

## EAOM-72F

*Automatic Generator Start Controller with Metering, Flat Type*

## EAOM-72F SOFT

*PC Communication Software for Programming and Remote Monitoring*

- Automatic engine start / stop
  - Automatic shutdown on fault condition
  - LED status and fault indication
  - Alternator voltage and frequency measurement and monitoring
  - Battery voltage measurement and monitoring
  - Simple push-button controlled operation
  - Over / under speed warning and shutdown
  - Remote start / stop input
  - Three user configurable inputs
  - Three Resistive Sender Inputs
  - Provides charge alternator excitation current
  - Two configurable outputs
  - Speed sensing from alternator frequency or magnetic pickup
  - Fully programmable
  - RS-232 communication port
  - Standard modem communication
- 
- **Monitors**

<ul style="list-style-type: none"> <li>Three phase alternator voltage</li> <li>Three phase current input</li> <li>Alternator power</li> <li>Alternator frequency</li> <li>Engine speed</li> <li>Oil pressure</li> </ul>	<ul style="list-style-type: none"> <li>Engine temperature</li> <li>Fuel level</li> <li>Battery voltage</li> <li>Engine running time</li> <li>Error indication</li> <li>Program parameters</li> </ul>
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  - **Controls**

<ul style="list-style-type: none"> <li>Engine fuel supply or stopping</li> <li>Starter motor</li> <li>Alarm horn</li> </ul>	<ul style="list-style-type: none"> <li>Automatic generator start and stop</li> <li>Preheat</li> </ul>
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  - **Fail Monitoring**

<ul style="list-style-type: none"> <li>Alternator Voltage, Frequency</li> <li>Engine Speed</li> <li>Engine Temperature</li> <li>Oil Pressure</li> </ul>	<ul style="list-style-type: none"> <li>Engine Start</li> <li>Charge Generator Voltage</li> <li>Emergency Stop</li> <li>Maintenance Due</li> </ul>
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## ABOUT INSTRUCTION MANUAL

Instruction manual of EAOM-72F 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, 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-72F

**Type Number** : EAOM-72F

**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

These products provide control and protection in the operation of a generator set. The units allow starting and stopping of the engine and indicates status and fault conditions. The unit monitors:

- Engine temperature
- Oil pressure
- Fuel level
- Charge generator voltage
- Engine speed
- Alternator output (voltage and frequency)
- Alternator current and power

It controls:

- Engine fuel supply or engine stopping, via external solenoid
- Starter motor via external relay
- Automatic generator start and stop
- Alarm horn
- Preheat (configurable relay feature)

A four-digit, seven-segment display provides extensive monitoring of unit and alternator parameters, including:

- Alternator output voltage and frequency
- Engine RPM
- Battery voltage
- Engine running time
- Load current and power
- Oil pressure value
- Coolant system temperature
- Fuel tank level value
- 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.

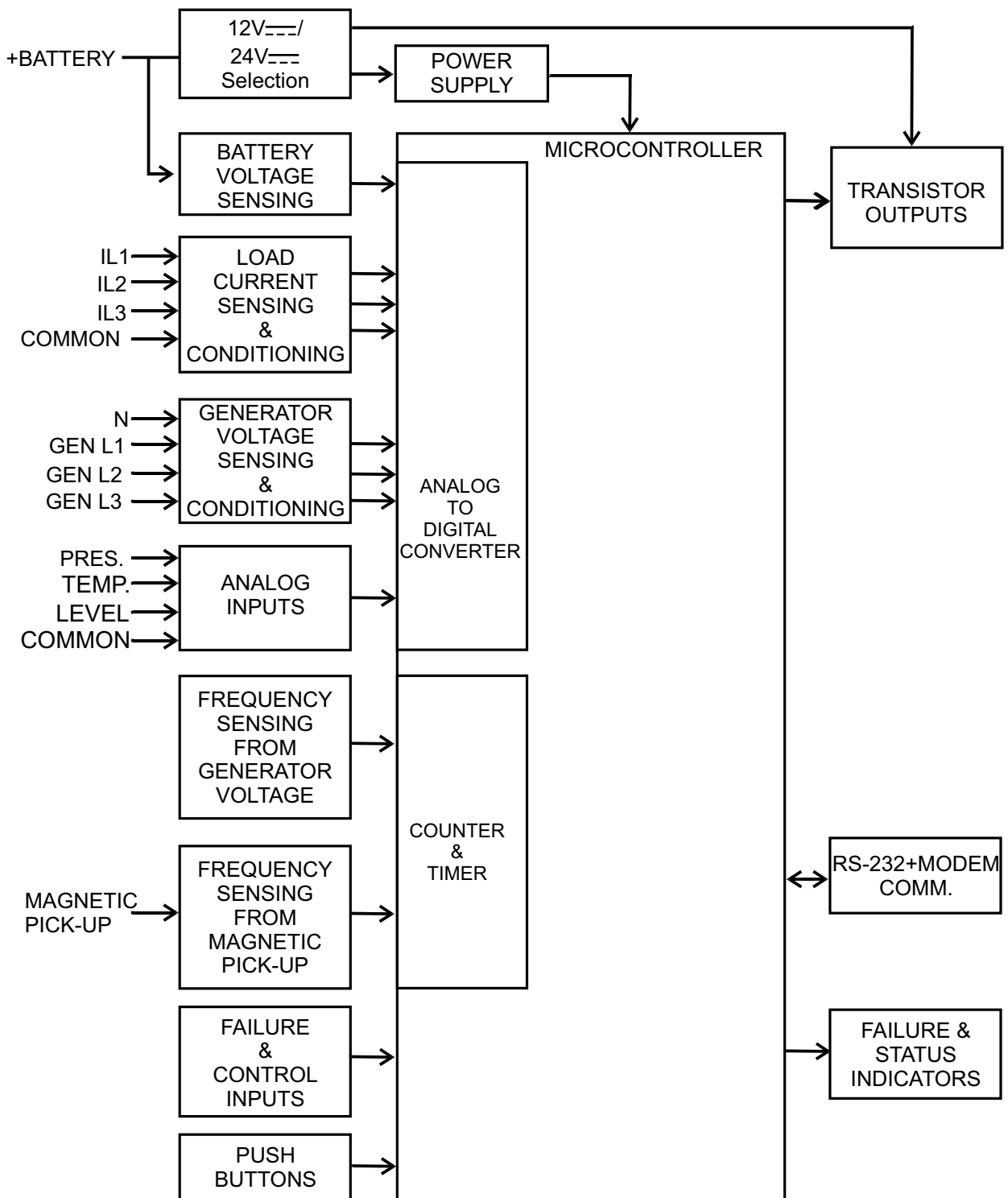
In the event that the engine fails to start on the first attempt, the attempt will be repeated a programmed number of times or until successful.

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

Remote start / stop and emergency stop inputs provide for remote control of the engine.

Three user defined configurable failure inputs are included that sound an external horn, flash indicators on the panel and can be programmed to stop the engine.

## 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-72F 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

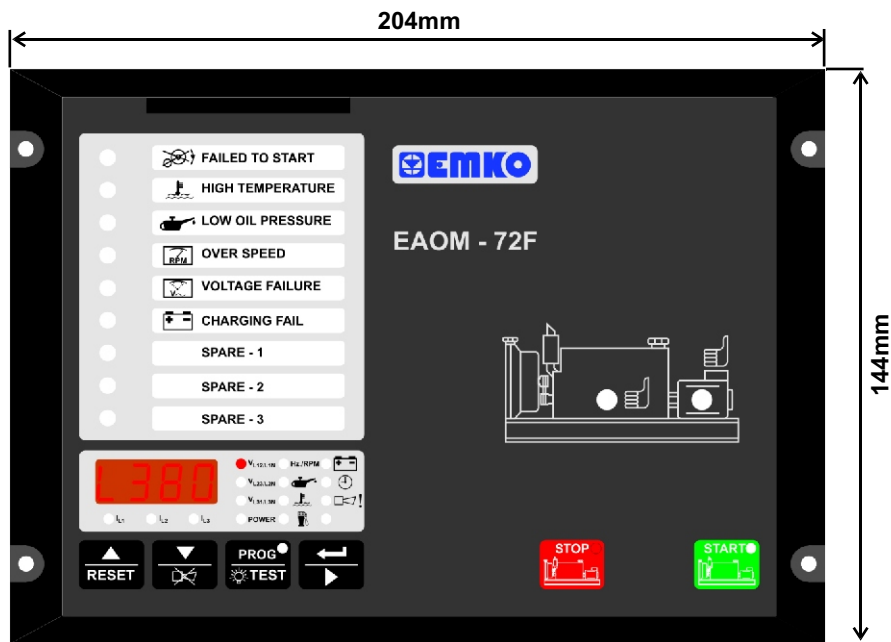
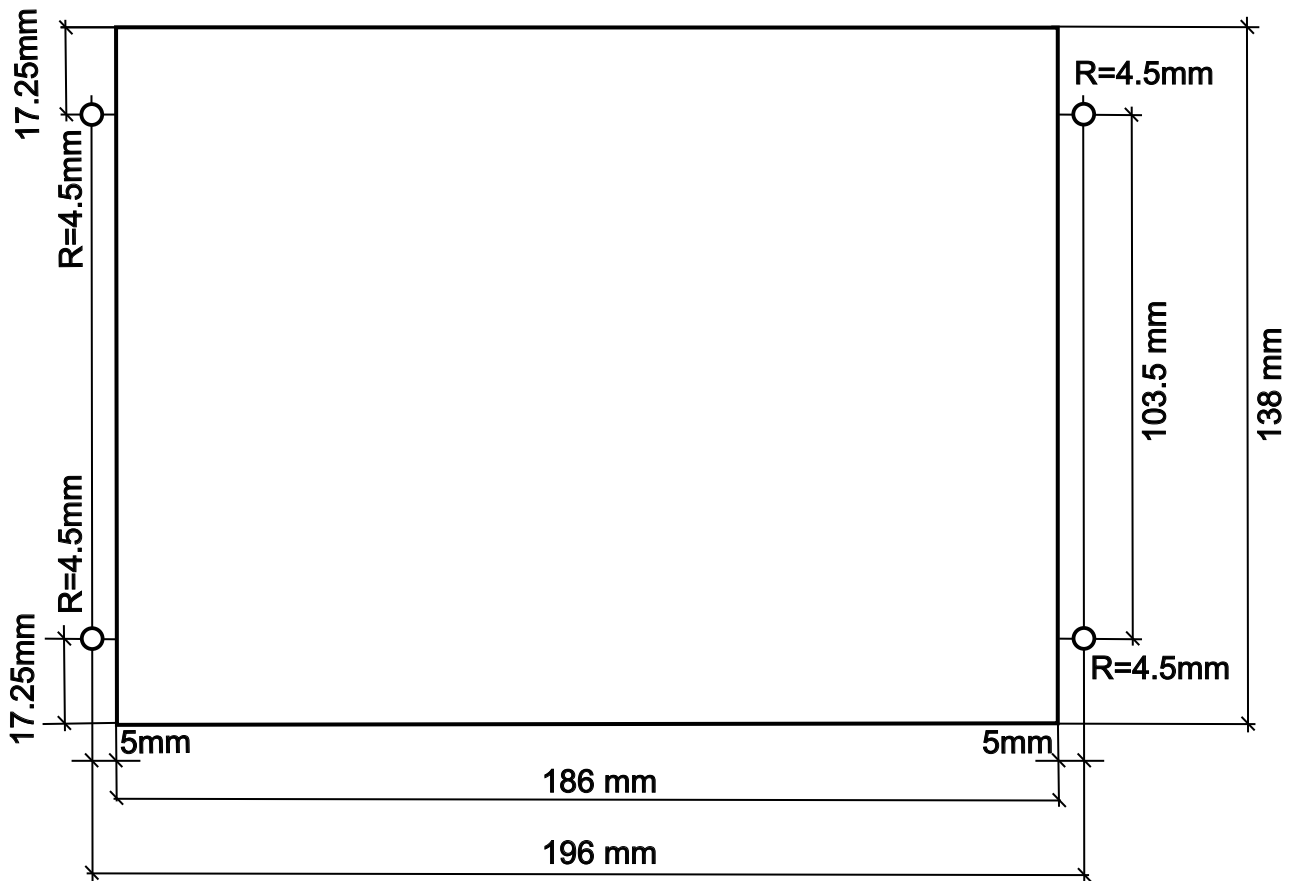


