TRANS-AMF
AUTOMATIC MAINS FAILURE UNIT
FOR DIESEL/GAS GENERATORS WITH J1939 ECUs
User Manual

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EU DECLARATION OF CONFORMITY

Manufacturer's Name : EMKO ELEKTRONIK A.S.
Manufacturer's Address : DOSAB, Karanfil Sk., No:6,
16369 Bursa, TURKEY

The manufacturer hereby declares that the product:

Product Name : Automatic Mains Failure Unit

Type Number : TRANS-AMF

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

Conforms to the following directives :

2006 / 95 / EC The Low Voltage Directive

2004 / 108 / EC The Electromagnetic Compatibility Directive

has been designed and manufactured to the following specifications:

EN 61000-6-4:2007 EMC Generic Emission Standard for Industrial Environments

EN 61000-6-2:2005 EMC Generic Immunity Standard for Industrial Environments

EN 61010-1:2001 Safety Requirements for electrical equipment for measurement, control and laboratory use

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When and Where Issued

25th February 2011

Bursa-TURKEY

Authorized Signature

Name : Serpil YAKIN

Position : Quality Manager

1.Introduction

1.1 General Specifications

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

The unit calculates engine RPM from Magnetic Pickup sensor input (MPU) or generator voltage signal.

The unit monitors J1939 ECU messages and provides remote start/stop control via J1939 protocol (supported ECUs: Volvo EMS2, Volvo EDC4, Perkins and standard messages).

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

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

The unit monitors generator operation and gives warning of any faults that are detected.
If a fault is detected, the unit shuts down the engine and shows the failure message on the LCD display.

Emergency stop input provide for remote control of the engine.

The configurable inputs 1, 4 and 5 can be programmed to perform 26 different functions.

Other four configurable inputs can be programmed to perform 25 different functions.

Six configurable outputs can be programmed for 114 different functions.

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.

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

If there is danger of serious accident resulting from a failure or defect in this unit , power off the system and seperate the electrical connection of the device from the system.

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

2.1 Unit Configuration

The unit can be programmed using the buttons and LCD display on the front panel or PC Software.

2.2 Panel Mounting

The unit is designed for panel mounting. Fixing is by two screw fixings.
1- Insert the unit in the panel cut-out from the front.
2- Insert the fixings in the slotted at the corners of the unit and tighten the fixing screws to secure the unit against the panel.

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.

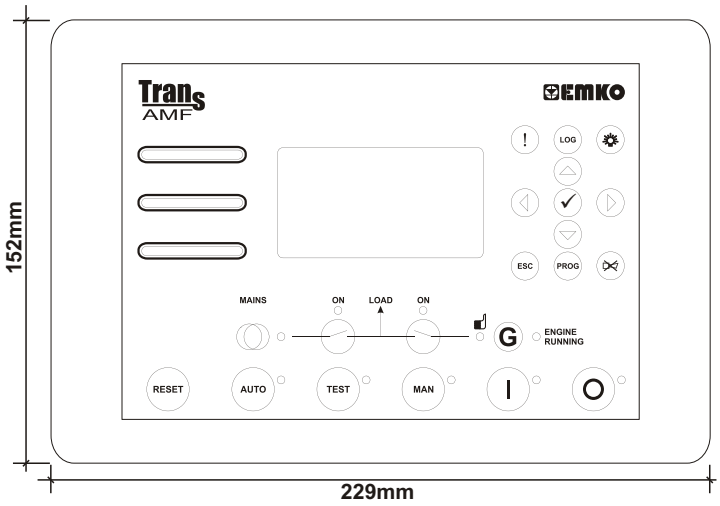


Figure 2.1 Front View

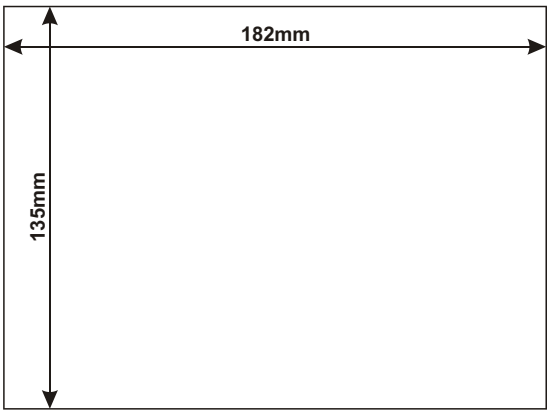
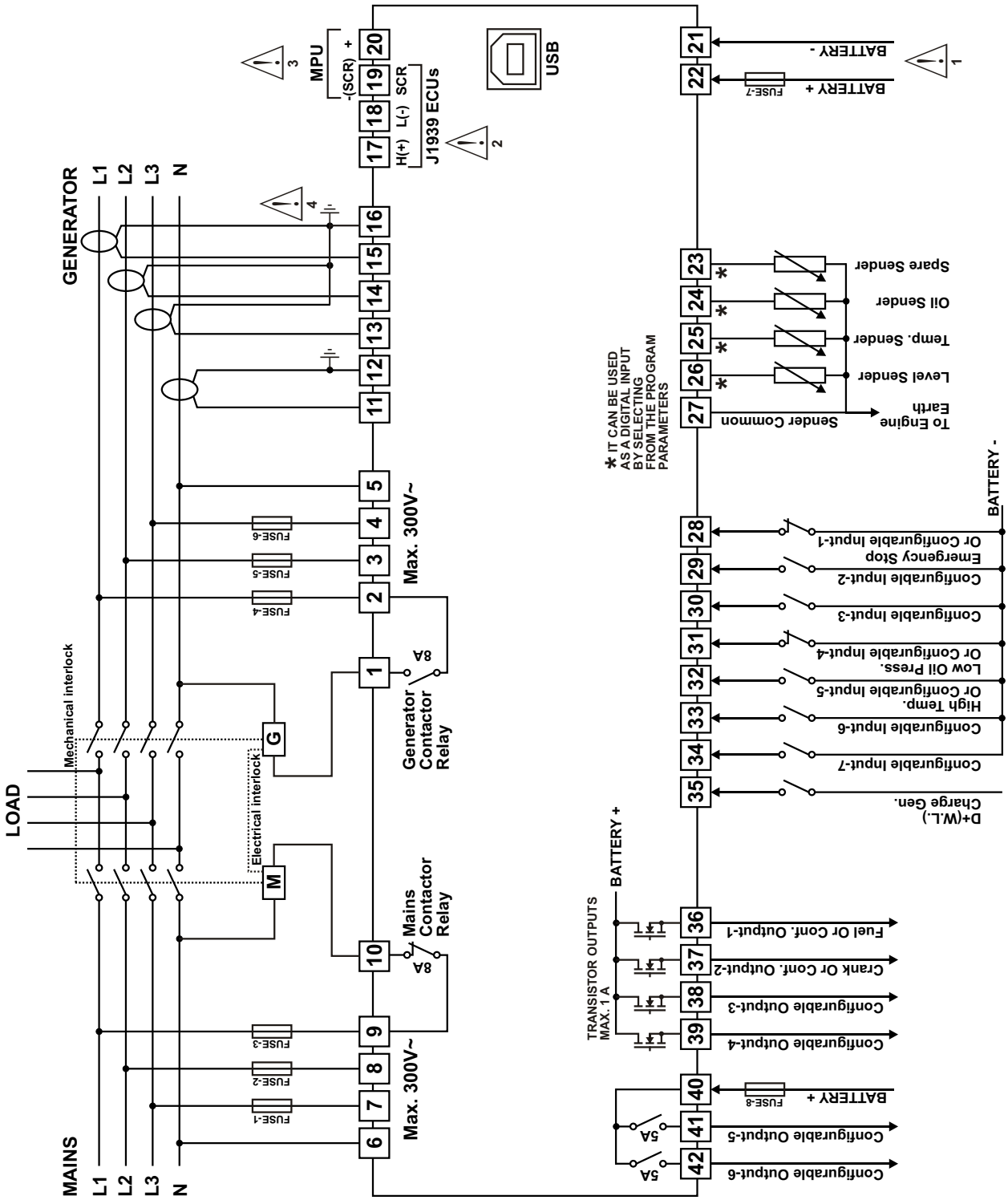


Figure 2.2 Panel Cut-Out

2.3 Electrical Connection

TRANS-AMF three phase connections schematic



FUSE-1, FUSE-2, FUSE-3, FUSE-4, FUSE-5, FUSE-6 2A. T
FUSE-7 6A. T
FUSE-8 Max. 10A. T

1- Connect the unit as shown in the appropriate diagram. Be sure to connect the battery supply the right way round and battery negative should be grounded.

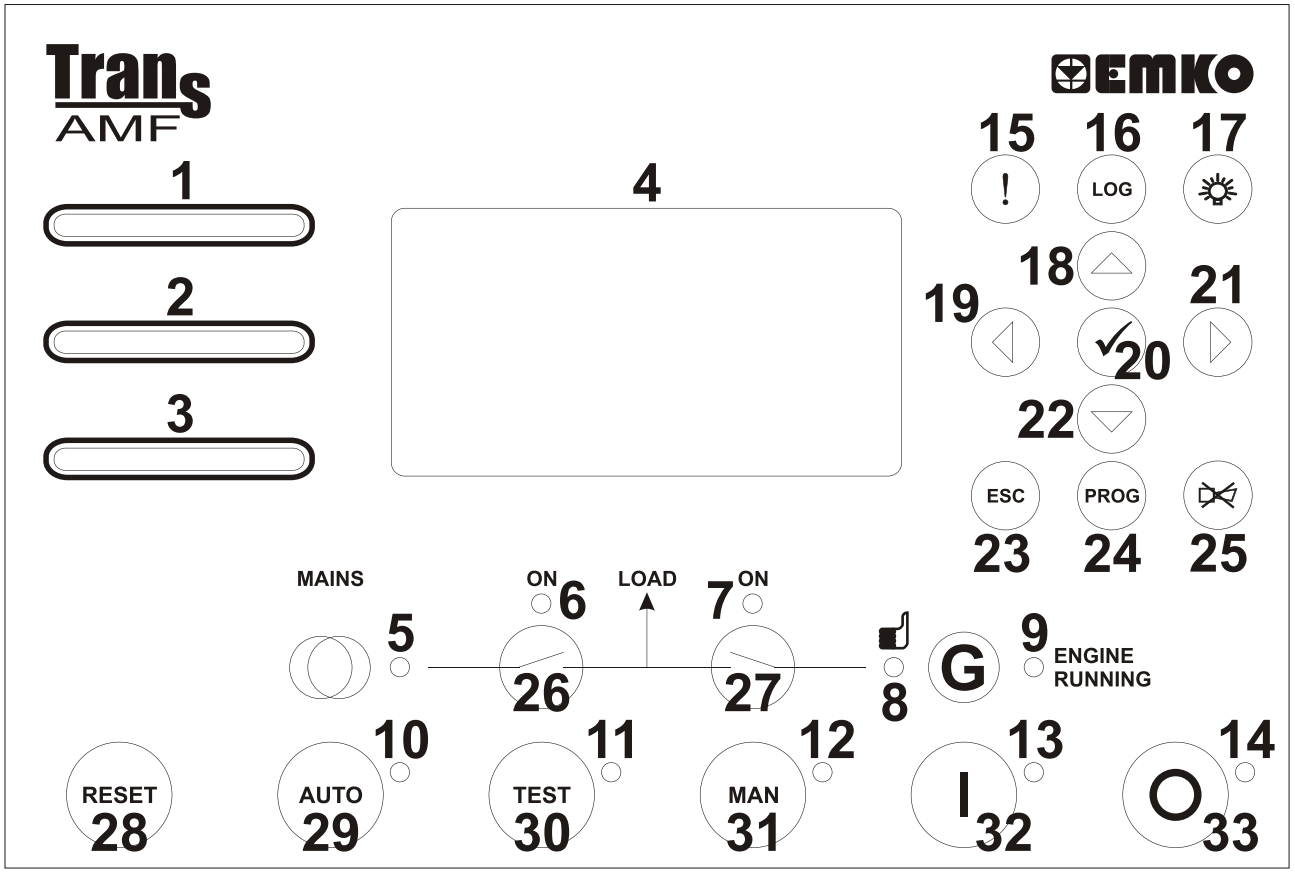
2- The CAN interface requires that a 120 Ohms terminator is fitted to each end of the communications link. This termination resistor is fitted internally into the unit. So it is not required externally. The screen is grounded at one end ONLY.

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

4- Current transformers secondary should be grounded.

3. Front Panel Description And Accessing To The Parameters

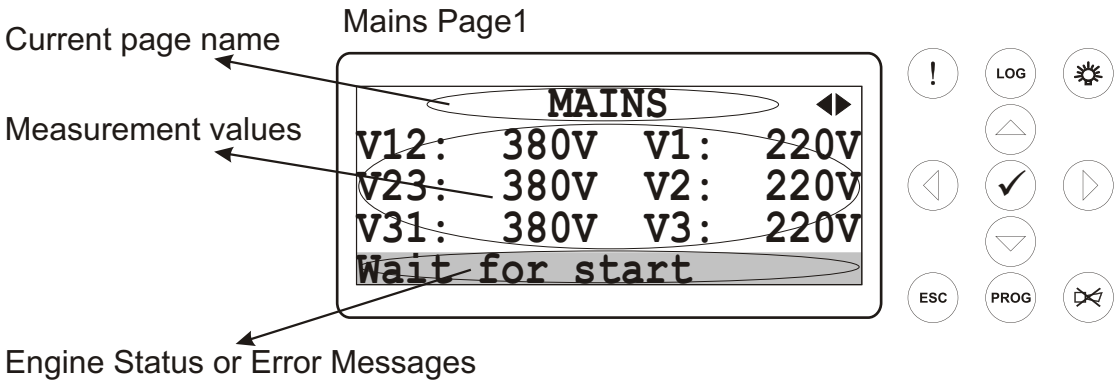
3.1 Front Panel Description



Number	Comment
1	This LED indicates that a "Shutdown" alarm was detected.
2	This LED indicates that a "Warning" alarm was detected
3	This LED indicates that a "Maintenance" alarm was detected
4	This LCD display is used for displaying the electrical measurements during normal operation, and editing/inspecting programming parameters in program mode.
5	This LED indicates that Mains voltage and frequency is within limits and is ready to take over the load.
6	This LED shows that the load is supplied from the mains.
7	This LED shows that the load is supplied from the generator.
8	This LED indicates that Generator voltage and frequency is within limits and is ready to take over the load.
9	This LED indicates that the engine has started and is running.
10	This LED shows that the unit is in the AUTO mode.
11	This LED shows that the unit is in the TEST mode.
12	This LED shows that the unit is in the MANUAL mode.
13	In the MAN, AUTO and TEST modes, this LED indicates that the engine is starting up or is running.
14	This LED shows that the unit is in the STOP mode.

