



## EAOM-71

**Automatic Generator Start Controller with  
Metering, Load Current and Power  
Measurement, 96x96 DIN Size**

## EAOM-71 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
- Provides charge alternator excitation current
- Two configurable relay outputs
- Speed sensing from alternator frequency or magnetic pickup
- Preheat
- Fully programmable
- RS-232 communication port
- Standard modem communication

### - Monitors

Alternator voltage and frequency  
Battery charging  
Engine RPM  
Load current (1 phase)

Battery voltage  
Engine running time  
Engine Power

### - Controls

Engine fuel supply or engine stopping  
Starter motor  
Over / Under speed

Preheat  
Alarm horn

### - Fail Monitoring

Engine temperature  
Oil pressure  
Over / Under speed  
Voltage fail

Charging alternator  
Emergency stop  
Low battery voltage  
Weak battery alarm

## ABOUT INSTRUCTION MANUAL

Instruction manual of EAOM-71 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-71

**Type Number** : EAOM-71

**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
- Charging alternator
- Over / Under speed
- Voltage fail
- Emergency stop
- Low battery voltage
- Weak battery alarm
- Alternator output (voltage and frequency)

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)
- Load transfer (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
- Elapsed time
- Battery charging
- Load current (1 phase)
- Temperature, pressure and fuel level from resistive senders
- Engine running time
- Engine Power
- Error indication
- Program parameters

The unit is extensively programmable with password protection on two levels. 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.

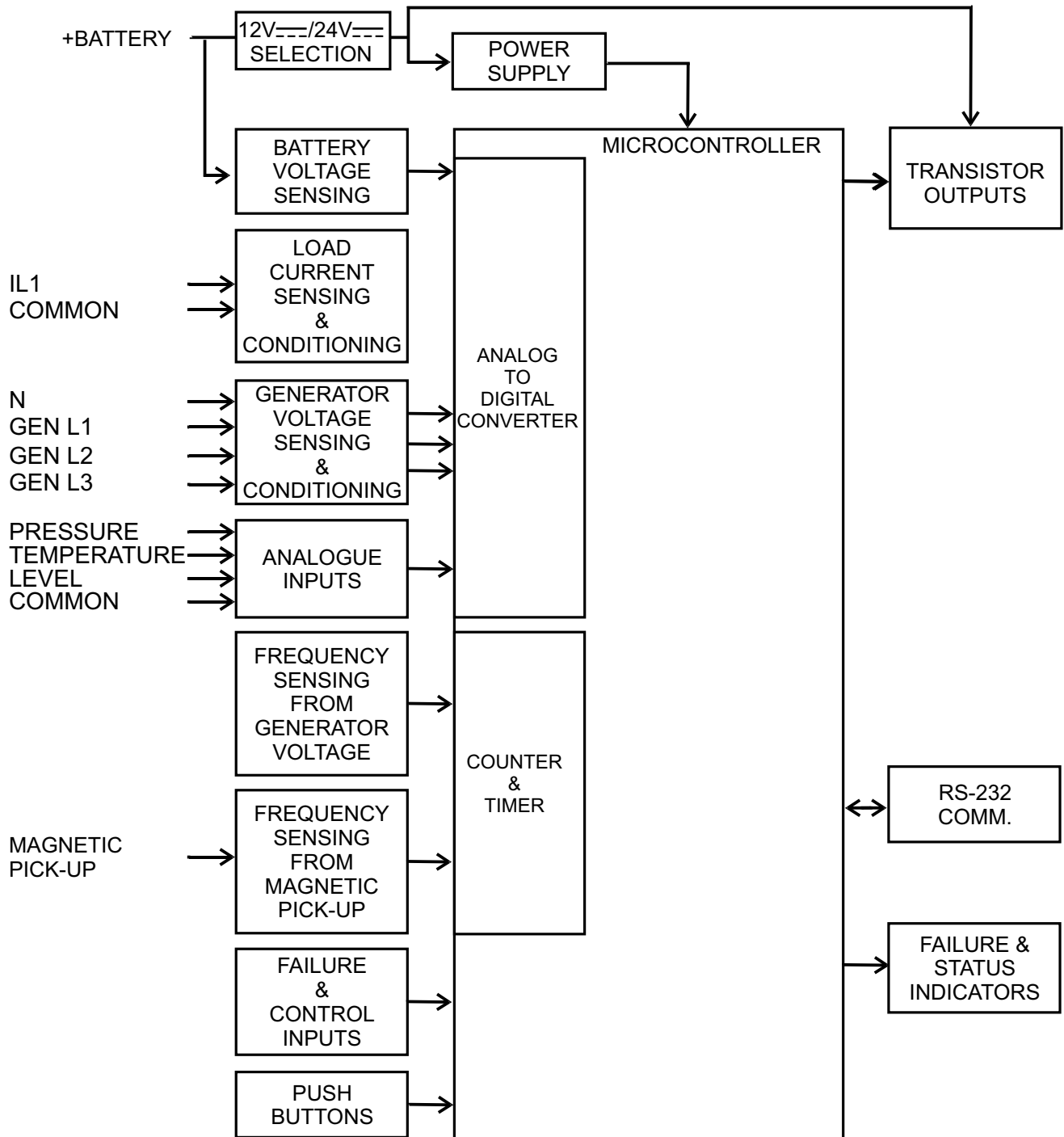
If a fault is detected, the unit shuts down the engine and indicates the failure by flashing an appropriate fault LED.

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

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

Two extra outputs can be configured to act on an alarm, when the engine is running, when a load can be transferred to the alternator or when engine preheating is required. The operational parameters of the unit can be monitored and controlled from a PC via a built-in RS-232 port.

## 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-71 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 results 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.

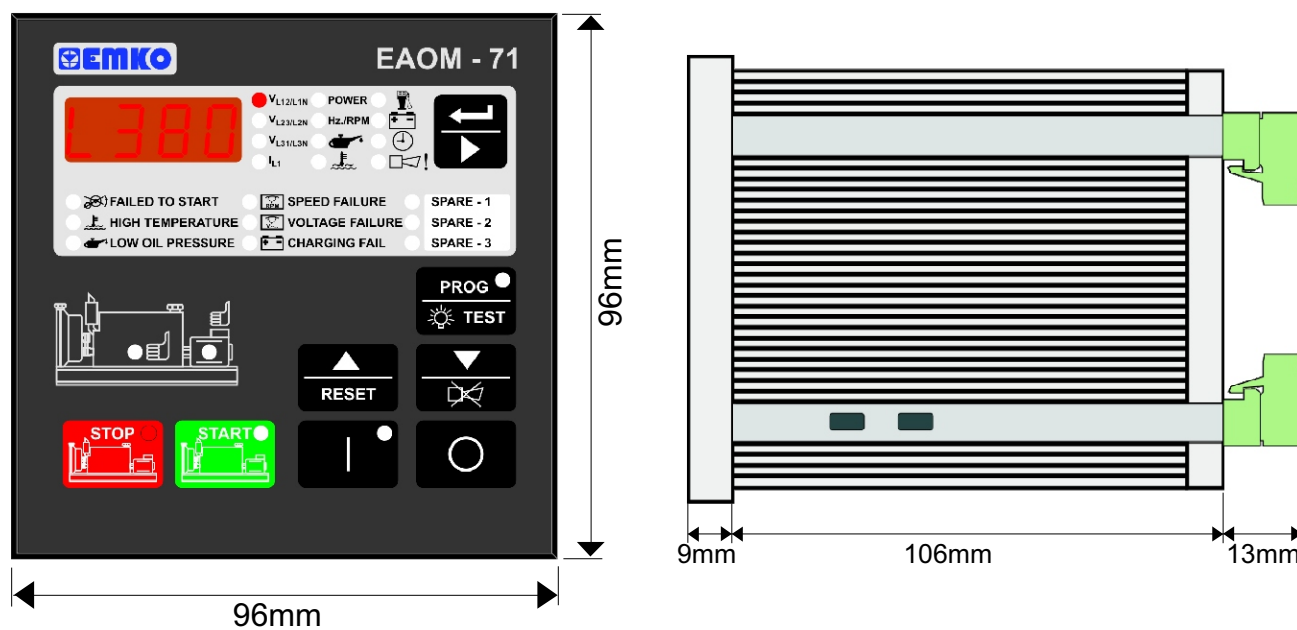
Report any shortage or damage to your local sales office as soon as possible.

## 2.1 General Description

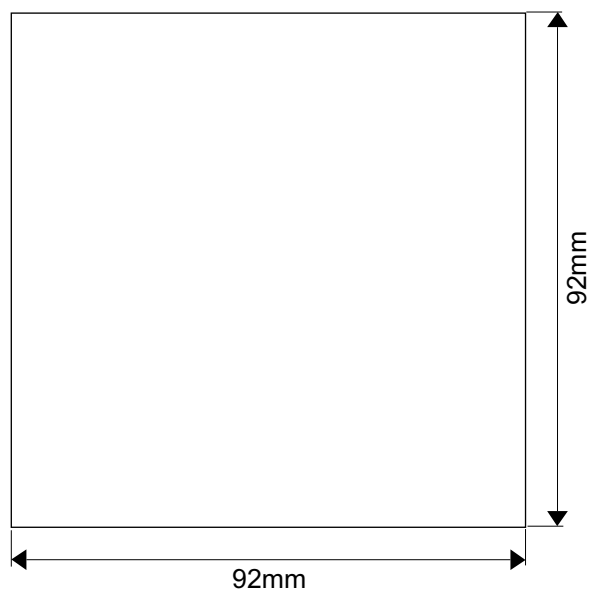
Front Panel ←  
IP54 Protection  
NEMA4X



## 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.



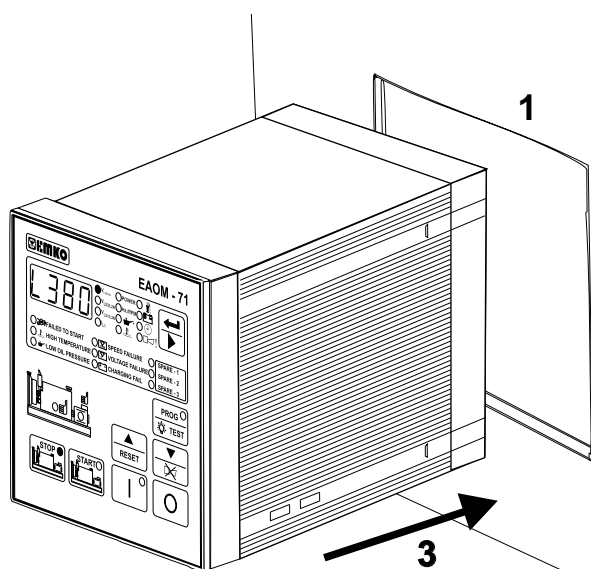
#### Forbidden Conditions:

**Corrosive atmosphere**

**Explosive atmosphere**

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

## 2.5 Panel Mounting



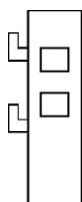
1. If fixing parts are on the unit firstly unscrew the fixing screws in the fixings parts to remove the fixings parts.

