



EAOM-6

**Automatic Generator Start
Controller with Metering,
96x96 DIN Size**

EAOM-6 SOFT

**PC Communication Software for
Programming and Remote Monitoring**

- Automatic engine start / stop
 - Automatic shutdown on fault condition
 - LED status and fault indication
 - Alternator voltages 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 feature
 - Fully programmable
 - RS-232 communication port
 - Standard modem communication
-
- **Monitors**
 - Alternator voltages and frequency
 - Battery charging
 - Engine RPM
 - **Controls**
 - Engine fuel supply or engine stopping
 - Starter motor
 - Over / Under speed
 - **Fail Monitoring**
 - Engine temperature
 - Oil pressure
 - Over / Under speed
 - Voltage fail
-
- Battery voltage
 - Engine running time
 - Engine Power
 - Preheat
 - Alarm horn
 - Charging alternator
 - Emergency stop
 - Low battery voltage
 - Weak battery alarm

ABOUT INSTRUCTION MANUAL

Instruction manual of EAOM-6 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.Ş.

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-6

Type Number : EAOM-6

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

It controls:

- Engine fuel supply or engine stopping, via external solenoid
- Starter motor via external relay
- 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
- Battery charging
- Engine running time
- Maintenance time
- Engine power
- Error indication
- Program parameters

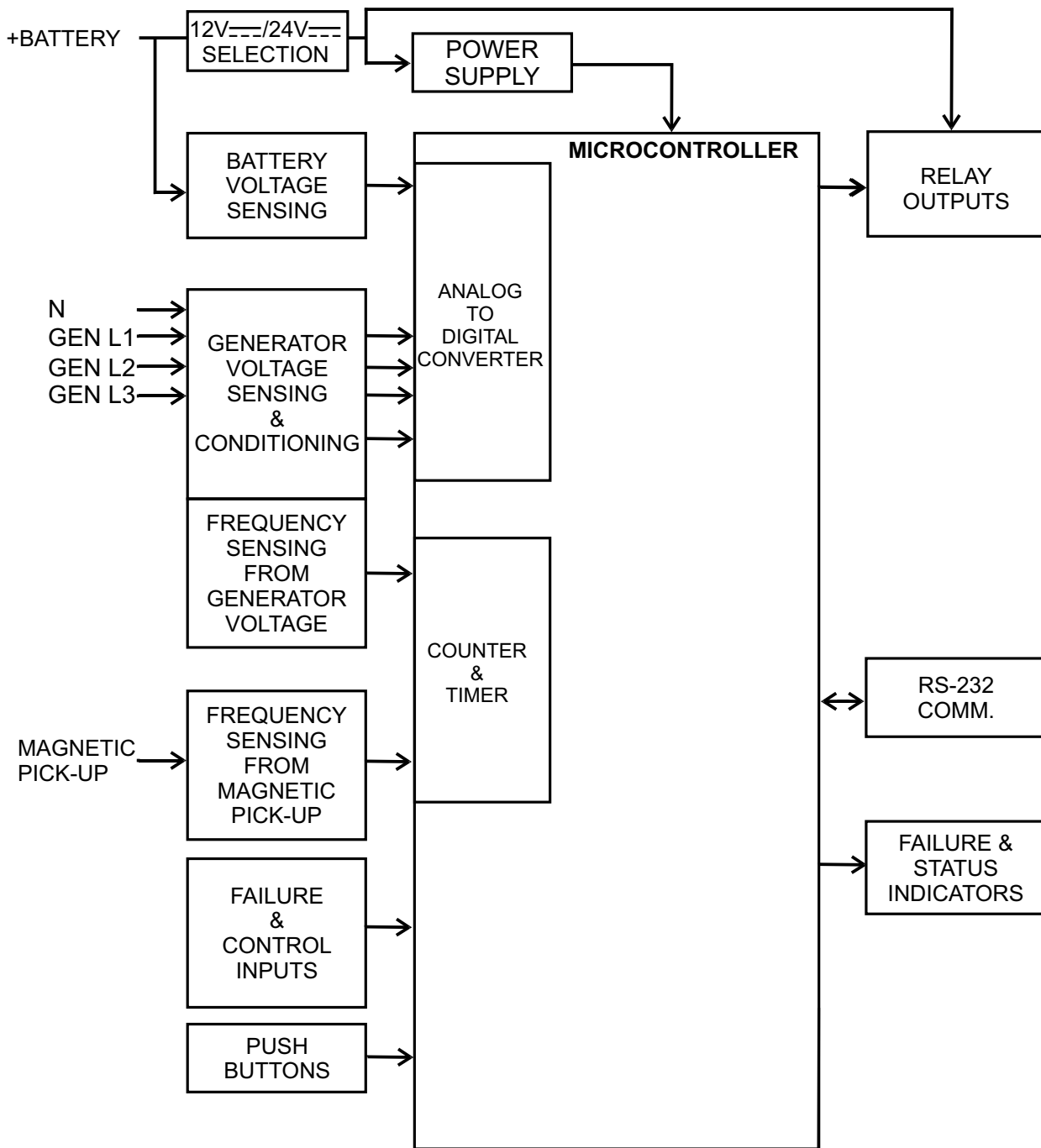
The unit is extensively programmable with password protection on two levels. In the event that the engine fails to start on the first attempt, the attempt will be repeated a programmed number of times or until successful.

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

Remote 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-6 unit.
- Operating Manual.
- Screw fixings.
- RS-232 Cable.

Before commencing installation:

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

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

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

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

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

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

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

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

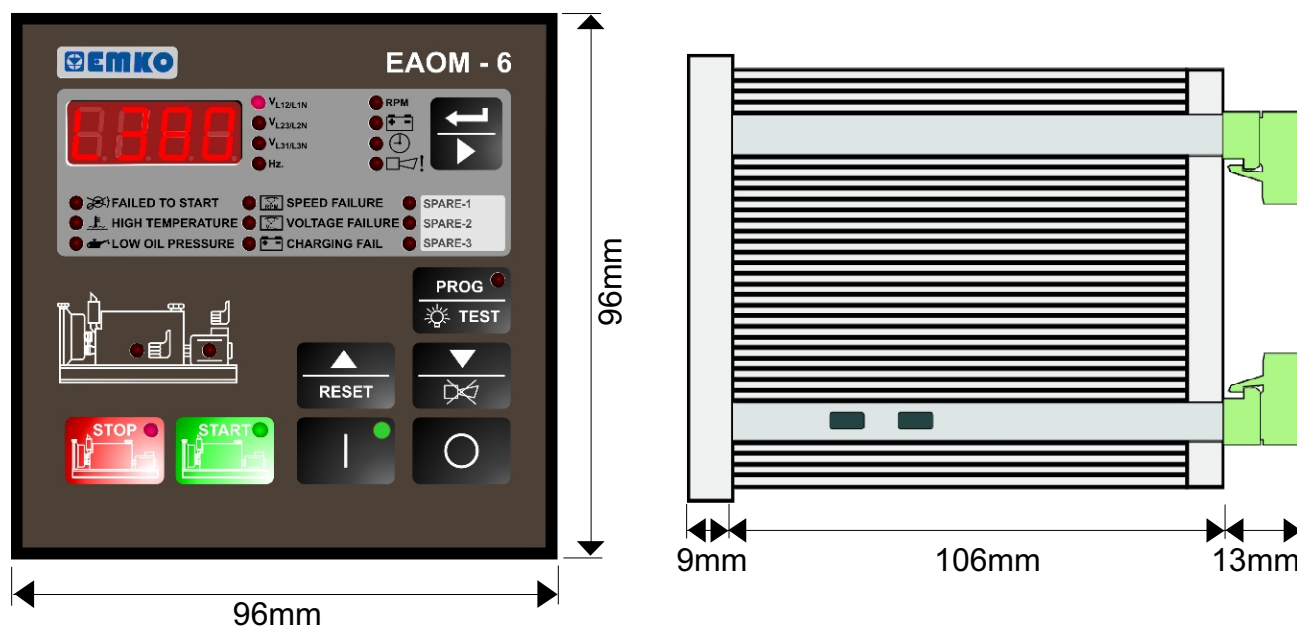
It is your responsibility if this equipment is used in a manner not specified in this instruction manual.