Number	Comment
15	Warning and Alarm messages shortcut button.
16	Event Logs shortcut button.
17	The LAMP TEST button illuminates all LED indicators.
18	This button is used for showing previous parameters on the currently selected page in normal operation. In Programming mode, it operates as an Up button (changing cursor position) or Increment button (increase parameter value).
19	This button is used for showing previous page in normal operation. In Programming mode, it operates as an Left button (changing cursor position).
20	This button is used for entering parameter edit section and saving parameter value in programming mode.
21	This button is used for showing next page in normal operation. In Programming mode, it operates as an Right button (changing cursor position).
22	This button is used for showing next parameters on the currently selected page in normal operation. In Programming mode, it operates as an Down button (changing cursor position) or Decrement button (decrease parameter value).
23	The Escape button is used for exit previous section in programming mode.
24	When this button is pressed, the unit goes into its PROGRAMMING Mode.
25	This button will silence the alarm horn after a failure has been detected.
26	This button opens or closes the mains contactor, only operative when manual mode is selected.
27	This button opens or closes the gen. contactor, only operative when manual mode is selected.
28	This button will reset the controller after a failure has been detected.
29	The AUTO button is used for changing operating mode of the unit to the AUTO Mode.
30	The TEST button is used for changing operating mode of the unit to the TEST Mode.
31	The MAN button is used for changing operating mode of the unit to the MANUAL Mode.
32	The START button is used for starting the engine when the unit is in the Manual Mode.
33	The STOP button is used for changing operating mode of the unit to the STOP Mode. The generator is stopped.

LCD display Description



128x64 Dot-matrix LCD display.

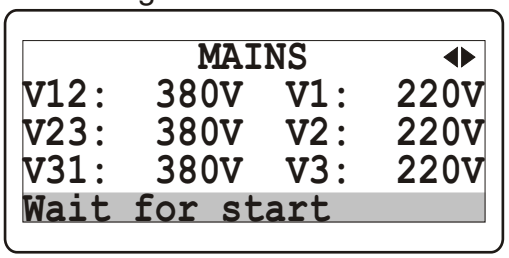
Use the Next and Previous buttons to select which Data display page (screen) is to be displayed.

When the Alarm (!) shortcut button is pressed, the Warning & Alarm display page is displayed.

When the Event log (LOG) shortcut button is pressed, the Event Log display page is displayed.

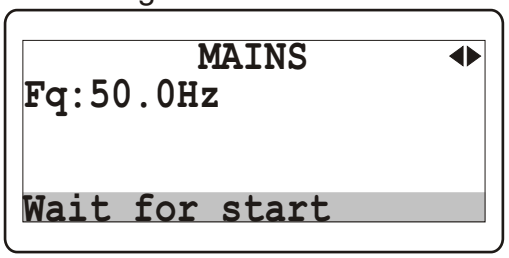
Data display pages on the LCD display;

Mains Page1:



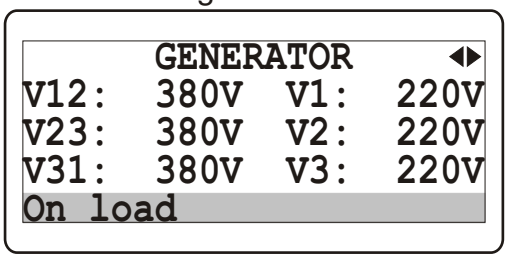
V12: Mains voltage L1-L2
V23: Mains voltage L2-L3
V31: Mains voltage L3-L1
V1: Mains voltage L1-N
V2: Mains voltage L2-N
V3: Mains voltage L3-N

Mains Page2:



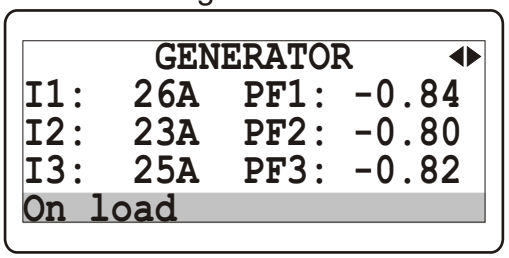
Fq: Mains frequency

Generator Page1:



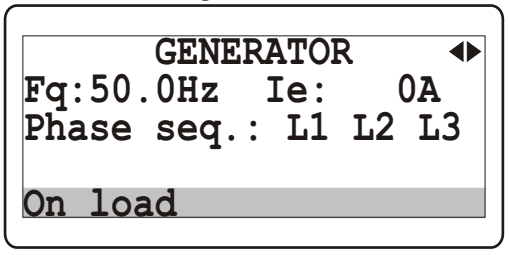
V12: Generator voltage L1-L2
V23: Generator voltage L2-L3
V31: Generator voltage L3-L1
V1: Generator voltage L1-N
V2: Generator voltage L2-N
V3: Generator voltage L3-N

Generator Page2:



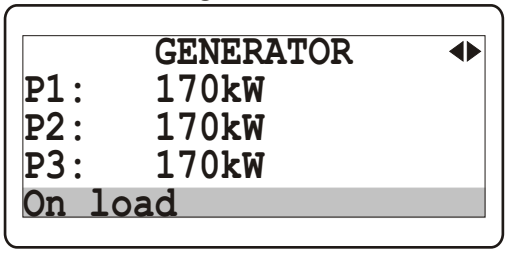
I1: Load Current L1
I2: Load Current L2
I3: Load Current L3
PF1: Generator power factor L1
PF2: Generator power factor L2
PF3: Generator power factor L3

Generator Page3:



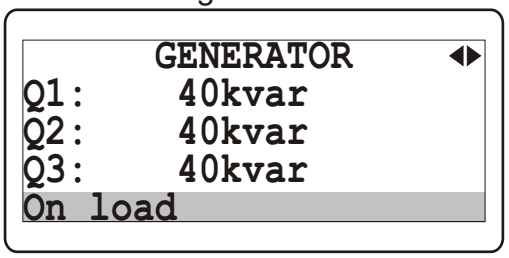
Fq: Generator frequency
Ie: Earth Current
Phase Seq.: Generator phase sequence

Generator Page4:



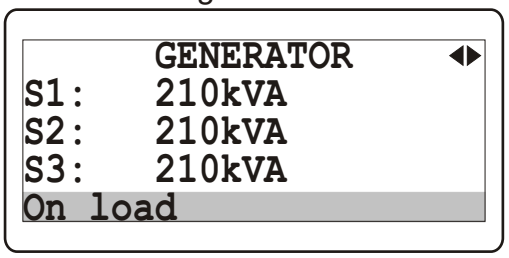
P1: Generator active power L1
P2: Generator active power L2
P3: Generator active power L3

Generator Page5:



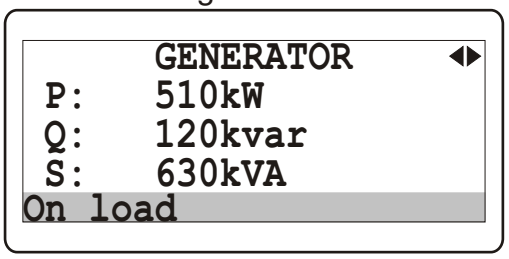
Q1: Generator reactive power L1
Q2: Generator reactive power L2
Q3: Generator reactive power L3

Generator Page6:



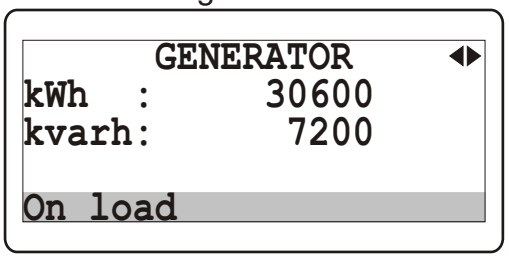
S1: Generator apparent power L1
S2: Generator apparent power L2
S3: Generator apparent power L3

Generator Page7:



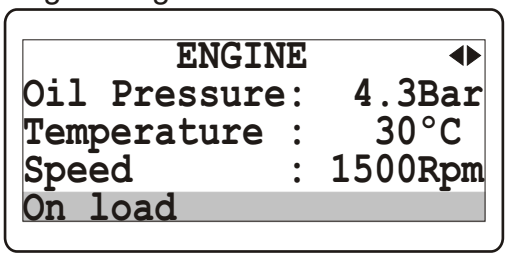
P: Generator total active power
Q: Generator total reactive power
S: Generator total apparent power

Generator Page8:



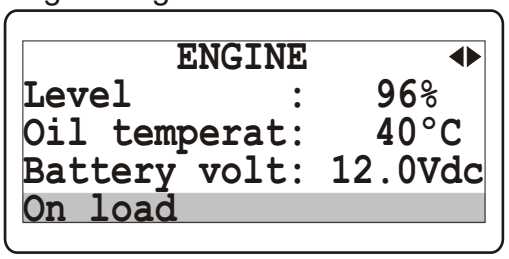
kWh: Generator active energy
kvarh: Generator reactive energy

Engine Page1:



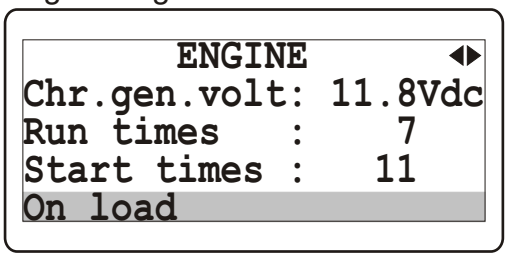
Oil pressure: Oil pressure sender input value
Temperature: Coolant temperature sender input value
Speed: Engine speed

Engine Page2:



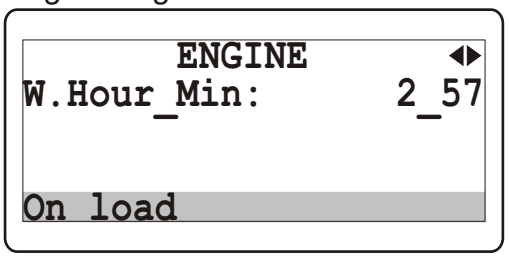
Level: Fuel level sender input value
Oil temperat: Oil temperature sender input value
Battery volt: Battery supply voltage

Engine Page3:



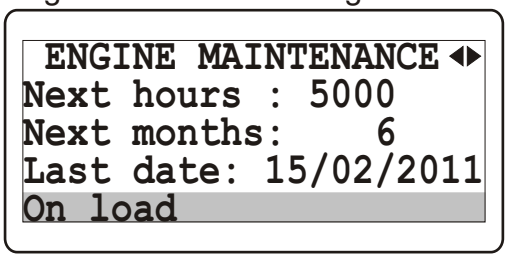
Chr.gen.volt: Charge generator voltage
Run times: Number of generator runs
Start times: Number of generator starts

Engine Page4:



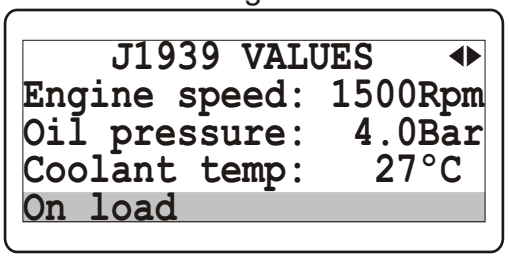
W.Hour_Min: Engine running time (Hour and Minute)

Engine Maintenance Page:



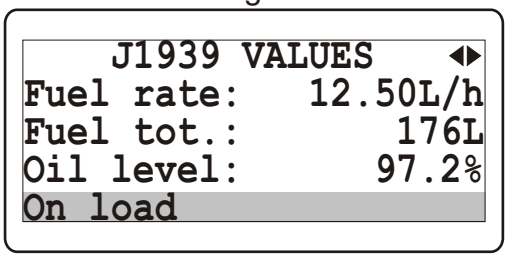
Next hours: The remaining hour for maintenance
Next months: The remaining month for maintenance
Last date: The last maintenance date

J1939 Values Page1:



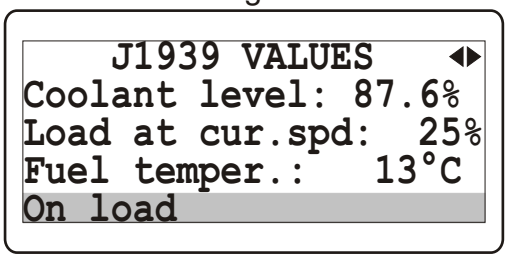
Engine speed: Engine speed via J1939
Oil pressure: Oil pressure via J1939
Coolant temp: Coolant temperature via J1939

J1939 Values Page2:



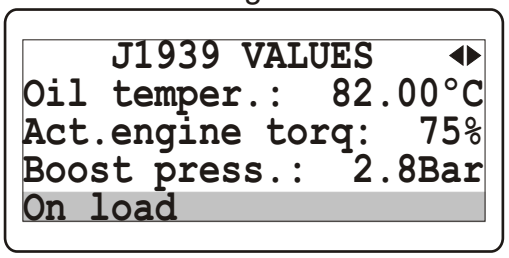
Fuel rate: Fuel rate via J1939
Fuel tot.: Fuel total used via J1939
Oil level: Oil level via J1939

J1939 Values Page3:



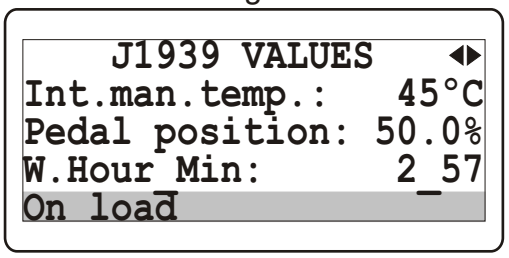
Coolant level: Coolant level via J1939
Load at cur.spd: Load at current speed via J1939
Fuel temper.: Fuel temperature via J1939

J1939 Values Page4:



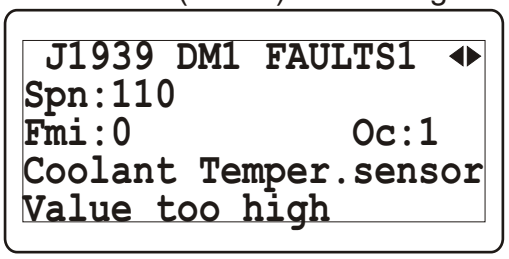
Oil temper.: Oil temperature via J1939
Act.engine torq: Actual engine torque via J1939
Boost press.: Boost pressure via J1939

J1939 Values Page5:



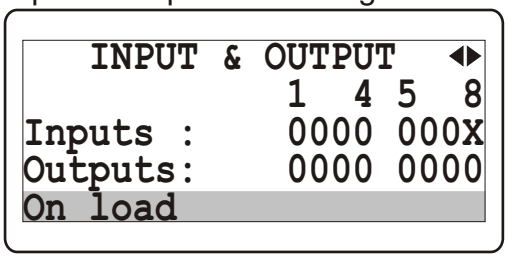
Int.man.temp.: Intake manifold temperature via J1939
Pedal position: Accelerator pedal position via J1939
W.Hour_Min: Working hour and minute via J1939

J1939 DM1 (Active) Faults Page:



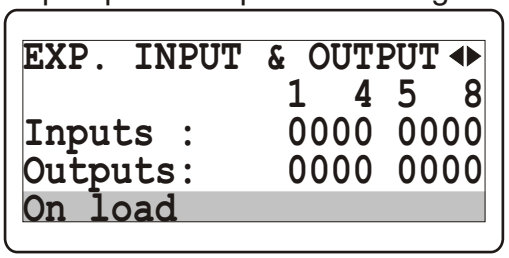
Spn: Suspect parameter number (e.g. SPN = 110 corresponds to coolant temperature sensor)
Fmi: Failure mode identifier (e.g. FMI = 0 means value too high)
Oc: Occurrence count (if OC = 0, no alarm is present)
The first 10 active alarm messages (Active Diagnostic Trouble Codes - DM1) with SPN, FMI, and OC are displayed). If more than one active fault condition is present, all of them is displayed sequencely by pressing Next and Previous buttons.