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.

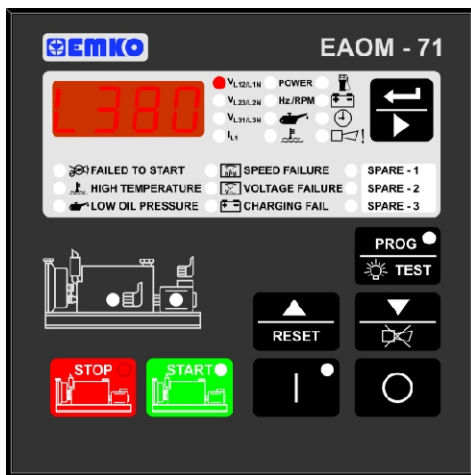


Fixing part



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.

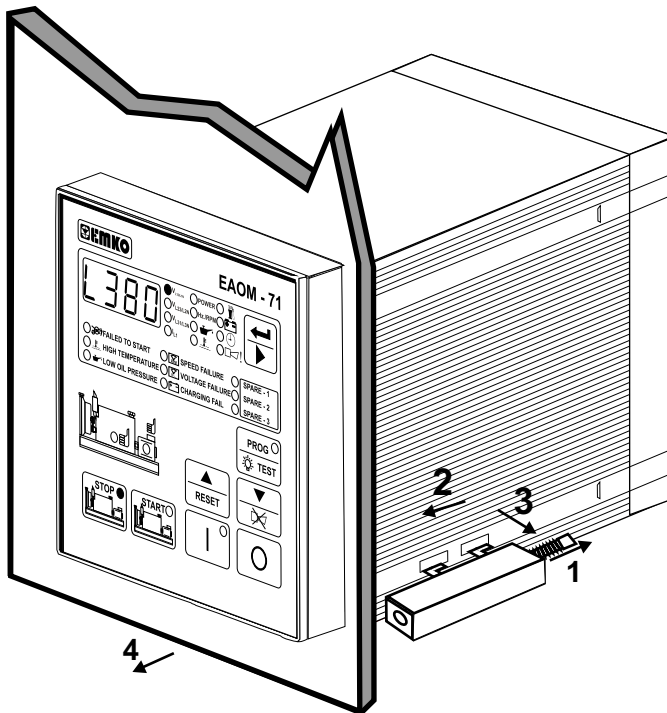


During mechanical installation, beware of any sharp burrs on the metal panel aperture. Ensure that the fixings are properly tightened to prevent the fixings becoming loose due to panel vibration.

Montage of the unit to a system must be done with its 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

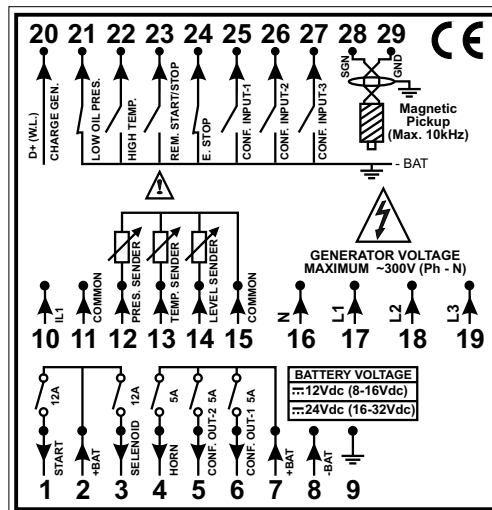


Before starting to remove the unit from panel, power off the unit and the related system.

1. Loosen the screws on the 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



Ensure the position of "Power supply position switch" is in the correct position according to the battery voltage (12 V $\text{---}$  or 24 V $\text{---}$ ).

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.

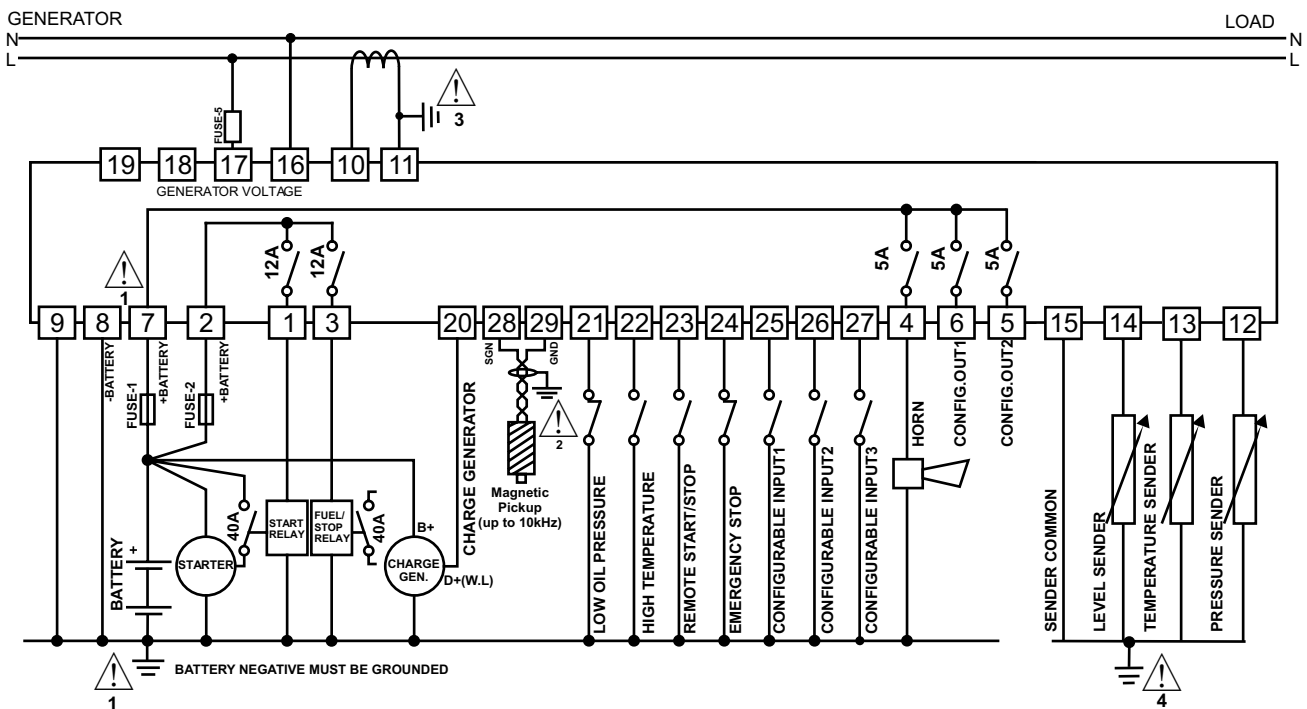
External fuse is recommended.

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

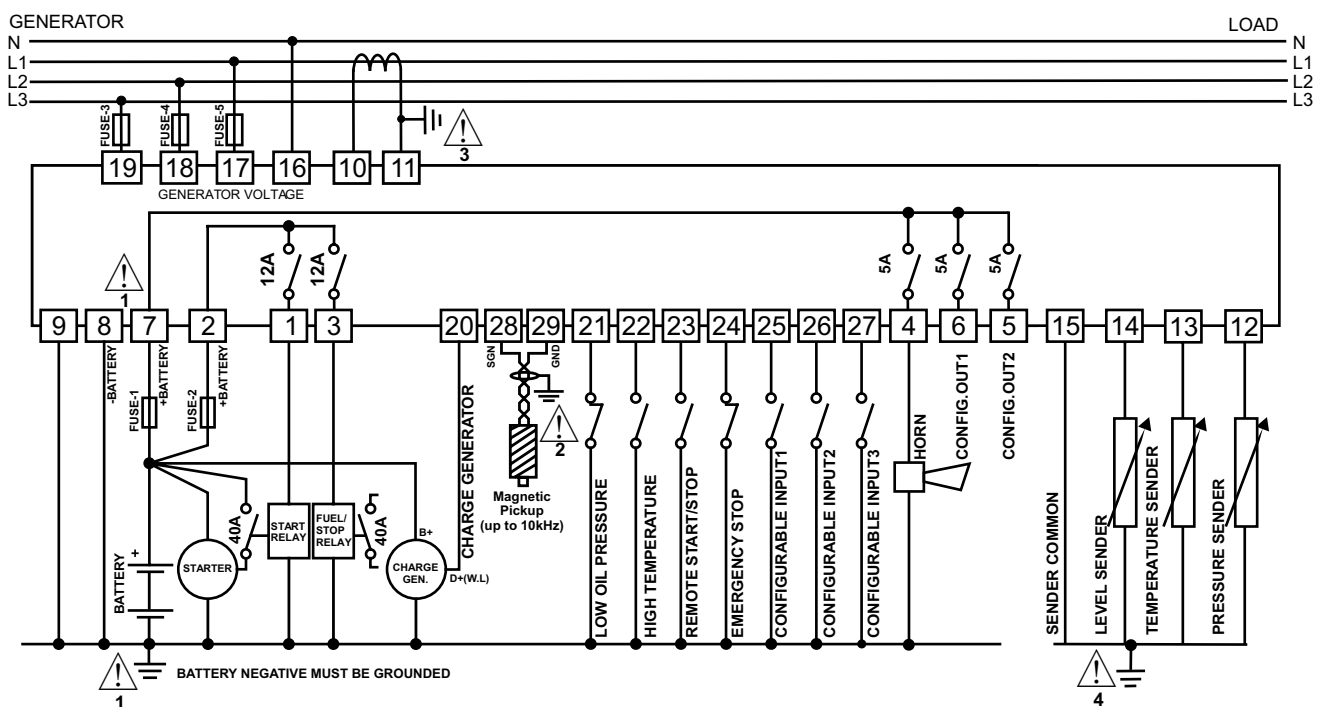
You must ensure that the device is correctly configured for your application. Incorrect configuration could result in damage to the process being controlled and/or personal injury. It is your responsibility, as the installer, to ensure that the configuration is correct. Device parameters has factory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



### 3.2.2 Three Phase Wiring Diagram



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 should meet the current required by horn and configurable output ( Max. 15 A. T)

FUSE-2 should meet the current required by solenoids ( Max.16 A. T)

FUSE-3, FUSE-4, FUSE-5 should be 1 A. 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- Second 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