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

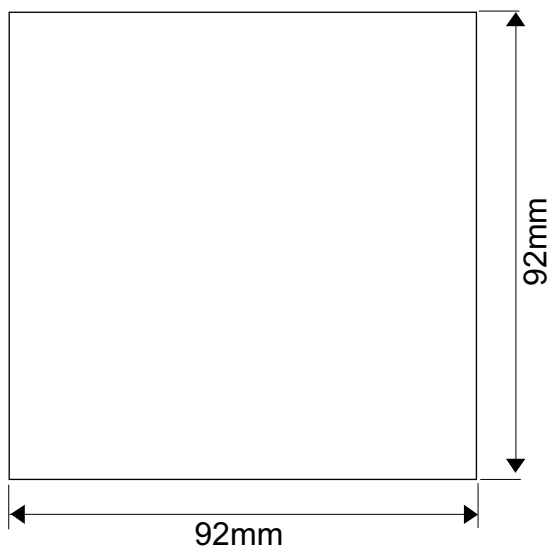
2.1 General Description



2.2 Dimensions



2.3 Panel Cut-Out



2.4 Environmental Ratings

Operating Conditions



Operating Temperature : -25°C to 70°C



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



Altitude : Up to 2000m.



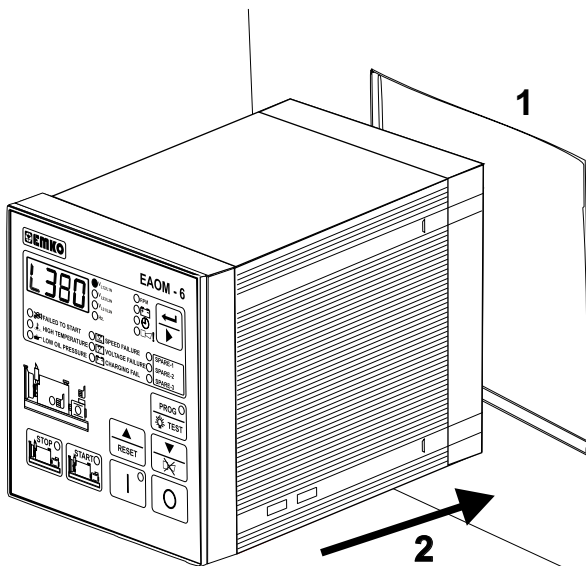
Forbidden Conditions:

Corrosive atmosphere

Explosive atmosphere

Home applications (The unit is only for industrial applications)

2.5 Panel Mounting

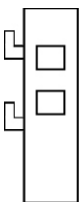


1. Prepare the panel cut-out in the correct dimensions. Maximum panel thickness is 7mm (0.28 inch)

2. Insert the unit in the panel cut-out from the front. If fixing parts are on the unit unscrew the fixing screws in the fixings parts to remove the fixings parts.



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



Fixing part



Fixing screw

2.6 Installation Fixing Screws



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

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

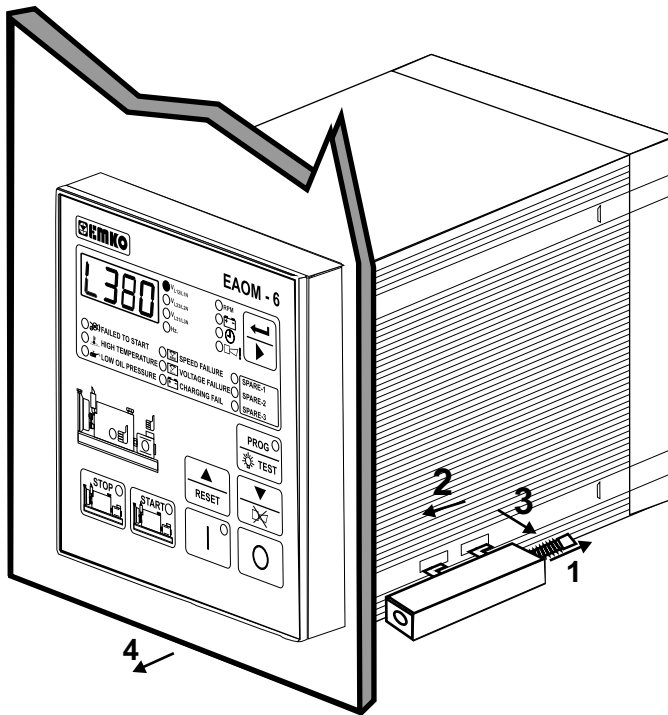


During mechanical installation, beware of any sharp burrs on the metal panel aperture. Ensure that the fixings are properly tightened to prevent the fixings becoming loose due to panel vibration.

Montage of the unit to a system must be done with it's own fixing screws. Do not do

the montage of the device with inappropriate fixing screws. Be sure that device will not fall while doing the montage.

2.7 Removing from the Panel

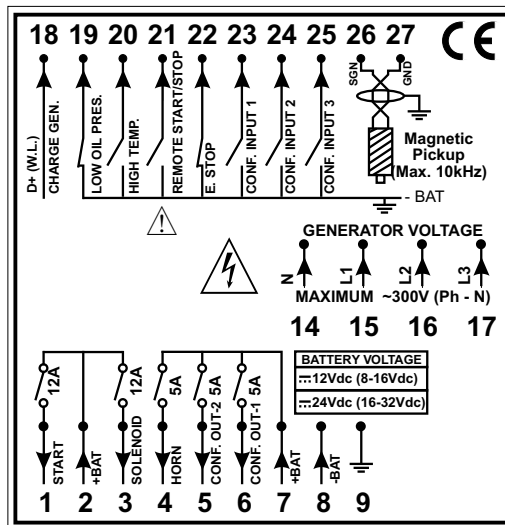


Before starting to remove the unit from panel, power off the unit and the related system.

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

3. ELECTRICAL WIRINGS

3.1 Terminal Layout and Connection Instructions



Ensure the position of "Power supply position switch" is in the correct position according to the battery voltage (12 V_{DC} or 24 V_{DC}).

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

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

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

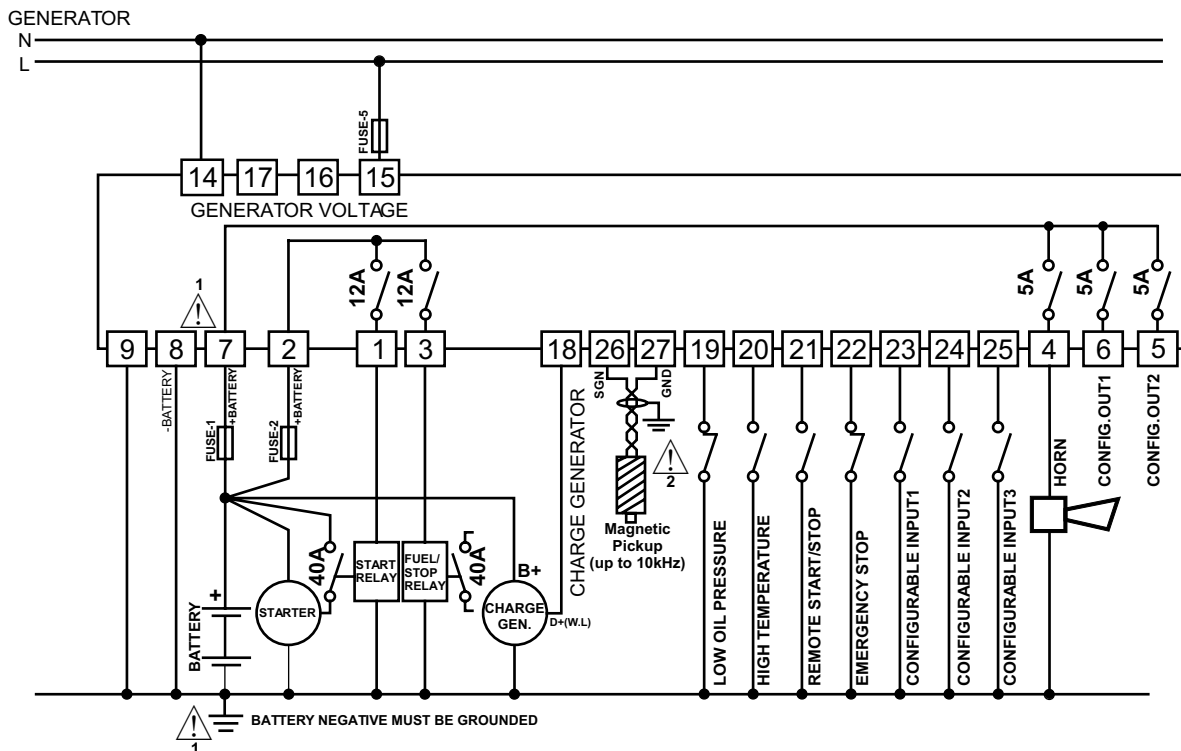
External fuse is recommended.