Input & Output Status Page:



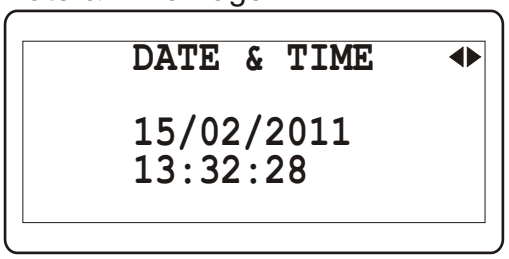
Inputs: Input status information. If an input is active, related digit is displayed as "1" else it is displayed as "0".
1: Conf. in-1, **2:** Conf. in-2, **3:** Conf. in-3, **4:** Conf. in-4,
5: Conf. in-5, **6:** Conf. in-6, **7:** Conf. in-7, **8:** Not available.
Outputs: Output status information. If an output is active, related digit is displayed as "1" else it is displayed as "0".
1: Conf. out-1, **2:** Conf. out-2, **3:** Conf. out-3, **4:** Conf. out-4,
5: Conf. out-5, **6:** Conf. out-6, **7:** Generator contactor,
8: Mains contactor.

Exp. Input & Output Status Page:



Inputs: Exp. input status information. If an input is active, related digit is displayed as "1" else it is displayed as "0".
1: Exp. conf. in-1, **2:** Exp. conf. in-2, **3:** Exp. conf. in-3,
4: Exp. conf. in-4, **5:** Exp. conf. in-5, **6:** Exp. conf. in-6,
7: Exp. conf. in-7, **8:** Exp. conf. in-8.
Outputs: Exp. output status information. If an output is active, related digit is displayed as "1" else it is displayed as "0".
1: Exp. conf. out-1, **2:** Exp. conf. out-2, **3:** Exp. conf. out-3,
4: Exp. conf. out-4, **5:** Exp. conf. out-5, **6:** Exp. conf. out-6,
7: Exp. conf. out-7, **8:** Exp. conf. out-8.

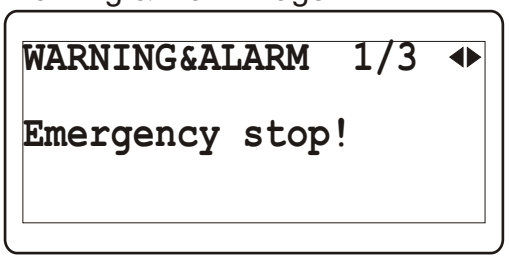
Date & Time Page:



Date: Day, Month, Year.
Time: Hour, minute, second.

Warning & Alarm display pages on the LCD display;

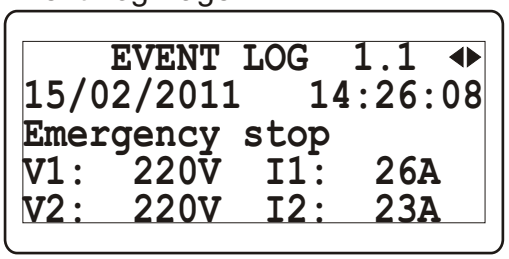
Warning & Alarm Page:



1/3: The first message of current alarms.
Emergency stop!: This message indicates that an emergency stop alarm has occurred.

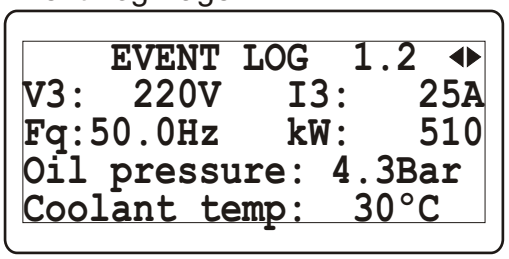
Event Log display pages on the LCD display;

Event Log Page1:



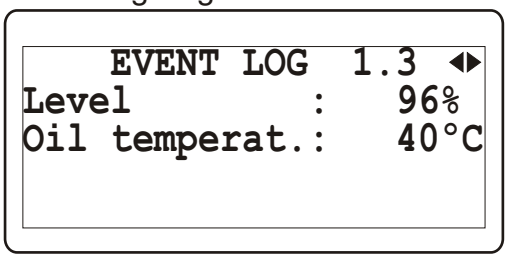
1.1: The first page of related event log
Emergency stop: This message indicates that an emergency stop alarm has occurred. (Event history: 15/02/2011 date, 14:26:08 time).
V1: Generator voltage L1-N
I1: Load Current L1
V2: Generator voltage L2-N
I2: Load Current L2

Event Log Page2:



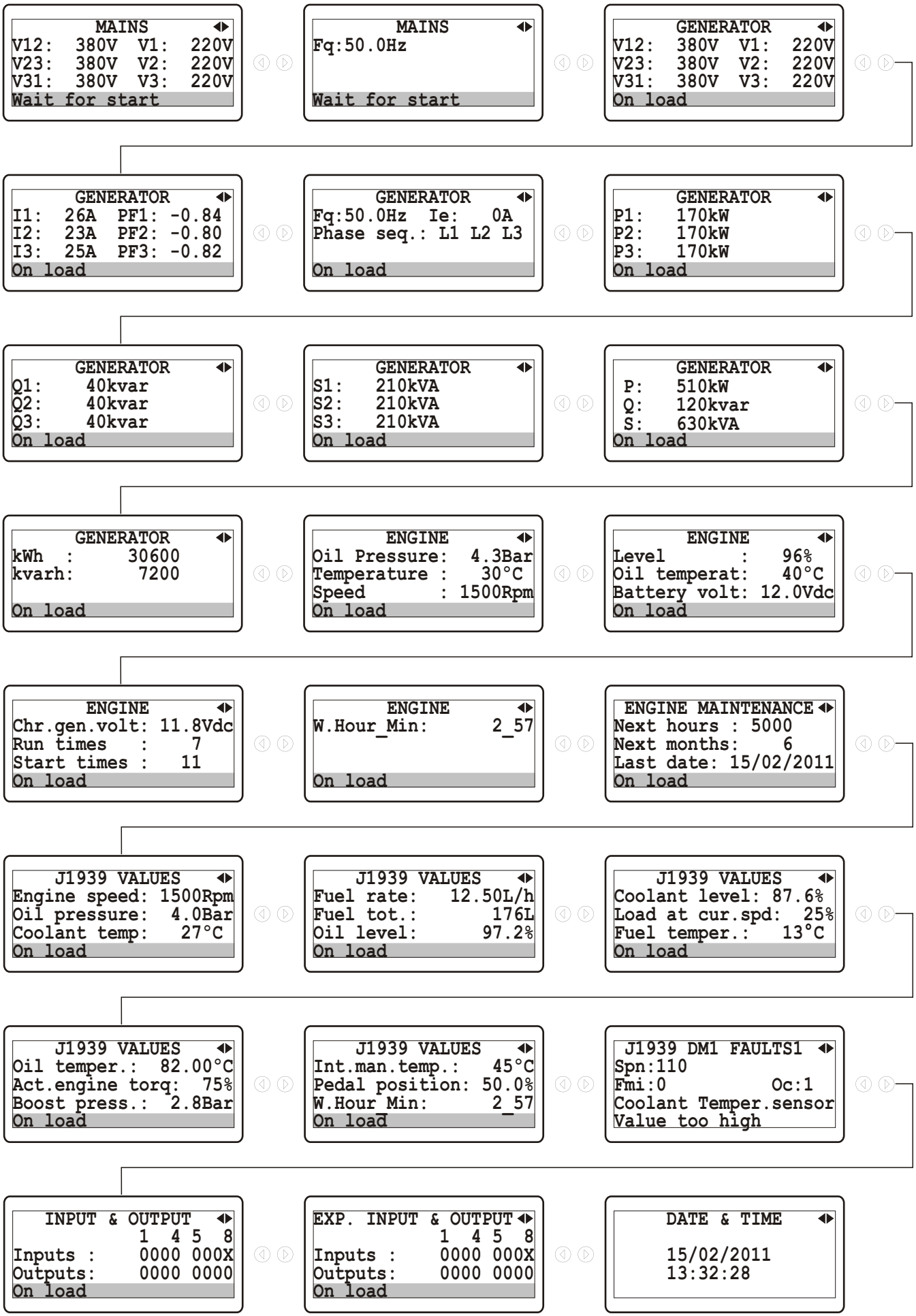
1.2: The second page of related event log
V3: Generator voltage L3-N
I3: Load Current L3
Fq: Generator frequency
kW: Generator total active power
Oil oressure: Oil pressure sender input value
Coolant temp: Coolant temperature sender input value

Event Log Page3:

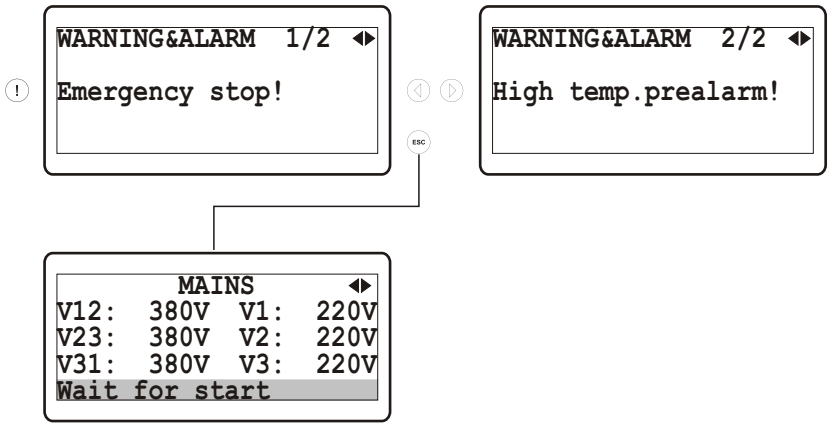


1.3: The last page of related event log
Level: Fuel level sender input value
Oil temperat.: Oil temperature sender input value
Events (from 1 to 50) can be displayed sequencely with the Next and Previous buttons.

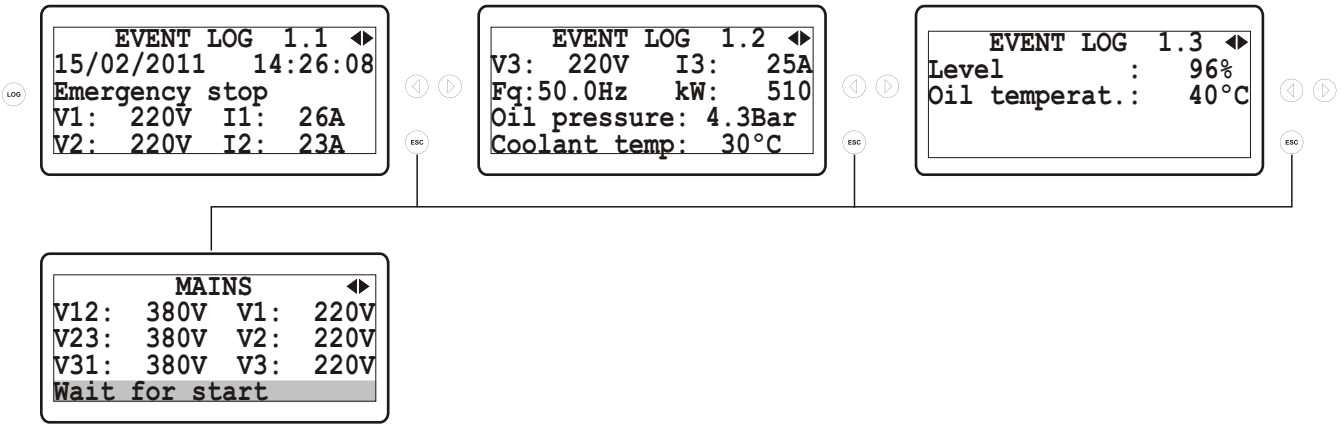
Example-1: Displaying all Data display pages.



