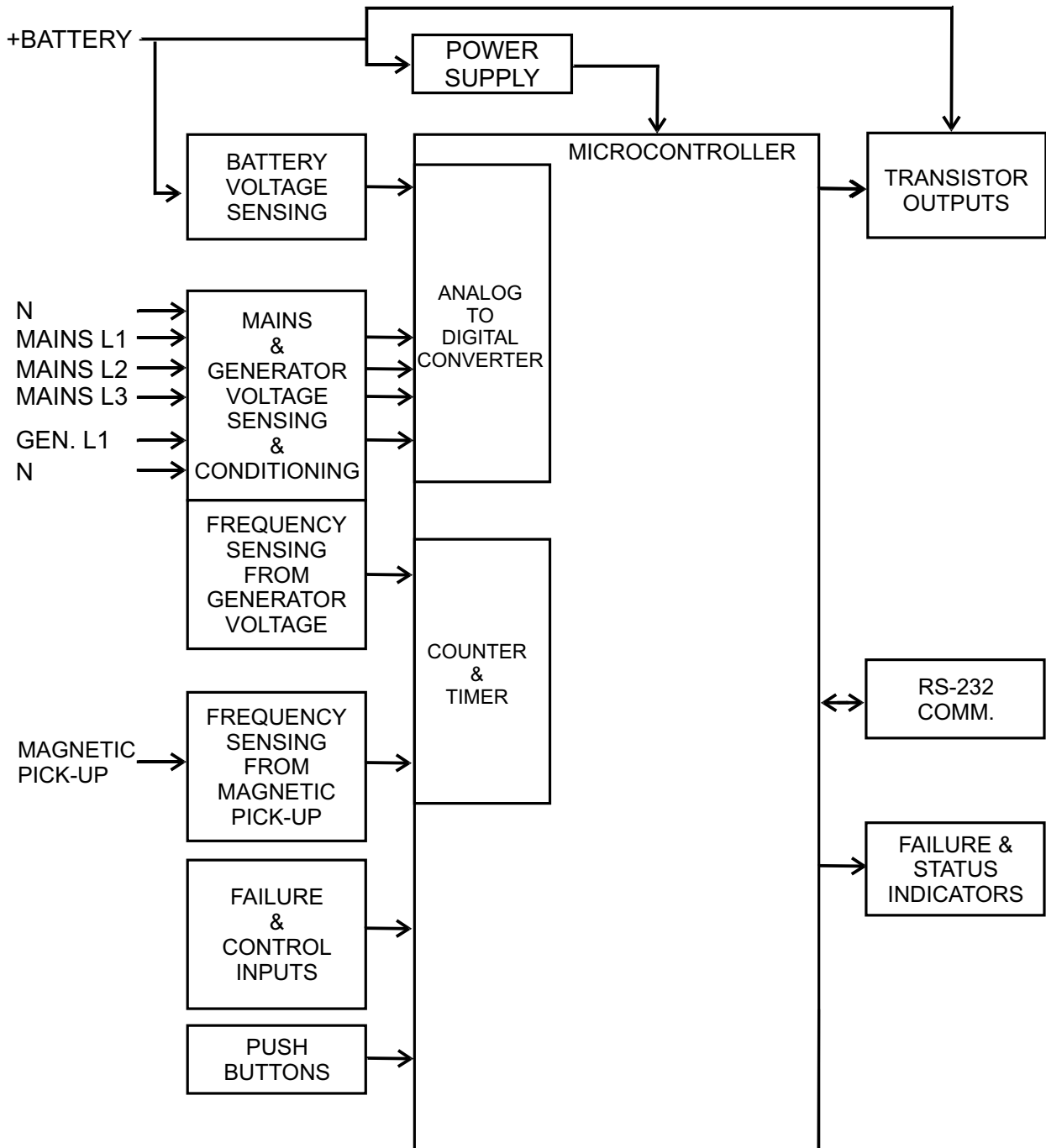
If a fault is detected, the unit shuts down the engine and indicates the failure by flashing a relevant fault LED.

Emergency stop and remote inhibit inputs provide for remote control of the engine. Configurable inputs can be programmed to perform many functions, such as warning alarms, stopping the engine or disconnecting the load.

A configurable output can be programmed for various functions, including alarms, operation as a pre-heat output, indication of engine running status and indication that the product is in Automatic mode.

The unit can be programmed using the buttons and display on the front panel. Refer to Section 5 Parameters for details. Alternatively, the unit can be programmed via the RS-232 communication port, using PC based software. EAOM-9 can communicate with this software over modem.

## 1.1 General Specifications



## **1.2 Warranty**

EMKO Elektronik warrants that the equipment delivered is free from defects in material and workmanship. This warranty is provided for a period of two years. The warranty period starts from the delivery date. This warranty is in force if duty and responsibilities which are determined in warranty document and instruction manual performs by the customer completely.

## **1.3 Maintenance**

Repairs should only be performed by trained and specialized personnel. Cut power to the device before accessing internal parts.

Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.



## 2. INSTALLATION



Before beginning installation of this product, please read the instruction manual and warnings below carefully.

Carefully unpack the unit and check for damage to the unit or to the cables supplied. Retain the packing in case of future need, e.g. returning the unit for calibration.

Check the contents, as follows:

- One EAOM-9 unit.
- Operating Manual.
- Screw fixings.
- RS-232 Cable.

Before commencing installation:

- Disconnect all electrical power to the machine.
- Make sure the machine cannot operate during installation.
- Follow all of the machine manufacturers' safety warnings.
- Read and follow all installation instructions.

A visual inspection of this product for possible damage occurred during shipment is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.

Be sure to use the rated power supply voltage to protect the unit against damage and to prevent failure.

Keep the power off until all of the wiring is completed so that electric shock and trouble with the unit can be prevented.

Never attempt to disassemble, modify or repair this unit. Tampering with the unit may result in malfunction, electric shock or fire.

Do not use the unit in combustible or explosive gaseous atmospheres.

During the equipment is putted in hole on the metal panel while mechanical installation some metal burrs can cause injury on hands, you must be careful.

Montage of the product on a system must be done with it's own fixing screws. Do not do the montage of the device with inappropriate fixing screws. Be sure that device will not fall while doing the montage.

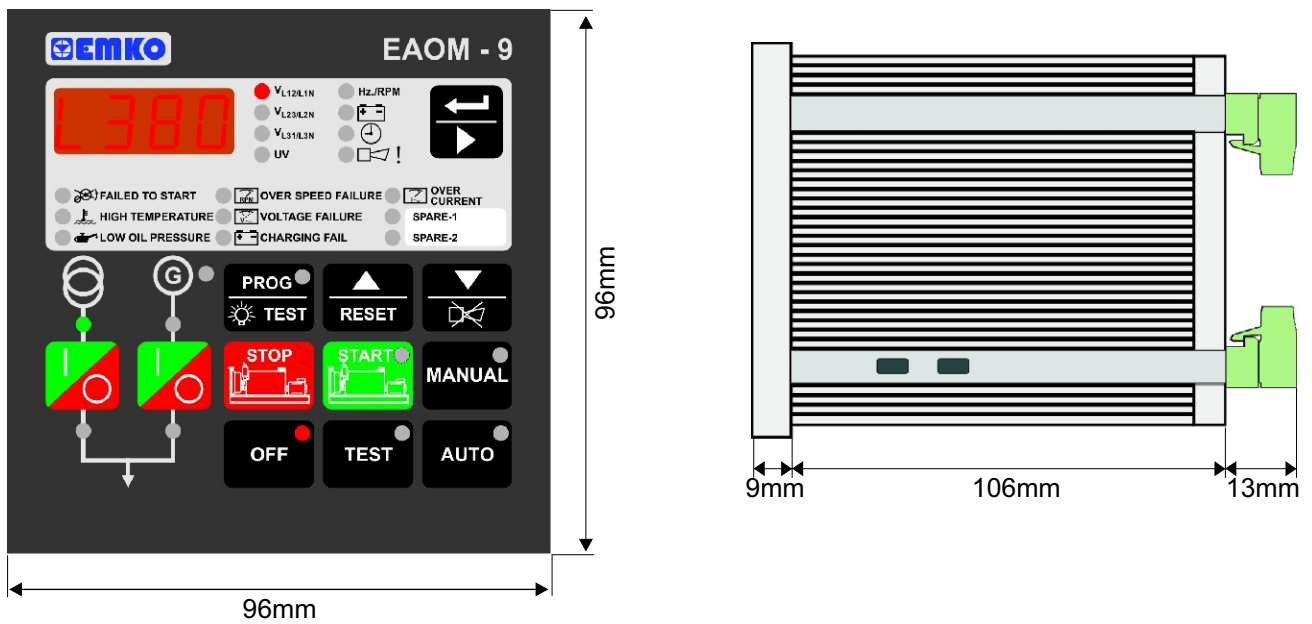
It is your responsibility if this equipment is used in a manner not specified in this instruction manual.

Report any shortage or damage to your local sales office as soon as possible.

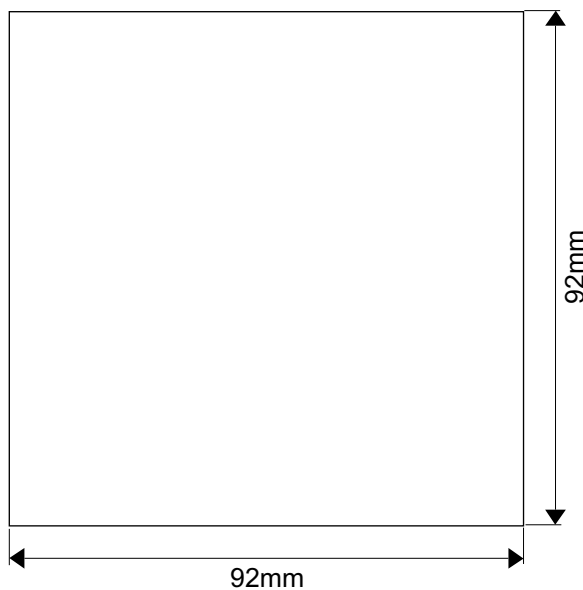
## 2.1 General Description



## 2.2 Dimensions



## 2.3 Panel Cut-Out



## 2.4 Environmental Ratings

### Operating Conditions



**Operating Temperature** : -25°C to 70°C



**Max. Operating Humidity** : 90% Rh (non-condensing)



**Altitude** : Up to 2000m.



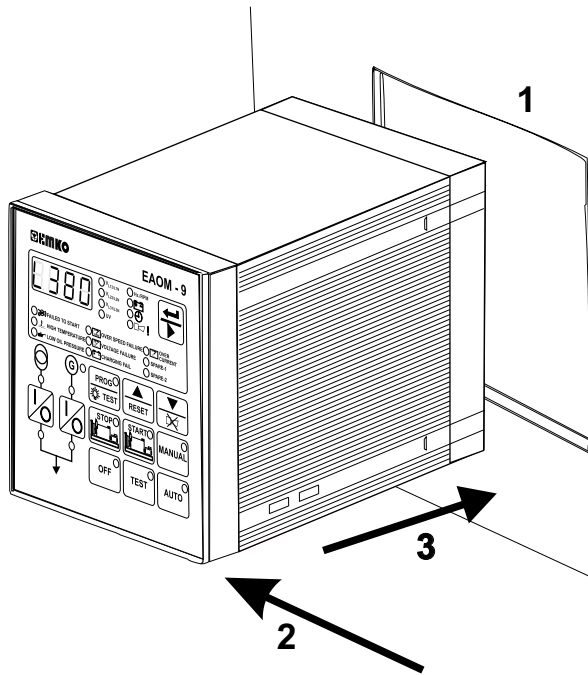
**Forbidden Conditions:**

**Corrosive atmosphere**

**Explosive atmosphere**

**Home applications (The unit is only for industrial applications)**

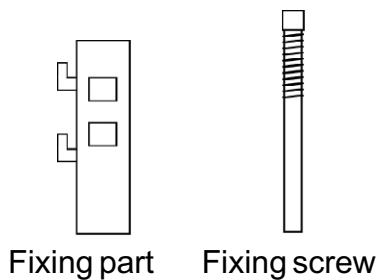
## 2.5 Panel Mounting



1. If fixing parts are on the unit firstly unscrew the fixing screws in the fixings parts to remove the fixings parts.
2. Insert the unit in the panel cut-out from the front. Maximum panel thickness is 7mm (0.28 inch)
3. Insert the fixings parts in the slotted that is located on the right and left sides of the unit and tighten the fixing screws to secure the unit against the panel.



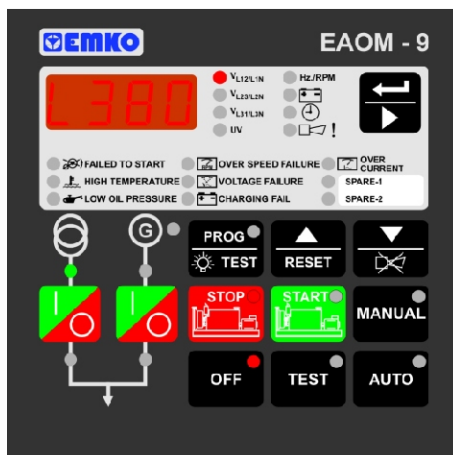
During installation into a metal panel, care should be taken to avoid injury from metal burrs which might be present. The equipment can loosen from vibration and become dislodged if installation parts are not properly tightened. These precautions for the safety of the person who does the panel mounting.