Figure 2.1 Front View



Figure 2.2 Side View

## 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.



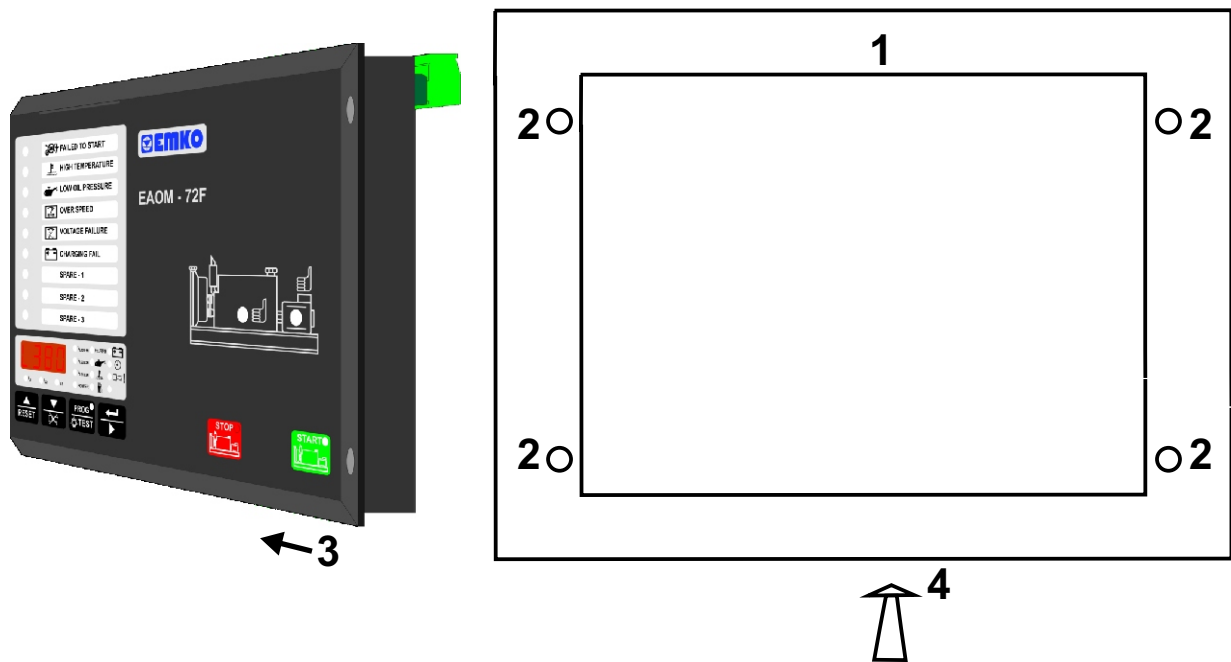
#### Forbidden Conditions:

Corrosive atmosphere

Explosive atmosphere

Home applications (The unit is only for industrial applications)

## 2.5 Panel Mounting

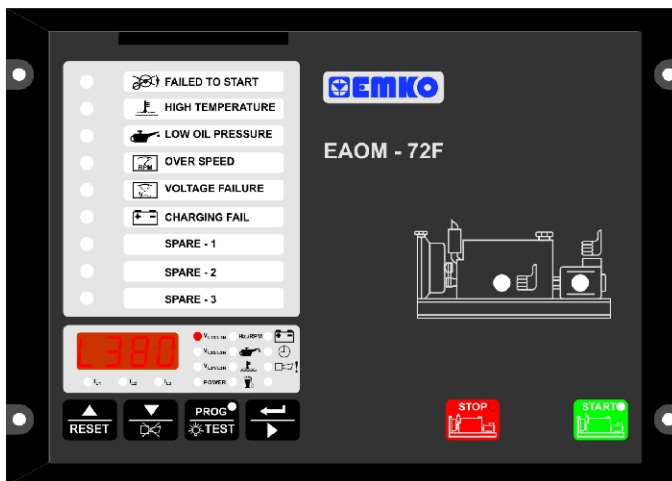


1. Before mounting the device in your panel, make sure that the cut-out is of the right size
2. Make sure that the diameter of the holes are of the right size and coordinate of the holes are true.
3. Check front panel gasket position
4. Insert the device through the cut-out. If the mounting screws are on the unit, put out them before inserting the unit to 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.

## 2.6 Installation Fixing Screws



The unit is designed for panel mounting. Fixing is done by four 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.



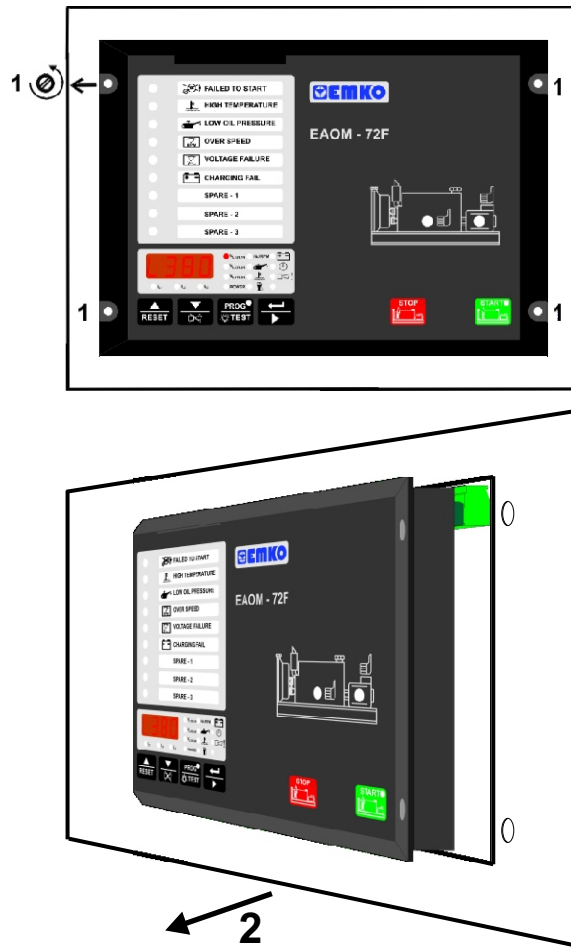
During mechanical installation, beware of any sharp burrs on the metal panel aperture. Ensure that the fixings are properly tightened to prevent the fixings becoming loose due to panel vibration.

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



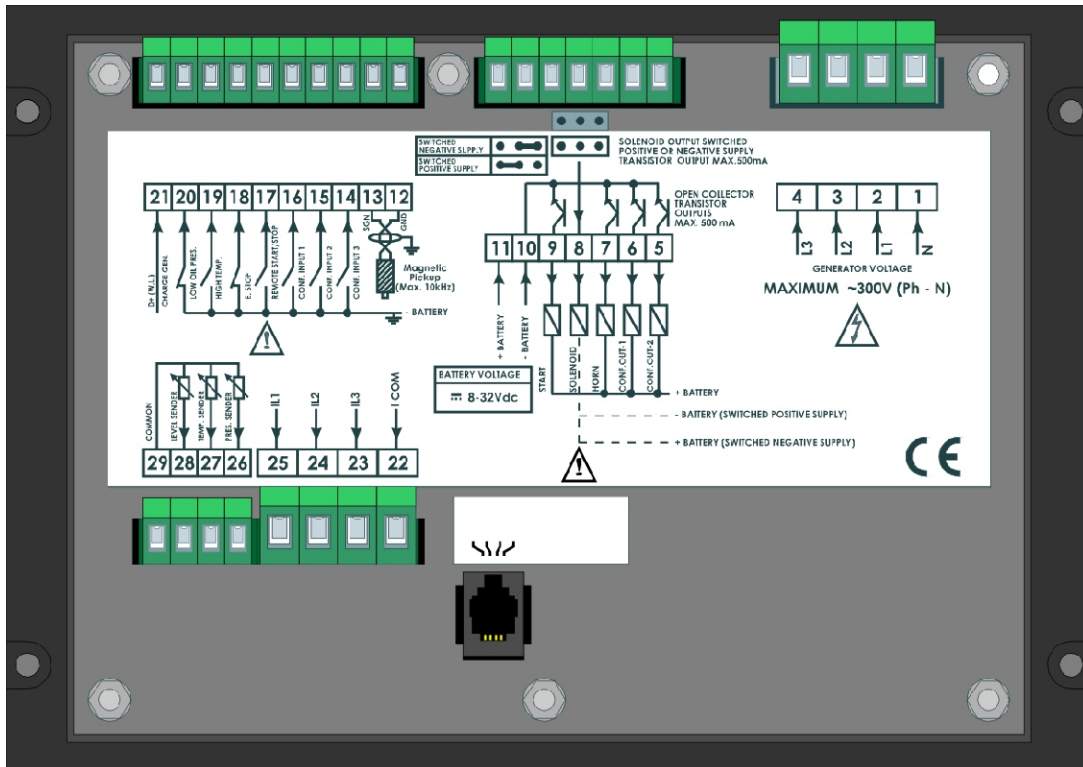
Before starting to remove the unit from panel, power off the unit and the related system.



1. Loosen the screws.
2. 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.

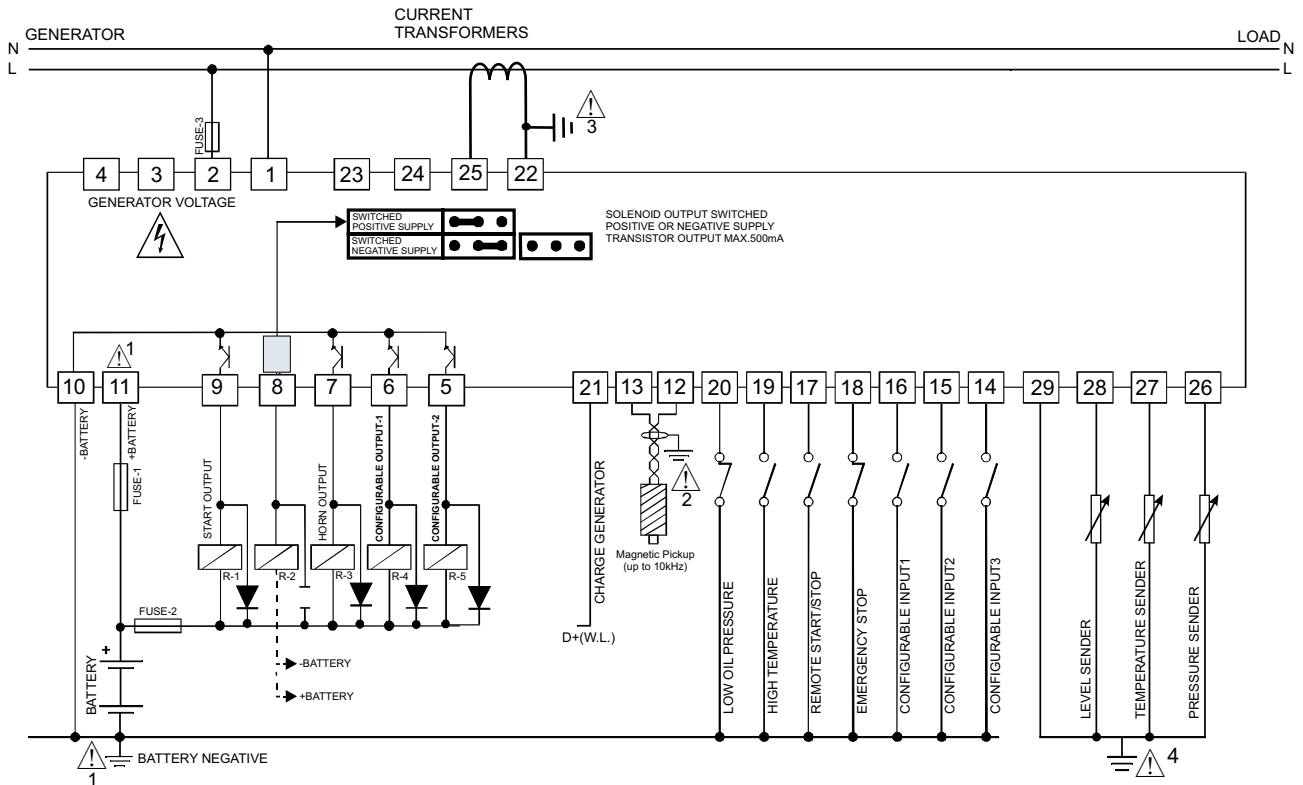
External fuse is recommended.