Example-2: Displaying all Warning&Alarm display pages

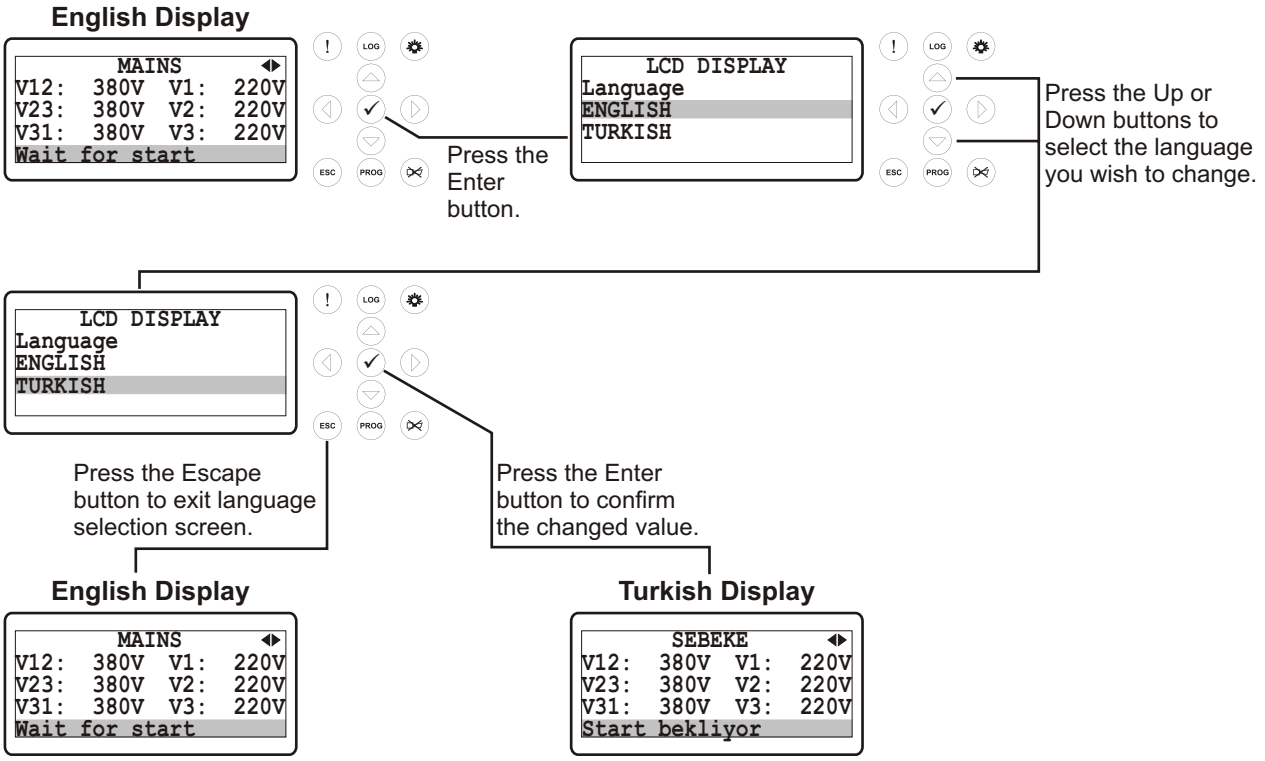


Example-3: Displaying all Event Log display pages

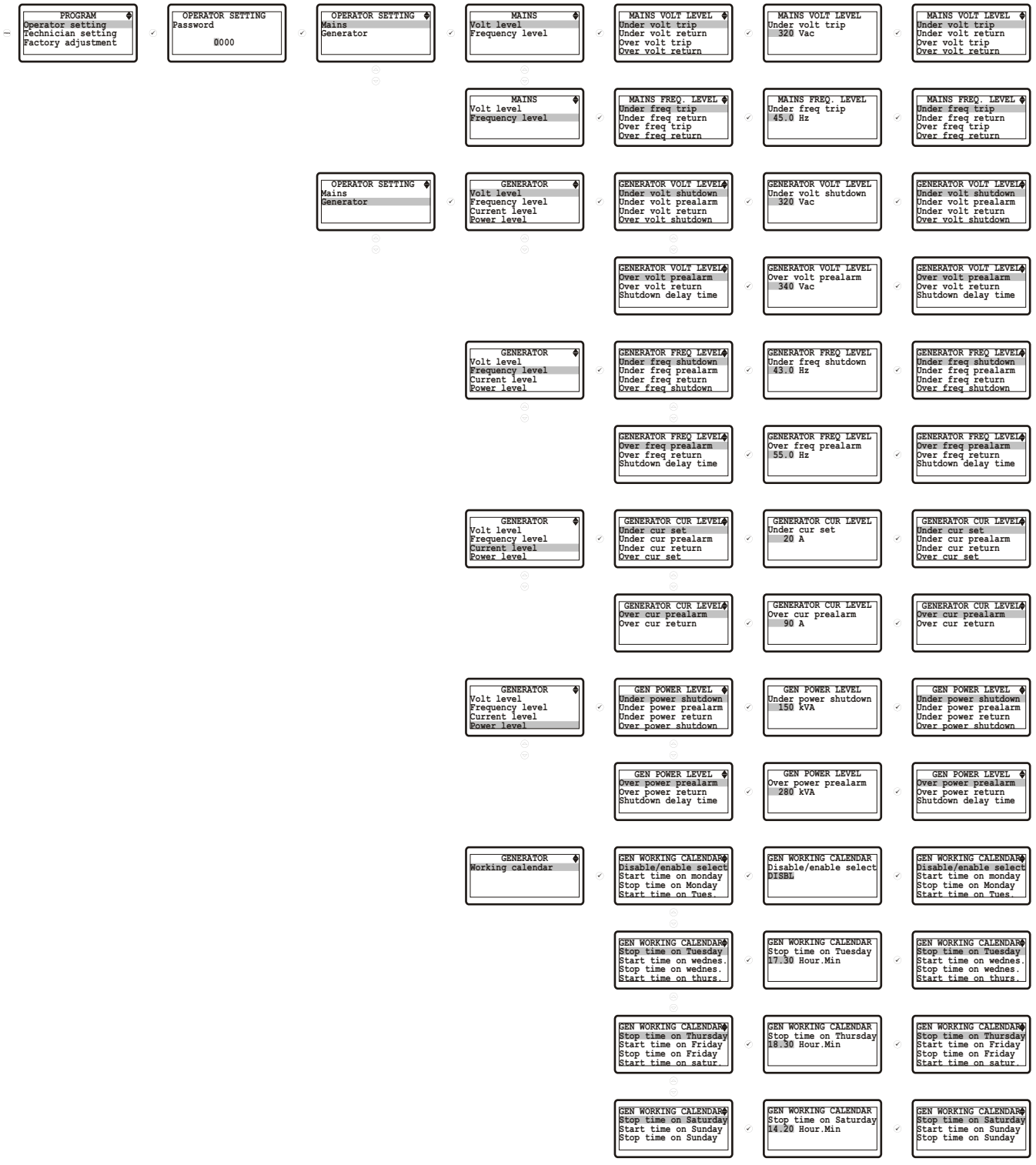


LCD display language selection

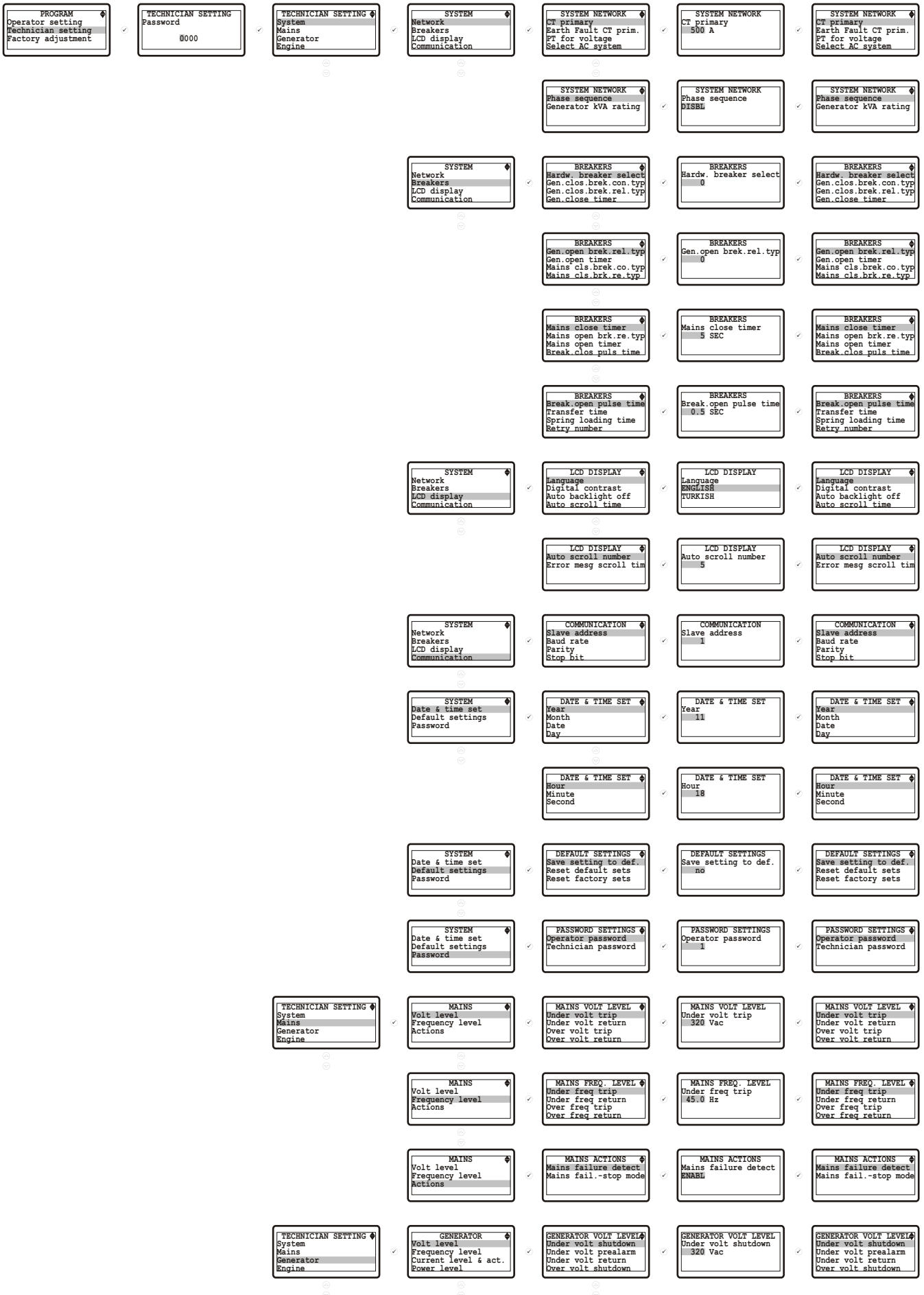
English Display

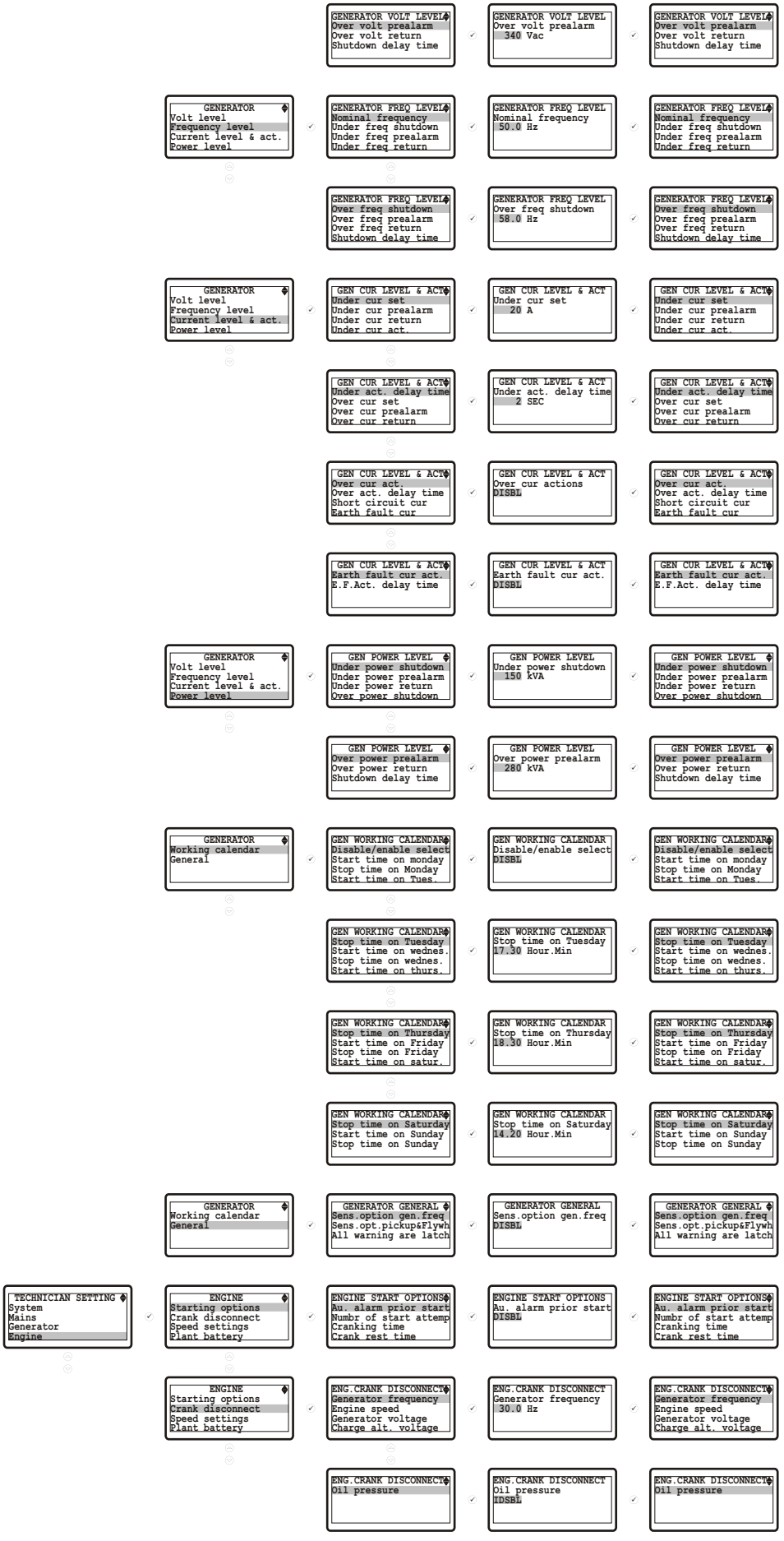


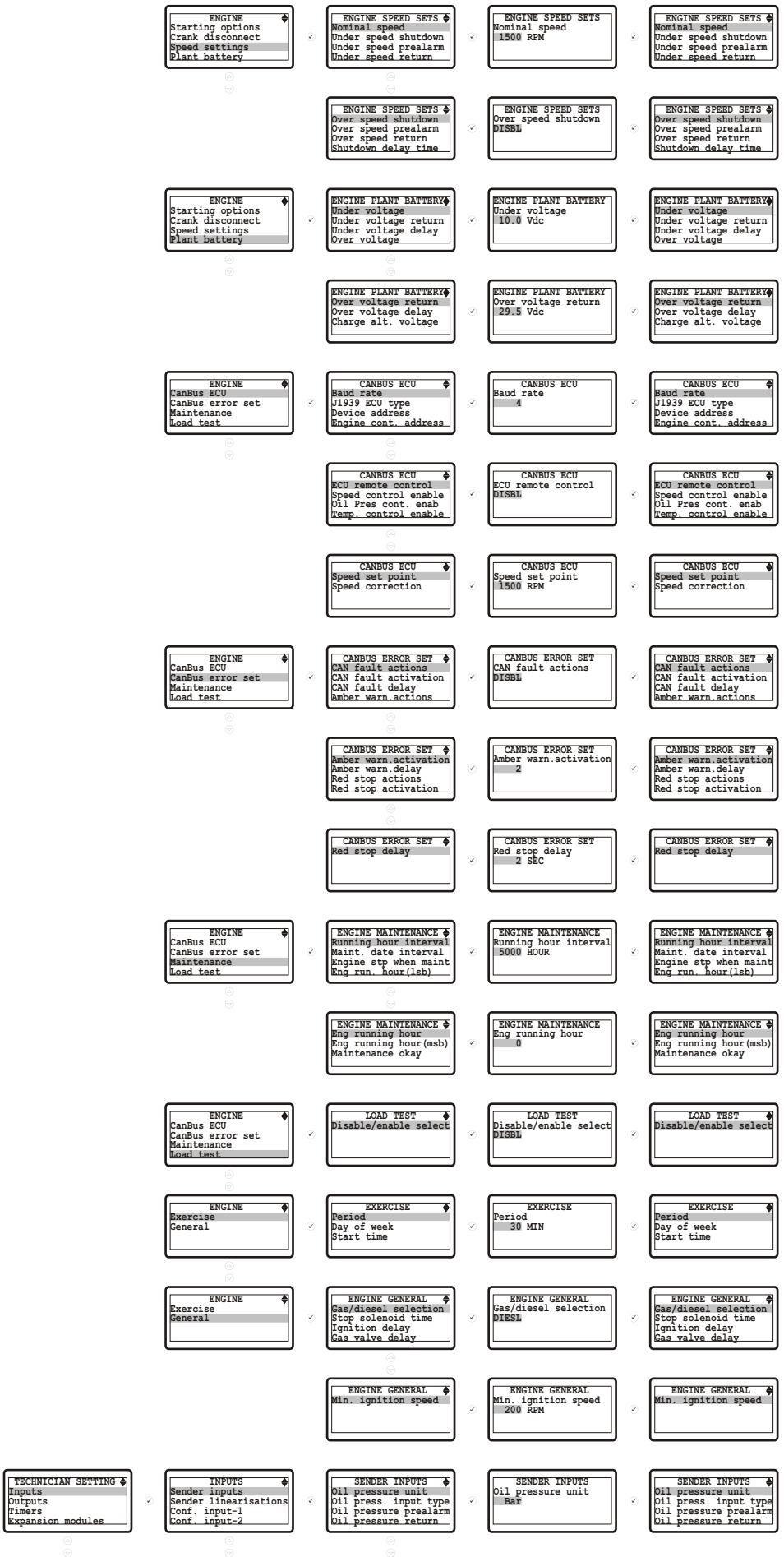
3.2 Accessing To The Operator Parameters