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

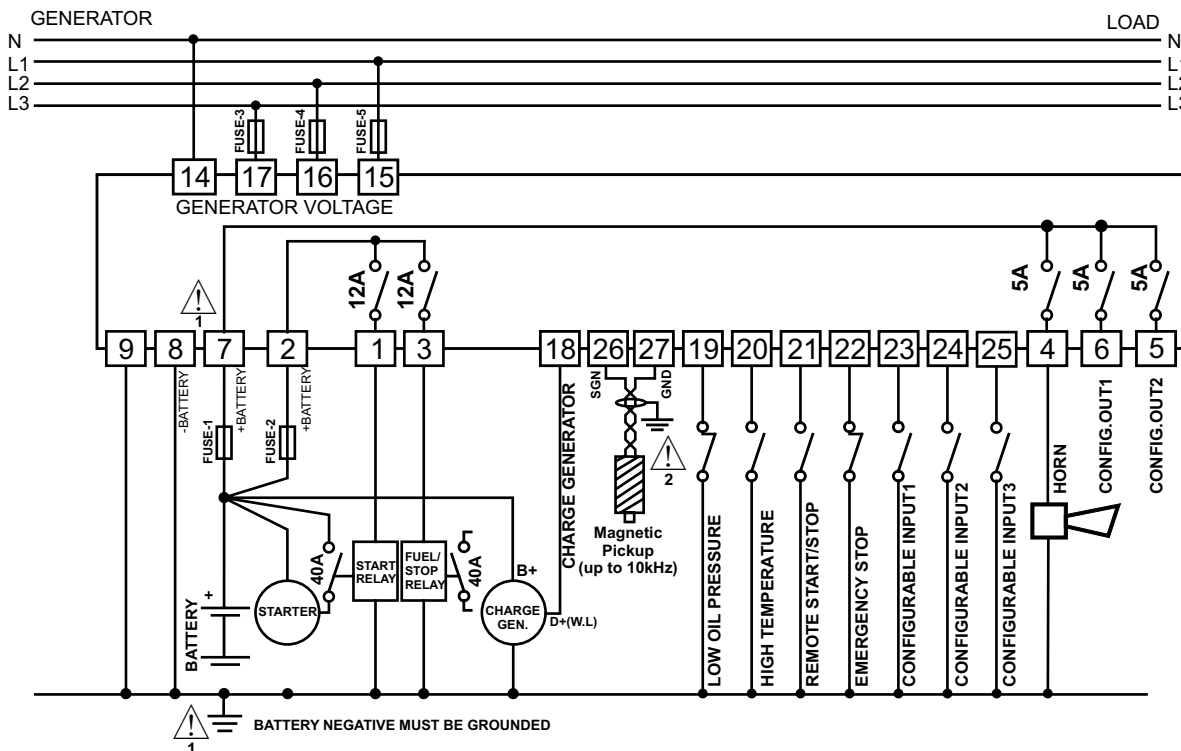
You must ensure that the device is correctly configured for your application. Incorrect configuration could result in damage to the process being controlled and/or personal injury. It is your responsibility, as the installer, to ensure that the configuration is correct. Device parameters has factory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

3.2 Electrical Wiring Diagram

3.2.1 1-Phase Wiring Diagram



3.2.2 3-Phase Wiring Diagram



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.

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 _{DC}
2	Positive battery supply input	2.5	Supplies external solenoids
3	Output to fuel solenoid	2.5	Max. 12A@24 V _{DC}
4	Output to horn	1.0	Max. 5A@24 V _{DC}
5	Configurable output-2	1.0	Max. 5A
6	Configurable output-1	1.0	Max. 5A
7	Positive battery supply input	2.5	For relay outputs
8	Negative battery supply input	2.5	
9	Negative battery supply input	2.5	
14	Alternator neutral	1.0	
15	L1 alternator input	1.0	
16	L2 alternator input	1.0	3-phase only
17	L3 alternator input	1.0	3-phase only
18	Input from charge generator	1.0	Terminal must be left unconnected if not used
19	Input from low oil pressure switch	0.5	Switch to 0 V _{DC} (NC)
20	Input from high temperature switch	0.5	Switch to 0 V _{DC} (NO)
21	Input from remote start/stop switch	0.5	Switch to 0 V _{DC} (NO)
22	Emergency stop input	0.5	Switch to 0 V _{DC} (NC)
23	Input from spare switch 1	0.5	Switch to 0 V _{DC} (NO)
24	Input from spare switch 2	0.5	Switch to 0 V _{DC} (NO)
25	Input from spare switch 3	0.5	Switch to 0 V _{DC} (NO)
26	Input from magnetic pick-up	0.5	
27	Input from magnetic pick-up	0.5	

Table 3.2 Unit wiring description

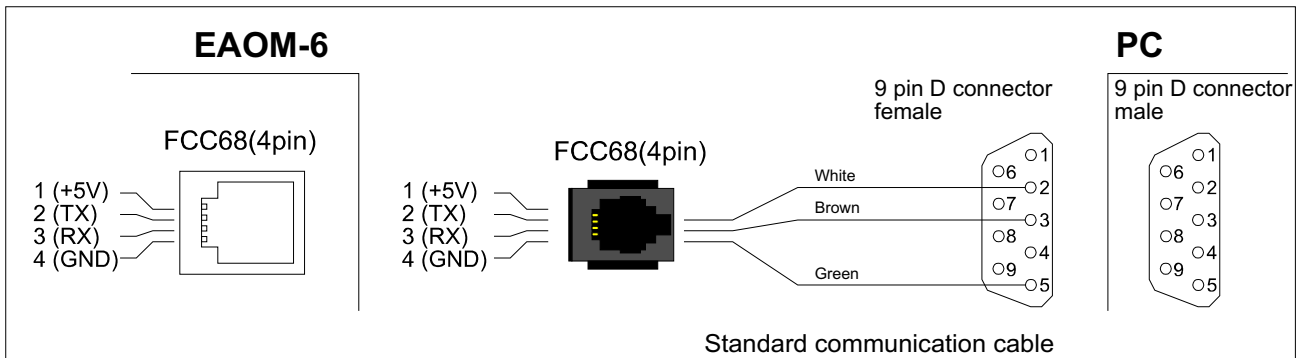
Pin	Function	
1	Output to Start solenoid. Controls starter motor	
2	Battery positive input. +12 V _{DC} or +24 V _{DC} . Feeds external solenoids	
3	Output to Fuel/Stop solenoid. Controls fuel to engine or controls engine stopping.	
4	Output to horn.	
5	Configurable output-2	
6	Configurable output-1	
7	Positive battery input. +12 V _{DC} or +24V _{DC} . Feeds relay outputs	
8	Negative battery input (0 V _{DC})	
9	Negative battery input (0 V _{DC})	
15	Voltage inputs from alternator. Unit can be programmed to read frequency from alternator voltage input (L1 phase) and detect to engine has started. Pins 16 and 17 not used on single phase applications.	
16		L1
17		L2
18	L3	
18	Charge generator failure input. It can be used to detect when engine has started. The EAOM-6 connection replaces the usual charge indicator lamp. It supplies current to the rotor coil from the battery until the engine is running.	
19	Input from Low Oil Pressure switch. Normally closed contact to 0V. Open on low oil pressure. It can be used to detect when engine has started.	
20	Input from High Temperature switch. Switched to 0V when engine temperature exceeds thermostat setting.	
21	Input from remote Start switch. Normally open contact. Closed to 0V to start engine. Open switch to stop engine.	
22	Input from Emergency Stop switch. Contact normally closed to 0V. Open on emergency to stop the engine.	
23	Spare 1 input. Normally open. When switched to 0V, sounds the horn and flashes indicator on panel. Can be programmed to stop the engine..	
24	Spare 2 input. Normally open. When switched to 0V, sounds the horn and flashes indicator on panel. Can be programmed to stop the engine..	
25	Spare 3 input. Normally open. When switched to 0V, sounds the horn and flashes indicator on panel. Can be programmed to stop the engine.	
26	Input from magnetic pickup. Unit can be programmed to read engine speed from	
27	magnetic pick-up and detect to engine has started.	



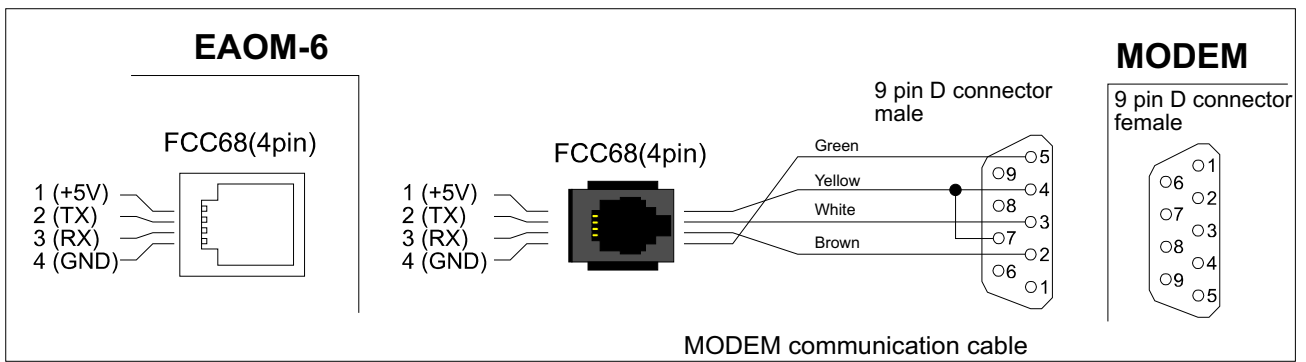
Remote starting. Arrangements must be made to prevent remote starting of the engine while engine maintenance is being carried out. This can be achieved by using a key switch as the remote double-pole switch such that the key can be removed to prevent remote starting.