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

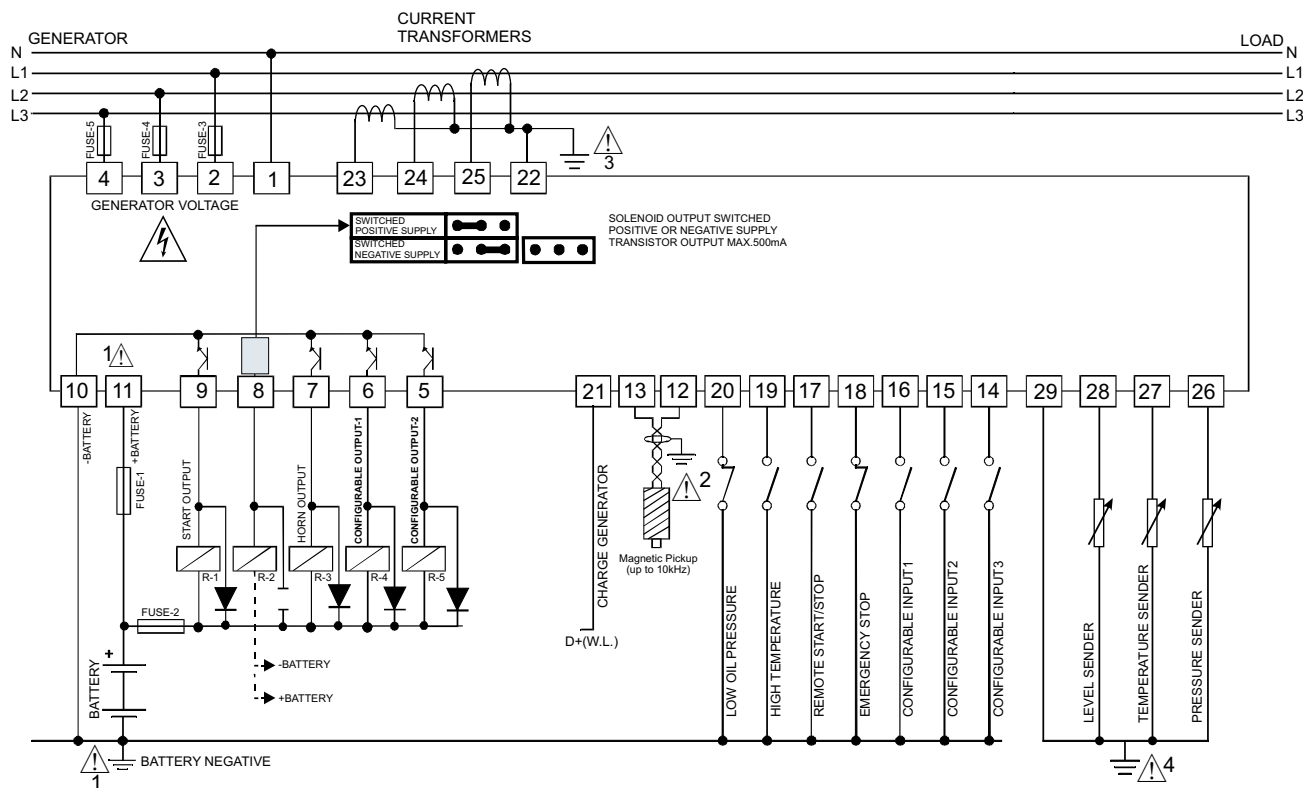
You must ensure that the device is correctly configured for your application. Incorrect configuration could result in damage to the process being controlled and/or personal injury. It is your responsibility, as the installer, to ensure that the configuration is correct. Device parameters has factory 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 1-Phase Wiring Diagram



### 3.2.2 3-Phase Wiring Diagram



- FUSE-1 1A. T
- FUSE-2 2A. T
- FUSE-3, FUSE-4, FUSE-5 1A. 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.
- 3- Secorder side of the current transformer must be connected to the earth point on the engine body.
- 4- The senders common must be connected to the earth point on the engine body.

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	Generator Neutral Conductor	2.5	
2	Generator Voltage Input (L1)	2.5	
3	Generator Voltage Input (L2)	2.5	3 phase applications only
4	Generator Voltage Input (L3)	2.5	3 phase applications only
5	Configurable output-2	1.0	500mA transistor output
6	Configurable output-1	1.0	500mA transistor output
7	Output to Alarm horn	2.5	500mA transistor output
8	Output to fuel relay or stop solenoid	2.5	500mA transistor output
9	Output to start/cranking relay	2.5	500mA transistor output
10	-Battery supply to EAOM-72F and transistor outputs common	1.0	--- Supply to unit
11	+Battery supply to EAOM-72F	1.0	--- Supply to unit
12	Input from magnetic pickup	1.0	
13		1.0	
14	Configurable failure input-3	1.0	Switch to 0 V--- (NO)
15	Configurable failure input-2	1.0	Switch to 0 V--- (NO)
16	Configurable failure input-1	2.5	Switch to 0 V--- (NO)
17	Remote inhibit input	2.5	Switch to 0 V--- (NO)
18	Emergency stop input	2.5	Switch to 0 V--- (NC)
19	Input from high temperature switch	2.5	Switch to 0 V--- (NO)
20	Input from low oil pressure switch	1.0	Switch to 0 V--- (NC)
21	Input from charge generator	1.0	
22	Current measuring input common	1.0	
23	Current measuring input for IL3	1.0	Analogue input
24	Current measuring input for IL2	1.0	Analogue input
25	Current measuring input for IL1	1.0	Analogue input
26	Pressure sender input	1.0	Analogue input
27	Temperature sender input	1.0	Analogue input
28	Level sender input	1.0	Analogue input
29	Sender common	1.0	

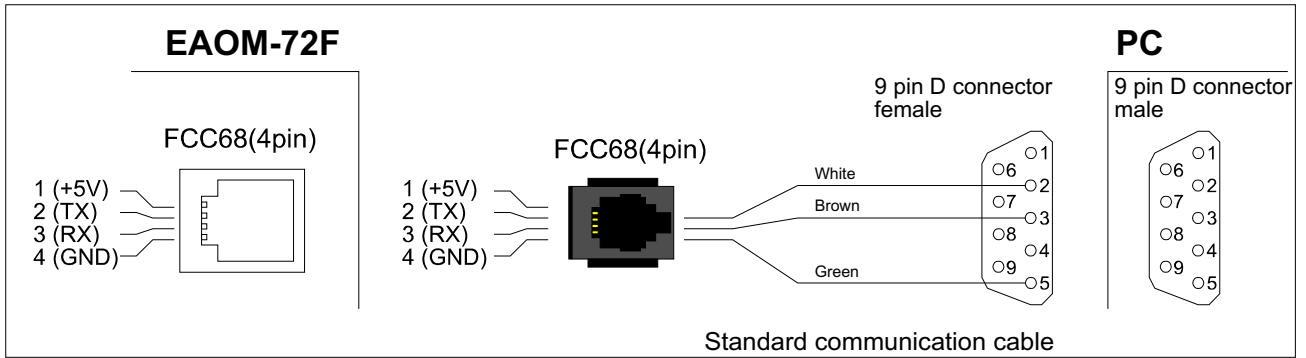


Table 3.2 Unit wiring description

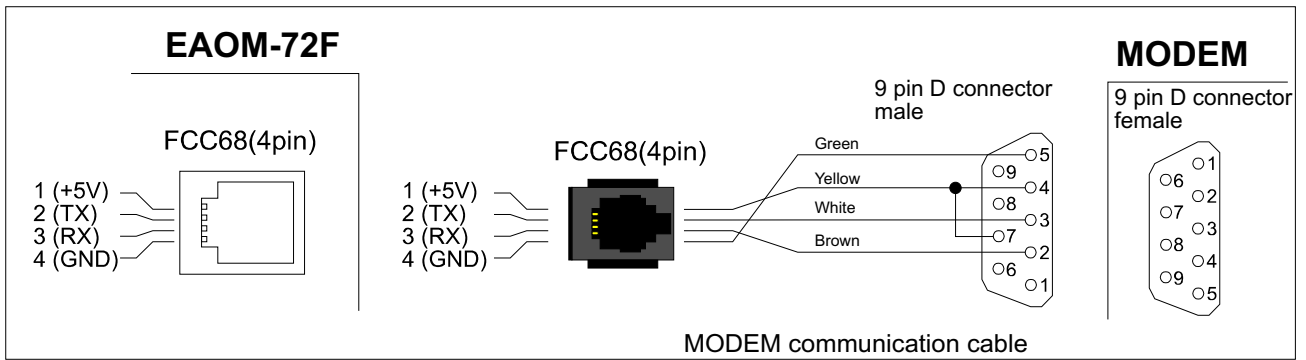
Pin	Function	
1	Generator neutral conductor to EAOM-72F	
2	L1	Generator voltage inputs. Pins 3 and 4 not used on single phase applications
3	L2	
4	L3	
5	Configurable Output-2	It can be programmed according to the Configurable Output-2 (P41)
6	Configurable Output-1	It can be programmed according to the Configurable Output-1 (P40)
7	Transistor output to horn. Max. 500 mA (via external relay)	
8	Transistor output to fuel / stop relay. Max. 500mA. Controls fuel to engine or engine stopping (via external relay and +V or -V selection link)	
9	Transistor output to start relay. Controls starter motor (via external relay)	
10	-V battery input. Supplies EAOM-72F and transistor outputs common.	
11	+V battery input. Supplies EAOM-72F.	
12	Input from magnetic pickup. Unit can be programmed for number of teeth detected on the flywheel and nominal RPM	
13		
14	Configurable failure input-3. Normally open. When switched to 0 volt, it can be programmed to sound the horn and flash indicator on panel	
15	Configurable failure input-2. Normally open. When switched to 0 volt, it can be programmed to sound the horn and flash indicator on panel	
16	Configurable failure input-1. Normally open. When switched to 0 volt, it can be programmed to sound the horn and flash indicator on panel	
17	Input from remote start switch. Normally open contact. Closed to 0 volt to start engine, open switch to stop the engine	
18	Input from the emergency stop switch. Normally close contact, switch to 0 volt when the switch opens, the engine stops and an alarm sounds.	
19	Input from temperature switch. Switch to 0V when the engine temperature exceeds thermostat setting.	
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 charge generator which can be used to detect when the engine has started if not used, this terminal should be connected to +V	
22	Current measuring input common	
23	Current measuring input for calculated power on load phase IL3.	
24	Current measuring input for calculated power on load phase IL2	
25	Current measuring input for calculated power on load phase IL1	
26	Analogue input for oil pressure measuring	
27	Analogue input for engine temperature measuring	
28	Analogue input for fuel tank level measuring	
29	Sender input common	

## 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-72F unit

### 4.3.3 Installing EAOM-72F Software

Insert the software CD into the CD-ROM drive on the PC. CD will autostart, then select EAOM-72F Install.exe from the menu.