Fixing part

Fixing screw

## 2.6 Installation Fixing Screws



The unit is designed for panel mounting. Fixing is done by two screw fixings

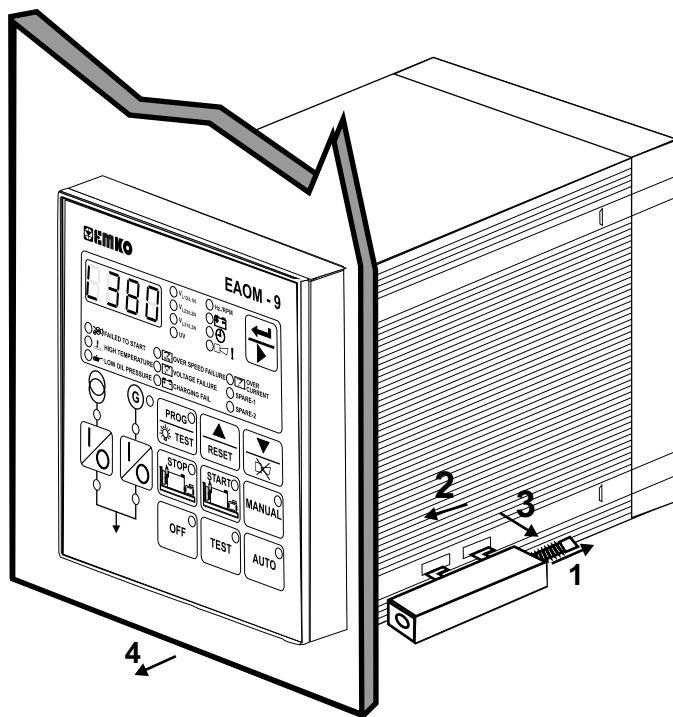
1. Insert the unit in the panel cut-out from the front side.
2. Insert the fixings through the mounting holes and tighten the fixing screws to secure the unit against the panel.



During mechanical installation, beware of any sharp burrs on the metal panel aperture. Ensure that the fixings are properly tightened to prevent the fixings becoming loose due to panel vibration.

Montage of the unit to a system must be done with it's own fixing screws. Do not do the montage of the device with inappropriate fixing screws. Be sure that device will not fall while doing the montage.

## 2.7 Removing from the Panel

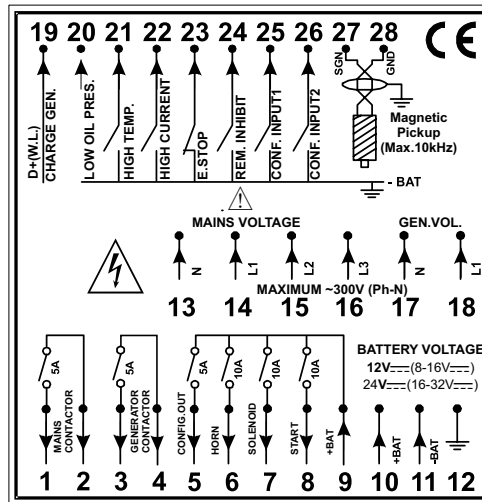


**Before starting to remove the unit from panel, power off the unit and the related system.**

1. Loosen the screws on the fixing parts on the left and right side of the device.
2. Pull the fixing parts through the 2nd direction
3. Take off the fixing parts.
4. Pull the unit through the front side of the panel

### 3. ELECTRICAL WIRINGS

#### 3.1 Terminal Layout and Connection Instructions



Only qualified personnel and trained technicians should work on this equipment. This equipment contains internal circuits with voltage dangerous to human life. Do not open or dismantle the product enclosure.

While installing the unit, battery voltage range must be controlled and appropriate battery voltage must be applied to the unit. Controlling prevents damages in unit and system and possible accidents as a result of incorrect battery voltage.

Switch on the battery voltage only after that all the electrical connections have been completed.

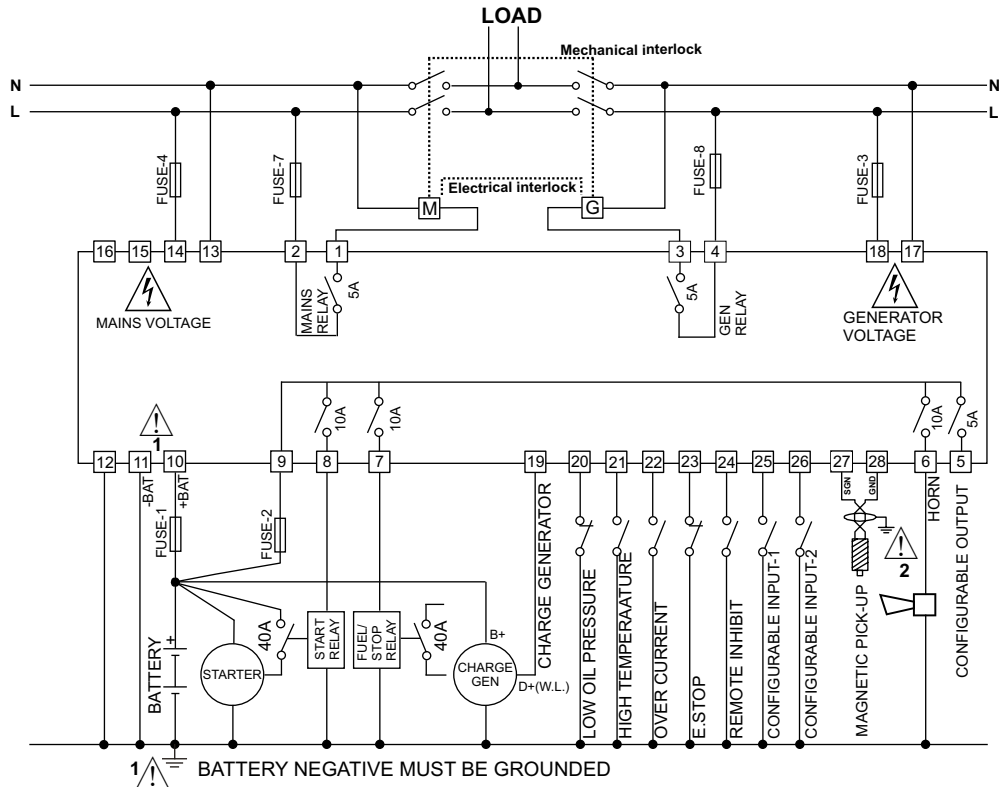
External fuse is recommended.

In case of failure it is suggested to return the instrument to the manufacturer for repair.

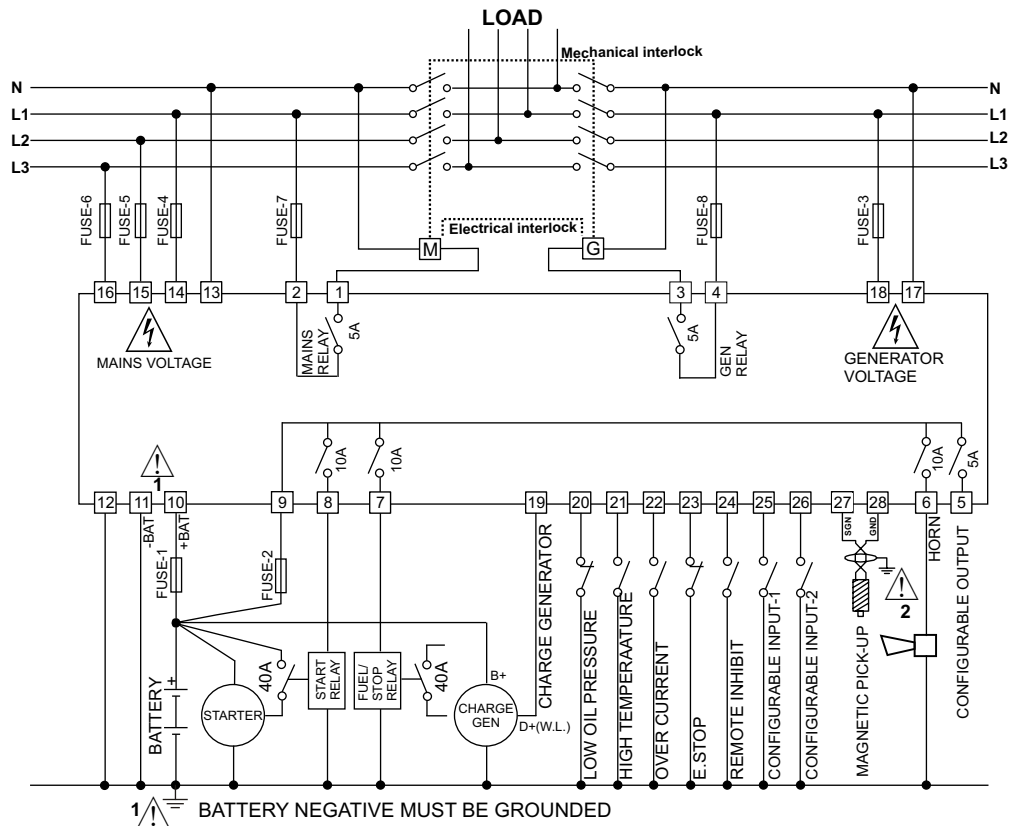
You must ensure that the device is correctly configured for your application. Incorrect configuration could result in damage to the process being controlled, and/or personal injury. It is your responsibility, as the installer, to ensure that the configuration is correct. Device parameters has factory default values. These parameters must be set according to the system's needs. There is severe danger for human life in the case of unauthorized intervention.

## 3.2 Electrical Wiring Diagram

### 3.2.1 Single Phase Wiring Schematic



### 3.2.2 Three Phase Wiring Schematic



All rear connectors are two-part removable and can be unplugged to facilitate fast and convenient connection. If remote start operation is required, the installer should ensure sufficient visual and audible warning takes place before commanding the start sequence. FUSE-1, FUSE-3, FUSE-4, FUSE-5 and FUSE-6 should be 1 A. T

FUSE-2 should meet the current required by solenoids (Max. 16A. T). FUSE-7, FUSE-8 should be max 5A. T.

1- Connect the unit as shown in the appropriate diagram above. Be sure to connect the battery supply the right way round and battery negative should be grounded. The connectors can be unplugged from the rear of the unit to facilitate connection.

2- Screened cable must be used for connecting the Magnetic Pickup, ensuring that the screen is grounded at one end ONLY.

Table 3.1 shows the connections and recommended cable sizes. Table 3.2 describes the functions of the connections.

Table 3.1 Unit wiring

Pin	Description	Cable Size (mm)	Notes
1,2	Mains contactor control	2.5	Volt-free on/off contact
3,4	Alternator contactor control	2.5	Volt-free on/off contact
5	Configurable output	1.0	Max. 5A@24 V <sub>DC</sub>
6	Output to horn	2.5	Max. 10A@24 V <sub>DC</sub>
7	Output to fuel/stop solenoid	2.5	Max. 10A@24 V <sub>DC</sub>
8	Output to start relay	2.5	Max. 10A@24 V <sub>DC</sub>
9	Positive battery supply input	2.5	For relay outputs
10	Positive battery supply input	1.0	
11	Negative battery supply to input	2.5	
12	Negative battery supply to input	2.5	
13	Mains neutral connection	1.0	
14	Mains L1 voltage input	1.0	
15	Mains L2 voltage input	1.0	3-phase only
16	Mains L3 voltage input	1.0	3-phase only
17	Alternator neutral connection	1.0	
18	Alternator L1 voltage input	1.0	
19	Input from charge generator	1.0	
20	Input from Low Oil Pressure switch	0.5	Switch to 0 V <sub>DC</sub> (NC)
21	Input from High Temperature switch	0.5	Switch to 0 V <sub>DC</sub> (NO)
22	Input from over-current sensor	0.5	Switch to 0 V <sub>DC</sub> (NO)
23	Emergency stop input	0.5	Switch to 0 V <sub>DC</sub> (NC)
24	Input from Remote Inhibit switch	0.5	Switch to 0 V <sub>DC</sub> (NO)
25	Input from Spare-1 switch	0.5	Switch to 0 V <sub>DC</sub> (NO)
26	Input from Spare-2 switch	0.5	Switch to 0 V <sub>DC</sub> (NO)
27	Input from Magnetic pickup		
28	Input from Magnetic pickup		