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

Processor	: 486 66MHZ
Operating Systems	: Windows 95/98/XP, Windows NT, Windows 2000
Ram	: 16 Mbyte
Monitor	: 14" SVGA (640x480 resolution)
Fixed Disk Free Space	: 5 Mbyte
Disk Drive	: CD-ROM
Communication	: An RS-232 communication port is needed to communicate with the EAOM-6 unit

4.3.3 Installing EAOM-6 Software

Insert the software CD into the CD-ROM drive on the PC. CD will autostart, then select EAOM-6 Install.exe from the menu.

4.3.4 Using Of EAOM-6 Communication Software

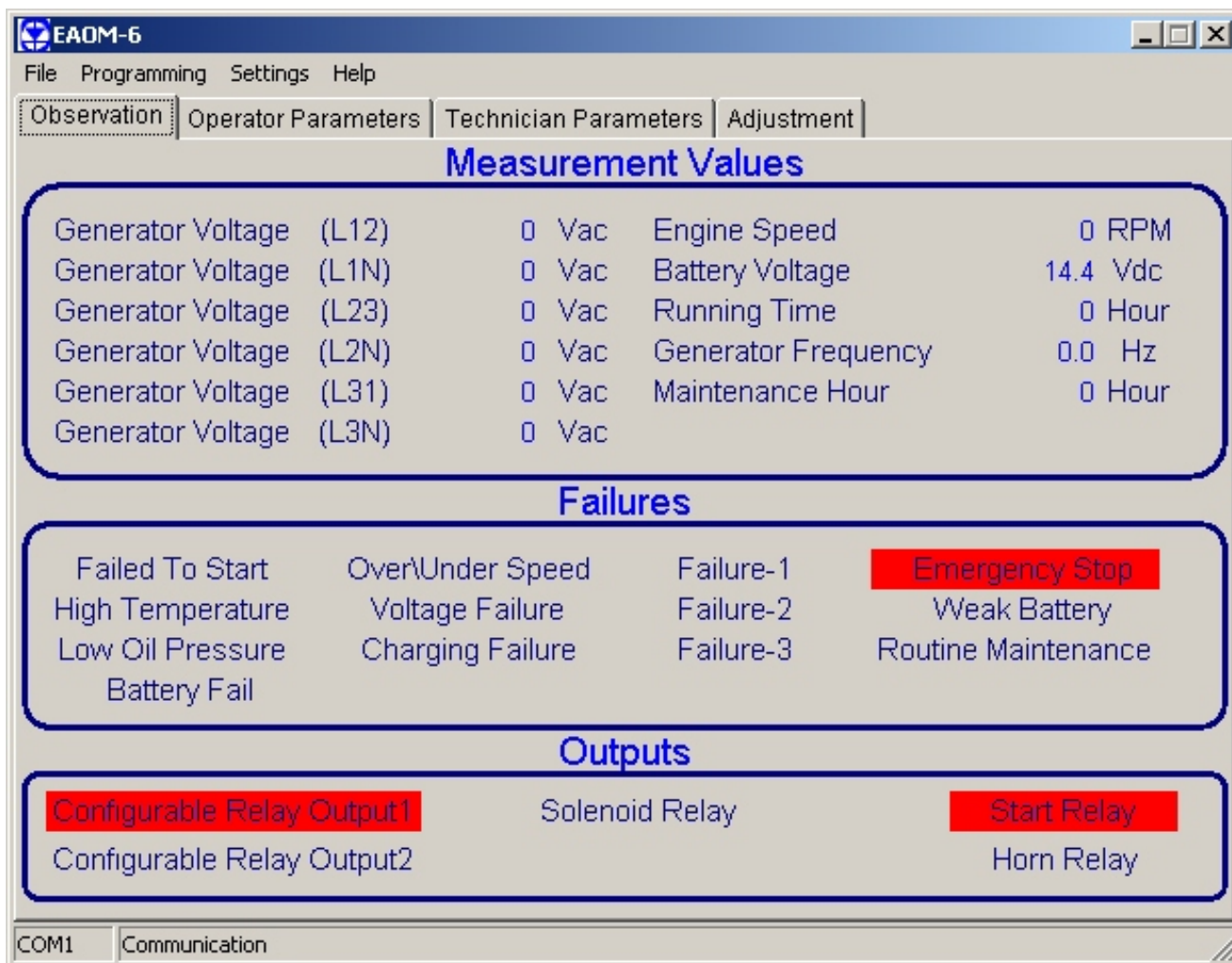
Press the windows START button icon, then select EAOM-6 SW EAOM-6 from the program menu.

4.3.5 Description

EAOM-6 unit communicates with the PC using RS-232 communications. The PC software allows the EAOM-6 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-6 PC SW: Observation Window, Operator Parameters Window, Technician Parameters Window and Adjustment Window.

4.3.6 Observation Window

In this window the values listed below can be observed.



Measurement Values

Generator Voltage
Engine Speed
Battery Voltage
Running Time
Generator Frequency
Maintenance Hour

Failures

Failed to Start
High Temperature
Low Oil Pressure
Over / Under Speed
Voltage Failure
Charging Failure
Failure 1 & 2 & 3
Emergency Stop
Weak Battery
Routine Maintenance
Battery Fail

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-6 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-6 unit.

4.3.9 MAIN MENU

4.3.9.1 FILE

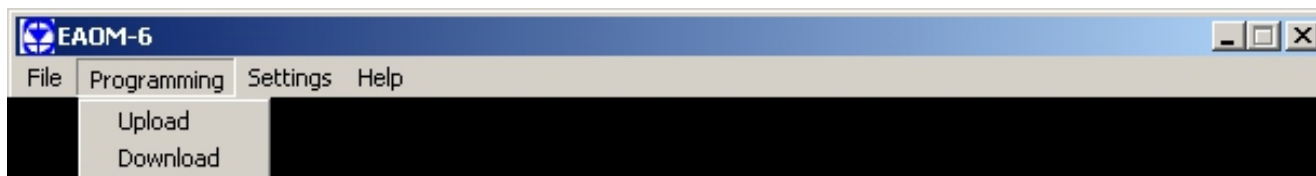
This menu allows the user to save configuration files to the disk, read from disk and write to disc



- Open** :This menu allows the user to load the registered configuration files to the PC.
- Save** :This menu allows the user to save the parameters with a name defined by user.
- Print** :This menu allows the user to print the parameters.
- Printer Setup** :This menu allows the user to select the printer that is connected to network or PC and change the configuration of the printer.
- Exit** :Exit the program.

4.3.9.2 PROGRAMMING

This menu is active only when the Operator or Technician Parameters Window is open. Using this menu allows the user to upload parameters from the EAOM-6 unit to the PC or download from the PC to the EAOM-6 unit.

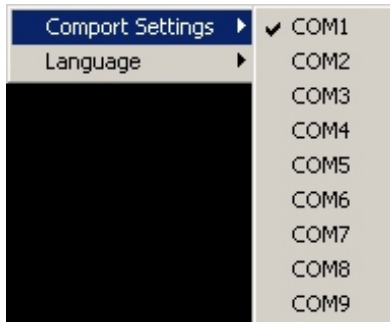


- Download** : With this menu user can load parameters from PC to EAOM-6 .
- Upload** : User can load the parameters stored on EAOM-6 unit to PC.