### 4.3.4 Using Of EAOM-72F Communication Software

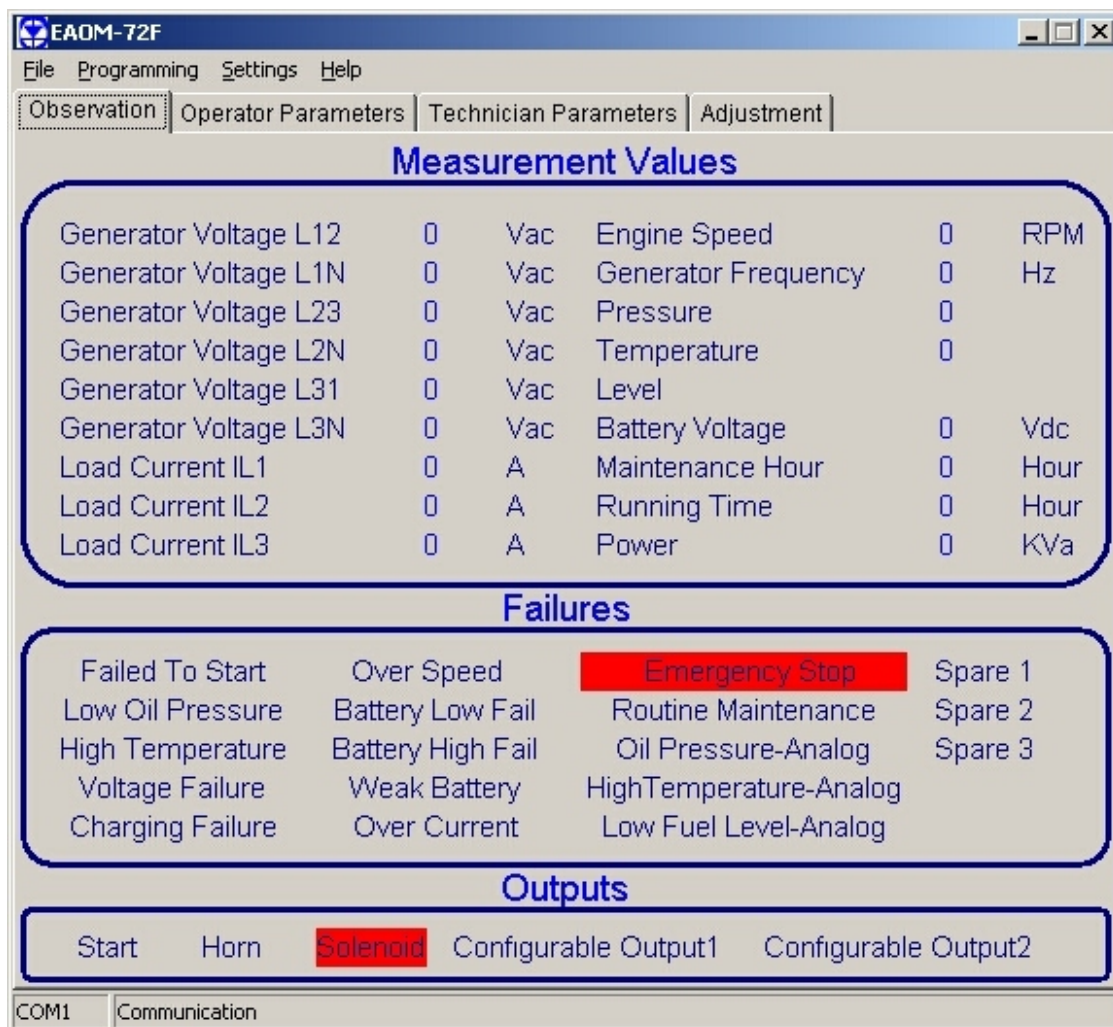
Press the windows START button icon, then select EAOM-72F SW EAOM-72F from the program menu.

### 4.3.5 Description

EAOM-72F unit communicates with the PC using RS-232 communications. The PC software allows the EAOM-72F 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-72F 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

Generator Voltage  
Load Current  
Engine Speed  
Generator Frequency  
Pressure  
Temperature  
Level  
Battery Voltage  
Maintenance Hour  
Running Time  
Power

#### Failures

Failed to Start  
Low Oil Pressure  
High Temperature  
Voltage Failure  
Charging Failure  
Over Speed  
Battery Low Fail  
Battery High Fail  
Weak Battery  
Over Current  
Emergency Stop  
Routine Maintenance  
Oil Pressure  
High Temperature  
Low Fuel Level  
Spare-1, 2, 3

#### Outputs

Start Relay  
Horn Relay  
Solenoid Relay  
Configurable Relay Output 1 & 2

### 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-72F 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-72F unit.

## 4.3.9 MAIN MENU

### 4.3.9.1 FILE

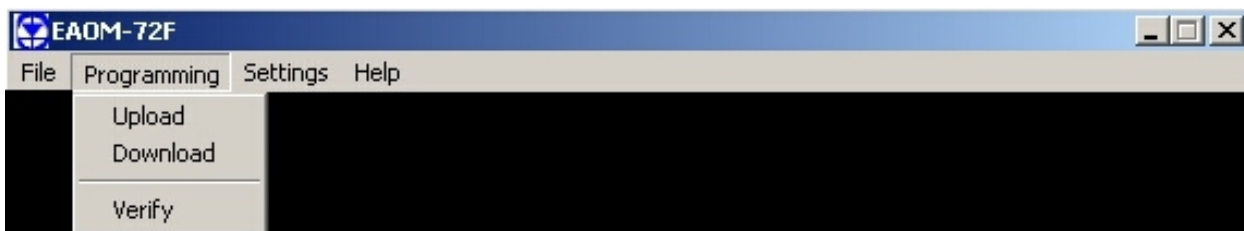
This menu allows the user to save configuration files to the disk, read from disk and write to disc



- 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-72F unit to the PC or download from the PC to the EAOM-72F unit.



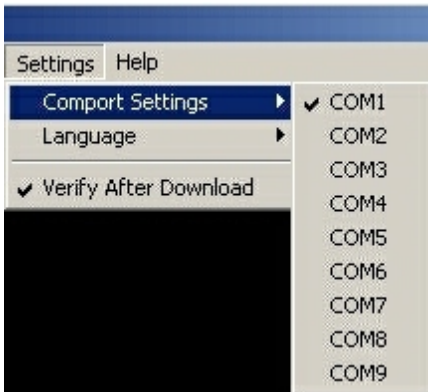
- Download** : With this menu user can load parameters from PC to EAOM-72F .
- Upload** : User can load the parameters stored on EAOM-72F unit to PC.
- Verify** : If user clicks on this selection, parameters are read to check if they are the same with the values on text boxes. For example if user does not check Verify After Download selection, after downloading user can verify the parameters with this selection.

### 4.3.9.3 Settings

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

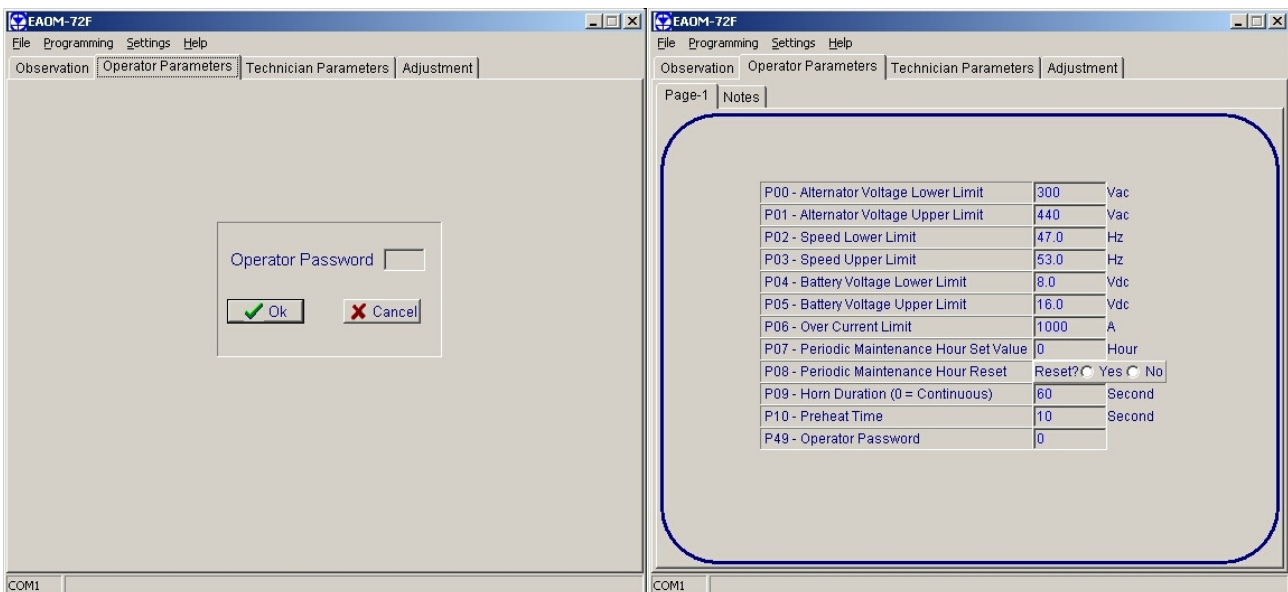
**Language:** Turkish or English can be selected.

**Verify After Download:** If this selection is checked, after downloading parameters are read to check if they are the same with the downloaded parameters.



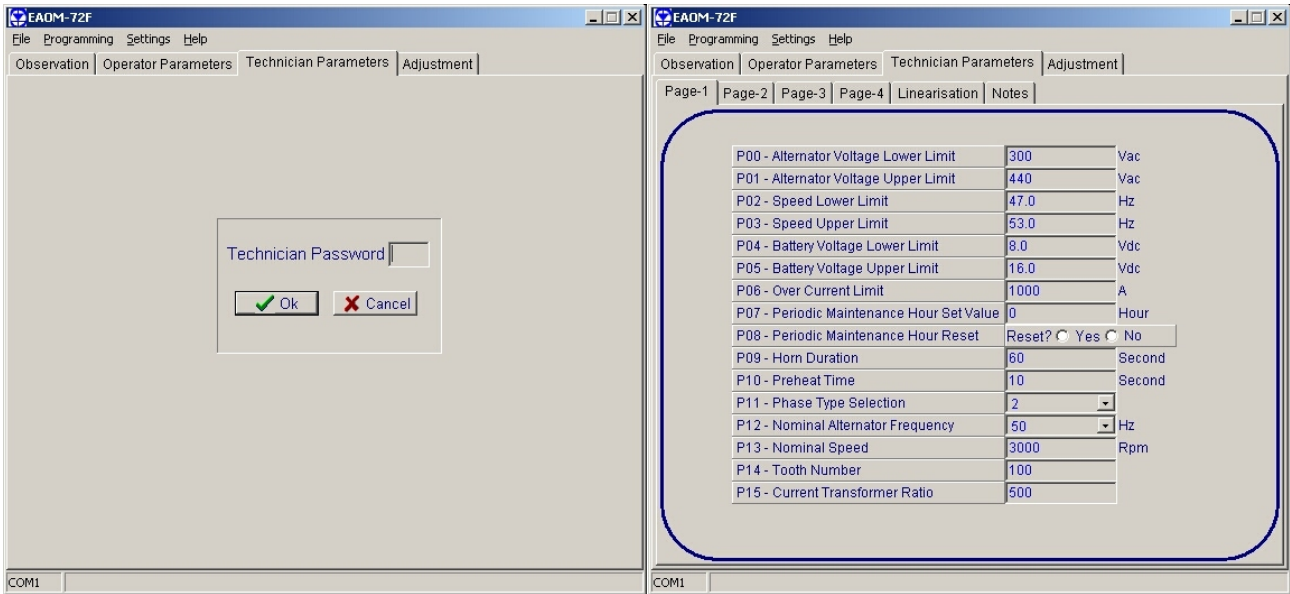
### 4.3.10 Entering to the Operator Parameters Window

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



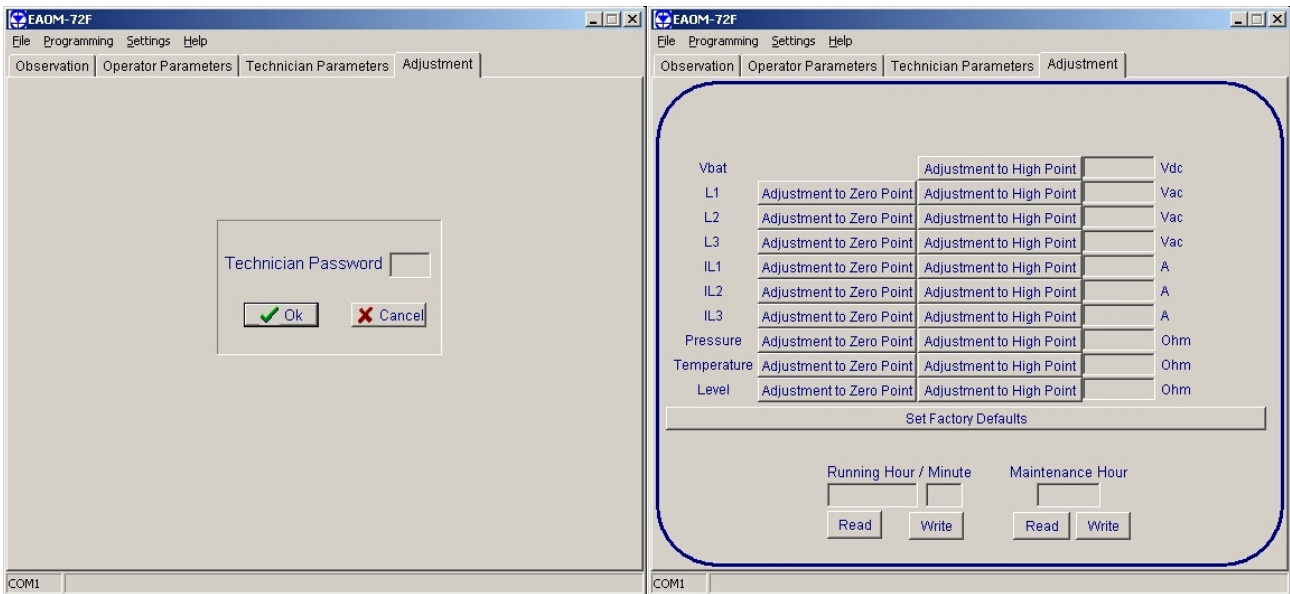
### 4.3.11 Entering to the Technician Parameters Window