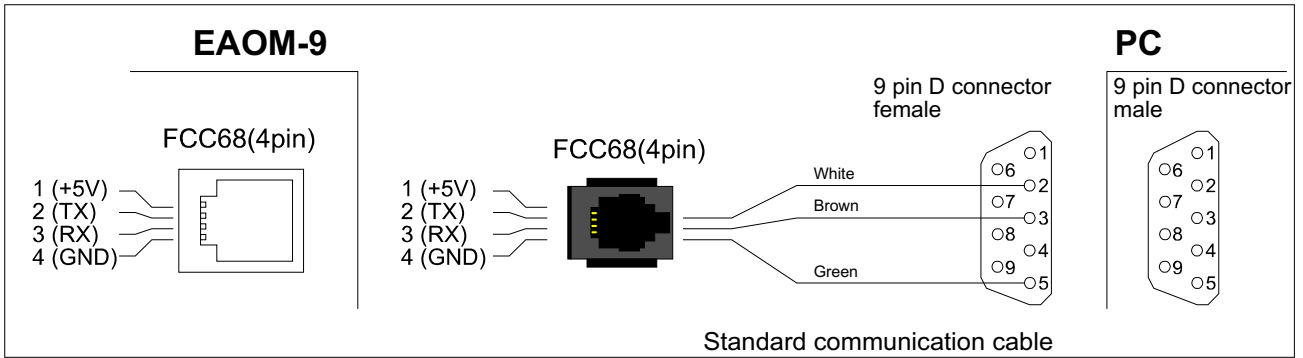


Table 3.2 Unit wiring description

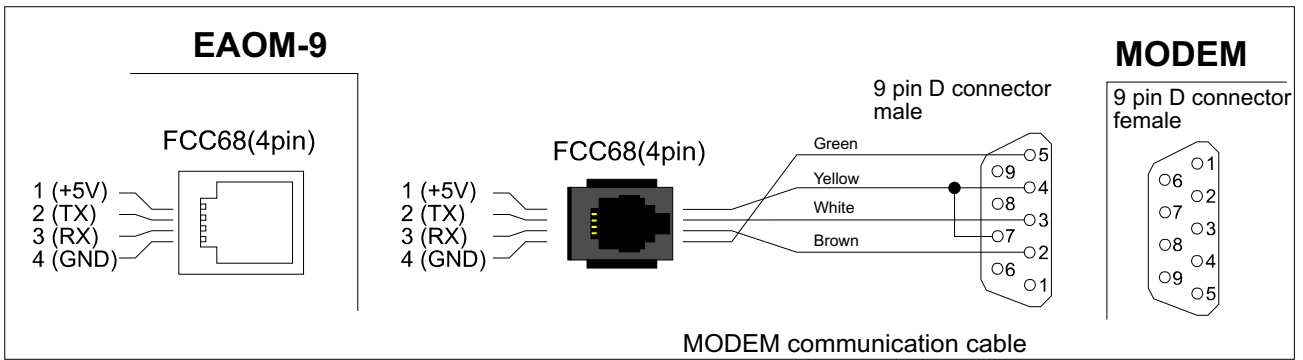
Pin	Function
1,2	Mains contactor. Volt-free relay contact. Closed to select mains.
3,4	Alternator contactor. Volt-free relay contact. Closed to select Alternator.
5	Configurable output can be programmed to provide contact closure when: alarm occurs, engine is running, unit is ready for automatic operation or preheat function.
6	Output to horn.
7	Output to Fuel/Stop solenoid. Controls fuel to engine or controls engine stopping.
8	Output to Start relay. Controls starter motor.
9	Battery positive input.+12 V <sub>DC</sub> or +24 V <sub>DC</sub> . Feeds relay outputs.
10	Positive battery input +12 V <sub>DC</sub> or +24 V <sub>DC</sub> .
11	Negative battery input (0 V <sub>DC</sub> )
12	Negative battery input (0 V <sub>DC</sub> )
13	Mains neutral connection.
14	L1
15	L2
16	L3
	Mains input. Used to detect mains failure for controlling automatic transfer of load to alternator pins 15 and 16 not used on single phase applications.
17	Alternator neutral connection.
18	Input from alternator L1. Unit can be programmed to use frequency of alternator output to detect when engine has started.
19	Charge generator failure input. It can be used to detect when engine has started. The EAOM-9 connection replaces the usual charge indicator lamp. It supplies current to the rotor coil from the battery until the engine is running.
20	Input from Low Oil Pressure switch. The oil pressure switch must be the type that closes when oil pressure is normal and opens on low oil pressure (failure condition or engine stopped)
21	Input from High Temperature switch. Switched to 0V when engine temperature exceeds thermostat setting.
22	Over current input. Normally open contact. Closed on over current. On over current, unit de-activates Alternator contactor to remove load. Engine is not shut down.
23	Emergency Stop. Normally closed contact. Open circuit to stop engine.
24	Input from Remote Inhibit switch. Normally open contact – allows normal Automatic mode operation. Close to 0V to inhibit automatic load transfer on mains failure.
25	Spare 1 input. Normally open. When switched to 0V, sounds the horn and flashes indicator on panel. Can be programmed to stop the engine or de-energise the alternator contactor.
26	Spare 2 input. Normally open. When switched to 0V, sounds the horn and flashes indicator on panel. Can be programmed to stop the engine or de-energise the alternator contactor.
27,28	Input from magnetic pickup. Unit can be programmed to read engine speed from magnetic pick-up and detect to engine has started.

## 4. RS-232 SERIAL INTERFACE, PROGRAMMING THE DEVICE OVER PC OR MODEM

### 4.1 Cable Connection Between RS-232 Terminal of the Device and PC



### 4.2 Cable Connection Between RS-232 Terminal of the Device and Modem



**Note:** For 9600 baud rate, cable length must be maximum 10 meters.

## 4.3 PC Interface

The PC interface kit comprises of a 9 pin D connector/FCC68(4 pin) connection lead with 2 meters of cable and the optional PC Software (Supplied on CD-ROM)

### 4.3.1 Technical Specifications

RS-232 **non-isolated** Serial interface  
9600 Baud Rate  
8 data bits, No Parity, 1 Stop Bit  
Maximum allowable cable length is 10 meters

### 4.3.2 Installation Instruction

#### 4.3.2.1 Minimum System Requirements

<b>Processor</b>	: 486 66MHZ
<b>Operating Systems</b>	: Windows 95/98/XP, Windows NT, Windows 2000
<b>Ram</b>	: 16 Mbyte
<b>Monitor</b>	: 14" SVGA (640x480 resolution)
<b>Fixed Disk Free Space</b>	: 5 Mbyte
<b>Disk Drive</b>	: CD-ROM
<b>Communication</b>	: An RS-232 communication port is needed to communicate with the EAOM-9 unit

### 4.3.3 Installing EAOM-9 Software

Insert the software CD into the CD-ROM drive on the PC. CD will autostart, then select EAOM-9 Install from the menu.

### 4.3.4 Using Of EAOM-9 Communication Software

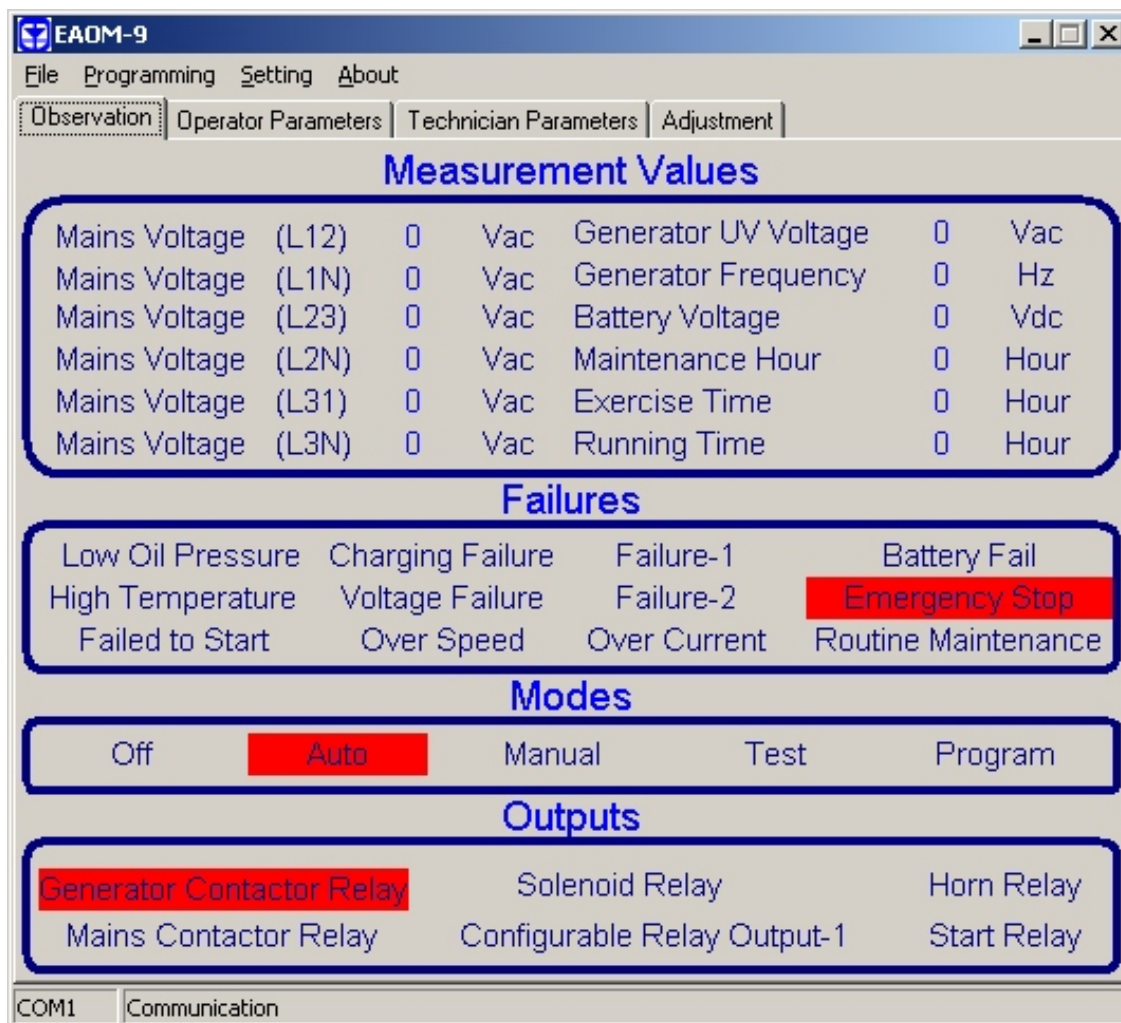
Press the windows START button icon, then select EAOM-9 SW EAOM-9 from the program menu.

### 4.3.5 Description

EAOM-9 unit communicates with the PC using RS-232 communications. The PC software allows the EAOM-9 unit's parameters and status information to be displayed on the PC screen. Operator and Technician parameters can be viewed. Parameters are password protected. There are four windows in EAOM-9 PC SW: Observation Window, Operator Parameters Window, Technician Parameters Window and Adjustment Window.

### 4.3.6 Observation Window

In this window the values listed below can be observed.



#### Measurement Values

Mains Voltages  
 Generator UV Voltage  
 Generator Frequency  
 Battery Voltage  
 Maintenance Hour  
 Exercise Time  
 Running Time

#### Failures

Low Oil Pressure  
 High Temperature  
 Failed to Start  
 Charging Failure  
 Voltage Failure  
 Over Speed  
 Failure 1 & 2  
 Over Current  
 Battery Fail  
 Emergency Stop  
 Routine Maintenance

#### Outputs

Mains Contactor Output  
 Generator Contactor Output  
 Configurable Output-1  
 Solenoid output  
 Start output  
 Horn output

#### Modes

Off  
 Auto  
 Manual  
 Test  
 Program

### 4.3.7 Operator Parameters Window

Operator parameters can be viewed and edited. Parameters are password protected. When the operator password is entered, it is compared with operator password that is registered inside the EAOM-9 unit.

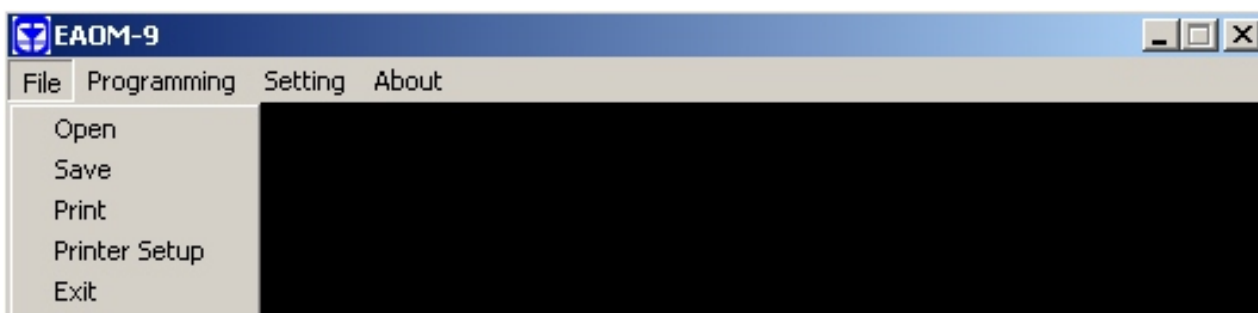
### 4.3.8 Technician Parameters Window

All parameters can be viewed and edited in this window. Parameters are password protected. When the technician password is entered, it is compared with technician password that is registered inside the EAOM-9 unit.