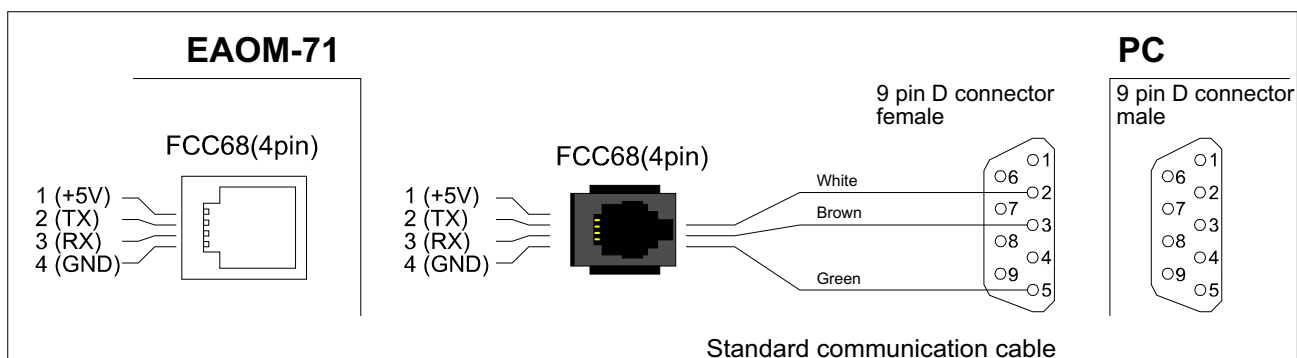
| Pin      | Description                                 | Cable Size (mm) | Notes                            |
|----------|---------------------------------------------|-----------------|----------------------------------|
| 1        | Output to start solenoid                    | 2.5             | Max. 12A@24 V <sub>DC</sub>      |
| 2        | Positive battery supply input               | 2.5             | Supply external solenoids.       |
| 3        | Output to fuel solenoid                     | 2.5             | Max. 12A@24 V <sub>DC</sub>      |
| 4        | Output to horn                              | 2.5             | Max. 5A@24 V <sub>DC</sub>       |
| 5        | Configurable output-2                       | 1.0             | Max. 5A                          |
| 6        | Configurable output-1                       | 1.0             | Max. 5A                          |
| 7        | +Battery supply input                       | 2.5             | Feeds relay outputs              |
| 8        | -Battery supply input                       | 2.5             | Supplies unit                    |
| 9        | Alternator neutral conductor to unit        | 2.5             |                                  |
| 10       | L1 alternator current transformer input     | 1.0             |                                  |
| 11       | Alternator current transformer common input | 1.0             |                                  |
| 12       | Pressure sender input                       | 1.0             |                                  |
| 13       | Temperature sender input                    | 1.0             |                                  |
| 14       | Fuel level sender input                     | 1.0             |                                  |
| 15       | Common input for senders                    | 1.0             |                                  |
| 16       | Alternator neutral conductor                | 2.5             |                                  |
| 17       | Alternator voltage input (L1)               | 2.5             |                                  |
| 18       | Alternator voltage input (L2)               | 2.5             | 3 phase only                     |
| 19       | Alternator voltage input (L3)               | 2.5             | 3 phase only                     |
| 20       | Input from charge generator                 | 1.0             |                                  |
| 21       | Input from oil pressure switch              | 1.0             | Switch to 0 V <sub>DC</sub> (NC) |
| 22       | Input from high temperature switch          | 1.0             | Switch to 0 V <sub>DC</sub> (NO) |
| 23       | Input from remote start/stop switch         | 1.0             | Switch to 0 V <sub>DC</sub> (NO) |
| 24       | Input from emergency stop switch            | 1.0             | Switch to 0 V <sub>DC</sub> (NC) |
| 25       | Configurable Input-1                        | 1.0             | Switch to 0 V <sub>DC</sub> (NO) |
| 26       | Configurable Input-2                        | 1.0             | Switch to 0 V <sub>DC</sub> (NO) |
| 27       | Configurable Input-3                        | 1.0             | Switch to 0 V <sub>DC</sub> (NO) |
| 28<br>29 | Input from magnetic pick-up                 | 1.0             |                                  |

Table 3.2 Unit wiring description

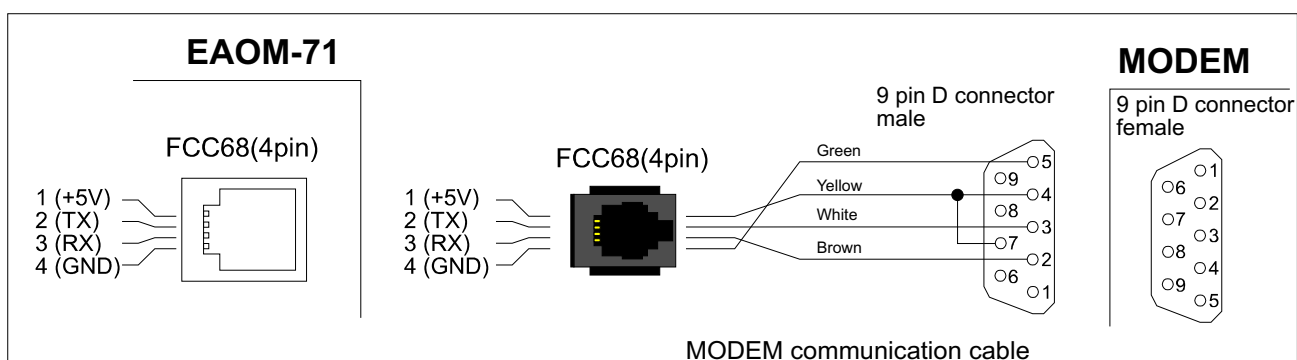
| Pin | Function                                                                                                                                                                                                                               |                                                                                                                                                                                             |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Output to Start solenoid. Controls starter motor                                                                                                                                                                                       |                                                                                                                                                                                             |
| 2   | Battery positive input. +12 V <sub>DC</sub> or +24 V <sub>DC</sub> . Feeds external solenoids                                                                                                                                          |                                                                                                                                                                                             |
| 3   | Output to Fuel/Stop solenoid. Controls fuel to engine or controls engine stopping                                                                                                                                                      |                                                                                                                                                                                             |
| 4   | Output to horn.                                                                                                                                                                                                                        |                                                                                                                                                                                             |
| 5   | Configurable output-2                                                                                                                                                                                                                  | Can be programmed to provide contact closures when:<br>alarm occurs, engine is running or load transfer is permitted                                                                        |
| 6   | Configurable output-1                                                                                                                                                                                                                  |                                                                                                                                                                                             |
| 7   | +Battery input. +12 V <sub>DC</sub> or +24 V <sub>DC</sub> . Feeds relay outputs.                                                                                                                                                      |                                                                                                                                                                                             |
| 8   | -Battery supply to the unit                                                                                                                                                                                                            |                                                                                                                                                                                             |
| 9   | Alternator neutral conductor to the unit                                                                                                                                                                                               |                                                                                                                                                                                             |
| 10  | L1 Alternator current transformer input                                                                                                                                                                                                | Calculated total power value<br>with measured L1 current value.                                                                                                                             |
| 11  | L1 Alternator current transformer common input                                                                                                                                                                                         |                                                                                                                                                                                             |
| 12  | Pressure sender input. Used oil pressure value measuring                                                                                                                                                                               |                                                                                                                                                                                             |
| 13  | Temperature sender input. Used coolant system temperature value measuring                                                                                                                                                              |                                                                                                                                                                                             |
| 14  | Level sender input. Used fuel tank value measuring                                                                                                                                                                                     |                                                                                                                                                                                             |
| 15  | Pressure, temperature and level sender common connection pin                                                                                                                                                                           |                                                                                                                                                                                             |
| 16  | Alternator neutral conductor                                                                                                                                                                                                           |                                                                                                                                                                                             |
| 17  | L1                                                                                                                                                                                                                                     | Voltage inputs from alternator. Unit can be programmed to use frequency of<br>alternator output to detect when engine has started. Pins 18 and 19 not used on<br>single phase applications. |
| 18  | L2                                                                                                                                                                                                                                     |                                                                                                                                                                                             |
| 19  | L3                                                                                                                                                                                                                                     |                                                                                                                                                                                             |
| 20  | Charge generator failure input. It can be used to detect when engine has started. The EAOM-71 connection replaces the usual charge indicator lamp. It supplies current to the rotor coil from the battery until the engine is running. |                                                                                                                                                                                             |
| 21  | 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)                                               |                                                                                                                                                                                             |
| 22  | Input from temperature switch. Switch to 0 V <sub>DC</sub> . When engine temperature exceeds thermostat setting.                                                                                                                       |                                                                                                                                                                                             |
| 23  | Remote start/stop input. When the switch to 0 V <sub>DC</sub> the engine will start, when the contact is opened the engine is stopped.                                                                                                 |                                                                                                                                                                                             |
| 24  | Emergency stop input. Normally closed. When switch is opened, engine will stop.                                                                                                                                                        |                                                                                                                                                                                             |
| 25  | Configurable Failure Input-1. Normally open. When switch to 0 V <sub>DC</sub> , sounds the horn and flashes indicator on panel. Can be programmed to stop the engine.                                                                  |                                                                                                                                                                                             |
| 26  | Configurable Failure Input-2. Normally open. When switch to 0 V <sub>DC</sub> , sounds the horn and flashes indicator on panel. Can be programmed to stop the engine.                                                                  |                                                                                                                                                                                             |
| 27  | Configurable Failure Input-3. Normally open. When switch to 0 V <sub>DC</sub> , sounds the horn and flashes indicator on panel. Can be programmed to stop the engine.                                                                  |                                                                                                                                                                                             |
| 28  | Input from magnetic pick-up. Unit can be programmed for number of teeth detected on wheel.                                                                                                                                             |                                                                                                                                                                                             |

## 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 Disc Free Space</b> | : 5 Mbyte                                                                     |
| <b>Disc Drive</b>            | : CD-ROM                                                                      |
| <b>Communication</b>         | : An RS-232 communication port is needed to communicate with the EAOM-71 unit |

#### 4.3.3 Installing EAOM-71 Software

Insert the software CD into the CD-ROM drive on the PC. CD will autostart, then select EAOM-71 Install.exe from the menu.