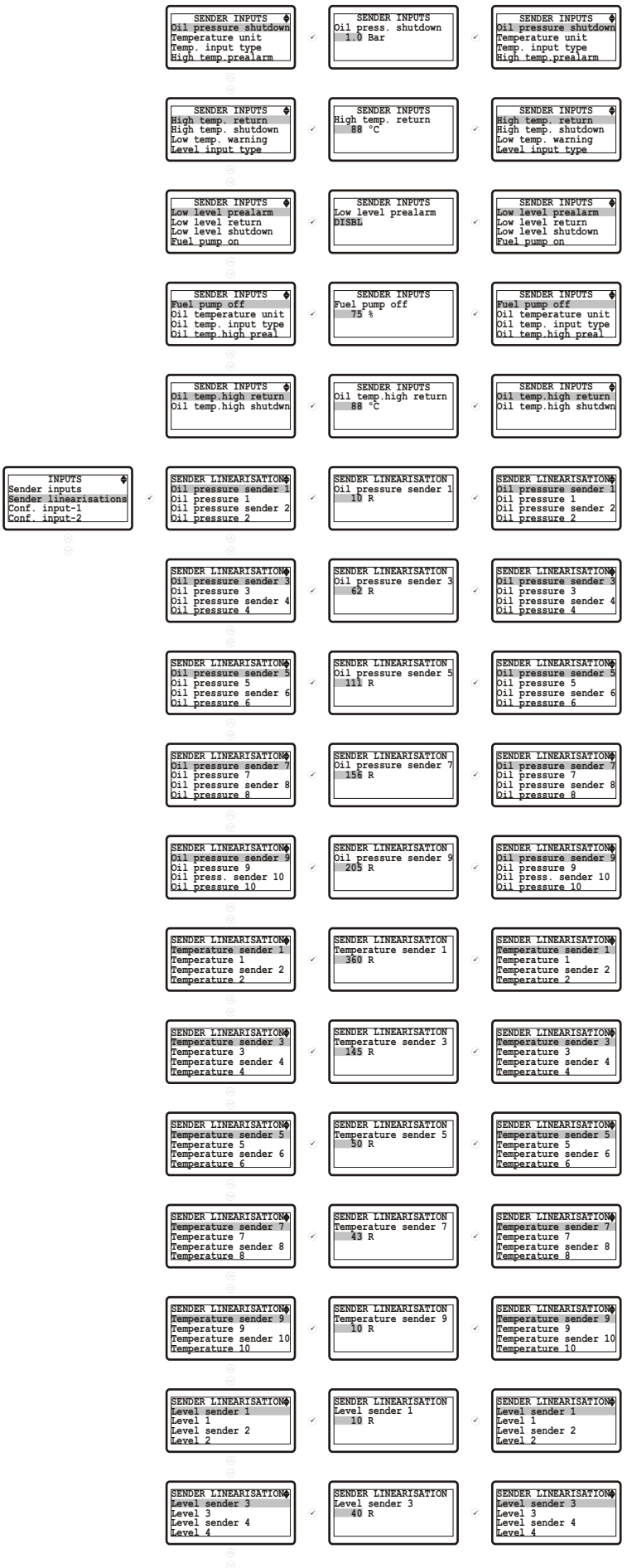


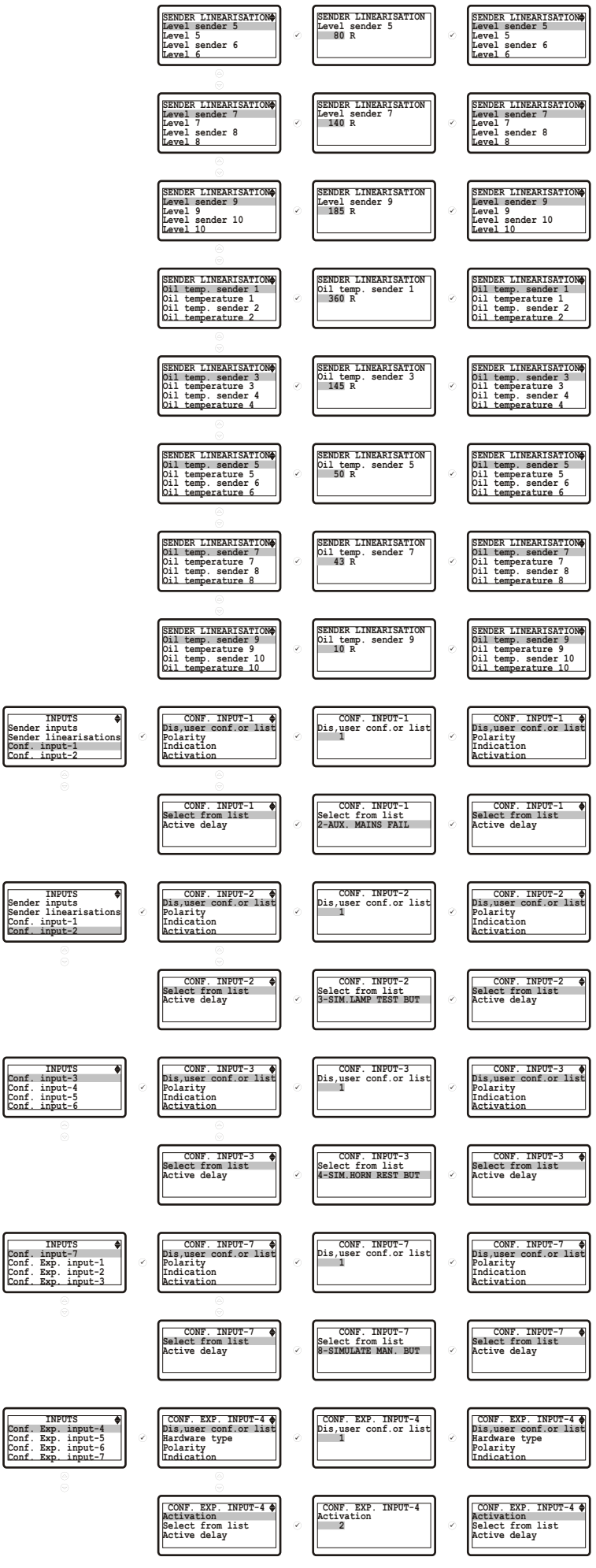
3.3 Accessing To The Technician Parameters