## 4.3.9 MAIN MENU

### 4.3.9.1 FILE

This menu allows the user to save configuration files to the disk, read from disk and write to the disc



**Open** :This menu allows the user to load the registered configuration files to the PC.

**Save** :This menu allows the user to save the parameters with a name defined by user.

**Print** :This menu allows the user to print the parameters.

**Printer Setup**:This menu allows the user to select the printer that is connected to network or PC and change the configuration of the printer.

**Exit** :Exit the program.

### 4.3.9.2 PROGRAMMING

This menu is active only when the Operator or Technician Parameters Window is open. Using this menu allows the user to upload parameters from the EAOM-9 unit to the PC or download from the PC to the EAOM-9 unit.



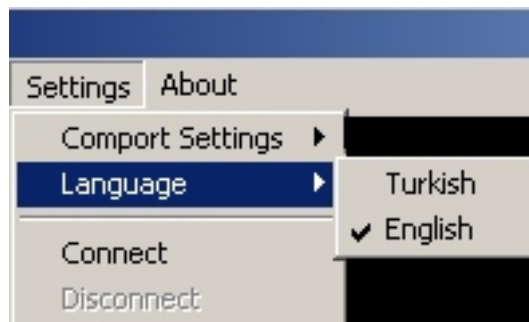
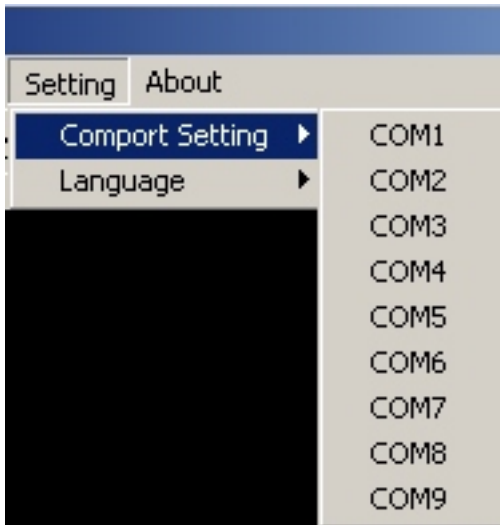
**Download** : With this menu user can load parameters from PC to EAOM-9.

**Upload** : User can load the parameters stored on EAOM-9 unit to PC.

### 4.3.9.3 Settings

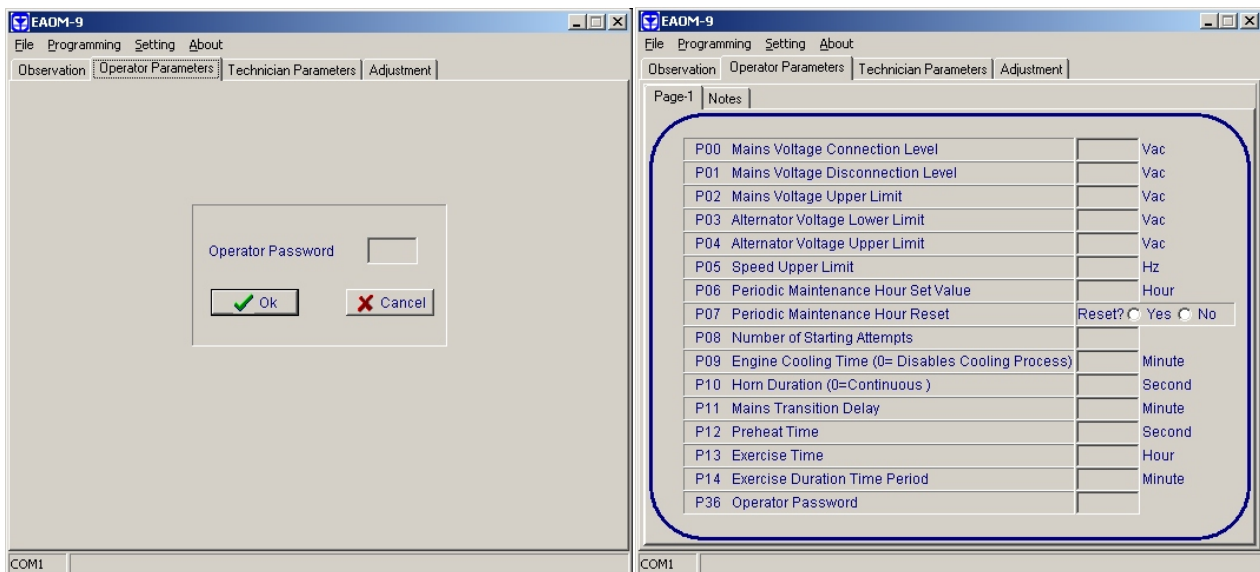
**Communication Port Settings:** With this menu, user can determine the serial port configurations of the PC

**Language:** Turkish or English can be selected.



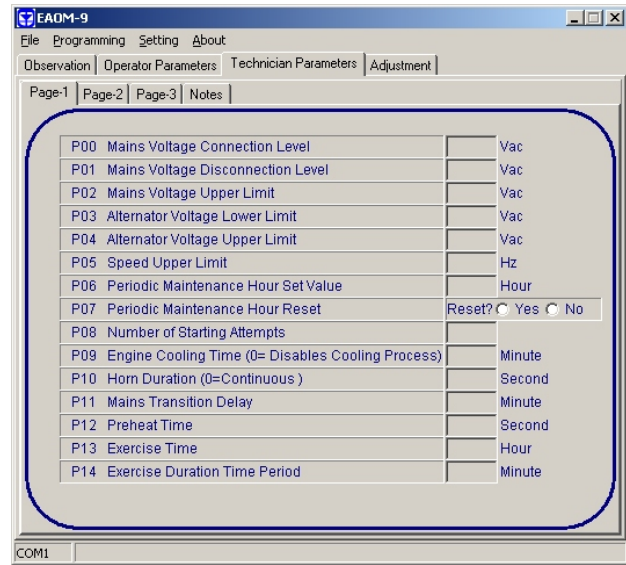
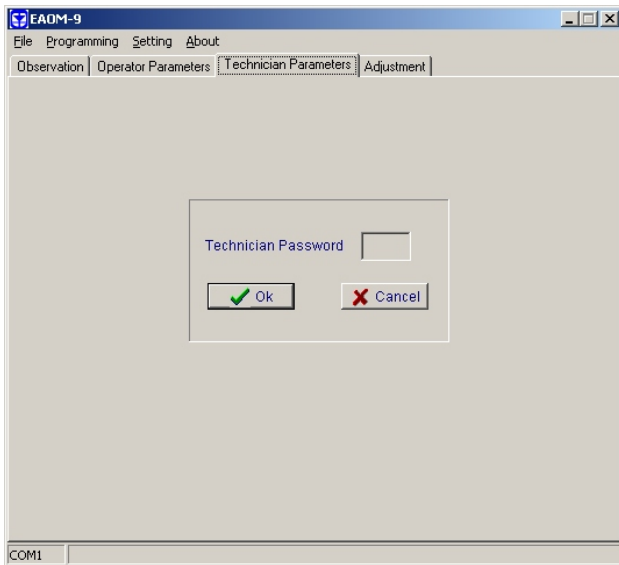
### 4.3.10 Entering to the Operator Parameters Window

Click Operator Parameter tab. Enter the Operator Parameter password. If the password is correct, operator parameters will be viewed.



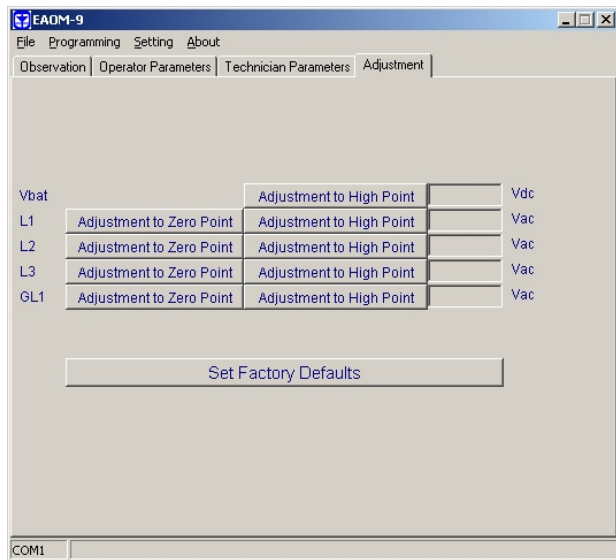
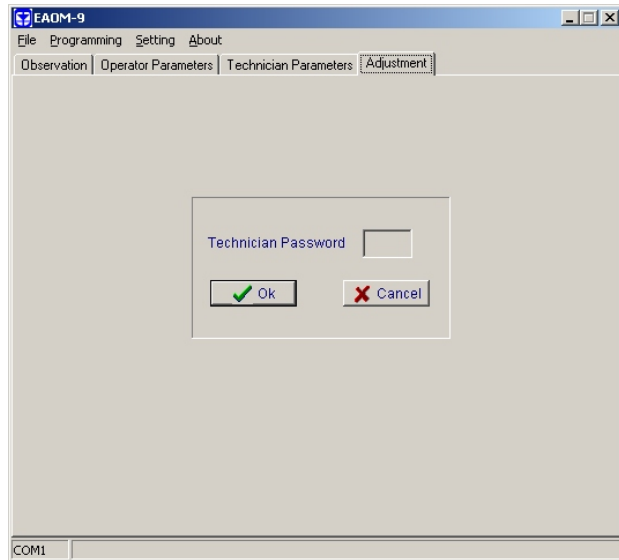
### 4.3.11 Entering to the Technician Parameters Window

Click Technician Parameter tab. Enter the Technician Parameter password. If password is correct, all parameters will be viewed.



### 4.3.12 Entering to the Adjustment Window

Click Adjustment tab. Enter the Technician password. If password is correct, adjustment window will be viewed.



#### **4.3.13 Load the Configuration File From the Disc**

Click 'Open' in File menu. Choose configuration file which includes operator or technician parameters on Open Dialog Box. When the user clicks the 'Open' button on the Open Dialog Box, parameters will be transferred to PC window.

#### **4.3.14 Save the Configuration File to the Disc**

Click 'Save' in File menu. After choosing where to save the file, enter the file name. When the user clicks the 'Save' button on Save Dialog Box, all parameters will be saved to the file.

#### **4.3.15 Upload**

For loading parameters from EAOM-9 unit to PC follow the steps below. If user is in operator parameters window, only operator parameters will be viewed. If user is in Technician Parameters Window, all parameters will be viewed. Press 'Upload' in Program menu. While loading the parameters, the hour-glass cursor is displayed. Please wait for the upload operation to complete, when the cursor returns to normal.

#### **4.3.16 Download**

For loading parameters from PC to EAOM-9 follow the steps below. If user is in operator parameters window, only operator parameters will be loaded. If user is in Technician Parameters Window, all parameters will be loaded. Press 'Download' in Program menu. While loading the parameters, the hour-glass cursor is displayed. Please wait for the download operation to complete, when the cursor returns to normal.



## 5. PARAMETERS

The unit is extensively programmable through the front panel and via PC software.

No	Definition of Parameter	Min	Max	Default	Unit
P00	Mains Voltage Connection Level	60	600	320	V $\sim$
P01	Mains Voltage Disconnection Level	60	600	300	V $\sim$
P02	Mains Voltage Upper Limit	60	600	440	V $\sim$
P03	Alternator Voltage Lower Limit	60	600	320	V $\sim$
P04	Alternator Voltage Upper Limit	60	600	440	V $\sim$
P05	Speed Upper Limit	30.0	75.0	53.0	Hz
P06	Periodic Maintenance Hour Set Value	0000	9999	5000	Hour
P07	Periodic Maintenance Hour Reset	Press 'Silence Alarm' button to reset			
P08	Number of Starting Attempts	1	10	3	Number
P09	Engine Cooling Time(0 disable cool process)	0	99	3	Minute
P10	Horn Duration (0 Continuous)	0	999	60	Second
P11	Mains Transition Delay	0	30	3	Minute
P12	Preheat Time	0	99	10	Second
P13	Exercise Time (0 Disable)	0	999	0	Hour
P14	Exercise Duration Time Period	0	999	20	Minute
P15	Single / Three Phase Selection	1/3		3	
P16	Speed Sensing Input Selection	0=Alternator Signal (Internal) 1=Magnetic Pickup		0	
P17	Nominal Alternator Frequency	50.0/60.0		50.0	Hz
P18	Nominal Speed	500	5000	3000	Rpm
P19	Tooth Number	1	1000	100	Number
P20	Battery Voltage Lower Limit	7.2	24.0	8.0	V $\text{---}$
P21	Mains Change Over Delay	0.1	25.0	1.0	Second
P22	Stop / Fuel Solenoid Selection	Stop / Fuel		Fuel	
P23	Stop Magnet Energising Time	0	99	20	Second
	Engine started signal	0=No, 1=Yes			
	P24.0 Charge Generator	0/1		1	
P24	P24.1 Speed	0/1		0	
	P24.2 Alternator Voltage	0/1		1	
	P24.3 Oil Pressure	0/1		0	
P25	Starting Attempt Duration	5	99	5	Second
P26	Alternator voltage limit for crank disconnection	40	360	300	V $\sim$
P27	Speed Limit for Crank Disconnection	20.0	45.0	40.0	Hz
P28	Oil Pressure Control Delay Time	0	99	30	Second
P29	Control on Delay	0	99	10	Second
P30	Alternator Voltage Fault Control Delay	0.0	10.0	5.0	Second
P31	Speed Fault Control Delay	0.0	10.0	5.0	Second
P32	Engine running time reset	Enter technician password to reset time to "0" (zero)			