#### 4.3.4 Using Of EAOM-71 Communication Software

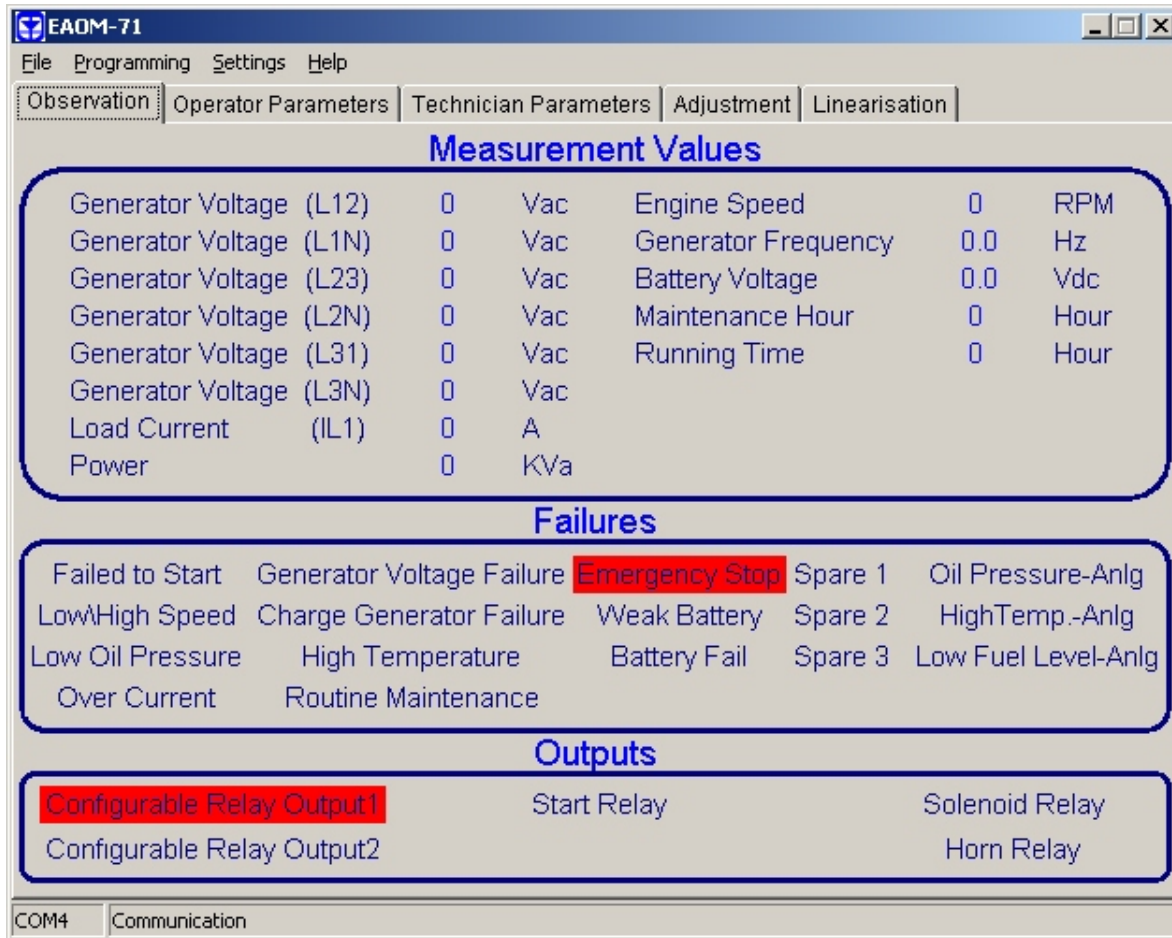
Press the windows START button icon, then select EAOM-71 SW EAOM-71 from the program menu.

#### 4.3.5 Description

EAOM-71 unit communicates with the PC using RS-232 communications. The PC software allows the EAOM-71 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-71 PC SW: Observation Window, Operator Parameters Window, Technician Parameters Window, Adjustment Window and Linearisation Window.

### 4.3.6 Observation Window

In this window the values listed below can be observed.



#### Measurement Values

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

#### Failures

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

#### Outputs

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

### 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-71 unit.

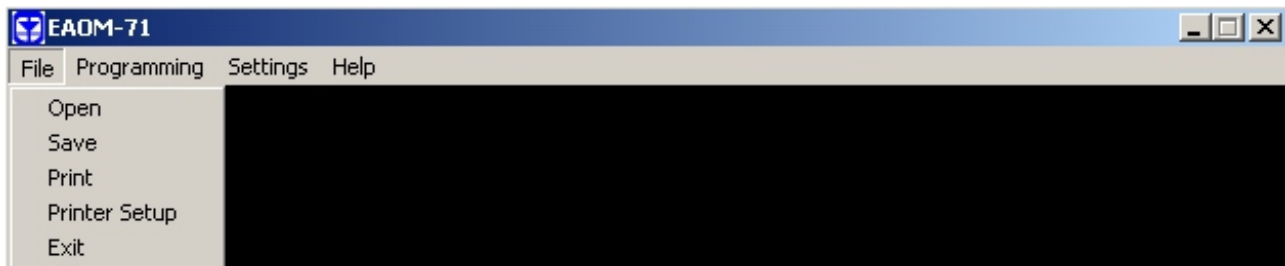
### 4.3.8 Technician Parameters Window

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-71 unit.

### 4.3.9 MAIN MENU

#### 4.3.9.1 FILE

This menu allows the user to save configuration files to the disc, read from disc 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-71 unit to the PC or download from the PC to the EAOM-71 unit.

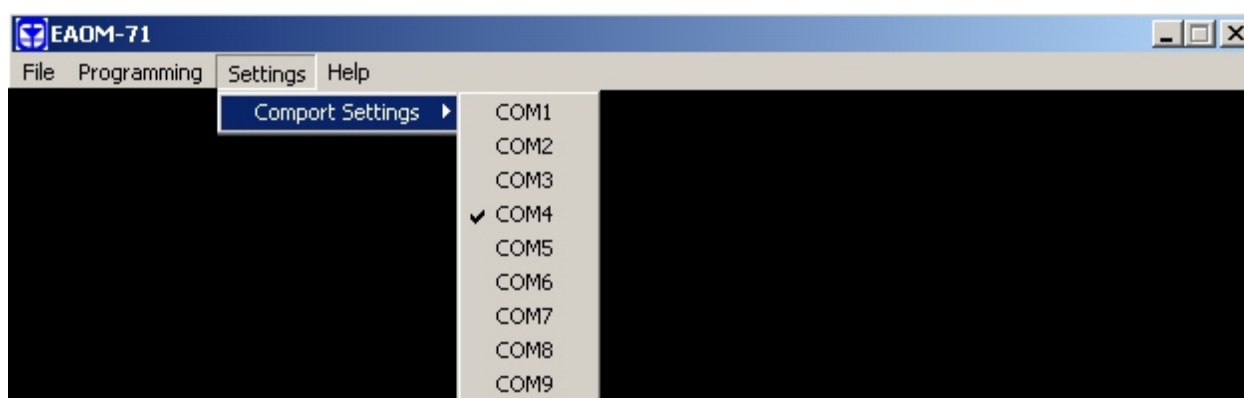


**Download** : With this menu user can load parameters from PC to EAOM-71 .

**Upload** : User can load the parameters stored on EAOM-71 unit to PC.

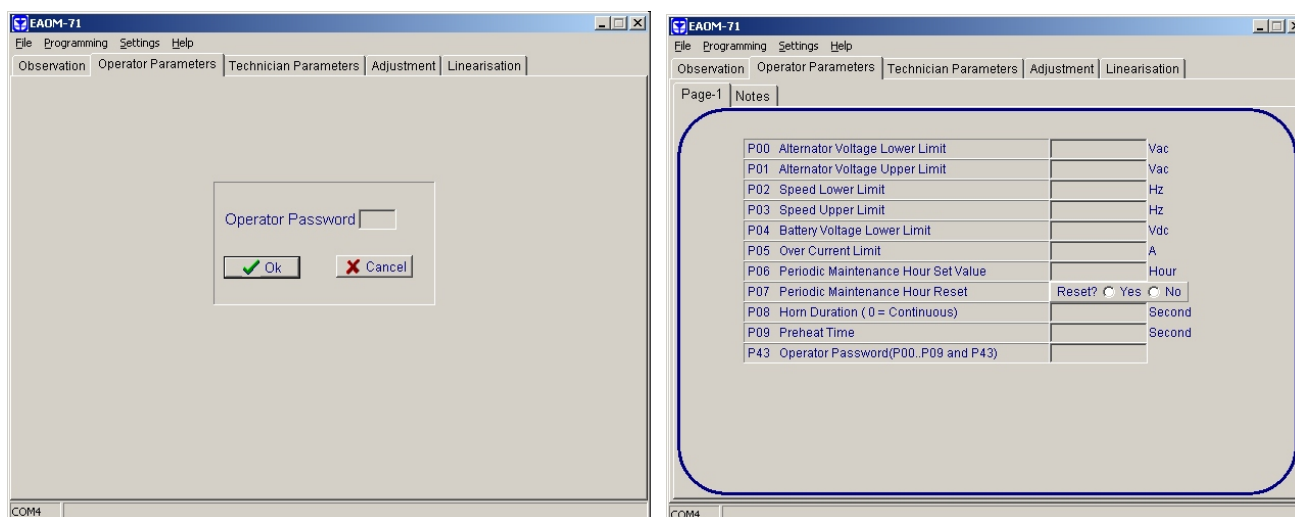
### 4.3.9.3 Settings

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



### 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.

The left screenshot shows the 'EAQM-71' software window with the 'Technician Parameters' tab selected. A dialog box titled 'Technician Password' is displayed, containing a password input field and 'Ok' and 'Cancel' buttons.

The right screenshot shows the 'EAQM-71' software window with the 'Technician Parameters' tab selected. The 'Page-1' tab is active, displaying a list of 14 parameters and their units:

| Parameter                               | Unit          |
|-----------------------------------------|---------------|
| P00 Alternator Voltage Lower Limit      | Vac           |
| P01 Alternator Voltage Upper Limit      | Vac           |
| P02 Speed Lower Limit                   | Hz            |
| P03 Speed Upper Limit                   | Hz            |
| P04 Battery Voltage Lower Limit         | Vdc           |
| P05 Over Current Limit                  | A             |
| P06 Periodic Maintenance Hour Set Value | Hour          |
| P07 Periodic Maintenance Hour Reset     | Reset? Yes No |
| P08 Horn Duration                       | Second        |
| P09 Preheat Time                        | Second        |
| P10 Single/Three Phase Selection        |               |
| P11 Nominal Alternator Frequency        | Hz            |
| P12 Nominal Speed                       | Rpm           |
| P13 Tooth Number                        |               |
| P14 Current Transformer Ratio           |               |

### 4.3.12 Entering to the Adjustment Window

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

The left screenshot shows the 'EAQM-71' software window with the 'Adjustment' tab selected. A dialog box titled 'Technician Password' is displayed, containing a password input field and 'Ok' and 'Cancel' buttons.