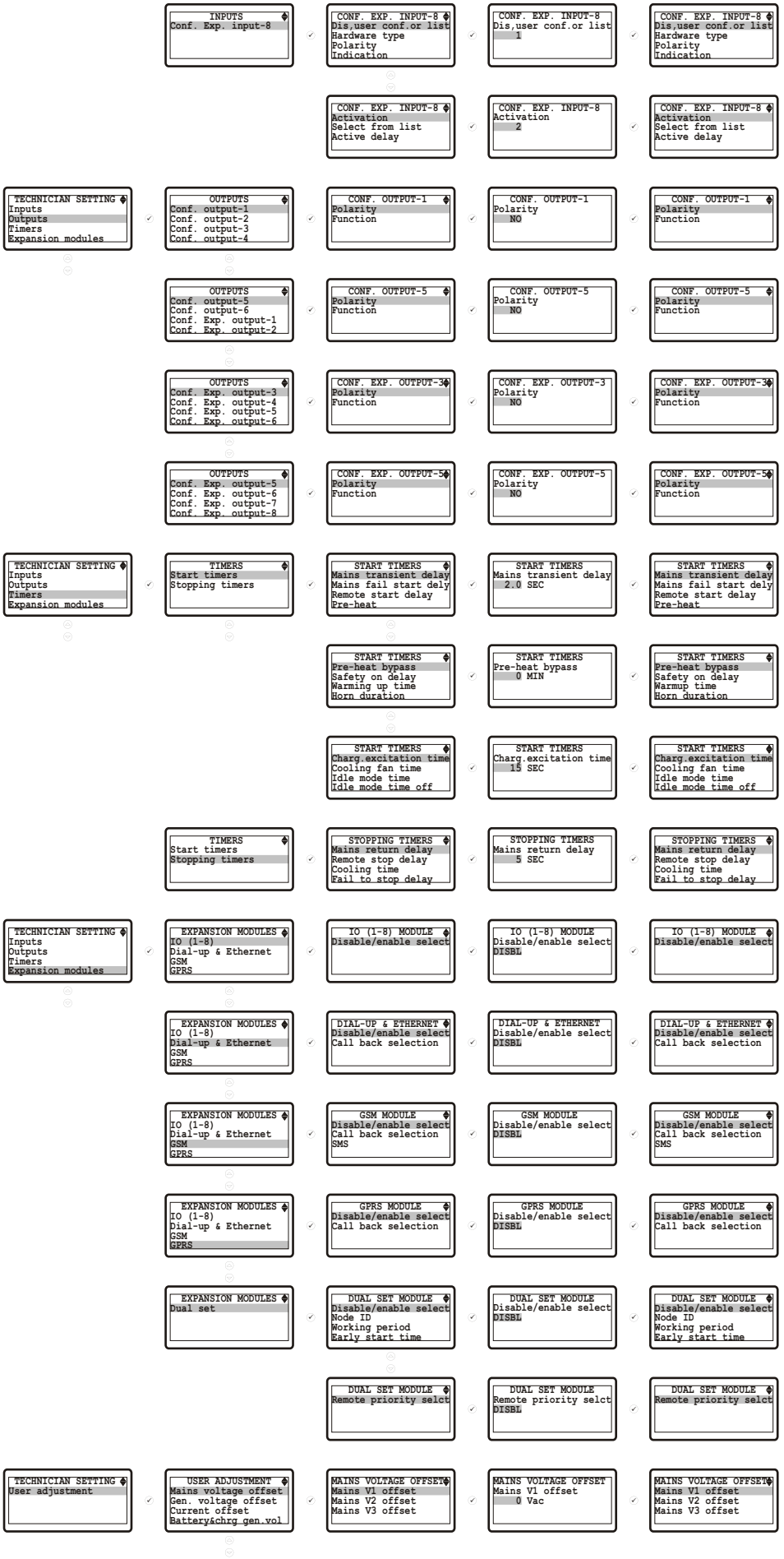


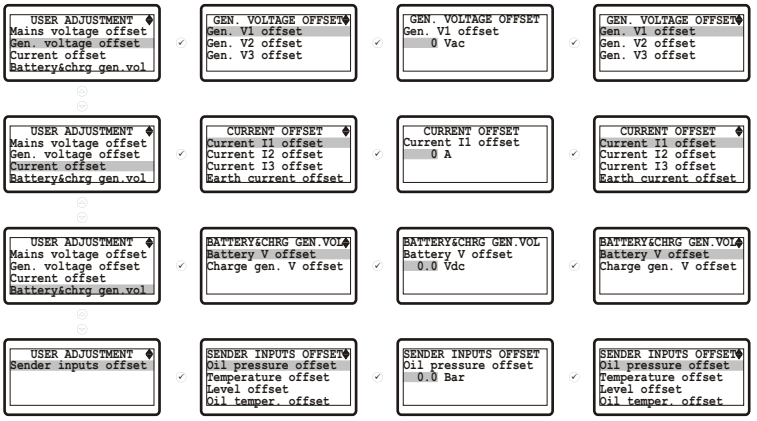

GENERATOR VOLT LEVEL
Over volt prealarm
Over volt return
Shutdown delay time
GENERATOR VOLT LEVEL
Over volt prealarm
340 Vac
GENERATOR VOLT LEVEL
Over volt prealarm
Over volt return
Shutdown delay time
GENERATOR
Volt level
Frequency level
Current level & act.
Power level
GENERATOR FREQ LEVEL
Nominal frequency
Under freq shutdown
Under freq prealarm
Under freq return
GENERATOR FREQ LEVEL
Nominal frequency
50.0 Hz
GENERATOR FREQ LEVEL
Nominal frequency
Under freq shutdown
Under freq prealarm
Under freq return
GENERATOR FREQ LEVEL
Over freq shutdown
Over freq prealarm
Over freq return
Shutdown delay time
GENERATOR FREQ LEVEL
Over freq shutdown
58.0 Hz
GENERATOR FREQ LEVEL
Over freq shutdown
Over freq prealarm
Over freq return
Shutdown delay time
GENERATOR
Volt level
Frequency level
Current level & act.
Power level
GEN CUR LEVEL & ACT
Under cur set
Under cur prealarm
Under cur return
Under cur act.
GEN CUR LEVEL & ACT
Under cur set
20 A
GEN CUR LEVEL & ACT
Under cur set
Under cur prealarm
Under cur return
Under cur act.
GEN CUR LEVEL & ACT
Under act. delay time
Over cur set
Over cur prealarm
Over cur return
GEN CUR LEVEL & ACT
Under act. delay time
2 SEC
GEN CUR LEVEL & ACT
Under act. delay time
Over cur set
Over cur prealarm
Over cur return
GEN CUR LEVEL & ACT
Over cur act.
Over act. delay time
Short circuit cur
Earth fault cur
GEN CUR LEVEL & ACT
Over cur actions
DISBL
GEN CUR LEVEL & ACT
Over cur act.
Over act. delay time
Short circuit cur
Earth fault cur
GEN CUR LEVEL & ACT
Earth fault cur act.
E.F.Act. delay time
GEN CUR LEVEL & ACT
Earth fault cur act.
DISBL
GEN CUR LEVEL & ACT
Earth fault cur act.
E.F.Act. delay time
GENERATOR
Volt level
Frequency level
Current level & act.
Power level
GEN POWER LEVEL
Under power shutdown
Under power prealarm
Under power return
Over power shutdown
GEN POWER LEVEL
Under power shutdown
150 kVA
GEN POWER LEVEL
Under power shutdown
Under power prealarm
Under power return
Over power shutdown
GEN POWER LEVEL
Over power prealarm
Over power return
Shutdown delay time
GEN POWER LEVEL
Over power prealarm
280 kVA
GEN POWER LEVEL
Over power prealarm
Over power return
Shutdown delay time
GENERATOR
Working calendar
General
GEN WORKING CALENDAR
Disable/enable select
Start time on monday
Stop time on Monday
Start time on Tues.
GEN WORKING CALENDAR
Disable/enable select
DISBL
GEN WORKING CALENDAR
Disable/enable select
Start time on monday
Stop time on Monday
Start time on Tues.
GEN WORKING CALENDAR
Stop time on Tuesday
Start time on wednes.
Stop time on wednes.
Start time on thurs.
GEN WORKING CALENDAR
Stop time on Tuesday
17.30 Hour.Min
GEN WORKING CALENDAR
Stop time on Tuesday
Start time on wednes.
Stop time on wednes.
Start time on thurs.
GEN WORKING CALENDAR
Stop time on Thursday
Start time on Friday
Stop time on Friday
Start time on satur.
GEN WORKING CALENDAR
Stop time on Thursday
18.30 Hour.Min
GEN WORKING CALENDAR
Stop time on Thursday
Start time on Friday
Stop time on Friday
Start time on satur.
GEN WORKING CALENDAR
Stop time on Saturday
Start time on Sunday
Stop time on Sunday
GEN WORKING CALENDAR
Stop time on Saturday
14.20 Hour.Min
GEN WORKING CALENDAR
Stop time on Saturday
Start time on Sunday
Stop time on Sunday
GENERATOR
Working calendar
General
GENERATOR GENERAL
Sens.option gen.freq
Sens.opt.pickup&Flywh
All warning are latch
GENERATOR GENERAL
Sens.option gen.freq
DISBL
GENERATOR GENERAL
Sens.option gen.freq
Sens.opt.pickup&Flywh
All warning are latch
TECHNICIAN SETTING
System
Mains
Generator
Engine
ENGINE
Starting options
Crank disconnect
Speed settings
Plant battery
ENGINE START OPTIONS
Au. alarm prior start
Numbr of start attemp
Cranking time
Crank rest time
ENGINE START OPTIONS
Au. alarm prior start
DISBL
ENGINE START OPTIONS
Au. alarm prior start
Numbr of start attemp
Cranking time
Crank rest time
ENGINE
Starting options
Crank disconnect
Speed settings
Plant battery
ENG.CRANK DISCONNECT
Generator frequency
Engine speed
Generator voltage
Charge alt. voltage
ENG.CRANK DISCONNECT
Generator frequency
30.0 Hz
ENG.CRANK DISCONNECT
Generator frequency
Engine speed
Generator voltage
Charge alt. voltage
ENG.CRANK DISCONNECT
Oil pressure
ENG.CRANK DISCONNECT
Oil pressure
IDSBL
ENG.CRANK DISCONNECT
Oil pressure


ENGINE
Starting options
Crank disconnect
Speed settings
Plant battery
ENGINE SPEED SETS
Nominal speed
Under speed shutdown
Under speed prealarm
Under speed return
Over speed shutdown
Over speed prealarm
Over speed return
Shutdown delay time
ENGINE PLANT BATTERY
Under voltage
Under voltage return
Under voltage delay
Over voltage
Over voltage return
Over voltage delay
Charge alt. voltage
CANBUS ECU
CanBus ECU
CanBus error set
Maintenance
Load test
Baud rate
J1939 ECU type
Device address
Engine cont. address
ECU remote control
Speed control enable
Oil Pres cont. enab
Temp. control enable
Speed set point
Speed correction
CANBUS ERROR SET
CAN fault actions
CAN fault activation
CAN fault delay
Amber warn.actions
Amber warn.activation
Amber warn.delay
Red stop actions
Red stop activation
Red stop delay
ENGINE MAINTENANCE
Running hour interval
Maint. date interval
Engine stp when maint
Eng run. hour(lsb)
Eng running hour
Eng running hour(msb)
Maintenance okay
LOAD TEST
Disable/enable select
EXERCISE
Period
Day of week
Start time
ENGINE GENERAL
Gas/diesel selection
Stop solenoid time
Ignition delay
Gas valve delay
Min. ignition speed
TECHNICIAN SETTING
Inputs
Outputs
Timers
Expansion modules
INPUTS
Sender inputs
Sender linearisations
Conf. input-1
Conf. input-2
SENDER INPUTS
Oil pressure unit
Oil press. input type
Oil pressure prealarm
Oil pressure return
Nominal speed
1500 RPM
Over speed shutdown
DISBL
Under voltage
10.0 Vdc
Over voltage return
29.5 Vdc
Baud rate
4
ECU remote control
DISBL
Speed set point
1500 RPM
CAN fault actions
DISBL
Amber warn.activation
2
Red stop delay
2 SEC
Running hour interval
5000 HOUR
Eng running hour
0
Disable/enable select
DISBL
Period
30 MIN
Gas/diesel selection
DIESL
Min. ignition speed
200 RPM
Oil pressure unit
Bar

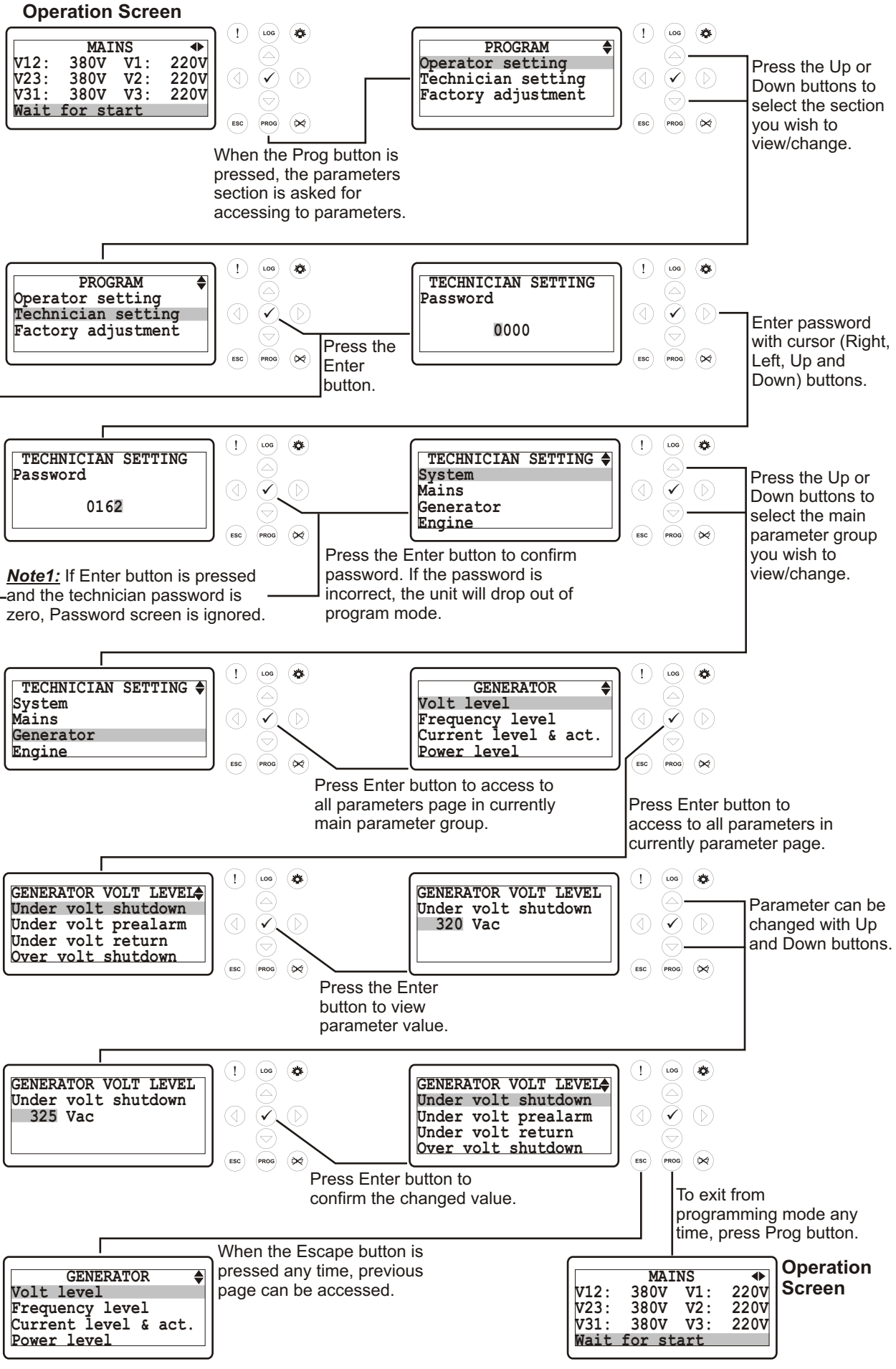

INPUTS
Sender inputs
Sender linearisations
Conf. input-1
Conf. input-2
SENDER INPUTS
Oil pressure shutdown
Temperature unit
Temp. input type
High temp.prealarm
SENDER INPUTS
Oil press. shutdown
1.0 Bar
SENDER INPUTS
Oil pressure shutdown
Temperature unit
Temp. input type
High temp.prealarm
SENDER INPUTS
High temp. return
High temp. shutdown
Low temp. warning
Level input type
SENDER INPUTS
High temp. return
88 °C
SENDER INPUTS
High temp. return
High temp. shutdown
Low temp. warning
Level input type
SENDER INPUTS
Low level prealarm
Low level return
Low level shutdown
Fuel pump on
SENDER INPUTS
Low level prealarm
DISBL
SENDER INPUTS
Low level prealarm
Low level return
Low level shutdown
Fuel pump on
SENDER INPUTS
Fuel pump off
Oil temperature unit
Oil temp. input type
Oil temp.high preal
SENDER INPUTS
Fuel pump off
75 %
SENDER INPUTS
Fuel pump off
Oil temperature unit
Oil temp. input type
Oil temp.high preal
SENDER INPUTS
Oil temp.high return
Oil temp.high shutdwn
SENDER INPUTS
Oil temp.high return
88 °C
SENDER INPUTS
Oil temp.high return
Oil temp.high shutdwn
SENDER LINEARISATION
Oil pressure sender 1
Oil pressure 1
Oil pressure sender 2
Oil pressure 2
SENDER LINEARISATION
Oil pressure sender 1
10 R
SENDER LINEARISATION
Oil pressure sender 1
Oil pressure 1
Oil pressure sender 2
Oil pressure 2
SENDER LINEARISATION
Oil pressure sender 3
Oil pressure 3
Oil pressure sender 4
Oil pressure 4
SENDER LINEARISATION
Oil pressure sender 3
62 R
SENDER LINEARISATION
Oil pressure sender 3
Oil pressure 3
Oil pressure sender 4
Oil pressure 4
SENDER LINEARISATION
Oil pressure sender 5
Oil pressure 5
Oil pressure sender 6
Oil pressure 6
SENDER LINEARISATION
Oil pressure sender 5
111 R
SENDER LINEARISATION
Oil pressure sender 5
Oil pressure 5
Oil pressure sender 6
Oil pressure 6
SENDER LINEARISATION
Oil pressure sender 7
Oil pressure 7
Oil pressure sender 8
Oil pressure 8
SENDER LINEARISATION
Oil pressure sender 7
156 R
SENDER LINEARISATION
Oil pressure sender 7
Oil pressure 7
Oil pressure sender 8
Oil pressure 8
SENDER LINEARISATION
Oil pressure sender 9
Oil pressure 9
Oil press. sender 10
Oil pressure 10
SENDER LINEARISATION
Oil pressure sender 9
205 R
SENDER LINEARISATION
Oil pressure sender 9
Oil pressure 9
Oil press. sender 10
Oil pressure 10
SENDER LINEARISATION
Temperature sender 1
Temperature 1
Temperature sender 2
Temperature 2
SENDER LINEARISATION
Temperature sender 1
360 R
SENDER LINEARISATION
Temperature sender 1
Temperature 1
Temperature sender 2
Temperature 2
SENDER LINEARISATION
Temperature sender 3
Temperature 3
Temperature sender 4
Temperature 4
SENDER LINEARISATION
Temperature sender 3
145 R
SENDER LINEARISATION
Temperature sender 3
Temperature 3
Temperature sender 4
Temperature 4
SENDER LINEARISATION
Temperature sender 5
Temperature 5
Temperature sender 6
Temperature 6
SENDER LINEARISATION
Temperature sender 5
50 R
SENDER LINEARISATION
Temperature sender 5
Temperature 5
Temperature sender 6
Temperature 6
SENDER LINEARISATION
Temperature sender 7
Temperature 7
Temperature sender 8
Temperature 8
SENDER LINEARISATION
Temperature sender 7
43 R
SENDER LINEARISATION
Temperature sender 7
Temperature 7
Temperature sender 8
Temperature 8
SENDER LINEARISATION
Temperature sender 9
Temperature 9
Temperature sender 10
Temperature 10
SENDER LINEARISATION
Temperature sender 9
10 R
SENDER LINEARISATION
Temperature sender 9
Temperature 9
Temperature sender 10
Temperature 10
SENDER LINEARISATION
Level sender 1
Level 1
Level sender 2
Level 2
SENDER LINEARISATION
Level sender 1
10 R
SENDER LINEARISATION
Level sender 1
Level 1
Level sender 2
Level 2
SENDER LINEARISATION
Level sender 3
Level 3
Level sender 4
Level 4
SENDER LINEARISATION
Level sender 3
40 R
SENDER LINEARISATION
Level sender 3
Level 3
Level sender 4
Level 4