4.3.9.3 Settings

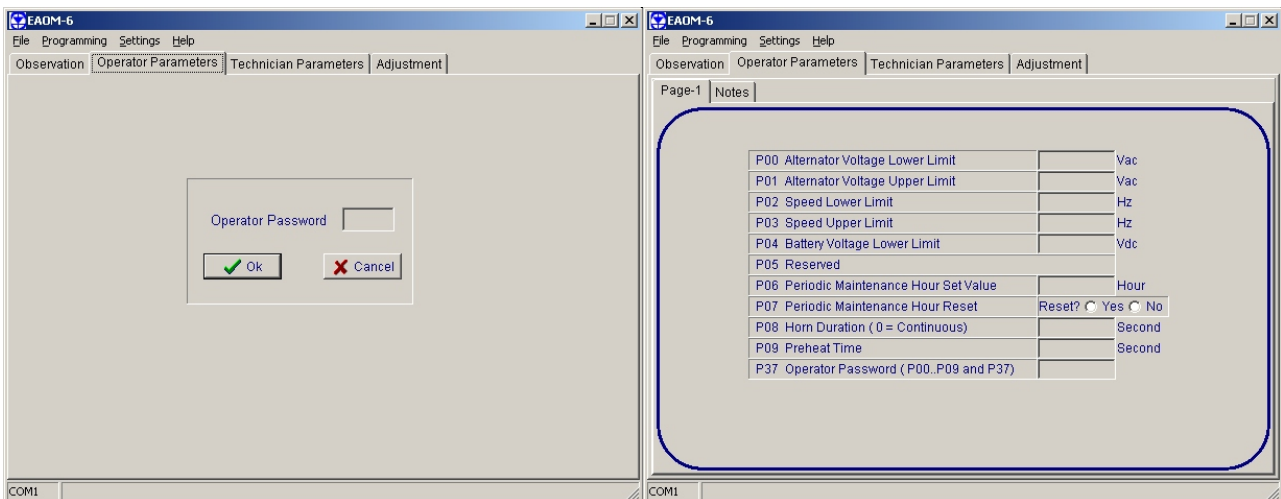
Communication Port Settings: With this menu, user can determine the serial port configurations of the PC

Language: Turkish or English can be selected.



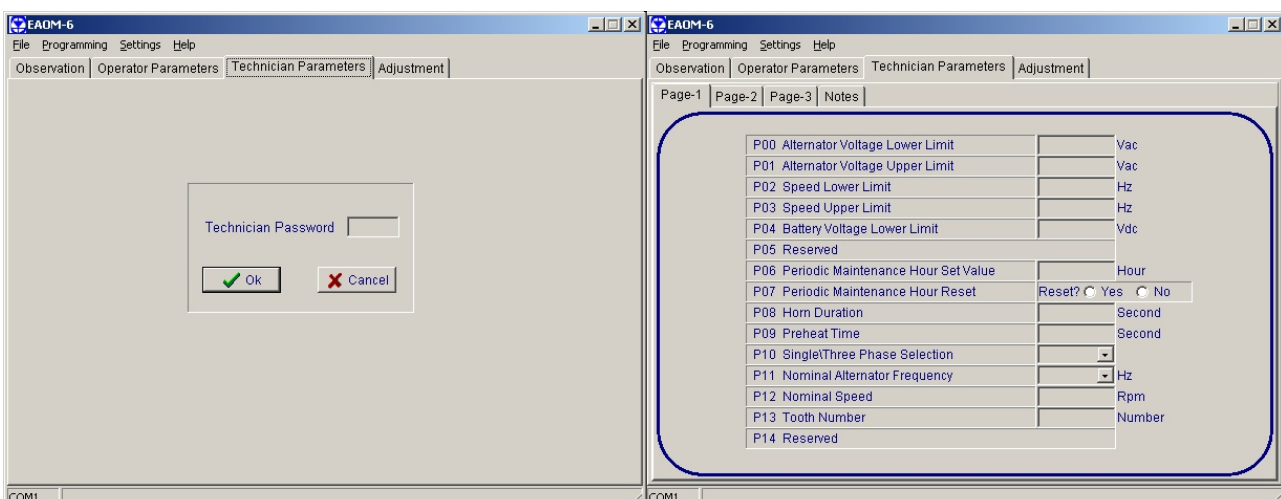
4.3.10 Entering to the Operator Parameters Window

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



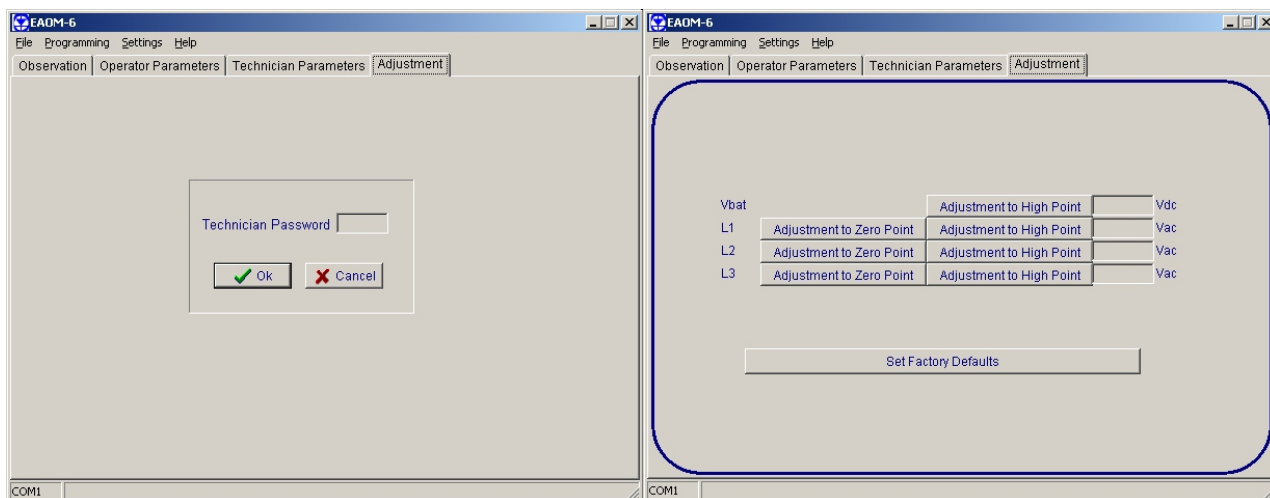
4.3.11 Entering to the Technician Parameters Window

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



4.3.12 Entering to the Adjustment Window

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



4.3.13 Load the Configuration File From the Disc

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

4.3.14 Save the Configuration File to the Disc

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

4.3.15 Upload

For loading parameters from EAOM-6 unit to PC follow the steps below. If user is in operator parameters window, only operator parameters will be viewed. If user is in Technician Parameters Window, all parameters will be viewed. Press 'Upload' in Program menu. While loading the parameters, the hour-glass cursor is displayed. Please wait for the upload operation to complete, when the cursor returns to normal.

4.3.16 Download

For loading parameters from PC to EAOM-6 follow the steps below. If user is in operator parameters window, only operator parameters will be loaded. If user is in Technician Parameters Window, all parameters will be loaded. Press 'Download' in Program menu. While loading the parameters, the hour-glass cursor is displayed. Please wait for the download operation to complete, when the cursor returns to normal.

5. PARAMETERS

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

No	Definition of Parameter	Min	Max	Default	Unit
P00	Alternator Voltage Lower Limit	60	600	300	V \sim
P01	Alternator Voltage Upper Limit	60	600	440	V \sim
P02	Speed Lower Limit	30.0	75.0	47.0	Hz
P03	Speed Upper Limit	30.0	75.0	53.0	Hz
P04	Battery Voltage Lower Limit	7.2	24.0	8.0	V \equiv
P05	Reserved				
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	Reserved				
P15	Speed Sensing Input Selection	0-Alternator Signal 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	3	0	
	0 - Only horn temporary				
	1 - Only horn permanent				
	2 - Engine stop				
	3 - Contactor releaser				
P32	Configurable Failure Input-2	0	3	0	
	0 - Only horn temporary				
	1 - Only horn permanent				
	2 - Engine stop				
	3 - Contactor releaser				

No	Definition of Parameter	Min	Max	Default	Unit
P33	Configurable Failure Input-3	0	3	0	
	0 - Only horn temporary				
	1 - Only horn permanent				
	2 - Engine stop				
	3 - Contactor releaser				
P34	Observing Time of Configurable Failure Inputs				
	P34.0 - For Configurable Failure Input-1				
	0 - Observation Continuously	0	1	0	
	1 - Observation While Engine Running				
	P34.1 - For Configurable Failure Input-2				
	0 - Observation Continuously	0	1	0	
	1 - Observation While Engine Running				
	P34.2 - For Configurable Failure Input-3				
	0 - Observation Continuously	0	1	0	
	1 - Observation While Engine Running				
P35	Configurable Output-1	0	13	0	
	0 - Alarm out				
	1 - Engine running				
	2 - Load permit				
	3 - Preheat				
	4 - Over speed				
	5 - High temperature				
	6 - Low oil pressure				
	7 - Maintenance due				
	8 - Failed to start				
	9 - Over / under speed				
	10 - Voltage failure				
	11 - Charging failure				
	12 - Low battery value				
	13 - Weak battery				
P36	Configurable Output-2	0	13	0	
	0 - Alarm out				
	1 - Engine running				
	2 - Load permit				
	3 - Preheat				
	4 - Over speed				
	5 - High temperature				
	6 - Low oil pressure				
	7 - Maintenance due				
	8 - Failed to start				
	9 - Over / under speed				
	10 - Voltage failure				
	11 - Charging failure				
	12 - Low battery value				
	13 - Weak battery				
P37	Operator Password	0	9990	0	
P38	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 started to run and 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 if the engine has started to run and 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 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 show the error message bAEr.