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



#### **4.3.13 Load the Configuration File From 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-72F 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-72F 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	Alternator Voltage Lower Limit	60	600	300	V $\sim$
P01	Alternator Voltage Upper Limit	60	600	440	V $\sim$
P02	Speed Lower Limit	30.0	75.0	47.0	Hz
P03	Speed Upper Limit	30.0	75.0	53.0	Hz
P04	Battery Voltage Lower Limit	7.2	24.0	8.0	V $\text{---}$
P05	Battery Voltage Upper Limit	12.0	32.0	30.0	V $\text{---}$
P06	Over Current Limit	1	9999	1000	A
P07	Periodic Maintenance Hour Set Value	0	9999	0	Hour
P08	Periodic Maintenance Hour Reset	Press 'Silence Alarm' button to reset			
P09	Horn Duration (0 = Continuous)	0	999	60	Second
P10	Preheat Time	0	99	10	Second
P11	Phase Type Selection	1/2/3/Series Delta		3	
P12	Nominal Alternator Frequency	50.0/60.0		50.0	Hz
P13	Nominal Speed	500	5000	3000	RPM
P14	Tooth Number	1	1000	100	
P15	Current Transformer Ratio	1	2000	500	
P16	Speed Sensing Input Selection	0-Alternator Signal 1-Magnetic Pick-up		1	
P17	Stop / Fuel Solenoid Selection	Stop / Fuel		Fuel	
P18	Stop Magnet Energising Time	0	99	20	Second
P19	Remote Start Time Delay	0	60	10	Second
P20	Remote Stop Time Delay	0	60	5	Second
P21	Engine started signal	0=No, 1=Yes			
	P21.0 Charge Generator	0/1		1	
	P21.1 Speed	0/1		0	
	P21.2 Alternator Voltage	0/1		1	
P21.3 Oil Pressure	0/1		0		
P22	Battery Voltage Weak Limit	6.0	14.4	7.0	V $\text{---}$
P23	Battery Voltage Weak Control Time	1	99	3	Second
P24	Alternator voltage limit for crank disconnection	40	360	300	V $\sim$
P25	Speed Limit For Crank Disconnection	20.0	45.0	40.0	Hz
P26	Number Of Starting Attempts	1	10	3	
P27	Starting Attempt Duration	5	99	5	Second
P28	Oil Pressure Bypass Time	0	99	30	Second
P29	Warm-up Time Delay	0	99	10	Second
P30	Control on Delay / Fast Loading Selection	0=Control on Delay 1=Fast Loading		0	Second
P31	Control On Delay	0	99	10	Second
P32	Alternator Voltage Fault Control Delay	0.0	10.0	5.0	Second
P33	Speed Fault Control Delay	0.0	10.0	5.0	Second
P34	Engine Cooling Time(0 = disable)	0	99	3	Minute
P35	Engine Running Time Reset	Enter technician password to reset time to '0' (zero)			

No	Definition of Parameter	Min	Max	Default	Unit
P36	Configurable Failure Input-1	0	4	0	
	0 - Status				
	1 - Fire switch				
	2 - Only horn temporary				
	3 - Only horn permanent				
P37	Configurable Failure Input-2	0	4	0	
	0 - Status				
	1 - Fire switch				
	2 - Only horn temporary				
	3 - Only horn permanent				
P38	Configurable Failure Input-3	0	4	0	
	0 - Status				
	1 - Fire switch				
	2 - Only horn temporary				
	3 - Only horn permanent				
P39	Observing Time of Configurable Failure Inputs				
	P39.0 - For Configurable Failure Input-1				
	0 - Observation Continuously	0	1	0	
	1 - Observation While Engine Running				
	P39.1 - For Configurable Failure Input-2				
0 - Observation Continuously	0	1	0		
1 - Observation While Engine Running					
P39.2 - For Configurable Failure Input-3	0 - Observation Continuously	0	1	0	
	1 - Observation While Engine Running				
	P40				
	Configurable Output-1	0	16	0	
	0 - Alarm out				
1 - Engine running					
2 - Load permit					
3 - Preheat					
4 - Over speed					
5 - Over current					
6 - Low fuel level					
7 - High temperature					
8 - Low oil pressure					
9 - Maintenance due					
10 - Failed to start					
11 - Over / under speed					
12 - Voltage failure					
13 - Charging failure					
14 - Low battery value					
15 - High battery voltage					
16 - Weak battery					

No	Definition of Parameter	Min	Max	Default	Unit
P41	Configurable Output-2	0	16	0	
	0 - Alarm out				
	1 - Engine running				
	2 - Load permit				
	3 - Preheat				
	4 - Over speed				
	5 - Over current				
	6 - Low fuel level				
	7 - High temperature				
	8 - Low oil pressure				
	9 - Maintenance due				
	10 - Failed to start				
	11 - Over / under speed				
	12 - Voltage failure				
	13 - Charging failure				
	14 - Low battery value				
	15 - High battery voltage				
	16 - Weak battery				
P42	Oil Pressure Switch / Sender Selection	0-Switch 1-Sender		0	
P43	Pressure Lower Limit	0.0	99.9	42.6	
P44	Pressure Configuration	0	2	1	
	0 - Disable the analog input				
	1 - Pre-alarm				
	2 - Shut down				
P45	Temperature Upper Limit	0	300	176	
P46	Temperature Configuration	0	2	1	
	0 - Disable the analog input				
	1 - Pre-alarm				
	2 - Shut down				
P47	Level Lower Limit	0	300	75	
P48	Level Configuration	0	2	1	
	0 - Disable the analog input				
	1 - Pre-alarm				
	2 - Shut down				
P49	Operator Password	0	9990	0	
P50	Technician Password	0	9990	0	

## 5.1 Program Functions

### 5.1.1 Alternator Voltage

P00 Alternator Voltage Lower Limit  
P01 Alternator Voltage Upper Limit  
P11 Phase Type Selection  
P32 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 (P32). The fault will only occur after the engine has been running for the period defined as the Control on Delay (P31). This failure immediately stops the generating set, without Engine Cooling Time (P34).

There are four possible system types:

P11= 1      Single phase system. Set parameters Alternator Voltage Lower Limit (P00) and Alternator Voltage Upper Limit (P01) as line to neutral voltage  
P11= 2      Single phase three wire with 180 degree phase shift between the phases.  
P11= 3      Three phase four wire. Parameters Alternator Voltage Lower Limit (P00) and Alternator Voltage Upper Limit (P01) are line to line voltage  
P11= 4      Series delta three phase four wire. A delta configuration where neutral is between two phases. Parameters Alternator Voltage Lower Limit (P00) and Alternator Voltage Upper Limit (P01) are line to line voltage

### 5.1.2 Alternator Frequency

P02 Speed Lower Limit  
P03 Speed Upper Limit  
P33 Speed Fault Control Delay

A fault will be reported if the alternator output frequency goes outside the window defined by the upper and lower limits for more than the time defined as the Speed Fault Control Delay (P33). The fault will only occur after the engine has been running for the period defined as the Control on Delay (P31). This failure immediately stops the generating set without Engine Cooling Time (P34)

### 5.1.3 Battery Voltage

P04 Battery Voltage Lower Limit  
P05 Battery Voltage Upper Limit

If the battery voltage drops below the defined Battery Voltage Lower Limit, an alarm occurs. The message bAT1 (Low battery) appears on the display. Similarly, if the battery voltage exceeds the defined Battery Voltage Upper Limit (P05), an alarm occurs. The message bAT3 (High Battery) appears on the display.

### 5.1.4 Over Current Limit (P06)

An alarm occurs if the load current exceeds the load current limit for more than 5 seconds after the period defined by the Control on Delay (P31). The message ocr (Over Current) appears on the display.

### 5.1.5 Maintenance Indication

P07 Periodic Maintenance Hour Set Value  
P08 Periodic Maintenance Hour Reset

To ensure reliability, the engine must be serviced at regular intervals. The unit can be set to indicate when a service is due. Set Periodic Maintenance Hour Set Value (P07) to the number of running hours between services. Use Periodic Maintenance Hour Reset (P08) to reset the hours

counter at each service. When the engine has run for the defined number of hours, the alarm LED will flash and when the alarm display option is selected, the display will read the error message bAEr. Setting Periodic Maintenance Hour Reset (P08) to zero will disable this feature.

#### **5.1.6 Remote Start Time Delay (P19)**

When the Remote Start/Stop Input is activated (starting), the engine will start after the Remote Start Time Delay (P19) period, in order to prevent unnecessary starting due to a fluctuating mains supply. The delay can be adjusted within a range 0-60 seconds.

#### **5.1.7 Remote Stop Time Delay (P20)**

When the Remote Start/Stop Input is de-activated (stopping), the engine will stop after the Remote Stop Time Delay (P20) period in order to ensure that the mains supply has stabilised before transferring the load back to mains. The delay can be adjusted within a range 0-60 seconds

#### **5.1.8 Warm-Up Time Delay (P29)**

The Warm-Up delay timer starts when the engine is up and running. This delays loading of the generator until it has stabilised. Once the time delay has expired, the load transfer command can be issued via one of the configurable relay outputs 1-2 (P40-P41) if configured for this function.

#### **5.1.9 Control on Delay / Fast-Loading Selection (P30)**

When “Fast-Loading” is enabled (P30=1) the Control On Delay (P31) timer can be terminated once all of the monitored parameters have reached their normal settings. This allows the engine protection features to come on-line much faster than waiting for the Control-On Delay (P31) timer to elapse.

#### **5.1.10 Speed Sensing**

P13 Nominal Speed (RPM)  
P14 Tooth Number  
P16 Speed Sensing Input Selection  
P25 Speed Limit for Crank Disconnection

This parameter specifies the method to read generator frequency. The choice is between alternator frequency and external magnetic pick-up. Frequency and speed is monitored so as to detect when engine has started and if there is a generator frequency failure. See Sections 5.1.2 Alternator Frequency, 5.1.13 Engine started signals (P18) and 5.1.14 Engine Starting. Speed Limit For Crank Disconnection (P25) should be set to the frequency that must be achieved at start-up. When magnetic pick-up is using Tooth Number (P14) must be entered correctly. Nominal Alternator Frequency (P12) and Nominal Speed (P13) are used to compute alternator RPM or frequency. If Speed Sensing Input Selection (P16) is set to 0 (from Alternator Voltage), the unit uses Nominal Alternator Frequency (P12) and Nominal Speed (P13) to calculate RPM from the measured frequency of the alternator voltage. If Speed Sensing Input Selection is 1 (from Magnetic pick-up), the unit uses Nominal Alternator Frequency (P12) and Nominal Speed (P13) to calculate alternator output frequency from the measured RPM.

#### **5.1.11 Stop / Fuel Solenoid Selection (P17)**

This parameter allows the use of either a Stop solenoid or a Fuel solenoid. With Fuel Solenoid selected, the fuel solenoid will be energised while the engine is required and de-energised to cut off the fuel and stop the engine. With Stop Solenoid selected, the stop solenoid is normally de-energised and only energised to stop the engine. The stop solenoid remains energised for the period defined as the Stop Magnet Energising Time (P18)

### 5.1.12 Stop Magnet Energising Time (P18)

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 (P17) is set to Stop Solenoid. See Section 5.1.11 Stop/Fuel Solenoid Selection (P17)

### 5.1.13 Engine Started Signals (P21)

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. Charging generator output.

1. Engine speed, as selected by Speed Sensing Input Selection (P16) and Speed Limit for Crank Disconnection (P25) (Section 5.1.10 Speed Sensing)

2. Alternator voltage as selected by parameters Alternator Voltage Limit for Crank Disconnection (P24)

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

### 5.1.14 Engine Starting

Number of Starting Attempts (P26)

Starting Attempt Duration (P27)

When the unit receives an Engine Start command from the front panel or via the remote start input, the starting sequence commences. If the preheating output has been configured (see section 5.1.21 Configurable Outputs), the display will show the HEAT message for the time period set by Preheat Time (P10). The unit energises the start solenoid to drive the starter motor and energises the Fuel solenoid (if selected – see Section 5.1.11 Stop/Fuel Solenoid selection (P17)) to provide fuel for the engine.