No	Definition of Parameter	Min	Max	Default	Unit
P33	Configurable Failure Input-1	0	6	0	Number
	0 Led flashes while input = 0 Volt 1 Led flashes while horn is sounding and then stays on until reset 2 As '1' plus engine stops 3 As '0' but only while engine running 4 As '1' but only while engine running 5 As '4' plus engine stops 6 As '4' plus alternator contactor de-energised				
P34	Configurable Failure Input-2	0	6	0	Number
	0 Led flashes while input = 0 Volt 1 Led flashes while horn is sounding and then stays on until reset 2 As '1' plus engine stops 3 As '0' but only while engine running 4 As '1' but only while engine running 5 As '4' plus engine stops 6 As '4' plus alternator contactor de-energised				
P35	Configurable Output	0	13	0	Number
	0 - Alarm Out 1 - Engine running 2 - Ready for Automatic transfer 3 - Preheat 4 - Load Permit 5 - Over Speed 6 - Over Current 7 - High Temperature 8 - Low Oil Pressure 9 - Maintenance Due 10 - Failed to Start 11 - Voltage Failure 12 - Charging Failure 13 - Low Battery Voltage				
P36	Operator password (P00 to P15 and P36)	0000	9990	0000	Number
P37	Technician password (P00 to P37)	0000	9990	0000	Number

## 5.1 Program Functions

### 5.1.1 Mains Voltage

P00 Mains Voltage Connection Level  
P01 Mains Voltage Disconnection Level  
P02 Mains Voltage Upper Limit

In Automatic mode, the unit uses these parameters to decide when to switch the load between the mains supply and the alternator – assuming the alternator is providing a satisfactory output. If the mains voltage is higher than the Mains Voltage Upper Limit (P02) or lower than the Mains Voltage Disconnection Level (P01), the unit connects the load to the generator instead of to the mains. If the mains voltage is low and the load is running on the generator, the unit will not restore the mains supply to the load until the mains voltage is between Mains Voltage Connection Level (P00) and Mains Voltage Upper Limit (P02) for Mains Transition Delay (P11) value. This hysteresis prevents constant switching between mains and generator as the mains varies about the switching levels. Figure 5.1 shows how, in automatic mode, the load is transferred between mains and generator as the mains voltage varies over time.

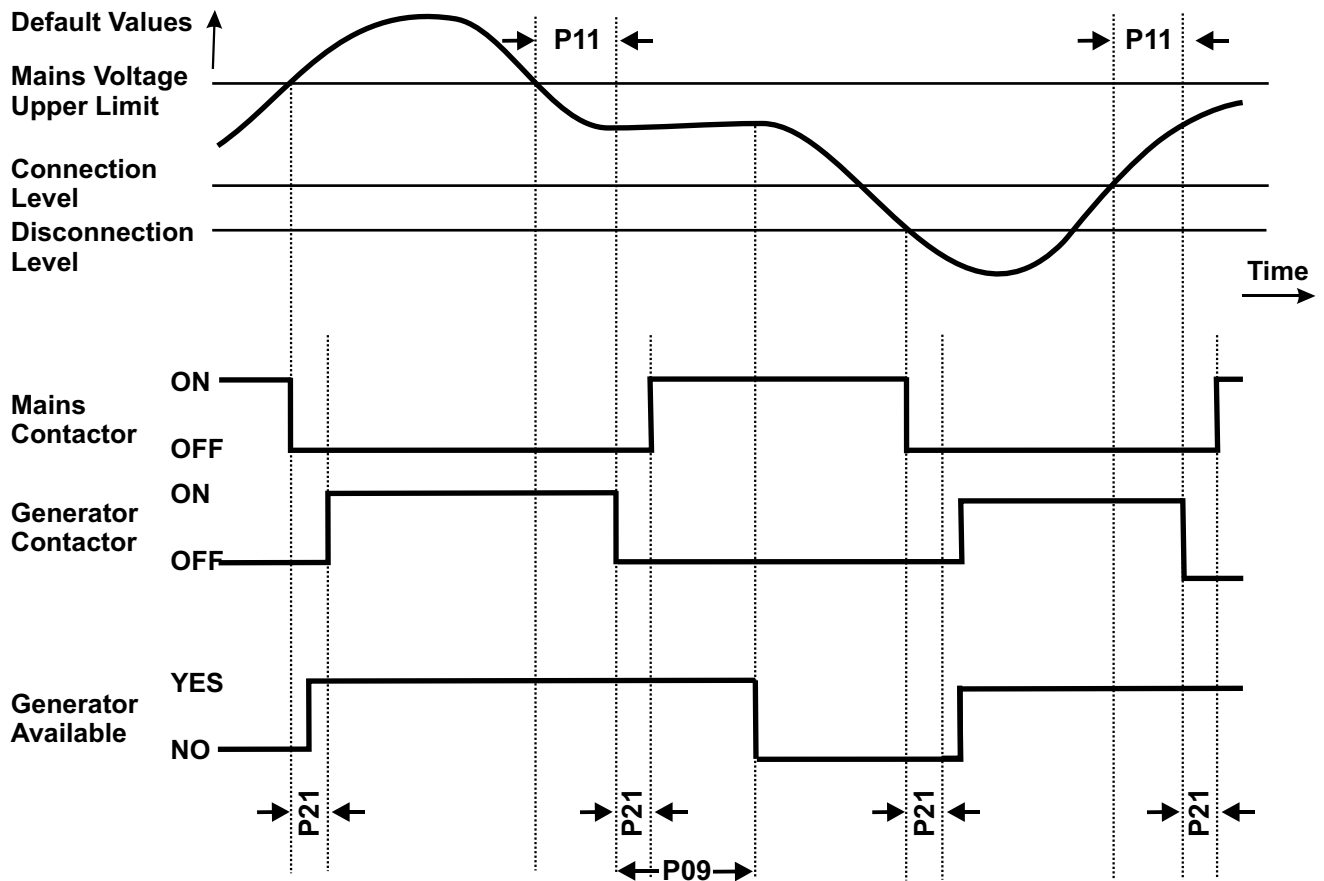


Figure 5.1

P09 = Engine Cooling Time  
P11 = Mains Transition Delay  
P21 = Mains Change Over Delay

## **5.1.2 Alternator Voltage**

P03 Alternator Voltage Lower Limit  
P04 Alternator Voltage Upper Limit  
P30 Alternator Voltage Fault Control Delay

A fault will be reported if the alternator output voltage goes outside the window defined by the upper and lower limits for more than the time defined as the Alternator Voltage Fault Control Delay (P30). The fault will only occur if the engine has been running for the period defined as the Control on Delay (P29). This failure immediately stops the generating set without Engine Cooling Time (P09)

## **5.1.3 Alternator Frequency**

P05 Speed Upper Limit  
P31 Speed Fault Control Delay

A fault will be reported if the alternator output frequency exceeds the upper limit for more than the time defined as the Speed Fault Control Delay (P31). The fault will only occur if the engine has been running for the period defined as the Control on Delay (P29). This failure immediately stops the generating set without engine cooling time.

## **5.1.4 Engine Cooling Time (P09)**

When operating under heavy load, the engine can get very hot and is only prevented from overheating by circulating coolant. If the engine is stopped abruptly under these conditions, it can overheat as the coolant flow is cut off. Where EAOM-9 controls the load, via one of the configurable outputs, it can ensure that the engine continues to run after the load has been removed. Engine Cooling Time (P09) defines the duration of this cooling off period.

## **5.1.5 Battery Voltage Lower Limit (P20)**

If the battery voltage drops below the defined Battery Voltage Lower Limit, an alarm occurs and “Low Battery Failure” LED illuminates.

## **5.1.6 Engine Starting**

Number of Starting Attempts (P08)  
Starting Attempt Duration (P25)

When the EAOM-9 receives an Engine Start command, it energises the start solenoid to drive the starter motor and energises the Fuel solenoid (if selected – see Section 5.1.9 Stop/Fuel selection). Starting attempt duration (P25) defines the maximum period for the start solenoid output is being active if one of the Engine Started Signals is not received (Refer to 5.1.7). It makes a new attempt after a delay equal to twice the defined Starting Attempt Duration (P25). Number of Starting Attempts (P08), defines the number of unsuccessful tries that the EAOM-9 will make before abandoning the attempts. If all these attempts fail, EAOM-9 will stop the starting attempts and start failure indication is displayed. Start failure can be reset with reset button.

### **5.1.7 Engine Started Signals (P24)**

The unit must de-energise the Start solenoid to disconnect the starter motor, once the engine is running. Conversely, if the engine does not start after the pre-set start time, the unit will turn off the starter motor and try again. Hence, the unit must be able to detect when the engine has started. Four signals are available to provide engine running information as follows :

0. Charge Generator (P24.0) ; from charging generator energising coil current.

1. Speed (P24.1); if engine speed is higher than Speed Limit for Crank Disconnection (P27), pay attention to the Speed Sensing Input Selection (P16) (Refer to 5.1.8)

2. Alternator Voltage (P24.2); if alternator voltage is higher than Alternator Voltage Limit for Crank Disconnection (P26)

3. Oil pressure; it looks if oil pressure switch is closed.

Any or all of these signals can be selected for use. It is advisable to select at least two of them –preferably 1. Engine speed, 2. Charging generator or Alternator voltage.

See Section 5.1.6 Engine Starting. If any of the selected signals appears, the unit assumes that the engine has started.

### **5.1.8 Speed Sensing Input Selection (P16)**

This parameter specifies the method by which the unit monitors generator speed. The choice is between alternator frequency and external magnetic pick-up. Speed is monitored so as to detect when the engine has started. See Sections 5.1.3 Alternator Frequency, 5.1.6 Engine Starting and 5.1.7 Engine started signals (P24)

Where alternator frequency is used, Nominal Alternator Frequency (P17) and Nominal Speed (P18) must be set correctly

Where the magnetic pick-up is used, Nominal Alternator Frequency (P17), Nominal Speed (P18) and Tooth Number (P19) must be set correctly.

### **5.1.9 Stop / Fuel Solenoid Selection (P22)**

This parameter allows the use of either a Stop solenoid or a Fuel solenoid. (See Section 5.1.6 Engine Starting.)

If Fuel Solenoid selected, the fuel solenoid will be energised while the engine is running and de-energised to cut off the fuel and stop the engine.

If Stop Solenoid selected, the stop solenoid is normally de-energised and only energised to stop the engine. The solenoid remains energised for the period defined as the Stop Magnet Energising Time (P23).

### **5.1.10 Stop Magnet Energising Time (P23)**

This parameter sets the period for which the Stop solenoid is energised to stop the engine. It applies only where parameter Stop / Fuel Solenoid Selection (P22) is set to Stop Solenoid.

### **5.1.11 Oil Pressure Control Delay Time (P28)**

This sets the delay before a Low Oil Pressure warning will be generated. The Low Oil Pressure fault indicator will light if the oil pressure switch contact remains opened, while the engine is running, after the period defined by parameter. This period begins when the EAOM-9 has detected engine starting and has cut off the drive to the starter motor. This failure immediately stops the generating set, without Engine Cooling Time (P09).

### 5.1.12 Control On Delay (P29)

During the initial period after the engine has been started, there can be fluctuations in engine speed and alternator output that could generate spurious fault indications. Control On Delay (P29) defines a period during which any fault indications, except High Temperature, will be ignored by the EAOM-9. Also, in the event of a mains failure, transfer of the load from mains to generator will be delayed until the end of the Control On Delay (P29) period. This period begins when the EAOM-9 has detected engine starting and has cut off the drive to the starter motor.

### 5.1.13 Configurable Inputs

A contact closure to 0V on any of these inputs causes the horn to sound for the period programmed by Horn Duration (P10) and lights the appropriate indicator on the panel. The Unit can be programmed to respond in one of seven ways:

0. Indication is unlatched - the LED flashes only while the input is 0V. This input has no effect if any other alarm condition is present.
1. Indication is latched. The LED flashes while the horn is sounding and then stays on until the reset button is pressed.
2. This is the same as 1 but, in addition, the engine is shut down. Options 3-6 are effective only while the engine is running.
3. Indication is unlatched - the LED flashes only while the input is 0V. This input operates only if the engine is running and has no effect if any other alarm condition is present.
4. Indication is latched. The LED flashes while the horn is sounding and then stays on until the reset button is pressed. This input operates only if the engine is running.
5. As 4 but, in addition, the engine is shut down.
6. As 4 but, in addition, the alternator contactor is de-energised to disconnect the load from the alternator. The engine is not shut down.