5.1.5 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, 5.1.8 Engine started signals (P18) and 5.1.10 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 (P15) 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.

5.1.6 Stop / Fuel Solenoid Selection (P16)

This parameter allows the use of either a Stop solenoid or a Fuel solenoid. (See Section 5.1.10 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 5.1.10 Engine Starting.

5.1.7 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 5.1.6 Stop/Fuel Solenoid Selection (P16)

5.1.8 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 (P18.0); from charging generator energising coil current.

1. Speed (P18.1); if engine speed is higher than Speed Limit for Crank Disconnection (P22), pay attention to the Speed Sensing Input Selection (P15) (Refer to 5.1.8)

2. Alternator Voltage (P18.2); if alternator voltage is higher than Alternator Voltage Limit for Crank Disconnection (P21)

3. Oil pressure (P18.3); 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 5.1.10 Engine Starting. If any of the selected signals appears, the unit assumes that the engine has started.

5.1.9 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.

5.1.10 Engine Starting

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

After that the unit energises the start solenoid to drive the starter motor and energises the Fuel solenoid, the starting sequence commences. If the preheating output has been configured (see section 5.1.15 Configurable Outputs), the display will show the HEAT message for the time period set by Preheat Time (P09). After that the unit energises the start solenoid to drive the starter motor and energises the Fuel solenoid (if selected – see Section 5.1.6 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 5.1.8 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.

5.1.11 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 opened, while the engine is running, after the period defined by parameter. This period begins when the EAOM-6 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).

5.1.12 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-6 has detected engine starting and has cut off the drive to the starter motor.

5.1.13 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.

5.1.14 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 four ways:

0. Indication is unlatched-the LED flashes and horn is sounding while the input is 0V. If the input is not 0V the led will cancel flashing and horn sound.
1. Indication is latched when the input is 0V then, the led flashes and horn is sounding then stays on until the Reset button is pressed.
2. This is the same as 1 but in addition the engine is stopped.
3. Contactor releaser. It is valid only if the load transfer permit output is selected in configuration outputs 1 and 2.

5.1.15 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 fourteen 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 engine is start to run and Control on Delay (P26) expired and Alternator output voltage is between Alternator Voltage Upper Limit (P00) and Alternator Voltage Lower 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. High temperature
6. Low oil pressure
7. Maintenance due
8. Failed to start
9. Over / under speed
10. Voltage failure
11. Charging failure
12. Low battery value
13. Weak battery

5.1.16 Operator Password (P37)

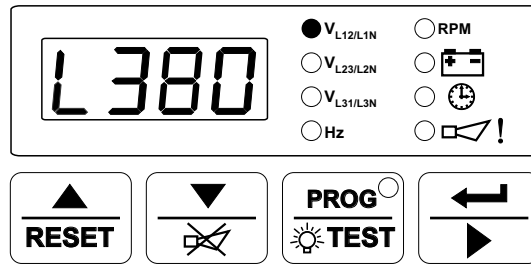
Use this option to change the Operator password. This password allows access to the parameters from Alternator Voltage Lower Limit (P00) to Preheat Time (P09) and Operator Password (P37).

5.1.17 Technician Password (P38)

Use this option to change the Technician password. It allows access to the all parameters from Alternator Voltage Lower Limit (P00) to Technician Password (P38).

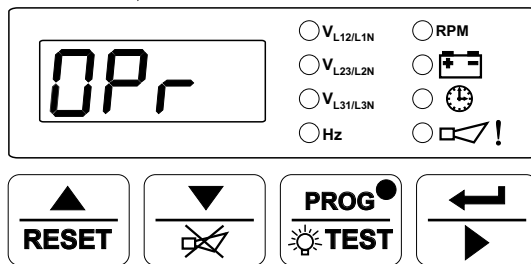
5.2 Changing and Saving Operator Parameter Value

Operation Screen



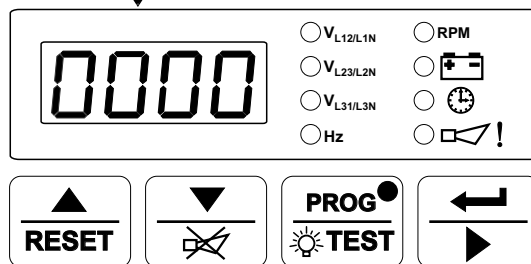
When button is pressed, all leds and digits are energised, because prog button is also used as test button. Continue to press the prog button for 5 seconds, Operator Menu Entering screen is shown and prog led lights on.

Operator Menu Entering Screen



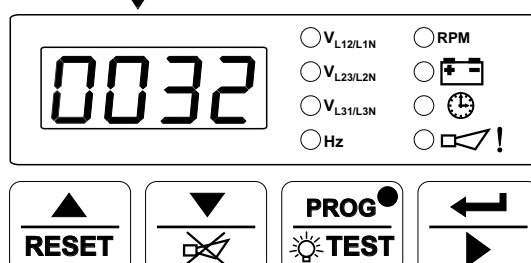
When button is pressed, operator password entering screen is shown.

Operator Password Entering Screen

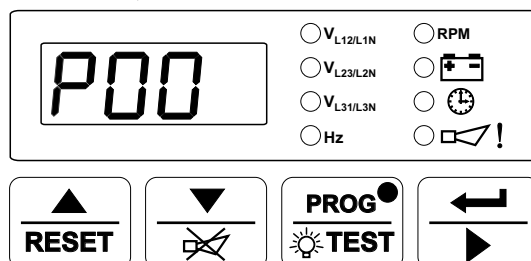


Change the password with and buttons

Operator Password Entering Screen

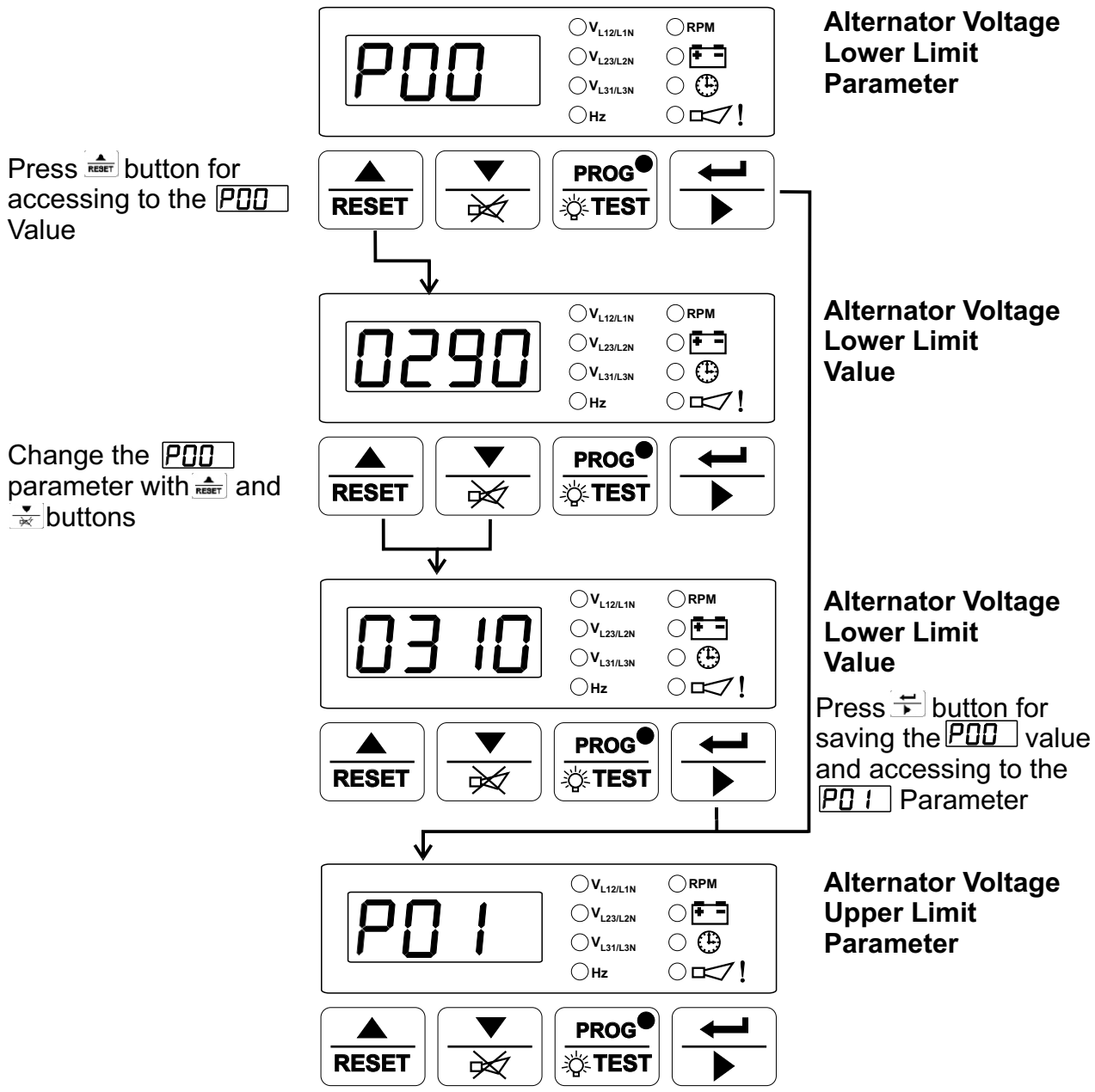


After entering the password, push the button for confirming the password and accessing to the first parameters of operator parameters.