If the unit detects that the engine has started, it de-energises the starter motor. Engine start signals are defined by parameter see Section 5.1.13 Engine started signals (P21). Starting Attempt Duration (P27) defines the maximum period for which drive will be applied to the starter motor. If the unit does not detect engine starting within this period, it cuts off the drive to the starter motor. It then makes a new attempt after a delay equal to twice the defined Starting Attempt Duration (P27).

Number of Starting Attempts (P26) defines the number of unsuccessful tries that the unit will make before abandoning the attempts. If all these attempts fail, further operations are locked out and a Failed to Start indication is displayed. The unit remains locked until the reset button has been pressed.

### 5.1.15 Oil Pressure Bypass 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 bypass time is also used for the analogue Oil Pressure Lower Limit (P43) if enabled and Pressure Configuration (P44) is set to shut down the engine

### 5.1.16 Control On Delay (P31)

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 (P31) defines a period during which any fault indications, except High Temperature, will be ignored by the unit. This period begins when the EAOM-72F has detected engine starting and has cut off the drive to the starter motor.

### 5.1.17 Engine Cooling Time (P34)

Engine Cooling Time (P34) defines the duration of the cooling-off period. 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 the unit controls the load, via one of the configurable outputs, it can ensure that the engine continues to run after the load has been removed.

### 5.1.18 Preheat Time (P10)

This timer is only operative when one of the configurable relay outputs is programmed to perform the pre-heat/post-heat function. When starting the generator, this output is active for time period defined in the Pre-Heat/Post-Heat time (P10) prior to running starter motor, and remains active during cranking and after the engine has started. If the engine fails to start, the pre-heating/post-heating output remains switched on during repeated starting attempts.

### 5.1.19 Current Transformer Ratio (P15)

The current transformer input / output ratio can be entered into parameter Current Transformer Ratio (P15), allowing the primary current value to be displayed. Example If the CT is 50:5A, set Current Transformer Ratio (P15) to 10.

### 5.1.20 Configurable Inputs

P36 Configurable Failure Input - 1  
P37 Configurable Failure Input - 2  
P38 Configurable Failure Input - 3

Connecting any of these inputs to 0V can activate the LED annunciator and/or alarm horn. The product can be programmed to respond in one of four ways:

0. Status – The LED lights only while the input is 0V.
1. Fire Switch Mode – When selected, the engine will keep running even if a shutdown signal or alarm is detected.
2. Only Horn Temporary – The LED lights and the alarm horn sounds while the input is at 0V.
3. Only Horn Permanent - The LED flashes while the horn is sounding and then stays on until the reset button is pressed.
4. Engine Stop - the same as 2 but, in addition, the engine is stopped.

### 5.1.21 Configurable Outputs

Configurable Output-1 (P40)  
Configurable Output-2 (P41)

These outputs can be programmed to operate in the following ways:

0. Alarm output. Active when any fault is reported. Can be used for either audible or visual alert
1. Engine running. Active while the engine is running.
2. Load transfer permitted. The output is active while the alternator output voltage is between the Alternator Voltage Lower Limit (P00) and Alternator Voltage Upper Limit (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.

3. Preheat function. On starting the generator, this output is active for time period defined in Preheat Time (P10) prior to running the starter motor.
4. Over Speed Shut-down Output. The fault will only occur after the engine has been running for the period defined in Speed Fault Control Delay (P33) and Speed Upper Limit (P03). This failure immediately stops the generating set, without Engine Cooling Time (P34) and activates this output.
5. Over Current Alarm output. Active when an over current fault is reported.
6. Low Fuel Level Alarm output. Active when a low fuel level fault is reported.
7. High Temperature Alarm output. Active when a high temperature fault is reported.
8. Low Oil Pressure Alarm output. Active when a low oil pressure fault is reported.
9. Maintenance Due Alarm output. Active when the maintenance due alarm (service) is reported
10. Failed To Start Alarm output. Active when failed to start fault is reported.
11. Over/Under Speed Alarm output. Active when over or under speed fault is reported.
12. Voltage Failure Alarm output. Active when an alternator voltage fault is reported.
13. Charging Failure Alarm output. Active when a charging fail fault is reported.
14. Low Battery Voltage Alarm output. Active when the low battery voltage fault is reported
15. High Battery Voltage Alarm output. Active when the high battery voltage fault is reported
16. Weak Battery Alarm output. Active when the weak battery fault is reported.

#### **5.1.22 Oil Pressure Switch / Sender Selection (P42)**

The product can determine engine oil pressure status from one of two sources. An oil pressure switch or an analogue pressure sender can be selected by parameter Oil Pressure Switch / Sender Selection (P42) as the source of the oil pressure signal. The sender limit Pressure Lower Limit (P43) is used as the starting signal and to shut down the engine if the analogue sender is selected. The Oil pressure Bypass Time (P28) will operate for both selections.

#### **5.1.23 Oil Pressure Lower Limit (P43)**

The minimum Oil pressure value for normal engine operation.

#### **5.1.24 Oil Pressure Alarm Configuration (P44)**

This parameter defines the function of the alarm when the measured oil pressure value is lower than the value of Oil Pressure Lower Limit (P43). If the parameter value is "0" then analogue pressure input is disabled. If the parameter value is "1" then it activates a pre-alarm (warning). If the parameter value is "2" then it activates the shut down alarm.

#### **5.1.25 Temperature Upper Limit (P45)**

The maximum temperature value for normal engine operation.

#### **5.1.26 Temperature Alarm Configuration (P46)**

This parameter defines the function of the alarm when the measured temperature value is higher than the value of Temperature Upper Limit (P45). If the parameter value is "0" then analogue temperature input is disabled. If the parameter value is "1" then it activates a pre-alarm (warning). If the parameter value is "2" then it activates the shut down alarm.

#### **5.1.27 Fuel Level Lower Limit (P47)**

The minimum fuel tank level value.

#### **5.1.28 Fuel Level Alarm Configuration (P48)**

This parameter defines the function of the alarm when the measured fuel tank level value is lower than the value of Fuel Level Lower Limit (P47). If the parameter value is "0" then analogue fuel level input is disabled. If the parameter value is "1" then it activates a pre-alarm (warning). If the parameter value is "2" then it activates the shut down alarm.



### **5.1.29 Operator Password (P49)**

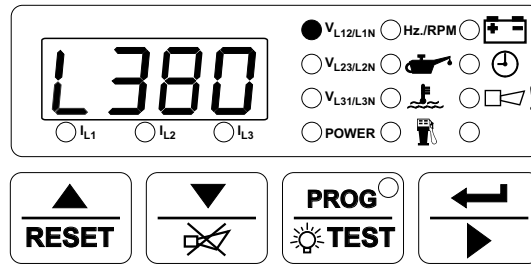
Use this option to change the Operator password. This password allows access to the parameters from Alternator Voltage Lower Limit (P00) to Preheat Time (P10) and Operator Password (P49).

### **5.1.30 Technician Password (P50)**

Use this option to change the Technician password. It allows access to the all parameters from Alternator Voltage Lower Limit (P00) to Technician Password (P50).

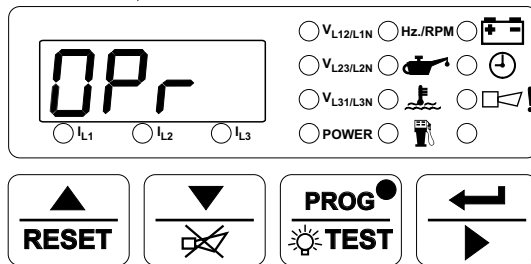
## 5.2 Changing and Saving Operator Parameter Value

Operation Screen



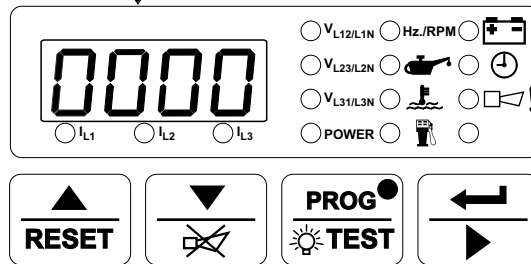
When button is pressed, all leds and digits are energised, because prog button is also used as test button. Continue to press the prog button for 5 seconds, Operator Menu Entering screen is shown and prog led lights on.

Operator Menu Entering Screen



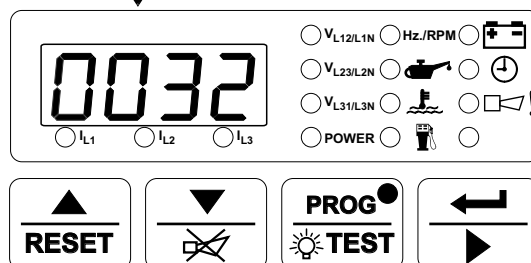
When button is pressed, operator password entering screen is shown.

Operator Password Entering Screen

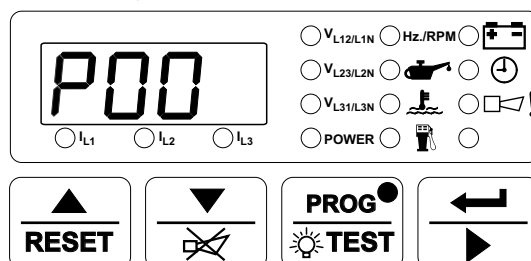


Change the password with and buttons

Operator Password Entering Screen

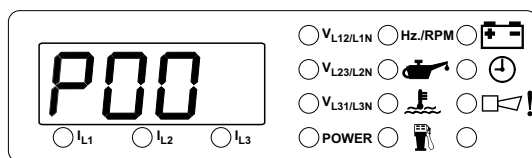


After entering the password, push the button for confirming the password and accessing to the first parameters of operator parameters.

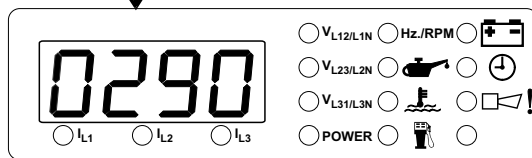
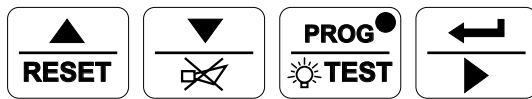


**NOTE :** If no operation is performed for 20 seconds, the device exits from the programming mode and turns to the main operation screen.



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

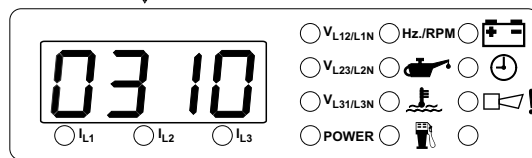
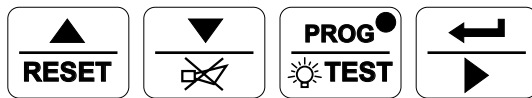


**Alternator Voltage Lower Limit Parameter**




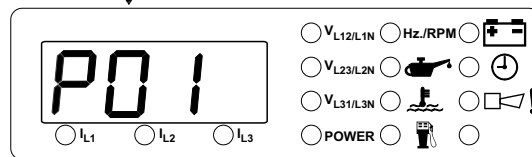
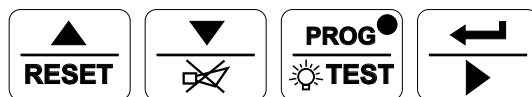
**Alternator Voltage Lower Limit Value**

Change the **P00** parameter with  and  buttons

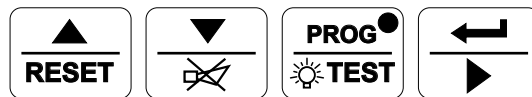



**Alternator Voltage Lower Limit Value**

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



**Alternator Voltage Upper Limit Parameter**

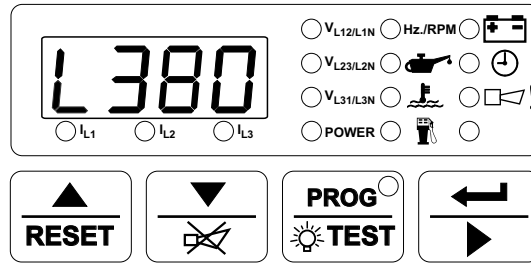


**NOTE :** Other operator parameters can be accessed as explained for **P00**  
 For exiting from programming mode, press 

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

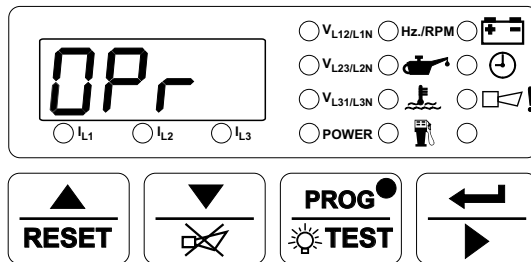
## 5.3 Changing and Saving Technician Parameter Value

### Operation Screen



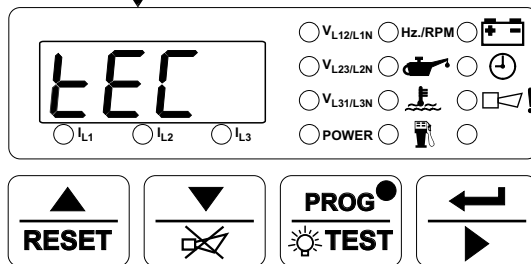
When button is pressed, all leds and digits are energised, because prog button is also used as test button. Continue to press the prog button for 5 seconds, Operator Menu Entering screen is shown and prog led lights on.