SENDER LINEARISATION
Level sender 5
Level 5
Level sender 6
Level 6
Level 80 R
SENDER LINEARISATION
Level sender 7
Level 7
Level sender 8
Level 8
Level 140 R
SENDER LINEARISATION
Level sender 9
Level 9
Level sender 10
Level 10
Level 185 R
SENDER LINEARISATION
Oil temp. sender 1
Oil temperature 1
Oil temp. sender 2
Oil temperature 2
Oil temp. 360 R
SENDER LINEARISATION
Oil temp. sender 3
Oil temperature 3
Oil temp. sender 4
Oil temperature 4
Oil temp. 145 R
SENDER LINEARISATION
Oil temp. sender 5
Oil temperature 5
Oil temp. sender 6
Oil temperature 6
Oil temp. 50 R
SENDER LINEARISATION
Oil temp. sender 7
Oil temperature 7
Oil temp. sender 8
Oil temperature 8
Oil temp. 43 R
SENDER LINEARISATION
Oil temp. sender 9
Oil temperature 9
Oil temp. sender 10
Oil temperature 10
Oil temp. 10 R
INPUTS
Sender inputs
Sender linearisations
Conf. input-1
Conf. input-2
CONF. INPUT-1
Dis,user conf.or list
Polarity
Indication
Activation
Dis,user conf.or list 1
Select from list
Active delay
Select from list 2-AUX. MAINS FAIL
CONF. INPUT-2
Select from list 3-SIM.LAMP TEST BUT
Conf. input-3
Conf. input-4
Conf. input-5
Conf. input-6
CONF. INPUT-3
Select from list 4-SIM.HORN REST BUT
Conf. input-7
Conf. Exp. input-1
Conf. Exp. input-2
Conf. Exp. input-3
CONF. INPUT-7
Select from list 8-SIMULATE MAN. BUT
Conf. Exp. input-4
Conf. Exp. input-5
Conf. Exp. input-6
Conf. Exp. input-7
CONF. EXP. INPUT-4
Hardware type
Activation 2


TECHNICIAN SETTING
Inputs
Outputs
Timers
Expansion modules
INPUTS
Conf. Exp. input-8
CONF. EXP. INPUT-8
Dis,user conf.or list
Hardware type
Polarity
Indication
Activation
Select from list
Active delay
OUTPUTS
Conf. output-1
Conf. output-2
Conf. output-3
Conf. output-4
Conf. output-5
Conf. output-6
Conf. Exp. output-1
Conf. Exp. output-2
Conf. Exp. output-3
Conf. Exp. output-4
Conf. Exp. output-5
Conf. Exp. output-6
Conf. Exp. output-7
Conf. Exp. output-8
CONF. OUTPUT-1
Polarity
Function
CONF. OUTPUT-5
CONF. EXP. OUTPUT-3
CONF. EXP. OUTPUT-5
TIMERS
Start timers
Stopping timers
START TIMERS
Mains transient delay
Mains fail start dely
Remote start delay
Pre-heat
Pre-heat bypass
Safety on delay
Warming up time
Warmup time
Horn duration
Charg.excitation time
Cooling fan time
Idle mode time
Idle mode time off
STOPPING TIMERS
Mains return delay
Remote stop delay
Cooling time
Fail to stop delay
EXPANSION MODULES
IO (1-8)
Dial-up & Ethernet
GSM
GPRS
Dual set
IO (1-8) MODULE
DIAL-UP & ETHERNET
GSM MODULE
GPRS MODULE
DUAL SET MODULE
Disable/enable select
Call back selection
SMS
Node ID
Working period
Early start time
Remote priority selct
USER ADJUSTMENT
Mains voltage offset
Gen. voltage offset
Current offset
Battery&chrg gen.vol
MAINS VOLTAGE OFFSET
Mains V1 offset
Mains V2 offset
Mains V3 offset
Dis,user conf.or list
1
Activation
2
Polarity
NO
Mains transient delay
2.0 SEC
Pre-heat bypass
0 MIN
Charg.excitation time
15 SEC
Mains return delay
5 SEC
Disable/enable select
DISBL
Remote priority selct
0 Vac


USER ADJUSTMENT
Mains voltage offset
Gen. voltage offset
Current offset
Battery&chrg gen.vol
GEN. VOLTAGE OFFSET
Gen. V1 offset
Gen. V2 offset
Gen. V3 offset
GEN. VOLTAGE OFFSET
Gen. V1 offset
0 Vac
GEN. VOLTAGE OFFSET
Gen. V1 offset
Gen. V2 offset
Gen. V3 offset
USER ADJUSTMENT
Mains voltage offset
Gen. voltage offset
Current offset
Battery&chrg gen.vol
CURRENT OFFSET
Current I1 offset
Current I2 offset
Current I3 offset
Earth current offset
CURRENT OFFSET
Current I1 offset
0 A
CURRENT OFFSET
Current I1 offset
Current I2 offset
Current I3 offset
Earth current offset
USER ADJUSTMENT
Mains voltage offset
Gen. voltage offset
Current offset
Battery&chrg gen.vol
BATTERY&CHRG GEN.VOL
Battery V offset
Charge gen. V offset
BATTERY&CHRG GEN.VOL
Battery V offset
0.0 Vdc
BATTERY&CHRG GEN.VOL
Battery V offset
Charge gen. V offset
USER ADJUSTMENT
Sender inputs offset
SENDER INPUTS OFFSET
Oil pressure offset
Temperature offset
Level offset
Oil temper. offset
SENDER INPUTS OFFSET
Oil pressure offset
0.0 Bar
SENDER INPUTS OFFSET
Oil pressure offset
Temperature offset
Level offset
Oil temper. offset

3.4 Changing And Saving Parameters Values



4. Parameters

4.1 Operator Parameters

4.1.1 Mains

MAINS VOLT LEVEL (*Mains->Volt level*)		Min	Max	Default	Unit
Under volt trip	Mains Under Voltage	60	600	320	V~
Under volt return	Mains Under Voltage Return	60	600	340	V~
Over volt trip	Mains Over Voltage	60	600	440	V~
Over volt return	Mains Over Voltage Return	60	600	420	V~

MAINS FREQ. LEVEL (*Mains->*Frequency *level*)		Min	Max	Default	Unit
Under freq trip	Mains Under Frequency	20.0	75.0	45.0	Hz
Under freq return	Mains Under Frequency Return	20.0	75.0	48.0	Hz
Over freq trip	Mains Over Frequency	20.0	75.0	55.0	Hz
Over freq return	Mains Over Frequency Return	20.0	75.0	52.0	Hz

4.1.2 Generator

GENERATOR VOLT LEVEL (*Generator->Volt level*)		Min	Max	Default	Unit
Under volt shutdown	Generator Under Voltage Shutdown	60(dis)	600	320	V~
Under volt prealarm	Generator Under Voltage Pre-Alarm	60(dis)	600	340	V~
Under volt return	Generator Under Voltage Pre-Alarm Return	60	600	350	V~
Over volt shutdown	Generator Over Voltage Shutdown	60	600	440	V~
Over volt prealarm	Generator Over Voltage Pre-Alarm	60(dis)	600	420	V~
Over volt return	Generator Over Voltage Pre-Alarm Return	60	600	400	V~
Shutdown delay time	Generator Voltage Shutdown Delay Time	0.0	10.0	1.0	Sec

GENERATOR FREQ LEVEL (*Generator->Frequency level*)		Min	Max	Default	Unit
Nominal frequency	Nominal Alternator Frequency	30.0	75.0	50.0	Hz
Under freq shutdown	Generator Under Frequency Shutdown	30.0(dis)	75.0	43.0	Hz
Under freq prealarm	Generator Under Frequency Pre-Alarm	30.0(dis)	75.0	45.0	Hz
Under freq return	Generator Under Frequency Pre-Alarm Return	30.0	75.0	46.0	Hz
Over freq shutdown	Generator Over Frequency Shutdown	30.0(dis)	75.0	58.0	Hz
Over freq prealarm	Generator Over Frequency Pre-Alarm	30.0(dis)	75.0	55.0	Hz
Over freq return	Generator Over Frequency Pre-Alarm Return	30.0	75.0	54.0	Hz
Shutdown delay time	Generator Frequency Shutdown Delay Time	0.0	10.0	1.0	Sec

GENERATOR CUR LEVEL (*Generator->Current level*)		Min	Max	Default	Unit
Under cur set	Generator Under Current Set	0	9999	1	A~
Under cur prealarm	Generator Under Current Pre-Alarm	0(dis)	9999	dis	A~
Under cur return	Generator Under Current Pre-Alarm Return	0	9999	5	A~
Over cur set	Generator Over Current Set	0	9999	9999	A~
Over cur prealarm	Generator Over Current Pre-Alarm	0(dis)	9999	9990	A~
Over cur return	Generator Over Current Pre-Alarm Return	0	9999	9980	A~

Note: dis = disable

GEN POWER LEVEL (*Generator->Power level*)		Min	Max	Default	Unit
Under power shutdown	Generator Under Power Shutdown	0(dis)	9999	dis	kVA
Under power prealarm	Generator Under Power Pre-Alarm	0(dis)	9999	dis	kVA
Under power return	Generator Under Power Pre-Alarm Return	0	9999	5	kVA
Over power shutdown	Generator Over Power Shutdown	0(dis)	9999	dis	kVA
Over power prealarm	Generator Over Power Pre-Alarm	0(dis)	9999	dis	kVA
Over power return	Generator Over Power Pre-Alarm Return	0	9999	0	kVA
Shutdown delay time	Generator Power Shutdown Delay Time	0	99	2	Sec

GEN WORKING CALENDAR (*Generator->Working calendar*)		Min	Max	Default	Unit
Disable/enable select	Working Calendar Disable or Enable	DISBL/ENABL		DISBL	
Start time on monday	Working Calendar Work Start Time on Monday	0.00	23.59	0.00	H.Min
Stop time on monday	Working Calendar Work Stop Time on Monday	0.00	23.59	23.59	H.Min
Start time on tues.	Working Calendar Work Start Time on Tuesday	0.00	23.59	0.00	H.Min
Stop time on tuesday	Working Calendar Work Stop Time on Tuesday	0.00	23.59	23.59	H.Min
Start time on wednes.	Working Calendar Work Start Time on Wednesday	0.00	23.59	0.00	H.Min
Stop time on wednes.	Working Calendar Work Stop Time on Wednesday	0.00	23.59	23.59	H.Min
Start time on thurs.	Working Calendar Work Start Time on Thursday	0.00	23.59	0.00	H.Min
Stop time on thursday	Working Calendar Work Stop Time on Thursday	0.00	23.59	23.59	H.Min
Start time on friday	Working Calendar Work Start Time on Friday	0.00	23.59	0.00	H.Min
Stop time on friday	Working Calendar Work Stop Time on Friday	0.00	23.59	23.59	H.Min
Start time on satur.	Working Calendar Work Start Time on Saturday	0.00	23.59	0.00	H.Min
Stop time on saturday	Working Calendar Work Stop Time on Saturday	0.00	23.59	23.59	H.Min
Start time on sunday	Working Calendar Work Start Time on Sunday	0.00	23.59	0.00	H.Min
Stop time on sunday	Working Calendar Work Stop Time on Sunday	0.00	23.59	23.59	H.Min

Please enter the days of the weekly workdays for Working Function. Example:

Disable/enable select DISBL The working calendar is disable
ENABL The working calendar is enable

Start time on monday 08.30 The working function is every Monday started at 08.30 o'clock (if it is enabled)

Stop time on monday 17.30 The working function is every Monday stopped at 17.30 o'clock (if it is enabled)

Start time on tues. 08.30 The working function is every Tuesday started at 08.30 o'clock (if it is enabled)

Stop time on tuesday 17.30 The working function is every Tuesday stopped at 17.30 o'clock (if it is enabled)

Start time on wednes. 08.30 The working function is every Wednesday started at 08.30 o'clock (if it is enabled)

Stop time on wednes. 17.30 The working function is every Wednesday stopped at 17.30 o'clock (if it is enabled)

Start time on thurs. 08.30 The working function is every Thursday started at 08.30 o'clock (if it is enabled)

Stop time on thursday 17.30 The working function is every Thursday stopped at 17.30 o'clock (if it is enabled)

Start time on friday 08.30 The working function is every Friday started at 08.30 o'clock (if it is enabled)

Stop time on friday 17.30 The working function is every Friday stopped at 17.30 o'clock (if it is enabled)

Start time on satur. 08.30 The working function is every Saturday started at 08.30 o'clock (if it is enabled)

Stop time on saturday 17.30 The working function is every Saturday stopped at 17.30 o'clock (if it is enabled)

Start time on sunday 08.30 The working function is every Sunday started at 08.30 o'clock (if it is enabled)

Stop time on sunday 17.30 The working function is every Sunday stopped at 17.30 o'clock (if it is enabled)

4.2 Technician Parameters

4.2.1 System

SYSTEM NETWORK (*System->Network*)		Min	Max	Default	Unit
CT primary	Current Transformer Primary	0	9999	500	A~
Earth fault CT prim.	Earth Fault Current Transformer Primary	0	9999	500	A~
PT for voltage	Voltage Transformer Ratio	1	50	1	
Select AC system	Select AC system; 0- 1 Phase 2 Wire 1- 3 Phase 4 Wire 2- 1 Phase 3 Wire	0	2	1	
Phase sequence	Generator Phase Sequence (dis, L123 or L321)	DISBL, L123, L321		DISBL	
Generator kVA rating	Generator kVA rating set	0	9999	300	kVA

CT primary
The unit calculates the CT Primary value by using the formula below in relation to Current Transformer used;
(**5A** / Secondary Value(**A**)) **x** (Primary Value(**A**))

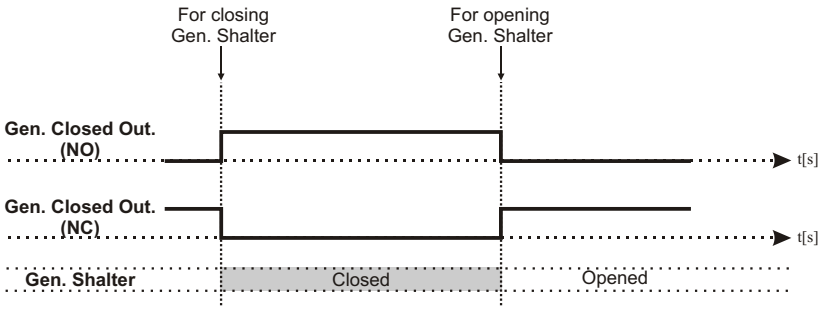
PT for voltage
Defines the scaling factor applied to voltage readout and associated fault conditions.
This PT ratio is for additional voltage transformers mounted the unit.