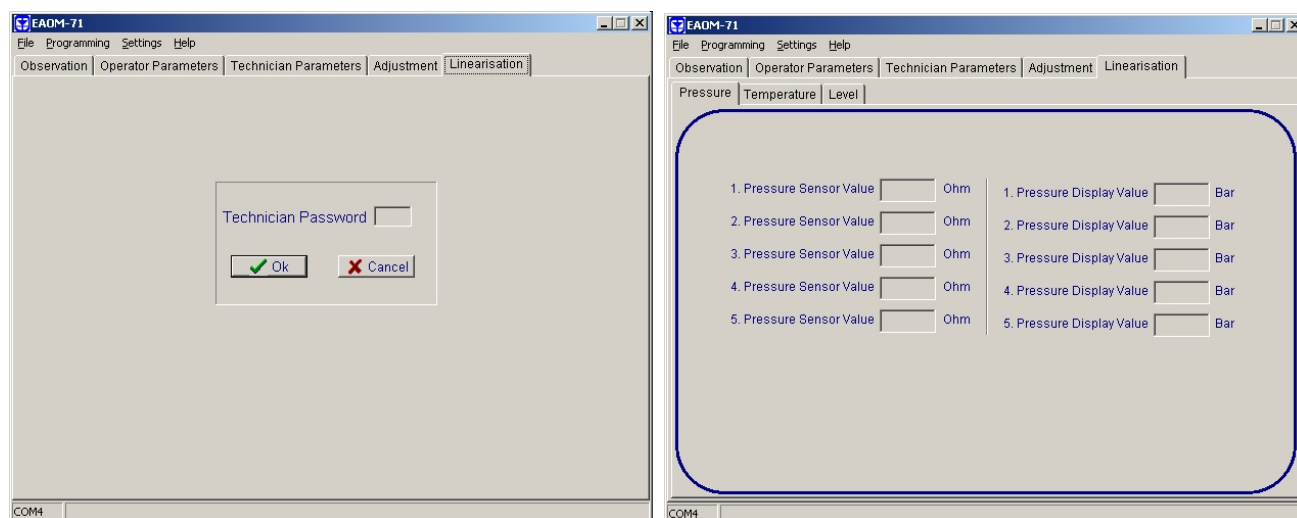
The right screenshot shows the 'EAQM-71' software window with the 'Adjustment' tab selected. The 'Adjustment' window displays a table of adjustment points and a 'Set Factory Defaults' button:

| Parameter   | Adjustment to Zero Point | Adjustment to High Point | Unit |
|-------------|--------------------------|--------------------------|------|
| Vbat        |                          |                          | Vdc  |
| L1          |                          |                          | Vac  |
| L2          |                          |                          | Vac  |
| L3          |                          |                          | Vac  |
| Pressure    |                          |                          | Ohm  |
| Temperature |                          |                          | Ohm  |
| Level       |                          |                          | Ohm  |
| IL1         |                          |                          | A    |

Set Factory Defaults

### 4.3.13 Entering to the Linearisation Window

Click Linearisation tab. Enter the Technician Parameter password. If password is correct, linearisation page will be viewed.



### 4.3.14 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.

### 4.3.15 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.

### 4.3.16 Upload

Operator parameters, technician parameters and linearisation values can be uploaded with this selection. For loading parameters from EAOM-71 unit to PC follow the steps below. 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.

### 4.3.17 Download

Operator parameters, technician parameters and linearisation values can be downloaded with this selection. For loading parameters from PC to EAOM-71 follow the steps below. 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 $\equiv$ |
| P05 | Over Current Limit                               | 1                                                     | 9999 | 1000    | A          |
| P06 | Periodic Maintenance Hour Set Value              | 0                                                     | 9999 | 5000    | Hour       |
| P07 | Periodic Maintenance Hour Reset                  | Press 'Silence Alarm' button to reset                 |      |         |            |
| P08 | Horn Duration (0 = Continuous)                   | 0                                                     | 999  | 60      | Second     |
| P09 | Preheat Time                                     | 0                                                     | 99   | 10      | Second     |
| P10 | Single / Three Phase Selection                   | 1/3                                                   |      | 3       |            |
| P11 | Nominal Alternator Frequency                     | 50.0/60.0                                             |      | 50.0    | Hz         |
| P12 | Nominal Speed                                    | 500                                                   | 5000 | 3000    | RPM        |
| P13 | Tooth Number                                     | 1                                                     | 1000 | 100     |            |
| P14 | Current Transformer Ratio                        | 1                                                     | 2000 | 500     |            |
| P15 | Speed Sensing Input Selection                    | 0-Alternator Signal<br>1-Magnetic Pick-up             |      | 0       |            |
| P16 | Stop / Fuel Solenoid Selection                   | Stop / Fuel                                           |      | Fuel    |            |
| P17 | Stop Magnet Energising Time                      | 0                                                     | 99   | 20      | Second     |
| P18 | Engine started signal                            | 0=No, 1=Yes                                           |      |         |            |
|     | P18.0 Charge Generator                           | 0/1                                                   |      | 1       |            |
|     | P18.1 Speed                                      | 0/1                                                   |      | 0       |            |
|     | P18.2 Alternator Voltage                         | 0/1                                                   |      | 1       |            |
|     | P18.3 Oil Pressure                               | 0/1                                                   |      | 0       |            |
| P19 | Battery Voltage Weak Limit                       | 6.0                                                   | 14.4 | 7.0     | V $\equiv$ |
| P20 | Battery Voltage Weak Control Time                | 1                                                     | 99   | 3       | Second     |
| P21 | Alternator voltage limit for crank disconnection | 40                                                    | 360  | 300     | V $\sim$   |
| P22 | Speed Limit For Crank Disconnection              | 20.0                                                  | 45.0 | 40.0    | Hz         |
| P23 | Number Of Starting Attempts                      | 1                                                     | 10   | 3       |            |
| P24 | Starting Attempt Duration                        | 5                                                     | 99   | 5       | Second     |
| P25 | Oil Pressure Bypass Time                         | 0                                                     | 99   | 30      | Second     |
| P26 | Control On Delay                                 | 0                                                     | 99   | 10      | Second     |
| P27 | Alternator Voltage Fault Control Delay           | 0.0                                                   | 10.0 | 5.0     | Second     |
| P28 | Speed Fault Control Delay                        | 0.0                                                   | 10.0 | 5.0     | Second     |
| P29 | Engine Cooling Time(0 = disable)                 | 0                                                     | 99   | 3       | Minute     |
| P30 | Engine Running Time Reset                        | Enter technician password to reset time to '0' (zero) |      |         |            |
| P31 | Configurable Failure Input-1                     | 0                                                     | 2    | 0       |            |
|     | 0 - Only horn temporary                          |                                                       |      |         |            |
|     | 1 - Only horn permanent                          |                                                       |      |         |            |
|     | 2 - Engine stop                                  |                                                       |      |         |            |
| P32 | Configurable Failure Input-2                     | 0                                                     | 2    | 0       |            |
|     | 0 - Only horn temporary                          |                                                       |      |         |            |
|     | 1 - Only horn permanent                          |                                                       |      |         |            |
|     | 2 - Engine stop                                  |                                                       |      |         |            |

| No  | Definition of Parameter                                                                                          | Min | Max | Default | Unit |
|-----|------------------------------------------------------------------------------------------------------------------|-----|-----|---------|------|
| P33 | Configurable Failure Input-3                                                                                     | 0   | 2   | 0       |      |
|     | 0 - Only horn temporary                                                                                          |     |     |         |      |
|     | 1 - Only horn permanent                                                                                          |     |     |         |      |
|     | 2 - Engine stop                                                                                                  |     |     |         |      |
| P34 | Observing Time of Configurable Failure Inputs                                                                    |     |     |         |      |
|     | P34.0 - For Configurable Failure Input-1<br>0 - Observation Continuously<br>1 - Observation While Engine Running | 0   | 1   | 0       |      |
|     | P34.1 - For Configurable Failure Input-2<br>0 - Observation Continuously<br>1 - Observation While Engine Running | 0   | 1   | 0       |      |
|     | P34.2 - For Configurable Failure Input-3<br>0 - Observation Continuously<br>1 - Observation While Engine Running | 0   | 1   | 0       |      |
| P35 | Configurable Output-1                                                                                            | 0   | 15  | 0       |      |
|     | 0 - Alarm out                                                                                                    |     |     |         |      |
|     | 1 - Engine running                                                                                               |     |     |         |      |
|     | 2 - Load transfer 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 - Weak battery                                                                                                |     |     |         |      |
| P36 | Configurable Output-2                                                                                            | 0   | 15  | 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 - Weak battery                                                                                                |     |     |         |      |

| No  | Definition of Parameter      | Min | Max  | Default | Unit |
|-----|------------------------------|-----|------|---------|------|
| P37 | Pressure Lower Limit         | 0.0 | 10.0 | 3.0     |      |
| P38 | Pressure Configuration       | 0   | 2    | 0       |      |
|     | 0 - Disable the analog input |     |      |         |      |
|     | 1 - Pre-alarm                |     |      |         |      |
|     | 2 - Shut down                |     |      |         |      |
| P39 | Temperature Upper Limit      | 0   | 200  | 80      |      |
| P40 | Temperature Configuration    | 0   | 2    | 0       |      |
|     | 0 - Disable the analog input |     |      |         |      |
|     | 1 - Pre-alarm                |     |      |         |      |
|     | 2 - Shut down                |     |      |         |      |
| P41 | Level Lower Limit            | 1   | 100  | 25      |      |
| P42 | Level Configuration          | 0   | 2    | 0       |      |
|     | 0 - Disable the analog input |     |      |         |      |
|     | 1 - Pre-alarm                |     |      |         |      |
|     | 2 - Shut down                |     |      |         |      |
| P43 | Operator Password            | 0   | 9990 | 0       |      |
| P44 | Technician Password          | 0   | 9990 | 0       |      |

## **5.1 Program Functions**

### **5.1.1 Alternator Voltage**

P00 Alternator Voltage Lower Limit  
P01 Alternator Voltage Upper Limit  
P27 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 (P27). The fault will only occur if the engine has been running for the period defined as the Control on Delay (P26). This failure immediately stops the generating set without Engine Cooling Time (P29)

### **5.1.2 Alternator Frequency**

P02 Speed Lower Limit  
P03 Speed Upper Limit  
P28 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 Alternator Speed Fault Control Delay (P28). The fault will only occur after the engine has been running for the period defined as the Control on Delay (P26). This failure immediately stops the generating set without Engine Cooling Time (P29)

### **5.1.3 Battery Voltage Lower Limit (P04)**

If the battery voltage drops below the defined Battery Voltage Lower Limit (P04), an alarm occurs and “Low Battery Failure” LED illuminates.

### **5.1.4 Over Current Limit (P05)**

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 (P26). The message ocr (Over Current) appears on the display.

### **5.1.5 Maintenance Indication**

P06 Periodic Maintenance Hour Set Value  
P07 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 (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 alarm LED will flash and when the alarm display option is selected, the display will read the error message bAEr.

### **5.1.6 Speed Sensing Input Selection (P15)**

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, 5.1.9 Engine started signals (P18) and 5.1.12 Engine Starting. Speed Limit For Crank Disconnection (P22) should be set to the frequency that must be achieved at start-up. When magnetic pick-up is using Tooth Number (P13) must be entered correctly. Nominal Alternator Frequency (P11) and Nominal Speed (P12) are used to compute alternator RPM or frequency. If Speed Sensing Input Selection (P15) is set to 0 (from Alternator Voltage), the unit

uses Nominal Alternator Frequency (P11) and Nominal Speed (P12) 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 (P11) and Nominal Speed (P12) to calculate alternator output frequency from the measured RPM.