### 5.1.14 Configurable Output (P35)

When active, this output provides battery voltage (12V $\overline{DC}$  or 24V $\overline{DC}$ ) and can be programmed in one of fourteen different ways:

0. Alarm output. Active when any fault is reported until reset. It can be used for either audible or visual alert.
1. Engine running. Active while the engine is running
2. Ready for automatic transfer. Output is active while the unit is in Manual, Test or Auto mode.
3. Preheat function. On starting the output is active for time period defined in Preheat Time (P12) prior to running the starter motor.
4. Load transfer permitted. This output is active while the alternator output voltage is between Mains Voltage Connection Level (P00) and Mains Voltage Disconnection Level (P01). This output can be used to control a contactor that transfers the load to the alternator once the generator set is up and running.
5. Over speed alarm
6. Over current alarm.
7. High temperature alarm output. Active when high temperature fault is reported.
8. Low oil pressure alarm output. Active when low oil pressure fault is reported.
9. Maintenance due alarm output. Active when maintenance due fault is reported.
10. Failed to start alarm output. Active when failed to start fault is reported.
11. Voltage failure alarm output. Active when voltage failure fault is reported.
12. Charging fail alarm output. Active when charging fail fault is reported.
13. Low battery voltage alarm output. Active when low battery voltage fault is reported.

### **5.1.15 Maintenance Indication**

P06 Periodic Maintenance Hour Set Value  
P07 Periodic Maintenance Hour Reset

To ensure reliability, the generator must be serviced at regular intervals. The EAOM-9 can be set to indicate when a service is due. Set Periodic Maintenance Hour Set Value (P06) to the number of running hours between services. Use Periodic Maintenance Hour Reset (P07) to reset the hours counter at each service. When the engine has run for the defined number of hours, the LED with exclamation mark will flash.

### **5.1.16 Engine Exercise**

P13 Exercise Time  
P14 Exercise Duration Time Period

This function allows the engine to be run automatically, without load, at fixed intervals, as specified by Exercise Time (P13). The engine runs for the number of minutes specified by Exercise Duration Time Period (P14). Exercising will only occur if the unit is set to Auto mode when exercising is due. To disable exercising, set Exercise Time (P13) to zero.

### **5.1.17 Operator Password (P36)**

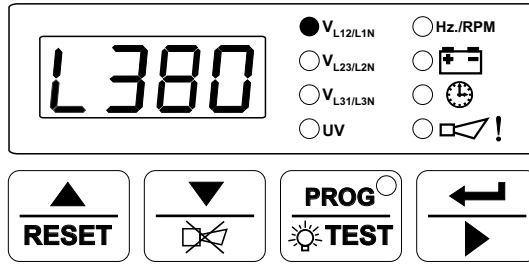
Use this option to change the Operator password. This password allows access to the parameters from Mains Voltage Connection Level (P00) to Exercise Duration Time Period (P14) and Operator Password (P36).

### **5.1.18 Technician Password (P37)**

Use this option to change the Technician password. It allows access to the all parameters: from Mains Voltage Connection Level (P00) to Technician Password (P37).

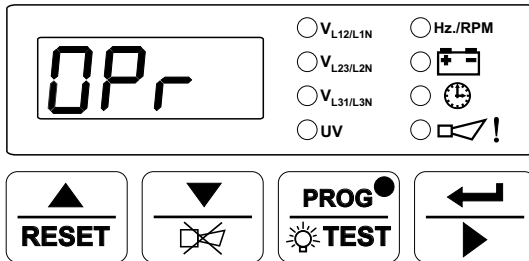
## 5.2 Changing and Saving Operator Parameter Value

Operation Screen



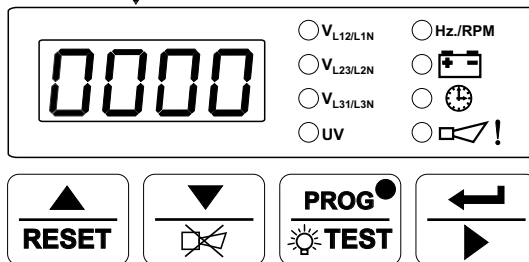
When button is pressed, all leds and digits are energised, because prog button is also used as test button. Continue to press the prog button for 5 seconds, Operator Menu Entering screen is shown and prog led lights on.

Operator Menu Entering Screen



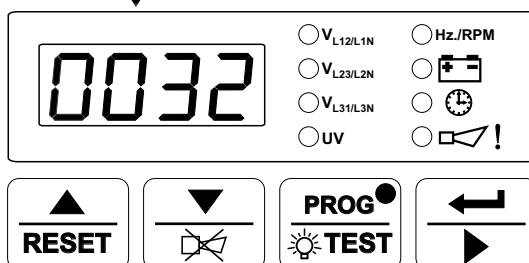
When button is pressed, operator password entering screen is shown.

Operator Password Entering Screen

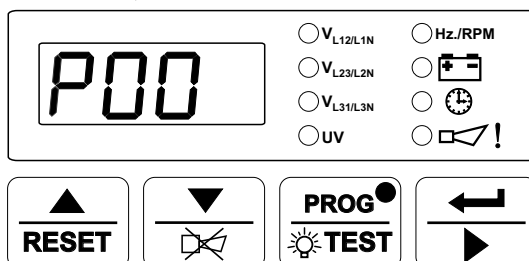


Change the password with and buttons

Operator Password Entering Screen



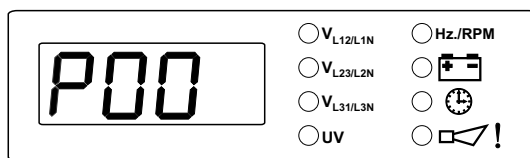
After entering the password, push the button for confirming the password and accessing to the first parameters of operator parameters.



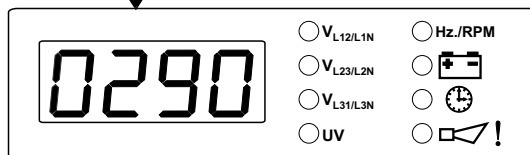
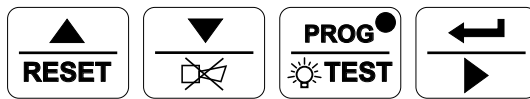
**NOTE :** If no operation is performed for 20 seconds, the device exits from the programming mode and turns to the main operation screen.





Press  button for accessing to the **P00** Value

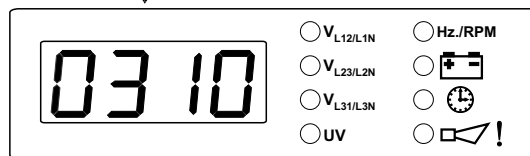
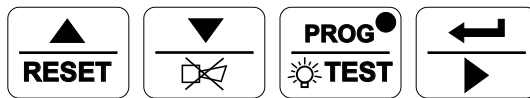


**Mains Voltage Connection Level Parameter**




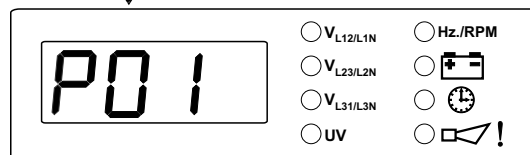
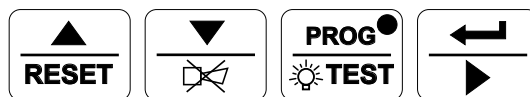
**Mains Voltage Connection Level Value**

Change the **P00** parameter with  and  buttons

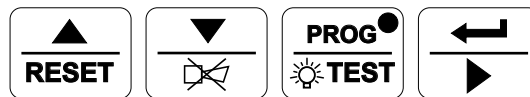



**Mains Voltage Connection Level Value**

Press  button for saving the **P00** value and accessing to the **P01** Parameter



**Mains Voltage Disconnection Level Parameter**

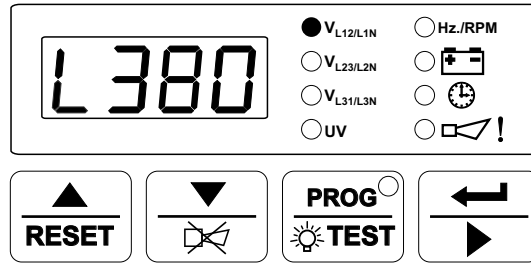



**NOTE :** Other operator parameters can be accessed as explained for **P00**   
 For exiting from programming mode, press 

**NOTE :** If no operation is performed for 20 seconds, the device exits from the programming mode and turns to the main operation screen.

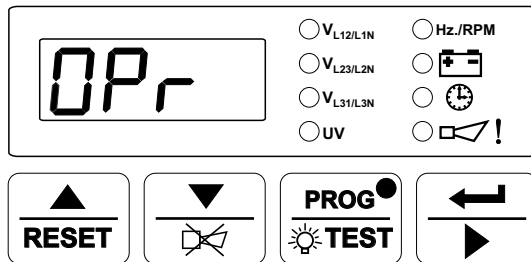
## 5.3 Changing and Saving Technician Parameter Value


Operation Screen



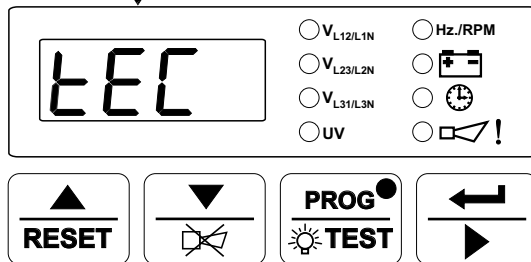
When  button is pressed, all leds and digits are energised, because prog button is also used as test button. Continue to press the prog button for 5 seconds, Operator Menu Entering screen is shown and prog led lights on.

Operator Menu Entering Screen



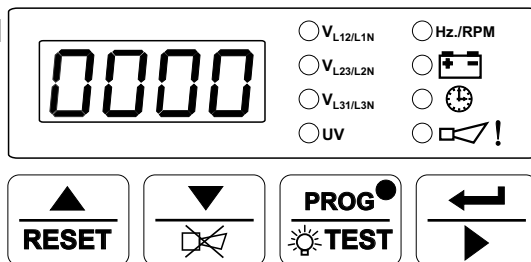
When  button is pressed for 10 seconds, technician menu entering screen is shown.

Technician Menu Entering Screen



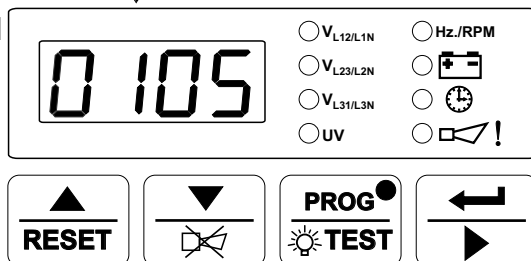
When  button is pressed, technician password entering screen is shown.

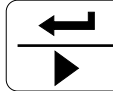
Technician Password Entering Screen



Change the password with  and  buttons

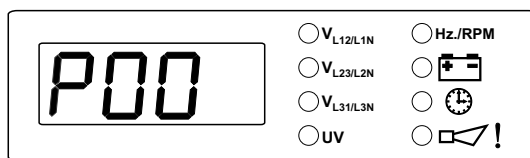
Technician Password Entering Screen



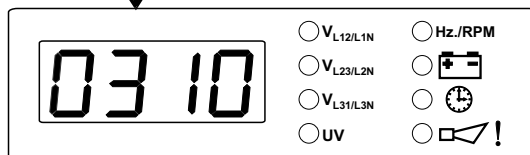
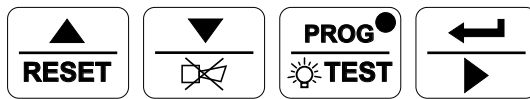
After entering the password, press the  button for confirming the password and accessing to the first parameters of technician parameters.

**NOTE :** If no operation is performed for 20 seconds, the device exits from the programming mode and turns to the main operation screen.



Press  button for accessing to the **P00** Value

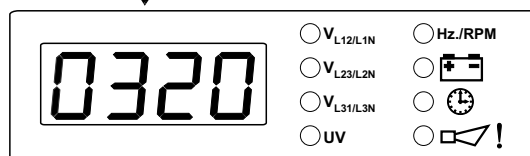
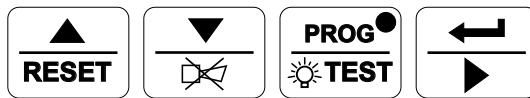


**Mains Voltage Connection Level Parameter**




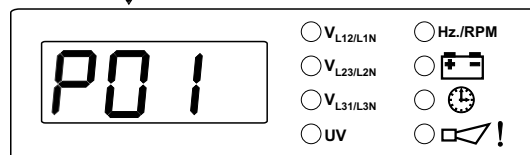
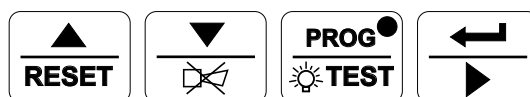
**Mains Voltage Connection Level Value**

Change the **P00** parameter with  and  buttons

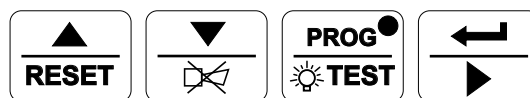



**Mains Voltage Connection Level Value**

Press  button for saving the **P00** value and accessing to the **P01** Parameter



**Mains Voltage Disconnection Level Parameter**



**NOTE :** Other technician paramaters can be accessed as explained for **P00**   
 For exiting from programming mode, press 

**NOTE :** If no operation is performed for 20 seconds, the device exits from the programming mode and turns to the main operation screen.