### Operator Menu Entering Screen



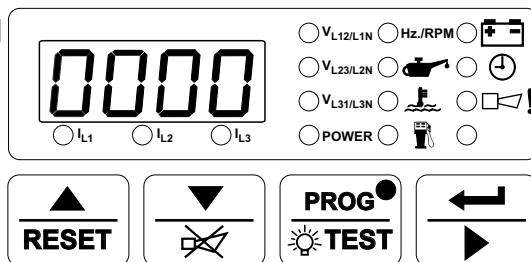
When button is pressed for 10 seconds, technician menu entering screen is shown.

### Technician Menu Entering Screen



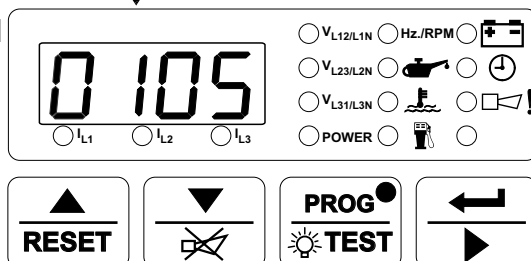
When button is pressed, technician password entering screen is shown.

### Technician Password Entering Screen



Change the password with and buttons

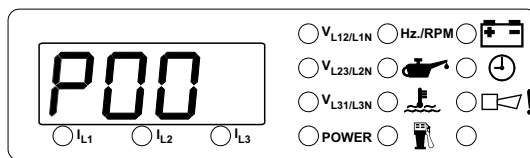
### Technician Password Entering Screen



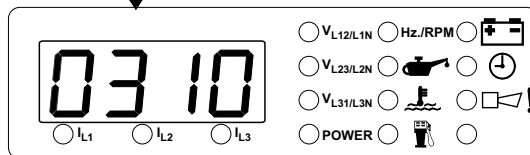
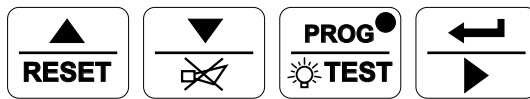
After entering the password, press the button for confirming the password and accessing to the first parameters of technician parameters.

**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

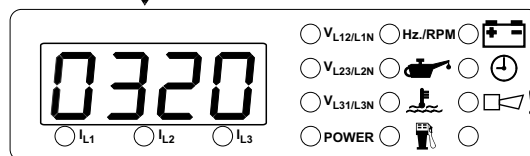
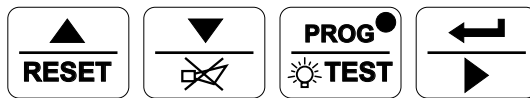


**Alternator Voltage Lower Limit Parameter**




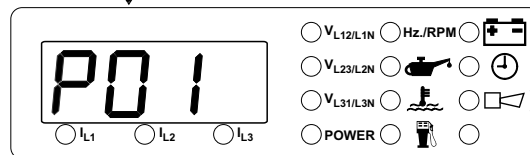
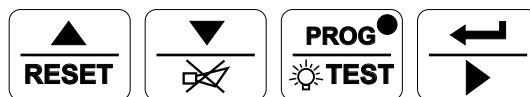
**Alternator Voltage Lower Limit Value**

Change the **P00** parameter with  and  buttons

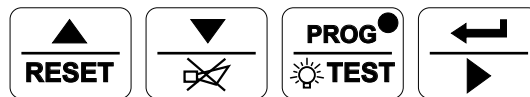



**Alternator Voltage Lower Limit Value**

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



**Alternator Voltage Upper Limit 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

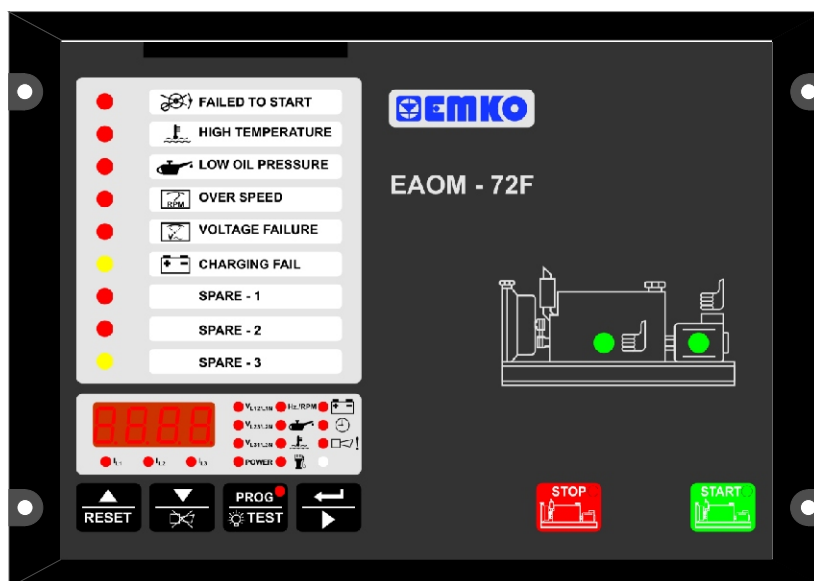


Beware of the high voltages connected to this unit.

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. Program the unit as detailed in Section 5. Parameters.
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. Ensure that the EAOM-72F display switched on.
7. Press the Engine Start Button (7).
8. Check that the engine start sequence commences. The starter motor should run for the Starting Attempt Duration (P27) for the Number of Starting Attempts (P26).
9. Check that the Failed to Start LED flashes.
10. Check that the alarm horn sound. Press the Silence Alarm button (5).
11. Restore the engine to operational state (reconnect the fuel solenoid).
12. Press the Reset button (6). The Failed to Start led switch off.
13. Press the Engine Start Button (7).
14. 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 to the unit. Check the programmable parameters.
15. Check that the engine runs up to its operating speed. If not and an alarm is present, check that the alarm is valid and then check the input wiring.
16. Press the Engine Stop Button (8). The engine should stop. Allow time for the engine to come to rest.
17. Operate the remote start switch (if fitted) and check that the engine starts.

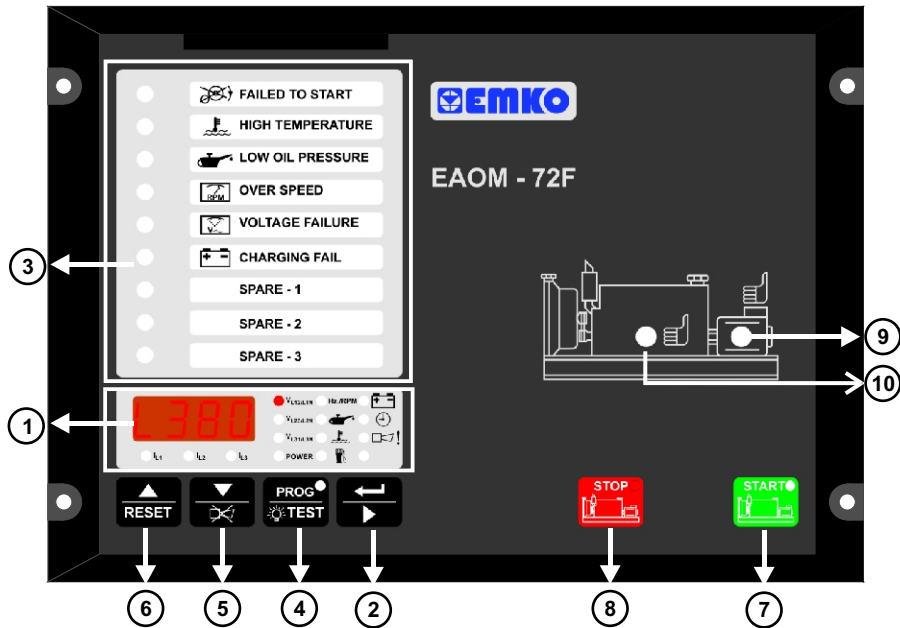
## 7. LAMP TEST

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



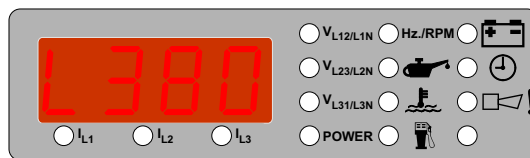
## 8. OPERATION


### 8.1 Front Panel Description



Number	Comment
1	Four-digit, seven-segment LED display. This displays the selected parameter from the list alongside. Use the Display scroll button (2) to select which parameter is to be displayed, as indicated by the adjacent LEDs.
2	The Display Scroll Button is used to step through all of the measured parameters.
3	Failure indicators – These LEDs flash continually in the event of a fault.
4	Programming / 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.
5	Down/Silence Alarm. Silences the audible alarm. The Decrement (down arrow) button is used in Programming mode as detailed in Section 5 Parameters.
6	Up/Reset. Restores unit operation after it has latched in a fault condition. The Increment (up arrow) function is used in Programming mode as detailed in Section 5 Parameters.
7	Start button. Starts the engine. A green LED in the corner shows that the button has been pressed
8	Stop button. Stops the engine. A red LED in the corner shows that the button has been pressed.
9	Alternator LED. The green LED illuminates to indicate that alternator output is available and within the defined operating limits.
10	Engine running LED. The green LED illuminates when the engine is running.

## 8.2 Display Mode Indicators



Four-digit, seven-segment LED display. This displays the selected parameter from the list alongside. Use the button to select which parameter is to be displayed, as indicated by the adjacent LEDs. The  button selects the parameter in sequence, as follows. Note that line voltage readings are prefixed by 'L' while phase-neutral readings are prefixed by 'n'.

- Alternator voltage L1-L2, prefix L
- Alternator voltage L1-N, prefix n
- Alternator voltage L2-L3, prefix L
- Alternator voltage L2-N, prefix n
- Alternator voltage L3-L1, prefix L
- Alternator voltage L3-N, prefix n
- Alternator frequency (Hz)
- Alternator L1 current (A)
- Alternator L2 current (A)
- Alternator L3 current (A)
- Alternator power output (VA) into load. This is the sum of voltage (L/N) x current for all phases.
- Alternator RPM, as measured by alternator frequency or magnetic pick-up as selected by Speed Sensing Input Selection (P16)
- Battery Voltage (VBAT)
- Engine running time in hours-since last reset via Engine Running Time Reset (P35). This is a six-digit number. The first three (high) digits are shown in the first display - prefixed H- and the second (low) in the second display - prefixed L.
- Oil pressure
- Temperature
- Fuel level
- The alarm LED will flash continually if the unit detects any fault. 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:
  - EStP - Emergency Stop
  - bAT1 - Low Battery Voltage
  - bAT2 - Weak Battery Alarm
  - bAT3 - High Battery Voltage Alarm
  - ocr - Over Current Failure
  - Serv - Routine maintenance due
  - LOPr - Low Oil Pressure
  - HtE - High Coolant Temperature Alarm
  - LoFL - Low Fuel Level Alarm



### 8.3 Starting the Engine

Press the START button on the panel or assert the Remote Start input (Pin 17). The engine should start. The sequence is as follows:

- The starter motor runs
- The engine starts

Once the engine is running,

- The starter motor disengages.
- The green engine and alternator LEDs (10) and (9) should both be illuminated after the control on delay period (P31)
- All alarm indicators should remain off.