#### **5.1.7 Stop / Fuel Solenoid Selection (P16)**

This parameter allows the use of either a Stop solenoid or a Fuel solenoid. (See Section 5.1.12 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 (P17). See Section 5.1.12 Engine Starting.

#### **5.1.8 Stop Magnet Energising Time (P17)**

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 (P16) is set to Stop Solenoid. See Section 5.1.7 Stop/Fuel Solenoid Selection (P16)

#### **5.1.9 Engine Started Signals (P18)**

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. Engine speed, as selected by Speed Sensing Input Selection (P15) and Speed Limit for Crank Disconnection (P22) (Section 5.1.6 Speed Sensing Input Selection (P15))
2. Alternator voltage as selected by parameters Alternator Voltage Limit for Crank Disconnection (P21)
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 5.1.12 Engine Starting. If any of the selected signals appears, the unit assumes that the engine has started.

#### **5.1.10 Battery Voltage**

Battery Voltage Weak Limit (P19)

Battery Voltage Weak Control Time (P20)

If the battery voltage drops below the level specified by the Battery Voltage Weak Limit (P19) for more than the Battery Voltage Weak Control Time (P20) during engine cranking an alarm occurs. The message Weak Battery is displayed on the LED display. Use the Reset Button to clear the alarm indication.

#### **5.1.11 Current Transformer Ratio (P14)**

The current transformer input / output ratio can be entered into this parameter, allowing the primary current value to be displayed.

### 5.1.12 Engine Starting

Number of Starting Attempts (P23)  
Starting Attempt Duration (P24)

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 5.1.17 Configurable Outputs), the display will show the HEAT message for the time period set by Preheat Time (P09). The unit energises the start solenoid to drive the starter motor and energises the Fuel solenoid (if selected – see Section 5.1.7 Stop/Fuel Solenoid selection (P16)) 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 P18 – see Section 5.1.9 Engine started signals (P18). Starting Attempt Duration (P24) 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 and de-energises the fuel solenoid, if selected. It then makes a new attempt after a delay equal to twice the defined Starting Attempt Duration (P24).

Number of Starting Attempts (P23) 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.

### 5.1.13 Oil Pressure By-Pass Time (P25)

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 closed, while the engine is running, after the period defined by parameter. This period begins when the EAOM-71 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 (P29).

### 5.1.14 Control On Delay (P26)

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 (P26) defines a period during which any fault indications, except High Temperature, will be ignored by the unit. This period begins when the EAOM-71 has detected engine starting and has cut off the drive to the starter motor.

### 5.1.15 Engine Cooling Time (P29)

Engine Cooling Time (P29) 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.

### 5.1.16 Configurable Inputs

Configurable Failure Input-1 (P31)  
Configurable Failure Input-2 (P32)  
Configurable Failure Input-3 (P33)

A contact closure to 0V on any of these inputs causes the horn to sound for the period programmed by Horn Duration (P08) and lights the appropriate indicator on the panel. The unit can be programmed to respond in one of three ways:

0. Indication is unlatched - the LED flashes only while the input is 0V. This indication is inhibited 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 stopped.

### 5.1.17 Configurable Outputs

Configurable Output-1 (P35)  
Configurable Output-2 (P36)

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

0. Alarm output. Active when any fault is reported. It can be used for either audible or visual alert.
1. Engine running. Active while the engine is running
2. Load transfer permitted. This output is active while the alternator output voltage is between 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 output is active for time period defined in Preheat Time (P09) prior to running the starter motor.
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 Voltage
15. Weak Battery

### 5.1.18 Pressure Lower Limit (P37)

The minimum oil pressure value, in "bar" units, can be entered into this parameter.

### 5.1.19 Pressure Configuration (P38)

This parameter defines the function of an alarm when the measured oil pressure value is lower than the value of Pressure Lower Limit (P37). If the parameter value is "0" then analogue pressure input is disabled. If the parameter value is "1" then it activates pre-alarm (warning). If the parameter value is "2" then it activates the shutdown alarm.

#### **5.1.20 Temperature Upper Limit (P39)**

The maximum temperature value, in “°C” units, can be entered into this parameter.

#### **5.1.21 Temperature Configuration (P40)**

This parameter defines the function of an alarm when the measured temperature value is higher than the value of Temperature Upper Limit (P39). If the parameter value is “0” then analogue pressure input is disabled. If the parameter value is “1” then it activates pre-alarm (warning). If the parameter value is “2” then it activates the shutdown alarm.

#### **5.1.22 Level Lower Limit (P41)**

The minimum fuel tank level value, in “%” units, can be entered into this parameter.

#### **5.1.23 Level Configuration (P42)**

This parameter defines the function of an alarm when the measured fuel tank level value is lower than the value of Level Lower Limit (P41). If the parameter value is “0” then analogue pressure input is disabled. If the parameter value is “1” then it activates pre-alarm (warning). If the parameter value is “2” then it activates the shutdown alarm.

#### **5.1.24 Operator Password (P43)**

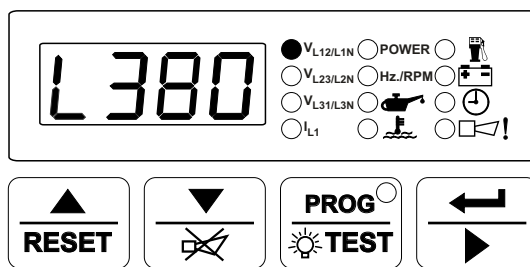
Use this option to change the Operator password. This password allows access to the parameters from Alternator Voltage Lower Limit (P00) to Preheat Time (P09) and Operator Password (P43).

#### **5.1.25 Technician Password (P44)**

Use this option to change the Technician password. It allows access to the all parameters from Alternator Voltage Lower Limit (P00) to Technician Password (P44).

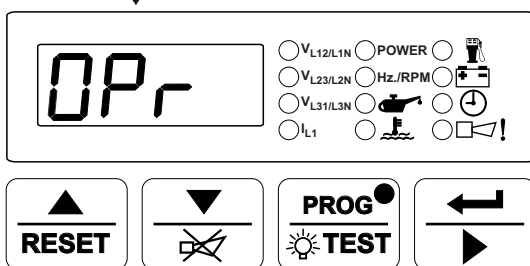
## 5.2 Changing and Saving Operator Parameter Value

### Operation Screen



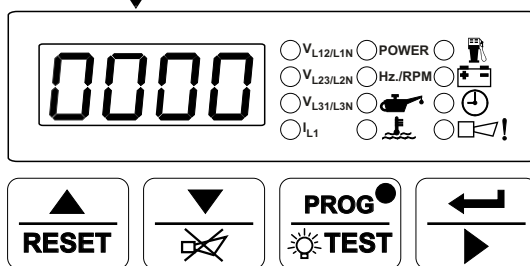
When button is pressed, all leds and digits are energised, because prog button is also used as test button. Continue to press the prog button for 5 seconds, Operator Menu Entering screen is shown and prog led lights on.

### Operator Menu Entering Screen



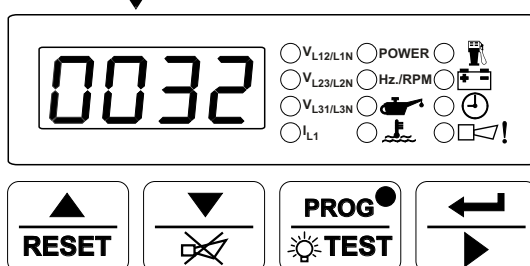
When button is pressed, operator password entering screen is shown.

### Operator Password Entering Screen

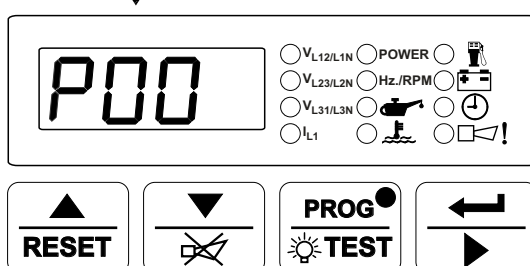


Change the password with and buttons

### Operator Password Entering Screen



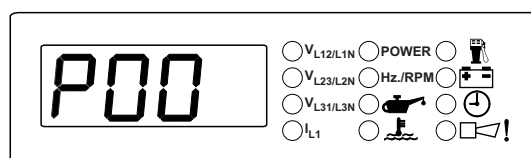
After entering the password, push the button for confirming the password and accessing to the first parameters of operator parameters.



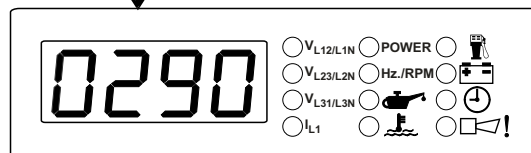
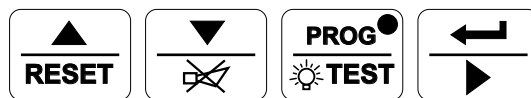
**Alternator Voltage Lower Limit Parameter**

**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

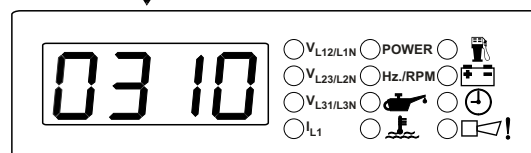
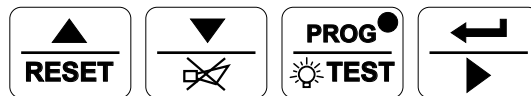


**Alternator Voltage Lower Limit Parameter**



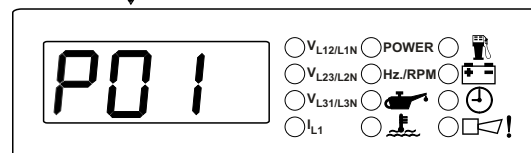
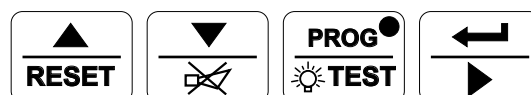
**Alternator Voltage Lower Limit Value**

Change the **P00** parameter with  and  buttons

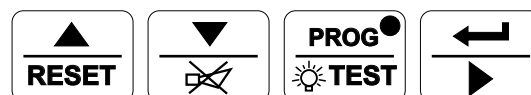


**Alternator Voltage Lower Limit Value**

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



**Alternator Voltage Upper Limit Parameter**

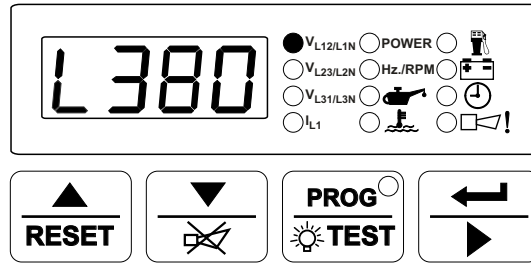


**NOTE :** Other operator paramaters can be accessed as explained for **P00**  
For exiting from programming mode, press 

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

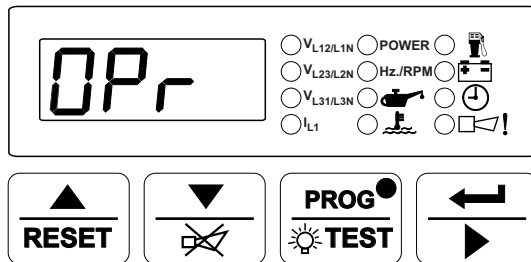
### 5.3 Changing and Saving Technician Parameter Value

#### Operation Screen



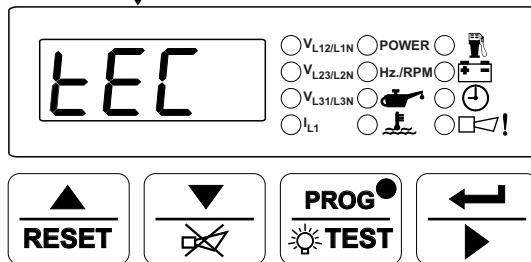
When button is pressed, all leds and digits are energised, because prog button is also used as test button. Continue to press the prog button for 5 seconds, Operator Menu Entering screen is shown and prog led lights on.