## 6. COMMISSIONING

These commissioning checks may interfere with the power supply to the load. Therefore they should not be carried out with a mission-critical load connected to the system.

### 6.1 Manual Operation

1. Check that the unit is correctly wired and that the wiring is of a standard and rating compatible with the system.
2. Check that the correct fuses are fitted.



**3. Be sure that the parameters are suitable for your system. Please refer to the Section 5 Parameters for details.**

4. Take temporary steps to prevent the engine from starting ( for example, disable the fuel solenoid).
  5. After a visual inspection to ensure it is safe to proceed, connect the battery supply.
  6. On the EAOM-9, press the Man (15) button. The LED on the button should light.
  7. Press the Engine Start (14) button. The LED on the button should light.
  8. Check that the engine start sequence commences. The starter motor should run for the programmed time period Starting Attempt Duration (P25) for the Number of Starting Attempts (P08) number of times.
  9. Check that the Start Failure LED flashes and the LED on the Engine Start button switches off.
  10. Restore the engine to operational state (reconnect the fuel solenoid).
  11. Press the Man (15) button. The LED on the button should light.
  12. Press the Engine Start (14) button. The LED on the button should light.
  13. Check the start sequence, as follows:
    - The starter motor runs
    - The engine starts
    - The starter motor disengages once the engine is running.
- If not, check that the engine is fully operational (fuel available etc.) and check the wiring and programming of the EAOM-9.
14. Check that the engine runs up to it's operating speed. If not and an alarm is present, check that the alarm is valid and then check the input wiring.
  15. Press the Engine Stop (13) button. At this moment the LED on the button should light. The engine should stop. Allow time for the engine to come to rest.


### 6.2. Auto Operation

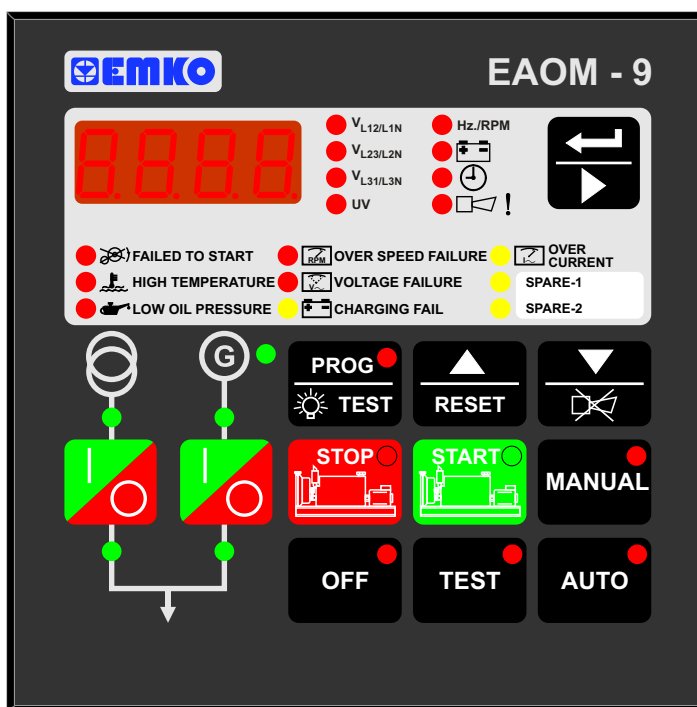
1. Check that the mains is connected to the unit and is present.
2. Check that the remote inhibit switch (if fitted) is set to enable (contact is open).
3. Check the mains voltage readings on the display.
4. Press the Auto button (18). The led on the button should light.
5. Switch off the mains supply to the unit. Check that the Alternator starts and after Control On Delay (P29) the load is transferred to the alternator.
6. Restore the mains supply to the unit. Check that after Mains Transition Delay (P11) the load is transferred back to the mains and the Alternator shuts down after Engine Cooling Time (P09).
7. Select Auto mode.
8. If a remote inhibit switch is fitted, set it to inhibit (closed).
9. Switch off the mains supply. Check that the alternator does not start.
10. Restore the mains supply and set the remote inhibit switch to enable.

## 6.3 Test Mode Operation

1. Check that the mains is connected to the unit.
2. Press the Test (17) button. The LED on the button should light.
3. Check that the generator starts and that the load is still connected to the mains.
4. Switch off the mains supply. Check that the contactors change over to connect the load to the generator. Check also that the Auto (18) LED is lit. The unit changes operating mode to AUTO Mode automatically.
5. Restore the mains supply. Check that the contactors reconnect the load to the mains supply.
6. Check that the generator shuts down after Engine Cooling Time (P09)

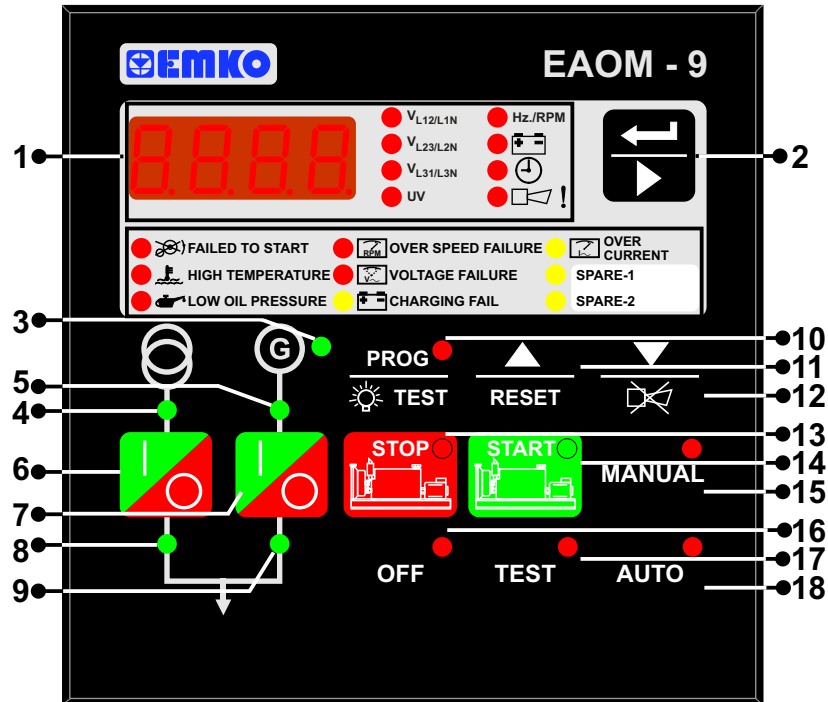
## 7. LAMP TEST


When  button is pressed, all leds and digits are energised.



## 8. OPERATION

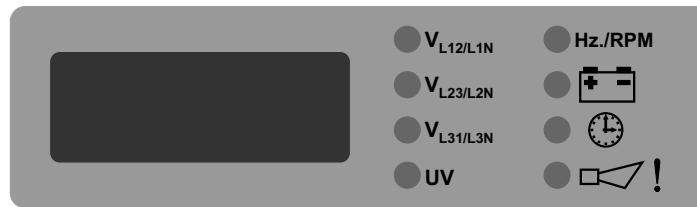
### 8.1 Front Panel Description





Number	Comment
1	Multi Function Display. This is used for displaying the electrical measurements during normal operation and editing / inspecting programming parameters in programming mode.
2	The Display Scroll Button  is used for rotating between measurement screen in normal operation and between programming parameters in programming mode.
3	Green LED lights to indicate that engine is running, as indicated by the signals selected by program parameter Engine Started Signals (P24).
4	Green LED indicates that mains voltage is available and is within the parameters set by Mains Voltage Connection Level (P00) and Mains Voltage Upper Limit (P02)
5	Green LED lights to indicate that alternator output is available and within the parameters set by Alternator Voltage Lower Limit (P03) and Alternator Voltage Upper Limit (P04)
6	In Manual mode, this button controls the mains contactor, toggling between on and off, as indicated by LED 8
7	In Manual mode, this button controls the alternator output contactor, toggling between on and off, as indicated by LED 9. Note : It is not possible to connect the mains and the alternator to the load at the same time. If one switch is operated to connect mains or alternator to the load, the unit will de-energise the other contactor before energising the selected contactor. In addition, the contactors should be wired and interlocked such that the two contactors can not be energised simultaneously.
8	Green LED lights to indicate that mains contactor is energised.
9	Green LED lights to indicate that alternator output contactor is energised.
10	Prog/Lamp Test. Lights all the LEDs and segments on the panel so that you can see if any are not working. Holding the button pressed for five seconds puts the unit into Programming mode.

Number	Comment
11	Up/Reset. Restores unit operation after it has latched in a fault condition. The up- arrow function is used in Programming mode as detailed in Section 5.3 Changing and Saving Technician Parameter Value.
12	Dec/Alarm Reset. Silences the audible alarm. The down arrow button is used in Programming mode as detailed in Section 5.3 Changing and Saving Technician Parameter Value.
13	Engine Stop. Stops the engine in Manual mode. A red LED in the corner shows that the button has been pressed.
14	Engine Start. Starts the engine. A red LED in the corner shows that the button has been pressed.
15	Manual mode. To control engine and contactors manually.
16	Off Mode
17	Test mode. This runs the alternator without connecting the load to the generator. The load will continue to be powered from the mains. The unit will indicate any faults detected in the alternator as if the unit was in Auto mode. If a mains failure occurs while the unit is in Test mode the unit will revert to Auto mode and proceed to connect the load to the alternator.
18	<p>Auto mode. In the event of a mains failure, the unit will:</p> <ul style="list-style-type: none"> <li>De-energise the mains contactor to disconnect the load</li> <li>Start the generator</li> </ul> <p>Once the alternator output is available and after the Control on Delay (P29), the unit energises the alternator contactor to connect the load to the alternator.</p> <p>When the mains supply is restored, the unit will, after the Mains Transition Delay (P11), de-energise the alternator contactor and energise the mains contactor, thus transferring the load back to the mains. The unit will then shut down the alternator after the Engine Cooling Time (P09)</p> <p>Note that an active (0V) input at pin24 Remote Inhibit will inhibit Automatic mode so that no automatic load transfer can occur.</p>

## 8.2 Display Mode Indicators



Four-digit, seven-segment LED display, with annunciators to indicate the parameter being displayed. Use the scroll button  to select the desired parameter. The button selects the parameters in sequence, as follows. Note that line to line voltage readings are prefixed by **L** while line to neutral readings are prefixed by **n**

- Mains voltage L1-L2, prefix **L**
- Mains voltage L1-N, prefix **n**
- Mains voltage L2-L3, prefix **L**
- Mains voltage L2-N, prefix **n**
- Mains voltage L3-L1, prefix **L**
- Mains voltage L3-N, prefix **n**
- Alternator voltage L1-UV
- Frequency (Hz)
- Battery voltage (  )
- Timers

Engine running time, in hours (since last reset). This is a six digit number, the first three digits are prefixed **H** (high) and the second three digits are prefixed **L** (low).

Automatic exercise timer. Elapsed waiting time (hours) to the next exercise is prefixed **E**, the exercise running time (minutes) is prefixed **r**

- The Alarm horn LED will flash continually if the unit detects at least one of the faults listed below. When the Display Select button is pressed so as to select this option, the display will show the cause of the fault indication. If more than one error condition is present, repeated pressing of the button will show each in turn.

Possible error messages are:

ES<sub>t</sub>P – Emergency Stop

bAT1 – Low Battery Voltage Alarm

Serv – Routine Maintenance due info



### 8.3 Mode Transition

The mode can be changed at any time. A change in mode will not effect the current state of the generator or load connection. For example; if the unit is in Auto mode with the generator running and the load running on the generator, changing the mode to Manual will not effect the operating state. Any changes between Auto, Manual and Test modes will not change the operating state.

### 8.4 Manual Start

1. Press the Man (15) button. The LED on the button will switch on.
2. Press the Engine Start (14) button on the panel. The LED on the button will switch on. The engine should start. The sequence is as follows:
  - The starter motor runs
  - The engine startsOnce the engine is running,
  - The LED (3) "Engine Running" illuminates.
  - The Generator Ready LED (5) switches on after Control on Delay (P29) time period.
  - The generator will not supply the load unless the Generator Ready LED (5) is illuminated (The contactor open / close button does not work)
3. Once both LEDs have illuminated, press the Mains Contactor Button (6) to disconnect the load from the mains supply LED (8) should go off.
4. Press the Generator Contactor Button (7) to connect the load to the generator supply. LED (9) should light.

### 8.5 Manual Stop

When the Engine Stop (13) button is pressed, the LED (9) on the button is illuminated and engine is stopped. When the Engine Stop button is pressed while the load is connected to the alternator output (generator output), the alternator contactor is released then the engine is stopped.

### 8.6 Auto Operation

Press the Auto (18) button to select Auto mode. The LED on the button will light to indicate this mode has been selected.

In the event of a mains voltage failure, the unit will start up the generator and, once the generator is running and generator is available to take the load, will transfer the load to the generator. When the mains is restored and stable, it will transfer the load back to the mains and, after Engine Cooling Time (P09) shut down the generator.

Note that if 0V in Remote Inhibit (Pin24), it will inhibit engine running.