### 8.4 Stopping the Engine

When the STOP button is pressed or the Remote Start input is released, the alternator voltage available LED (9) will switch off and the contactor will release, but the engine will continue running for the duration of the Engine Cooling Time (P34). At the end of the cooling period, the engine will stop.

## 9. FAULT FINDING

Warning: Beware of the high voltages connected to this unit.

Indicators on the central section of the panel will flash if a fault is detected. If a fault is indicated, proceed as follows:

1. Find and fix the fault.
2. Press the Reset button to enable a restart.
3. Press the Engine Start button

In addition to the indicators on the centre panel, the Alarm LED will flash in the event of a fault. To discover the fault being reported by the Alarm LED, press repeatedly until the Alarm option has been selected. The display will indicate the fault condition, as follows:

### 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 (P26). The unit must be reset, by pressing the Failure Reset (6) 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-72F will stop the engine without any Engine Cooling Time (P34).

#### 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 Bypass Time (P28). If this fault occurs, the EAOM-72F will stop the engine without any Engine Cooling Period (P34).

#### 9.1.4 Charge Generator Failure LED

This LED flashes and the horn sounds if the output from the battery charge generator fails after the engine has started. The fault will not be indicated if it occurs within the period defined by the Control On Delay (P31) after the engine has started. This failure will not shut down the engine.

#### 9.1.5 Over Speed LED

This LED flashes if the alternator speed goes outside the values defined by the Speed Lower Limit (P02) and Speed Higher Limit (P03) parameters. For a fault to be indicated, the speed must be outside these limits for longer than the period defined by the Speed Fault Control Delay parameter (P33). Alternator speed is measured either by measuring alternator output frequency or by monitoring an external magnetic pick-up as selected by program parameter Speed Sensing Input Selection (P16). This failure immediately stops the generating set without Engine Cooling Time (P34).

#### 9.1.6 Generator Voltage Failure LED

This LED flashes if the alternator output fails to reach the value specified by the Alternator Voltage Lower Limit parameter (P00) within the period defined by the Control on Delay parameter (P31). This failure immediately stops the generating set without Engine Cooling Time (P34).

#### 9.1.7 Spare-1, 2, 3

Spare inputs 1, 2 and 3. These inputs function as per the programming of parameters Configurable Failure Input-1, 2, 3 (P36, P37, P38). The LEDs will indicate the status of the input lines and the course of action is determined by the programming.

### **9.1.8 Low Oil Pressure Alarm (LoPr)**

The analogue pressure sensor is connected to the unit via Pressure Sender (Pin 26). Pressure Configuration (P44) defines the course of events when the measured oil pressure value is lower than the value of Pressure Lower Limit (P43) . Depending on the programming, the engine will shut down and/or the alarm will sound.

### **9.1.9 High Coolant Temperature Alarm(HItE)**

The analogue temperature sensor is connected to the unit via Temperature Sender (Pin 27). Temperature Configuration (P46) defines the course of events when measured temperature value is higher than the value of Temperature Upper Limit (P45). Depending on the programming, the engine will shut down and/or the alarm will sound.


### **9.1.10 Low Fuel Level Alarm (LoFL)**

The analogue fuel level sensor is connected to the unit via Level Sender (Pin 28). Level Configuration (P48) defines the course of events when the measured fuel tank level is lower than the value of Level Lower Limit (P47) . Depending on the programming, the engine will shut down and/or the alarm will sound.

### **9.1.11 Emergency Stop Message LED (EStP)**

The remote Emergency Stop button has been pressed and has shut down the engine. Press Reset to remove the indication and restore unit operation.

### **9.1.12 Low Battery Voltage Message (bAT1)**

The LED switches on when the battery voltage falls below the value specified by the Battery Voltage Lower Limit (P04). The EAOM-72F measures battery voltage at the EAOM-72F terminals. This failure is indicated with an error messages in EAOM-72F. When this failure occurs in EAOM-72F, the led with exclamation mark starts to flash and user can see the error messages with the Scroll button  .

### **9.1.13 Weak Battery Alarm Message (bAT2)**

This message appears if, during engine cranking, the battery voltage drops below the value specified by the Battery Voltage Weak Limit (P22) for longer than the period specified by the Battery Voltage Weak Control Time (P23). The message is reset by Reset Button.

### **9.1.14 High Battery Voltage Message (bAT3)**

This message appears if, while the engine is running, the battery voltage rises above the value specified by the Battery Voltage Upper Limit (P05). The EAOM-72F measures battery voltage at the rear terminals.

### **9.1.15 Routine Maintenance Due (SErV)**

The interval (hours run) between routine maintenance, set by program parameter Periodic Maintenance Hour Set Value (P07), has expired. On completion of the required engine maintenance, reset the maintenance timer using Periodic Maintenance Hour Reset ( P08).

### **9.1.16 Over Current (ocr)**

This message will appear on the display if the alternator current exceeds the value programmed into the Over Current Limit (P06) for more than 5 seconds after the period defined by the Control On Delay (P31) parameter.

Symptom	Possible Remedy
Unit is inoperative.	Check all the wiring of the unit.
	Check the --- supply. (measure voltage between pins 10 and 11)
	Check the --- 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 (P26)	Check fuel solenoid and wiring, fuel and battery. Reset the EAOM-72F and restart the engine.
	Check solenoid transistor output activated, (Fuel Solenoid if selected)
	Check the signals that the EAOM-72F 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 (Pin9) of the EAOM-72F.



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

## 10. PROGRAMMABLE PARAMETERS

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

No	Definition of Parameter	Min	Max	Default	Unit
P00	Alternator Voltage Lower Limit	60	600		V $\sim$
P01	Alternator Voltage Upper Limit	60	600		V $\sim$
P02	Speed Lower Limit	30.0	75.0		Hz
P03	Speed Upper Limit	30.0	75.0		Hz
P04	Battery Voltage Lower Limit	7.2	24.0		V $\text{---}$
P05	Battery Voltage Upper Limit	12.0	32.0		V $\text{---}$
P06	Over Current Limit	1	9999		A
P07	Periodic Maintenance Hour Set Value	0	9999		Hour
P08	Periodic Maintenance Hour Reset	Press 'Silence Alarm' button to reset			
P09	Horn Duration (0 = Continuous)	0	999		Second
P10	Preheat Time	0	99		Second
P11	Phase Type Selection	1/2/3/Series Delta			
P12	Nominal Alternator Frequency	50.0/60.0			Hz
P13	Nominal Speed	500	5000		RPM
P14	Tooth Number	1	1000		
P15	Current Transformer Ratio	1	2000		
P16	Speed Sensing Input Selection	0-Alternator Signal 1-Magnetic Pick-up			
P17	Stop / Fuel Solenoid Selection	Stop / Fuel			
P18	Stop Magnet Energising Time	0	99		Second
P19	Remote Start Time Delay	0	60		Second
P20	Remote Stop Time Delay	0	60		Second
P21	Engine started signal	0=No, 1=Yes			
	P21.0 Charge Generator	0/1			
	P21.1 Speed	0/1			
	P21.2 Alternator Voltage	0/1			
P21	P21.3 Oil Pressure	0/1			
P22	Battery Voltage Weak Limit	6.0	14.4		V $\text{---}$
P23	Battery Voltage Weak Control Time	1	99		Second
P24	Alternator voltage limit for crank disconnection	40	360		V $\sim$
P25	Speed Limit For Crank Disconnection	20.0	45.0		Hz
P26	Number Of Starting Attempts	1	10		
P27	Starting Attempt Duration	5	99		Second
P28	Oil Pressure Bypass Time	0	99		Second
P29	Warm-up Time Delay	0	99		Second
P30	Control on Delay / Fast Loading Selection	0=Control on Delay 1=Fast Loading			Second
P31	Control On Delay	0	99		Second
P32	Alternator Voltage Fault Control Delay	0.0	10.0		Second
P33	Speed Fault Control Delay	0.0	10.0		Second
P34	Engine Cooling Time(0 = disable)	0	99		Minute
P35	Engine Running Time Reset	Enter technician password to reset time to '0' (zero)			

No	Definition of Parameter	Min	Max	Default	Unit
P36	Configurable Failure Input-1	0	4		
P37	Configurable Failure Input-2	0	4		
P38	Configurable Failure Input-3	0	4		
P39	Observing Time of Configurable Failure Inputs				
	P39.0 - For Configurable Failure Input-1 0 - Observation Continuously 1 - Observation While Engine Running	0	1		
	P39.1 - For Configurable Failure Input-2 0 - Observation Continuously 1 - Observation While Engine Running	0	1		
	P39.2 - For Configurable Failure Input-3 0 - Observation Continuously 1 - Observation While Engine Running	0	1		
P40	Configurable Output-1	0	16		
P41	Configurable Output-2	0	16		
P42	Oil Pressure Switch / Sender Selection		0-Switch 1-Sender		
P43	Pressure Lower Limit	0.0	99.9		
P44	Pressure Configuration	0	2		
P45	Temperature Upper Limit	0	300		
P46	Temperature Configuration	0	2		
P47	Level Lower Limit	0	300		
P48	Level Configuration	0	2		
P49	Operator Password	0	9990		
P50	Technician Password	0	9990		

## 11. SPECIFICATIONS

<b>Equipment Use</b>	: Electrical control equipment for generating sets
<b>Housing&amp; Mounting</b>	: 144mmx204mmx37mm (including connectors) plastic housing for panel mounting
<b>Panel Cut-Out</b>	: 138mmx186mm
<b>Protection</b>	: NEMA4X (IP65 at front panel, IP20 at rear side)
<b>Weight</b>	: Approximately 0.7 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>	: 8-32 V===
<b>Supply Voltage Measurement</b>	: 8-32 V===, accuracy:1% FS, resolution : 0.1 V===
<b>Generator Voltage Measurement</b>	: Single phase, 2 wire 35 to 300 VL-N ~ Single phase, 3 wire 35 to 300 VL-N ~ Three phase, 4 wire 35 to 300 VL-N ~
<b>Measurement Accuracy</b>	: 1% of range (Voltage and Current) 2% of range (Resistive)
<b>Cranking Dropouts</b>	: Battery voltage can be 0V=== 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. (@35-300 VL-N===)
<b>Magnetic Pickup Freq. Range</b>	: 35 Hz - 10 kHz (@3-35 Volts peak)
<b>Load Current Measurement</b>	: Via three current transformer inputs 0-5A~
<b>Power Calculating</b>	: Three phase: (V1xI1)+(V2xI2)+(V3xI3) Single phase: V1 (phase to neutral) x I1 Series Delta:L12=L1N+L2N, L23= $\sqrt{(L2N)^2+(L3N)^2}$ , L31= $\sqrt{(L3N)^2+(L1N)^2}$
<b>Analogue Resistive Sender Input Range</b>	: 10 to 650Ω
<b>Communication Interface</b>	: RS-232 serial communication
<b>Contact Sensing Input</b>	: Emergency Stop (NC), Oil pressure switch (NC), Temperature switch (NO), Remote start / stop input (NO), Configurable input 1 (NO), Configurable input 2 (NO), Configurable input 3 (NO)
<b>Output</b>	: Start Output (500mA transistor output), Fuel Output (500mA transistor output), Alarm Output (500mA transistor output), Configurable Output-1 (500mA transistor output), Configurable Output-2 (500mA transistor output)
<b>Led Display</b>	: Voltage L1-L2, Voltage L1-N, Voltage L2-L3, Voltage L2-N, Voltage L3-L1, Voltage L3-N, L1 current, L2 current, L3 current, Fuel tank level value, Generator KVA output, Error indication, Engine RPM, Program parameters, Alternator frequency (Hz), Battery voltage (V===), Engine running time, Oil pressure value, Coolant system temperature
<b>Failure Indicators</b>	: Engine Start, Low Oil Pressure, High Engine Temperature, Over Speed, Generator Voltage, Charging Fail, User Configurable Input 1, User Configurable Input 2, User Configurable Input 3
<b>Status Indicators</b>	: Engine Start, Engine Stop, Engine Running, Generator ready to take the load
<b>Information Alarms</b>	: Emergency stop, Low battery voltage, High battery voltage, Weak battery alarm, Routine maintenance due, Over current failure, Low oil pressure, High temperature alarm, Low fuel level
<b>Approvals</b>	: GOST-R, C E