#### Operator Menu Entering Screen



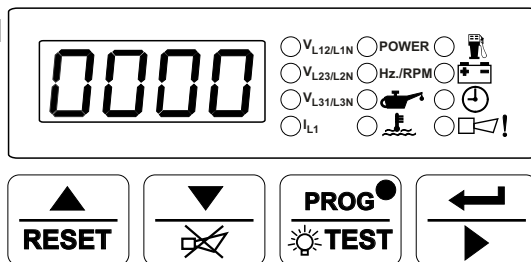
When button is pressed for 10 seconds, technician menu entering screen is shown.

#### Technician Menu Entering Screen



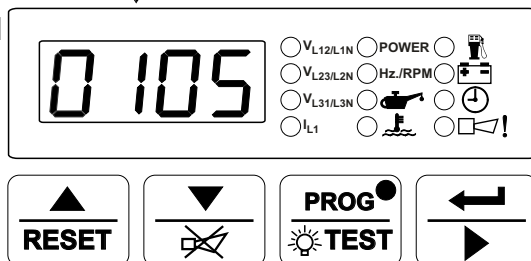
When button is pressed, technician password entering screen is shown.

#### Technician Password Entering Screen



Change the password with and buttons

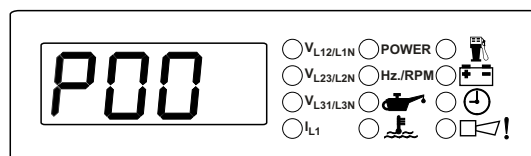
#### Technician Password Entering Screen



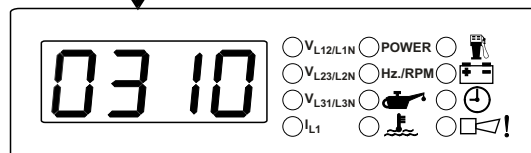
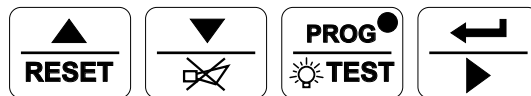
After entering the password, press the button for confirming the password and accessing to the first parameters of technician parameters.

**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

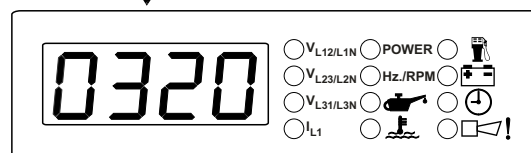
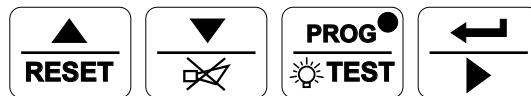


**Alternator Voltage Lower Limit Parameter**



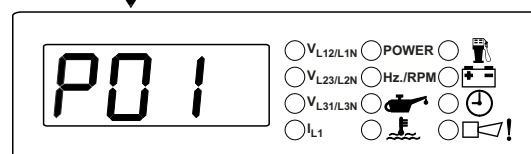
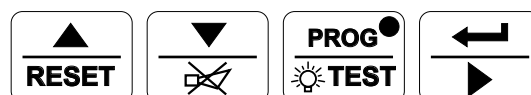
**Alternator Voltage Lower Limit Value**

Change the **P00** parameter with  and  buttons

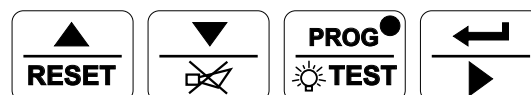


**Alternator Voltage Lower Limit Value**

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

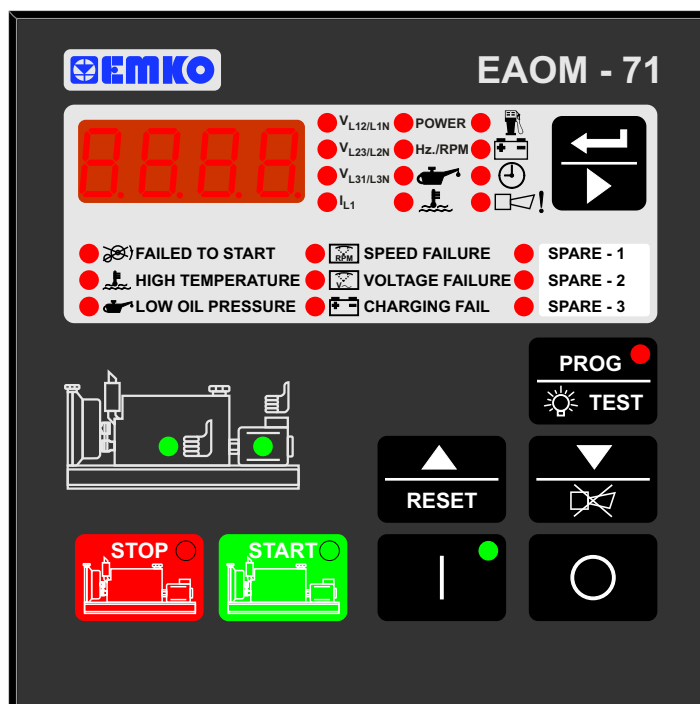


Beware of the high voltages connected to this unit.

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. Press the Power On button (7).
7. Press the Engine Start Button (6).
8. Check that the engine start sequence commences. The starter motor should run for the Starting Attempt Duration (P24) for the Number of Starting Attempts (P23).
9. Check that the Failed to Start LED flashes.
10. Press the Power Off Button (8).
11. Restore the engine to operational state (reconnect the fuel solenoid).
12. Press the Power On Button (7)
13. Press the Engine Start Button (6).
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 (5). 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.

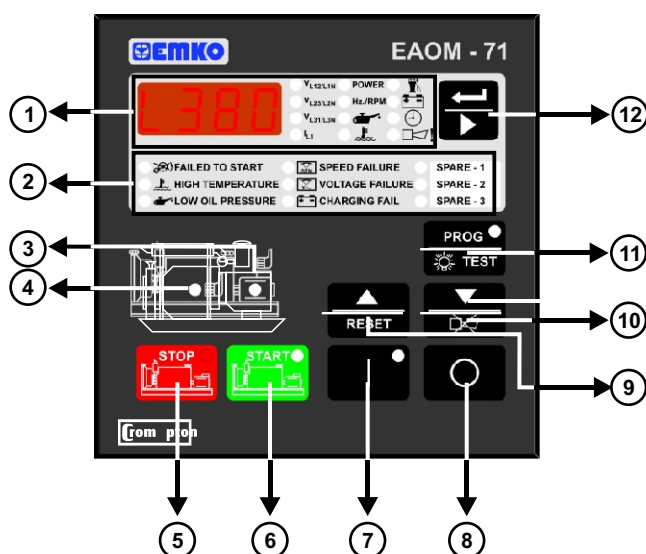
## 7. LAMP TEST

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



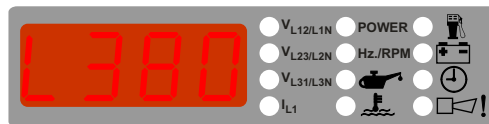
## 8. OPERATION

### 8.1 Front Panel Description



| Number | Comment                                                                                                                                                                                                                                   |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Multi Function Display. This is used for displaying the electrical measurements during normal operation and editing / inspecting programming parameters in programming mode.                                                              |
| 2      | Failure Indicators. Detailed information available in Section 9 Fault Finding.                                                                                                                                                            |
| 3      | Green LED lights to indicate that alternator output is available and within the parameters set by Alternator Voltage Lower Limit (P00) and Alternator Voltage Upper Limit (P01).                                                          |
| 4      | Green LED lights to indicate that engine is running, as indicated by the signals selected by program parameter Engine Started Signals (P18).                                                                                              |
| 5      | Engine Stop button. Stops the engine. A red LED in the corner shows that the button has been pressed.                                                                                                                                     |
| 6      | Engine Start button. Starts the engine. A green LED in the corner shows that the button has been pressed.                                                                                                                                 |
| 7      | Power On. Turns on the unit. A green LED in the corner of the button shows that the unit is on.                                                                                                                                           |
| 8      | Power Off. Turns off the unit and stops the engine if it is running. In the Off state the unit consumes no current from the battery.                                                                                                      |
| 9      | Up/Reset. Restores unit operation after it has latched in a fault condition. The Increment (uparrow) function is used in Programming mode as detailed in Section 5 Parameters.                                                            |
| 10     | Down/Silence Alarm. Silences the audible alarm. The Decrement (down arrow) button is used in Programming mode as detailed in Section 5 Parameters.                                                                                        |
| 11     | Prog/Test. Lights all the LEDs and segments on the panel so that you can see if any is not working. Holding the button pressed for ten seconds puts the unit into programming mode.                                                       |
| 12     | The Display Scroll Button  is used for rotating between measurement screen in normal operation and between programming parameters in programming mode. |

## 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 L1 current
- Alternator power output (VA) into load. This is the sum of voltage (L/N) x current for all phases.
- Alternator frequency (Hz)
- Alternator RPM, as measured by alternator frequency or magnetic pick-up as selected by Speed Sensing Input Selection (P15)
- Oil pressure
- Temperature
- Fuel level
- Battery Voltage (VBAT)
- Engine running time in hours-since last reset via Engine Running Time Reset (P30). 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.
- 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:

ES<sub>t</sub>P - Emergency Stop

bAT1 - Low Battery Voltage

bAT2 - Weak Battery Alarm

ocr – Over Current Failure

SE<sub>r</sub>v-Routine maintenance due

## 8.3 Starting the Engine

1. Press the Power On button.
2. Press the Engine Start button on the panel or the remote Start button. The engine should start. The sequence is as follows:
  - The starter motor runs
  - The engine startsOnce the engine is running,
  - The starter motor disengages.
  - The green Engine (3) and Alternator Leds (4) light.
  - The alarm indicators remain off.