### 8.7 Test Operation

Press the Test (17) button to select Test mode. The LED on the button will switch on. This mode allows for testing of the generator off load. All alarm circuits will operate so that any faults will be reported. If a mains failure occurs while the unit is in Test mode, the unit will revert to Auto mode and will switch the load to the generator.

### 8.8 Engine Exercising

The unit incorporates facilities for exercising the engine on a regular basis. If the unit is in Auto mode, after an interval (hours) determined by Exercise Time (P13), the unit will go into Test mode and start up the engine. The system will run in Test mode, without transferring the load to the alternator, for the period (minutes) determined by Exercise Duration Time Period (P14). At the end of this period, the unit will revert to Auto mode, shut down the engine and reset the exercise interval timer. If the unit is not in Auto mode at that time, the unit will restart the exercise interval timer without having exercised the engine. If the mains fails while the engine is being exercised, the unit will revert to Auto mode and transfer the load to the alternator. If the user changes the mode, the engine exercise will be abandoned and the unit will respond according to the mode selected and the current state of the mains supply.

## 9. FAULT FINDING

Indicators on the central section of the panel will flash if a fault is detected. Fault conditions latch so that further operation is prevented. If a failure is indicated, proceed as follows:

1. Change the unit in to MAN mode and stop the generator
2. Find and fix the fault.
3. Press the Failure Reset (11) button to enable a restart.
4. Select the required mode of operation – Manual, Auto or Test.

### 9.1 Fault indications

#### 9.1.1 Failed to Start LED

This LED flashes if the engine has not started after the programmed Number of Starting Attempts (P08). The unit must be reset, by pressing the Failure Reset (11) button, before a fresh attempt can be made.

#### 9.1.2 High Temperature LED

This LED flashes if the thermostatic switch on the engine indicates high temperature. If this fault occurs, the EAOM-9 will stop the engine without any Engine Cooling Time (P09).

#### 9.1.3 Low Oil Pressure LED

This LED flashes if the Oil Pressure Switch on the engine indicates low oil pressure while the engine is running. To obtain this indication, the engine must have been running for at least the period specified by the Oil Pressure Control Delay Time (P28). If this fault occurs, the EAOM-9 will stop the engine without any Engine Cooling Period (P09).

#### 9.1.4 Charge Generator Failure LED

After the engine has started, if a failure is detected in charge generator input this led flashes.

#### 9.1.5 Over Speed LED

This failure is indicated if the generator runs for Control On Delay (P29) time. This LED flashes if the alternator speed goes above the Speed Upper Limit (P05). For a fault to be indicated, the speed must be over this limit for longer than the period defined by the Speed Fault Control Delay (P31).

Alternator speed is measured either by measuring alternator output frequency or by monitoring an external magnetic pick-up, as selected by Speed Sensing Input Selection (P16).

This failure immediately stops the generating set, without any Engine Cooling Time (P09) period.

#### 9.1.6 Generator Voltage Failure LED

This failure is indicated if the generator runs for Control On Delay (P29) time. This LED flashes if the alternator output voltage is outside of the limits programmed into Alternator Voltage Lower Limit (P03) and Alternator Voltage Upper Limit (P04), for a time period longer than the Alternator Voltage Fault Control Delay (P30). This failure immediately releases the generator contactor, and stops the generating set without any Engine Cooling Time (P09) period.

### 9.1.7 Over Current LED

This failure is indicated if the generator runs for Control On Delay (P29) time. The unit monitors an external Over Current relay (Pin 22) when the Generator is running and the Load is on the Generator. If the input becomes active at any time, this LED flashes and the generator contactor is released, but the engine continues to run.

### 9.1.8 Configurable Input-1 and 2 LED

This input can be controlled continuously or when Control on Delay (P29) is expired after engine has started according to the user selection.

It can be temporary or permanent.


It can be configured to show the Status

Only horn sounding and led flashing


Engine stops beside horn sounding and led flashing

Contactor de-energising beside horn sounding and led flashing


### 9.1.9 Emergency Stop Message

The remote Emergency Stop button has been pressed and has shut down the engine. After fixing the fault press Failure Reset (11) to remove the indication and restore EAOM-9 operation. This failure is indicated with an error messages in EAOM-9. When this failure occurs in EAOM-9 the led with exclamation mark starts to flash and user can see the error messages with the Scroll button .

### 9.1.10 Low Battery Voltage Message

The LED switches on when the battery voltage falls below the value specified by the Battery Voltage Lower Limit (P20). The EAOM-9 measures battery voltage at the EAOM-9 terminals. This failure is indicated with an error messages in EAOM-9. When this failure occurs in EAOM-9, the led with exclamation mark starts to flash and user can see the error messages with the Scroll button .

### 9.1.11 Maintenance Time Message

The interval (hours run) between routine maintenance, set by Periodic Maintenance Hour Set Value (P06), has expired. On completion of the required engine maintenance, reset the maintenance timer using Periodic Maintenance Hour Reset (P07). This failure is indicated with an error message in EAOM-9. When this failure occurs in EAOM-9, the led with exclamation mark starts to flash and user can see the error messages with the Scroll button . This failure is not stopped the generating set. If the failure is cleared with the reset button, hours run is cleared by the EAOM-9.

Symptom	Possible Remedy
Unit is inoperative.	Check all the wiring of the unit.
	Check the $\text{---}$ supply. (measure voltage between pins 10 and 11)
	Check the $\text{---}$ fuse.
Low oil pressure fault after engine has started	Check engine oil level and pressure.
	Check oil pressure switch and wiring.
High engine temperature fault after engine has started	Check engine temperature and cooling systems.
	Check switch and wiring.
Failed to start fault. Engine failed to start after Number of Starting Attempts (P08)	Check fuel solenoid and wiring, fuel and battery. Reset the EAOM-9 and restart the engine.
	Check solenoid transistor output activated, (Fuel Solenoid if selected)
	Check the signals that the EAOM-9 is using to determine if the engine has started. Refer to the engine manual.
Starter motor Inoperative.	Check wiring to starter solenoid.
	Check battery supply.
	Check battery supply is present on the Start output (Pin8) of the EAOM-9.



**Isolate the equipment from the electricity supply during mechanical and electrical maintenance. When this is not possible, the equipment must be in the “OFF” position.**

## 10. PROGRAMMABLE PARAMETERS

No	Definition of Parameter	Min	Max	User Def.Value	Unit
P00	Mains Voltage Connection Level	60	600		V $\sim$
P01	Mains Voltage Disconnection Level	60	600		V $\sim$
P02	Mains Voltage Upper Limit	60	600		V $\sim$
P03	Alternator Voltage Lower Limit	60	600		V $\sim$
P04	Alternator Voltage Upper Limit	60	600		V $\sim$
P05	Speed Upper Limit	30.0	75.0		Hz
P06	Periodic Maintenance Hour Set Value	0000	9999		Hour
P07	Periodic Maintenance Hour Reset	Press 'Silence Alarm' button to reset			
P08	Number of Starting Attempts	1	10		Number
P09	Engine Cooling Time(0 disable cool process)	0	99		Minute
P10	Horn Duration (0 Continuous)	0	999		Second
P11	Mains Transition Delay	0	30		Minute
P12	Preheat Time	0	99		Second
P13	Exercise Time (0 Disable)	0	999		Hour
P14	Exercise Duration Time Period	0	999		Minute
P15	Single / Three Phase Selection	1/3			
P16	Speed Sensing Input Selection	0=Alternator Signal (Internal) 1 = Magnetic Pick-up			
P17	Nominal Alternator Frequency	50.0/60.0			Hz
P18	Nominal Speed	500	5000		Rpm
P19	Tooth Number	1	1000		Number
P20	Battery Voltage Lower Limit	7.2	24.0		V $\text{---}$
P21	Mains Change Over Delay	0.1	25.0		Second
P22	Stop / Fuel Solenoid Selection	Stop / Fuel			
P23	Stop Magnet Energising Time	0	99		Second
P24	Engine started signal	0=No, 1=Yes			
	P24.0 Charge Generator	0/1			
	P24.1 Speed	0/1			
	P24.2 Alternator Voltage	0/1			
P24.3 Oil Pressure	0/1				
P25	Starting Attempt Duration	5	99		Second
P26	Alternator voltage limit for crank disconnection	40	360		V $\sim$
P27	Speed Limit for Crank Disconnection	20.0	45.0		Hz
P28	Oil Pressure Control Delay Time	0	99		Second
P29	Control on Delay	0	99		Second
P30	Alternator Voltage Fault Control Delay	0.0	10.0		Second
P31	Speed Fault Control Delay	0.0	10.0		Second
P32	Engine running time reset	Enter technician password to reset time to "0" (zero)			
P33	Configurable Failure Input-1	0	6		
P34	Configurable Failure Input-2	0	6		
P35	Configurable Output	0	13		
P36	Operator Password	0	9990		
P37	Technician Password	0	9990		

## 11. SPECIFICATIONS

<b>Equipment Use</b>	: Electrical control equipment for generating sets
<b>Housing&amp; Mounting</b>	: 96 mm x 96 mm x 115 mm (excluding 13mm clips) housing for panel mounting
<b>Panel Cut-Out</b>	: 92 mm x 92 mm
<b>Protection</b>	: NEMA 4X (IP54 at front panel, IP20 at rear side).
<b>Weight</b>	: Approximately 0.65 Kg.
<b>Environmental Ratings</b>	: Standard, indoor at an altitude of less than 2000 meters with non-condensing humidity.
<b>Operating/Storage Temperature</b>	: -25 °C to +70 °C / -40 °C to +85 °C
<b>Operating/Storage Humidity</b>	: 90 % max. (None condensing)
<b>Installation Overvoltage Category</b>	: II Appliances, portable equipment.
<b>Pollution Degree</b>	: II, normal office or workplace, none conductive pollution
<b>Mode of Operation</b>	: Continuous
<b>EMC</b>	: EN-61000-6-4, EMC generic emission standard for industrial equipment EN-61000-6-2, EMC generic immunity standard for industrial equipment
<b>Electrical Safety</b>	: EN-61010-1, safety requirements for electrical equipment for measurement, control and laboratory use
<b>Supply Voltage</b>	: 12.0V <sub>DC</sub> (8.0V <sub>DC</sub> to 16.0V <sub>DC</sub> ) or 24.0V <sub>DC</sub> (16.0V <sub>DC</sub> to 32V <sub>DC</sub> ) switch selectable
<b>Supply Voltage Measurement</b>	: 8.0-40.0 V <sub>DC</sub> .
<b>Mains Voltage Measurement</b>	: 35 to 300VL-N <sub>AC</sub> . Accuracy:1%FS, Resolution : 1V <sub>AC</sub>
<b>Generator Voltage Measurement</b>	: 35 to 300VL-N <sub>AC</sub> 2 wire connection. Accuracy:1%FS, Resolution:1V <sub>AC</sub>
<b>Measurement Accuracy</b>	: Volts 1% Frequency : 0.25%
<b>Cranking Dropouts</b>	: Battery voltage can be 0V <sub>DC</sub> for max. 100msn during cranking (battery voltage should be at least nominal voltage before cranking)
<b>Generator Speed Measurement</b>	: From alternator or magnetic pickup
<b>Alternator Frequency Range</b>	:10-110 Hz. (@35-300VL-N <sub>AC</sub> )
<b>Magnetic Pickup Freq. Range</b>	:35 Hz - 10 kHz (@3-35 Volts peak)
<b>Charge Generator Excitation</b>	:12 V <sub>DC</sub> or 24 V <sub>DC</sub> , 200 mA, max 3W
<b>Communication Interface</b>	: RS-232 serial communication
<b>Contact Sensing Input</b>	: Emergency Stop (NC), Oil pressure switch (NC), Temperature switch (NO), Remote inhibit input (NO), Configurable input 1 (NO), Configurable input 2 (NO), Over current input (NO)
<b>Outputs</b>	: Start Relay Output 10A (@12/24V <sub>DC</sub> ), Fuel Relay Output 10A (@12/24V <sub>DC</sub> ), Alarm Relay Output 10A (@12/24V <sub>DC</sub> ), Configurable Relay Output 5A(@12/24V <sub>DC</sub> ), Mains Contactor Relay Output. 5A(@12/24V <sub>DC</sub> ), Generator Contactor Relay Output. 5A(@12/24V <sub>DC</sub> )
<b>Display (4-digit, 7-segment LED display)</b>	: Mains L1 – L2 Voltage, Mains L1 – N Voltage, Mains L2 – L3 Voltage, Mains L2 – N Voltage, Mains L3 – L1 Voltage, Mains L3 – N Voltage, Generator Voltage, Generator Frequency Hz, Engine Speed RPM, Battery Voltage <sub>DC</sub> , Total Run Hours, Failure Information
<b>Failure Indicators</b>	: Engine start, High temperature, Low oil pressure, Engine over speed Generator voltage failure, Charging fail, Over current, User configurable input 1, User configurable input 2
<b>Status Indicators</b>	: Off mode, Test mode, Auto mode, Manual mode, Manual engine start, Manual engine stop, Engine running, Mains voltage available, Generator is ready to take the load, Mains contactor, Generator contactor
<b>Information Alarms</b>	: Low battery voltage, Emergency stop, Maintenance due
<b>Approvals</b>	: GOST-R, C E