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.

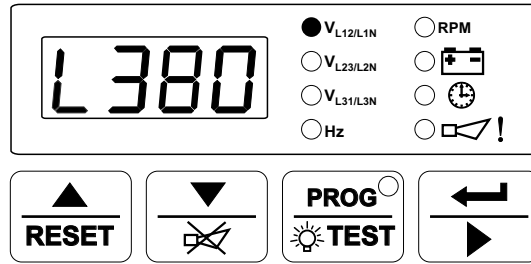


NOTE : Other operator parameters can be accessed as explained for **P00**
 For exiting from programming mode, press

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

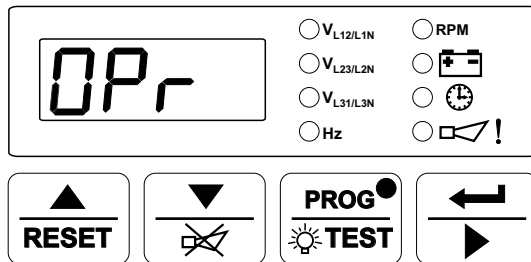
5.3 Changing and Saving Technician Parameter Value

Operation Screen



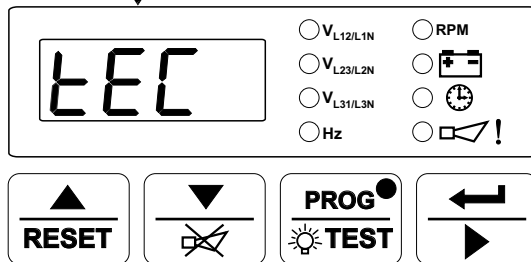
When button is pressed, all leds and digits are energised, because prog button is also used as test button. Continue to press the prog button for 5 seconds, Operator Menu Entering screen is shown and prog led lights on.

Operator Menu Entering Screen



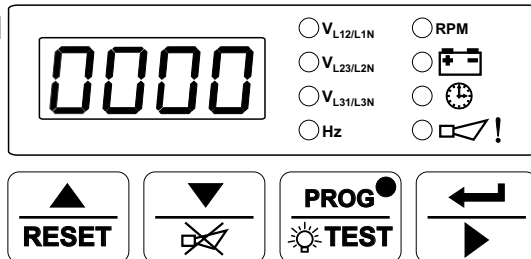
When button is pressed for 10 seconds, technician menu entering screen is shown.

Technician Menu Entering Screen



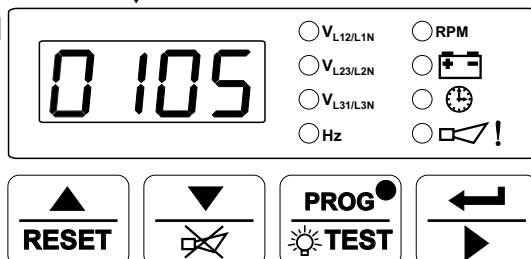
When button is pressed, technician password entering screen is shown.

Technician Password Entering Screen



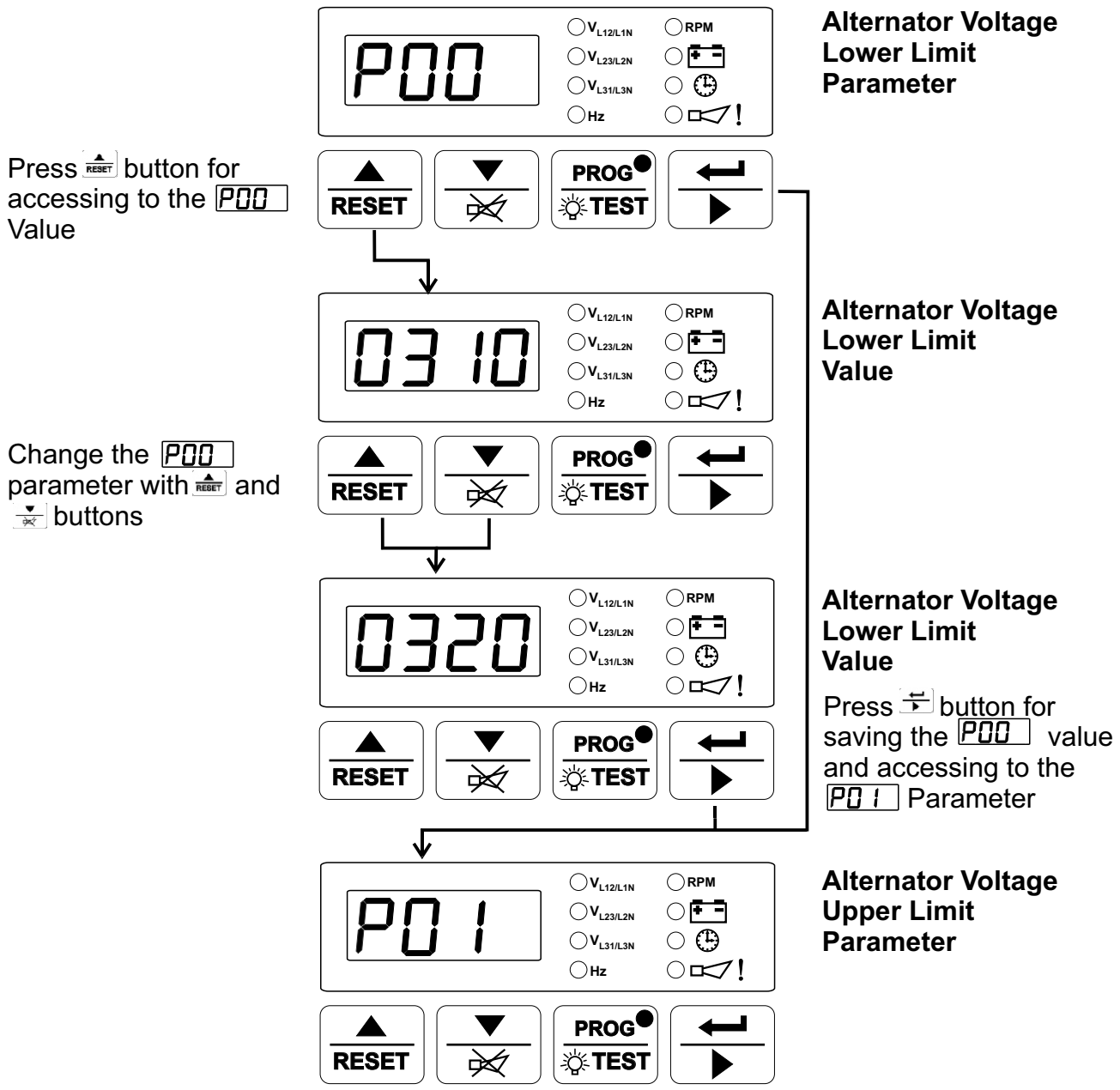
Change the password with and buttons

Technician Password Entering Screen



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


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

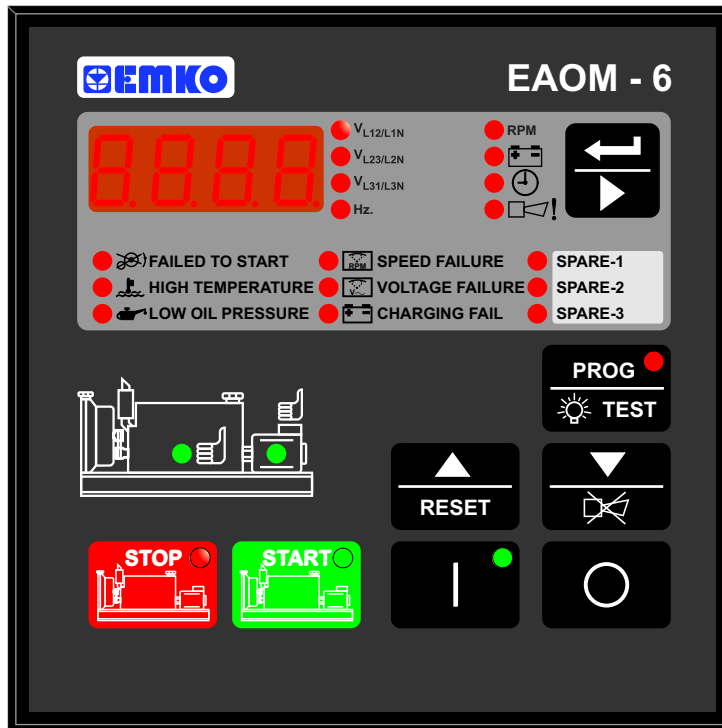


NOTE : Other technician paramaters can be accessed as explained for **P00**
 For exiting from programming mode, press