## 8.4 Stopping the Engine

Press the Engine Stop button. The engine will stop and all indicators on the unit will go off.

## 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 (P23). The unit must be reset, by pressing the Failure Reset (9) 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-71 will stop the engine without any Engine Cooling Time (P29).

#### 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 By-Pass Time (P25). If this fault occurs, the EAOM-71 will stop the engine without any Engine Cooling Time (P29).

#### 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 (P26) after the engine has started. This failure will not shut down the engine.

#### 9.1.5 Over / Under 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 (P28). 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 (P15). This failure immediately stops the generating set without Engine Cooling Time (P29).

#### 9.1.6 Generator Voltage Failure LED

This LED flashes if the generator output fails to reach the values specified by the Alternator Voltage Lower Limit parameter (P00) within the period defined by the Control on Delay parameter P26. This failure immediately stops the generating set without Engine Cooling Time (P29).

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

Spare inputs 1, 2 and 3. These show the states of the Spare inputs on pins 25, 26, 27. The indications may be either latched or momentary.

### 9.1.8 Emergency Stop Message LED

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

### 9.1.9 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-71 measures battery voltage at the EAOM-71 terminals. This failure is indicated with an error messages in EAOM-71. When this failure occurs in EAOM-71, the led with exclamation mark starts to flash and user can see the error messages with the Scroll button .

### 9.1.10 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 (P19) for longer than the period specified by the Battery Voltage Weak Control Time (P20). The message is reset by Reset Button.

### 9.1.11 Routine Maintenance Due (SErV)

The interval (hours run) between routine maintenance, set by program parameter 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).

### 9.1.12 Over Current (ocr)

This message will appear on the display if the alternator current exceeds the value programmed into the Over Current Limit (P05) for more than 5 seconds after the period defined by the Control On Delay (P26) parameter.

This fault de-activates the configurable outputs P35.2 and P36.2 (Load Transfer Permit). Thus removing any alternator load controlled by these outputs. The engine will continue to run.

| Symptom                                                                               | Possible Remedy                                                                                                                              |
|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Unit is inoperative.                                                                  | Check all the wiring of the unit.                                                                                                            |
|                                                                                       | Check the  supply. (measure voltage between pins 7 and 8) |
|                                                                                       | 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 (P23) | Check fuel solenoid and wiring, fuel and battery. Reset the EAOM-71 and restart the engine.                                                  |
|                                                                                       | Check solenoid transistor output activated, (Fuel Solenoid if selected)                                                                      |
|                                                                                       | Check the signals that the EAOM-71 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 (Pin1) of the EAOM-71.                                                                   |



**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 $\equiv$ |
| P05 | Over Current Limit                               | 1                                                     | 9999 |         | A          |
| P06 | Periodic Maintenance Hour Set Value              | 0                                                     | 9999 |         | Hour       |
| P07 | Periodic Maintenance Hour Reset                  | Press 'Silence Alarm' button to reset                 |      |         |            |
| P08 | Horn Duration (0 = Continuous)                   | 0                                                     | 999  |         | Second     |
| P09 | Preheat Time                                     | 0                                                     | 99   |         | Second     |
| P10 | Single / Three Phase Selection                   | 1/3                                                   |      |         |            |
| P11 | Nominal Alternator Frequency                     | 50.0/60.0                                             |      |         | Hz         |
| P12 | Nominal Speed                                    | 500                                                   | 5000 |         | RPM        |
| P13 | Tooth Number                                     | 1                                                     | 1000 |         |            |
| P14 | Current Transformer Ratio                        | 1                                                     | 2000 |         |            |
| P15 | Speed Sensing Input Selection                    | 0-Alternator Signal<br>1-Magnetic Pick-up             |      |         |            |
| P16 | Stop / Fuel Solenoid Selection                   | Stop / Fuel                                           |      |         |            |
| P17 | Stop Magnet Energising Time                      | 0                                                     | 99   |         | Second     |
| P18 | Engine started signal                            | 0=No, 1=Yes                                           |      |         |            |
|     | P18.0 Charge Generator                           | 0/1                                                   |      |         |            |
|     | P18.1 Speed                                      | 0/1                                                   |      |         |            |
|     | P18.2 Alternator Voltage                         | 0/1                                                   |      |         |            |
|     | P18.3 Oil Pressure                               | 0/1                                                   |      |         |            |
| P19 | Battery Voltage Weak Limit                       | 6.0                                                   | 14.4 |         | V $\equiv$ |
| P20 | Battery Voltage Weak Control Time                | 1                                                     | 99   |         | Second     |
| P21 | Alternator voltage limit for crank disconnection | 40                                                    | 360  |         | V $\sim$   |
| P22 | Speed Limit For Crank Disconnection              | 20.0                                                  | 45.0 |         | Hz         |
| P23 | Number Of Starting Attempts                      | 1                                                     | 10   |         |            |
| P24 | Starting Attempt Duration                        | 5                                                     | 99   |         | Second     |
| P25 | Oil Pressure Bypass Time                         | 0                                                     | 99   |         | Second     |
| P26 | Control On Delay                                 | 0                                                     | 99   |         | Second     |
| P27 | Alternator Voltage Fault Control Delay           | 0.0                                                   | 10.0 |         | Second     |
| P28 | Speed Fault Control Delay                        | 0.0                                                   | 10.0 |         | Second     |
| P29 | Engine Cooling Time(0 = disable)                 | 0                                                     | 99   |         | Minute     |
| P30 | Engine Running Time Reset                        | Enter technician password to reset time to '0' (zero) |      |         |            |
| P31 | Configurable Failure Input-1                     | 0                                                     | 3    |         |            |
| P32 | Configurable Failure Input-2                     | 0                                                     | 3    |         |            |
| P33 | Configurable Failure Input-3                     | 0                                                     | 3    |         |            |

| No  | Definition of Parameter                                                                                          | Min | Max  | Default | Unit |
|-----|------------------------------------------------------------------------------------------------------------------|-----|------|---------|------|
| P34 | Observing Time of Configurable Failure Inputs                                                                    |     |      |         |      |
|     | P34.0 - For Configurable Failure Input-1<br>0 - Observation Continuously<br>1 - Observation While Engine Running | 0   | 1    |         |      |
|     | P34.1 - For Configurable Failure Input-2<br>0 - Observation Continuously<br>1 - Observation While Engine Running | 0   | 1    |         |      |
|     | P34.2 - For Configurable Failure Input-3<br>0 - Observation Continuously<br>1 - Observation While Engine Running | 0   | 1    |         |      |
| P35 | Configurable Output-1                                                                                            | 0   | 13   |         |      |
| P36 | Configurable Output-2                                                                                            | 0   | 13   |         |      |
| P37 | Pressure Lower Limit                                                                                             | 0.0 | 10.0 |         |      |
| P38 | Pressure Configuration                                                                                           | 0   | 2    |         |      |
| P39 | Temperature Upper Limit                                                                                          | 0   | 200  |         |      |
| P40 | Temperature Configuration                                                                                        | 0   | 2    |         |      |
| P41 | Level Lower Limit                                                                                                | 1   | 100  |         |      |
| P42 | Level Configuration                                                                                              | 0   | 2    |         |      |
| P43 | Operator Password                                                                                                | 0   | 9990 |         |      |
| P44 | Technician Password                                                                                              | 0   | 9990 |         |      |

## 11. SPECIFICATIONS

|                                              |                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Equipment Use</b>                         | : Electrical control equipment for generating sets                                                                                                                                                                                                                                                      |
| <b>Housing&amp; Mounting</b>                 | : 96mmx96mmx92mm(excl. 13mm clips)                                                                                                                                                                                                                                                                      |
| <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 0.7 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<br>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>                   | : 12V---(8.0V--- to 16.0V---) or 24.0V--- (16.0V--- to 32.0V---) switch selectable                                                                                                                                                                                                                      |
| <b>Supply Voltage Measurement</b>            | : 8.0-40.0V---. Accuracy : 1%, Resolution : 0.1V---                                                                                                                                                                                                                                                     |
| <b>Operating Current</b>                     | : Max. 350mA (@12V---), Max. 400mA (@24V---)                                                                                                                                                                                                                                                            |
| <b>Generator Voltage Measurement</b>         | : Single phase, 2 wire 35 to 300VL-N ~ Accuracy : 1%FS, Resolution : 1V~                                                                                                                                                                                                                                |
| <b>Generator Current</b>                     | : 0 to 5 A~, CT operated (The CT ratio is programmable)                                                                                                                                                                                                                                                 |
| <b>Engine Speed</b>                          | : 0.25% of full scale, 35-10.000Hz magnetic pickup                                                                                                                                                                                                                                                      |
| <b>Power Calculating</b>                     | : Single phase = $V1 (L/N) \times I1$<br>Three phase = $(V1 \times I1) + (V2 \times I2) + (V3 \times I3)$                                                                                                                                                                                               |
| <b>Measurement Accuracy</b>                  | : Volts: 1% Frequency: 0.25% Ampere: 1%                                                                                                                                                                                                                                                                 |
| <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. (@35-300VL-N---)                                                                                                                                                                                                                                                                           |
| <b>Magnetic Pickup Freq. Range</b>           | : 35 Hz - 10 kHz (@3-35 Volts peak)                                                                                                                                                                                                                                                                     |
| <b>Charge Generator Excitation</b>           | : 12 V--- or 24 V---, 200 mA, max 3W (BU SATIR YOKTU OLMALI MI?)                                                                                                                                                                                                                                        |
| <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>Outputs</b>                               | : Start Relay Output 12A (@12/24V---), Fuel Relay Output 12A (@12/24V---), Horn Relay Output 5A (@12/24V---), Configurable Relay Output 1. 5A(@12/24V---), Configurable Relay Output 2. 5A (@12/24V---)                                                                                                 |
| <b>Display (4digit,7segment led display)</b> | : Generator L1-L2 Voltage, Generator L1-N Voltage, Generator L2 -L3 Voltage, Generator L2 - N Voltage, Generator L3 - L1 Voltage, Generator L3 - N Voltage, Generator Frequency Hz, Generator Current (IL1, IL2, IL3), Engine Speed RPM, Battery Voltage ---, Engine Running Hours, Failure Information |
| <b>Failure Indicators</b>                    | : Engine Start, High Engine Temperature, Low Oil Pressure, Over / Under Speed, Generator Voltage Fail, Charge Generator Fail, User Configurable Input1, User Configurable Input2, User Configurable Input3                                                                                              |
| <b>Status Indicators</b>                     | : Power On, Engine Start, Engine Stop, Engine Running, Program, Generator is ready to take the load                                                                                                                                                                                                     |
| <b>Information Alarms</b>                    | : Emergency stop, Low battery voltage, Weak battery alarm, Routine Maintenance due                                                                                                                                                                                                                      |
| <b>Approvals</b>                             | : GOST-R, C E                                                                                                                                                                                                                                                                                           |