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

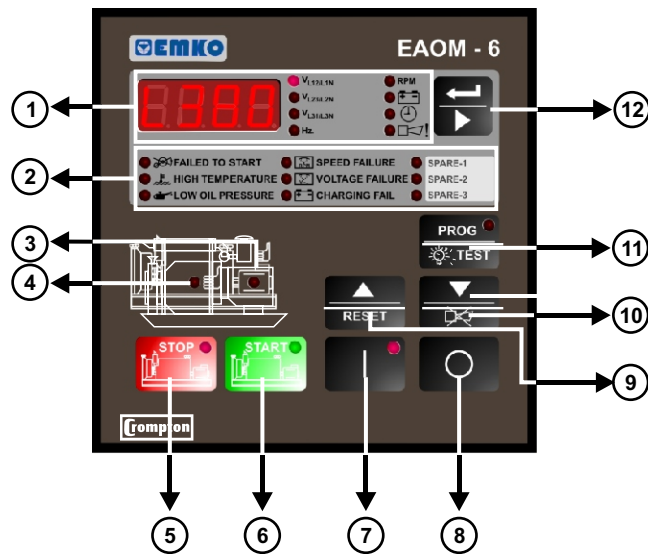
6. LAMP TEST


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



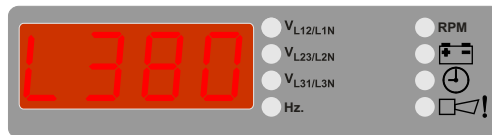
7. OPERATION


7.1 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
3	Green LED lights to indicate that alternator output is available and within the Parameters set by P00 and 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 (up arrow) function is used in Programming mode as detailed in Section 5.3 Changing and Saving Technician Parameter Value
10	Down/Silence Alarm. Silences the audible alarm. The Decrement (down arrow) button is used in Programming mode as detailed in Section 5.3.
11	Prog/Test. Lights all the LEDs and segments on the panel so that you can see if any are not working. Holding the button pressed for 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.

7.2 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'.

- Mains voltage L1-L2, prefix **L**
- Mains voltage L1-N, prefix **n**
- Mains voltage L2-L3, prefix **L**
- Mains voltage L2-N, prefix **n**
- Mains voltage L3-L1, prefix **L**
- Mains voltage L3-N, prefix **n**
- Alternator frequency (Hz)
- Alternator speed (RPM), as measured by alternator frequency or magnetic pick-up as selected by Speed Sensing Input Selection (P15)
- 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:

EStP - Emergency Stop

bAT1 - Low Battery Voltage

bAT2 - Weak Battery Alarm

7.3 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 and Alternator Leds (3) and (4) light.

7.4 Stopping the Engine

Press the stop button or remote stop button the engine will stop.

8. 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 5.3 Changing and Saving Technician Parameter Value
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) number of times.
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 runningIf 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.

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 center 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-6 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-6 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 parameter (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 Speed Sensing Input Selection parameter (P15). This failure immediately stops the generating set without any Engine Cooling Time (P29)

9.1.6 Generator Voltage Failure LED

This failure is indicated if the generator runs for Control On Delay (P26) time. This LED flashes if the alternator output voltage is outside of the limits programmed into Alternator Voltage Lower Limit (P00), and Alternator Voltage Upper Limit (P01), for a time period longer than the Alternator Voltage Fault Control Delay (P27). This failure immediately releases the generator contactor, and stops the generating set without any Engine Cooling Time (P29) period.


9.1.7 Spare-1, 2, 3

Spare inputs 1, 2 and 3. These show the states of the Spare inputs on pins 23, 24, 25. 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)



When the battery voltage falls below the value specified by the Battery Voltage Lower Limit (P04). The EAOM-6 measures battery voltage at the EAOM-6 terminals. This failure is indicated with an error messages in EAOM-6. When this failure occurs in EAOM-6, 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 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).

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-6 and restart the engine.
	Check solenoid transistor output activated, (Fuel Solenoid if selected)
	Check the signals that the EAOM-6 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 (Pin3) of the EAOM-6.



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

10. PROGRAMMABLE PARAMETERS

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 ---
P05	Reserved				
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	Reserved				
P15	Speed Sensing Input Selection	0-Alternator Signal 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 ---
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 0 - Observation Continuously 1 - Observation While Engine Running	0	1		
	P34.1 - For Configurable Failure Input-2 0 - Observation Continuously 1 - Observation While Engine Running	0	1		
	P34.2 - For Configurable Failure Input-3 0 - Observation Continuously 1 - Observation While Engine Running	0	1		
P35	Configurable Output-1	0	13		
P36	Configurable Output-2	0	13		
P37	Operator Password	0	9990		
P38	Technician Password	0	9990		

11. SPECIFICATIONS

Equipment Use	: Electrical control equipment for generating sets
Housing& Mounting	: 96mmx96mmx115mm (excl. 13mm clips)
Panel Cut-Out	: 92 mm x 92 mm
Protection	: NEMA 4X (IP54 at front panel, IP20 at rear side).
Weight	: Approximately 0.7 Kg.
Environmental Ratings	: Standard, indoor at an altitude of less than 2000 meters with non-condensing humidity
Operating/Storage Temperature	: -25 °C to +70 °C / -40 °C to +85 °C
Operating/Storage Humidity	: 90 % max. (None condensing)
Installation Over Voltage Category	: II appliances, portable equipment
Pollution Degree	: II, normal office or workplace, none conductive pollution
Mode of operation	: Continuous
EMC	: EN-61000-6-4, EMC generic emission standard for industrial equipment EN-61000-6-2, EMC generic immunity standard for industrial equipment
Electrical Safety	: EN-61010-1, safety requirements for electrical equipment for measurement, control and laboratory use
Supply Voltage(---)	: 12V---(8.0V--- to 16.0V---) or 24.0V--- (16.0V--- to 32.0V---) switch selectable
Supply Voltage Measurement	: 8.0-40.0V---. Accuracy : 1%, Resolution : 0.1V---
Generator Voltage Measurement	: Single phase, 2 wire 35 to 300VL-N ~ Accuracy : 1%FS, Resolution : 1V~
Measurement Accuracy	: Volts: 1% Frequency: 0.25% Ampere: 1%
Cranking Dropouts	: Battery voltage can be 0V--- for max. 100msn during cranking (battery voltage should be at least nominal voltage before cranking)
Generator Speed Measurement	: From alternator or magnetic pickup
Alternator Frequency Range	: 10-110 Hz. (@35-300VL-N---)
Magnetic Pickup Freq. Range	: 35 Hz - 10 kHz (@3-35 Volts peak)
Charge Generator Excitation	: 12 V--- or 24 V---, 200 mA, max 3W
Communication Interface	: RS-232 serial communication
Contact Sensing Input	: 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)
Outputs	: Start Relay Output 12A (@12/24V---), Fuel Relay Output 12A (@12/24V---), Alarm Relay Output 5A (@12/24V---), Configurable Relay Output 1. 5A(@12/24V---), Configurable Relay Output 2. 5A (@12/24V---)
Display (4digit,7segment LED display)	: Generator (L1-L2, L1-N, L2-L3, L2 - N, L3 - L1, L3 - N) Voltage, Generator Frequency Hz, Engine Speed RPM, Battery Voltage ---, Engine Running Hours, Failure Information
Failure Indicators	: 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
Status Indicators	: Power On, Engine Start, Engine Stop, Engine Running, Generator is ready to take the load
Information Alarm	: Emergency stop, Low battery voltage, Weak battery alarm, Routine Maintenance due
Approvals	: GOST-R, C E