BREAKERS (*System->Breakers*)		Min	Max	Default	Unit
Hardw. breaker select	Hardware Breaker Selection	0	2	0	
Gen.clos.brek.con.typ	Gen Close Breaker Contact Type	NO / NC		0	
Gen.clos.brek.rel.typ	Gen Close Breaker Relay Type	NOR / PULS		0	
Gen.close timer	Gen Close Timer	1	250	5	Sec
Gen.open brek.rel.typ	Gen Open Breaker Relay Type	NOR / PULS		0	
Gen.open timer	Gen Open Timer	1	250	5	Sec
Mains cls.brek.co.typ	Mains Close Breaker Contact Type	NO / NC		0	
Mains cls.brk.re.typ	Mains Close Breaker Relay Type	NOR / PULS		0	
Mains close timer	Mains Close Timer	1	250	5	Sec
Mains open brk.re.typ	Mains Open Breaker Relay Type	NOR / PULS		0	
Mains open timer	Mains Open Timer	1	250	5	Sec
Break.clos puls time	Breaker Close Pulse Time	0.0	10.0	0.5	Sec
Break.open pulse time	Breaker Open Pulse Time	0.0	10.0	0.5	Sec
Transfer time	Transfer Time	0	250	2	Sec
Spring loading time	Spring Loading Time	1	250	3	Sec
Retry number	Retry Number	1	250	5	

Hardware Breaker Selection
0- Mains and Gen schalters have only close drives and if close drive off schalter will open. Parameters; GEN CLOSE BREAKER CONTACT TYPE, GEN CLOSE TIMER(if gen closed input selected), GEN OPEN TIMER(if gen closed input selected), MAIN CLOSE BREAKER CONTACT TYPE, MAINS CLOSE TIMER(if mains closed input selected), MAINS OPEN TIMER(if mains closed input selected), TRANSFER TIME.

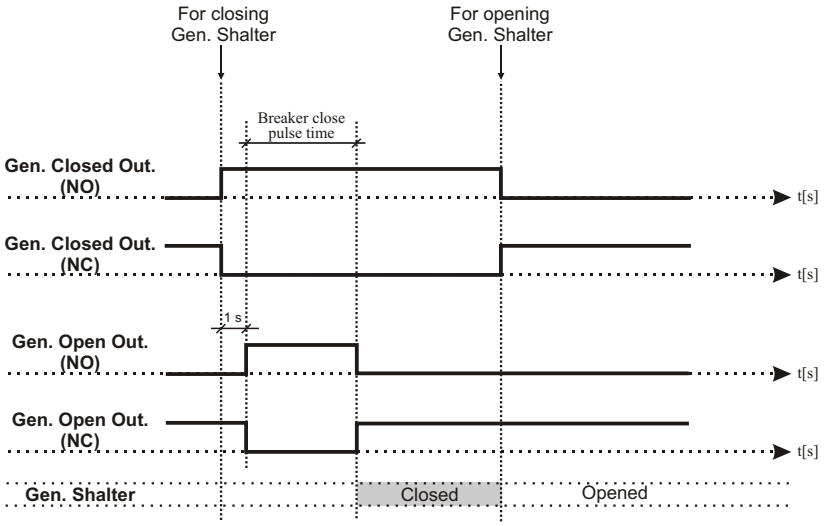
Note-1 : NO / NC : Normally Open / Normally Close
2 : NOR / PULS : Normal / Pulse

Example: If Hardware Breaker Selection parameter is selected as 0;



1- Mains and Gen schalters have only close drives, when want to schalter close, close breaker output on and after 1 sec. open breaker output on and after breaker close pulse time open breaker output will off. When want to schalter open close breaker output and open breaker output will off.
Parameters; GEN CLOSE BREAKER CONTACT TYPE, GEN CLOSE TIMER(if gen closed input selected), GEN OPEN TIMER(if gen closed input selected), MAIN CLOSE BREAKER CONTACT TYPE, MAINS CLOSE TIMER(if mains closed input selected), MAINS OPEN TIMER(if mains closed input selected),BREAKER CLOSE PULSE TIME, TRANSFER TIME.

Example: If Hardware Breaker Selection parameter is selected as 1;

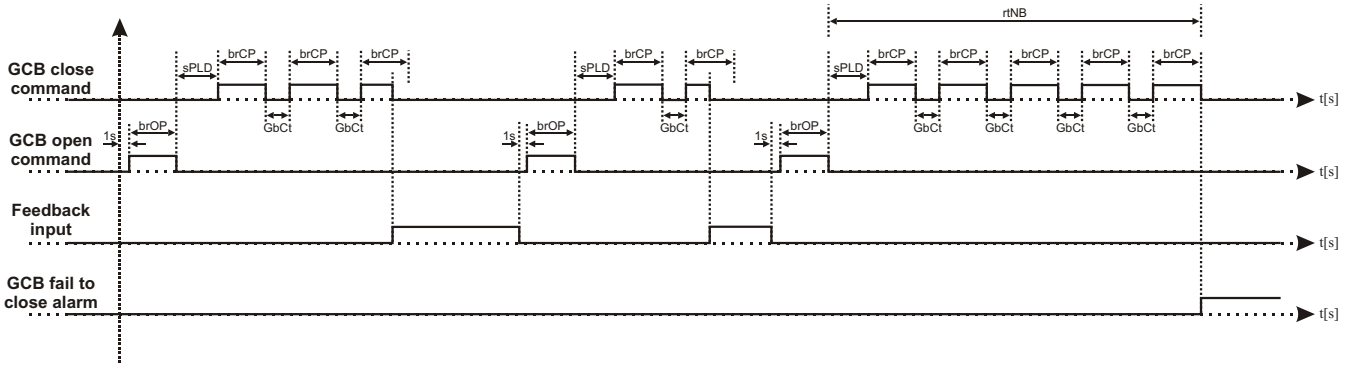


2- USER CONFIGURED: User can select all the schalter types. Used for Motorised Schalters.

Parameters; GEN CLOSE BREAKER CONTACT TYPE, GEN CLOSE BREAKER RELAY TYPE, GEN CLOSE TIMER(if gen closed input selected), GEN OPEN BREAKER RELAY TYPE, GEN OPEN TIMER(if gen closed input selected), MAIN CLOSE BREAKER CONTACT TYPE, MAIN CLOSE BREAKER RELAY TYPE, MAINS CLOSE TIMER(if mains closed input selected), MAIN OPEN BREAKER RELAY TYPE, MAINS OPEN TIMER(if mains closed input selected), BREAKER CLOSE PULSE TIME(if Gen Close Breaker Relay Type or Main Close Breaker Relay Type parameter is selected as 1), BREAKER OPEN PULSE TIME(if Gen Open Breaker Relay Type or Main Open Breaker Relay Type parameter is selected as 1), TRANSFER TIME, SPRING LOADING TIME, RETRY NUMBER.

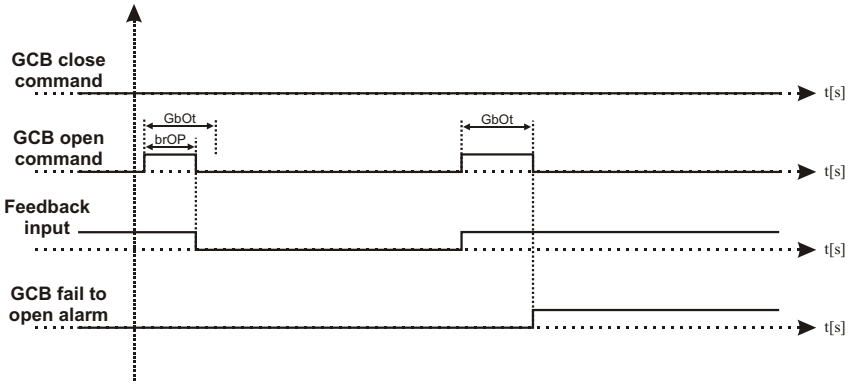
Example-1: GCB Close Diagram.
If Hardware Breaker Selection parameter is selected as 2 (user configured), Gen. Close Breaker Relay Type parameter is selected as 1 (PULSE) and Gen. Open Breaker Relay Type parameter is selected as 1 (PULSE);

GbCt: Gen close timer
brCP: Breaker close pulse time
brOP: Breaker open pulse time
sPLD: Spring loading time
rtNB: Retry number



Example-2: GCB Open Diagram.
If Hardware Breaker Selection parameter is selected as 2 (user configured), Gen. Close Breaker Relay Type parameter is selected as 1 (PULSE) and Gen. Open Breaker Relay Type parameter is selected as 1 (PULSE);

GbOt: Gen open timer
brOP: Breaker open pulse time



Gen Close Timer
This is used to monitor the closure of the generator contactor or breaker. It will only operate if an auxiliary input is configured as ‘Generator Closed Auxiliary’ and connected to the auxiliary on the generator contactor or breaker. Once a generator closed signal is issued the ‘gen close timer’ is initiated. Should the ‘Generator Closed Auxiliary’ input become active the timer the ‘gen close timer’ is cancelled. If the timer expires and the ‘Generator Closed Auxiliary’ has not become active the module will issue a ‘generator failed to close’ alarm.

Gen Open Timer
This is used to monitor the opening of the generator contactor or breaker. It will only operate if an auxiliary input is configured as ‘Generator Closed Auxiliary’ and connected to the auxiliary on the generator contactor or breaker. Once a generator open signal is issued the ‘gen open timer’ is initiated. Should the ‘Generator Closed Auxiliary’ input become in-active the timer ‘gen open timer’ is cancelled. If the timer expires and the ‘Generator Closed Auxiliary’ has not become in-active the module will issue a ‘generator failed to open’ alarm.

Mains Close Timer
This is used to monitor the closure of the mains contactor or breaker. It will only operate if an auxiliary input is configured as ‘Mains Closed Auxiliary’ and connected to the auxiliary on the mains contactor or breaker. Once a mains closed signal is issued the ‘mains close timer’ is initiated. Should the ‘Mains Closed Auxiliary’ input become active the timer the ‘mains close timer’ is cancelled. If the timer expires and the ‘Mains Closed Auxiliary’ has not become active the module will issue a ‘mains failed to close’ alarm.

Mains Open Timer
This is used to monitor the opening of the mains contactor or breaker. It will only operate if an auxiliary input is configured as 'Mains Closed Auxiliary' and connected to the auxiliary on the mains contactor or breaker. Once a mains open signal is issued the 'mains open timer' is initiated. Should the 'Mains Closed Auxiliary' input become in-active the timer the 'mains open timer' is cancelled. If the timer expires and the 'Mains closed auxiliary' has not become in-active the module will issue a 'mains failed to open' alarm.

Breaker Close Pulse Time
This is used to determine the duration of the Mains and Generator close signals. This timer is only used if Pulsed outputs are configured to be used.

Breaker Open Pulse Time
This is used to determine the duration of the Mains and Generator close signals. This timer is only used if Pulsed outputs are configured to be used.

Transfer Time
This is used to allow for fixed duration transfer breaks when switching from mains to generator and back. It can be used to ensure that the supply is removed from the load for fixed period of time to allow pumps/motors to come to rest etc.

Spring Loading Time
When the unit give open command to the (GCB or MCB) breaker and after that the unit want to give close command the same breaker, this time for between open and close commands, because if there is no delay between open and close commands can be problem the motorized switches.

Retry Number
The unit try to close (GCB or MCB) breaker number of this parameter. If each try there is no close feedback, after last try the alarm will be activated.

LCD DISPLAY (*System->LCD display*)		**Min**	**Max**	**Default**	**Unit**
Language	Laguage Selection	ENGLISH/TURKISH		ENGLISH	
Digital contrast	Digital Contrast	1	9	5	
Auto backlight off	Auto Backlight Off	ENABL/DISBL		DISBL	
Auto scroll time	Auto Scroll Time	0 (dis)	250	0	Sec
Auto scroll number	Auto Scroll Number	1	24	5	
Error mesg scroll tim	Scroll Time For Error Messages	1	250	2	Sec

Laguage Selection
Language selection: English or Turkish.

Digital Contrast
It is used to change contrast of LCD Display.

Auto Backlight Off
ENABL: If any button is not pressed during 120 secs, LCD backlight is automatically changed power safety mode.
DISBL: LCD backlight is on continuously.

Auto Scroll Time
The scroll time between all data display pages.

Auto Scroll Number
The number of data display pages that will be scrolled.

Scroll Time For Error Messages
Error messages are displayed the last line of LCD Display. If more than one error condition is present, each of them is displayed during time defined by Auto Scroll Timer parameter.

Note: dis = disable

COMMUNICATION (*System->Communication*)		Min	Max	Default	Unit
Slave address	Slave Address	1	247	1	
Baud rate	Baud Rate 0 - 1200 baud 1 - 2400 baud 2 - 4800 baud 3 - 9600 baud 4 - 19200 baud 5 - 38400 baud	0	5	3	
Parity	Parity 0 - NONE 1 - ODD 2 - EVEN	0	2	0	
Stop bit	Stop Bit (0-> 1 stop bit,1-> 2 stop bit)	0	1	0	

DATE & TIME SET (*System->Date & time set*)		Min	Max	Default	Unit
Year	Year	0	99		
Month	Month	1	12		
Date	Date	1	31		
Day	Day of week	1	7		
Hour	Hour	0	23		
Minute	Minute	0	59		
Second	Second	0	59		

DEFAULT SETTINGS (*System->Default settings*)		Min	Max	Default	Unit
Save setting to def.	Save setting to default	YES / NO		NO	
Reset default sets	Reset default sets	YES / NO		NO	
Reset factory sets	Reset factory sets	YES / NO		NO	

Save setting to default
If this parameter is selected as “Yes”, the unit’s currently parameters save as default sets.
After this parameter is reset automatically to “No”.

Reset default sets
If this parameter is selected as “Yes”, the unit’s parameters back to default sets.
After this parameter is reset automatically to “No”.

Reset factory sets
If this parameter is selected as “Yes”, the unit’s parameters back to factory sets.
After this parameter is reset automatically to “No”.

PASSWORD SETTINGS (*System->Password settings*)		Min	Max	Default	Unit
Operator password	Operator Password	0	9999	0	
Technician password	Technician Password	0	9999	0	

Operator Password
Use this option to change the Operator password. This password allows access to operator parameters section.

Technician Password
Use this option to change the Technician password. It allows access to both operator and technician parameters section.

Note: dis = disable

4.2.2 Mains

MAINS VOLT LEVEL (*Mains->Volt level*)		Min	Max	Default	Unit
Under volt trip	Mains Under Voltage	60	600	320	V~
Under volt return	Mains Under Voltage Return	60	600	340	V~
Over volt trip	Mains Over Voltage	60	600	440	V~
Over volt return	Mains Over Voltage Return	60	600	420	V~

MAINS FREQ. LEVEL (*Mains->Frequency level*)		Min	Max	Default	Unit
Under freq trip	Mains Under Frequency	20.0	75.0	45.0	Hz
Under freq return	Mains Under Frequency Return	20.0	75.0	48.0	Hz
Over freq trip	Mains Over Frequency	20.0	75.0	55.0	Hz
Over freq return	Mains Over Frequency Return	20.0	75.0	52.0	Hz

MAINS ACTIONS (*Mains->Actions*)		Min / Max	Default	Unit
Mains failure detect	Mains Failure Detection En/Dis	ENABL/DISBL	ENABL	
Mains fail.-stop mode	Look Mains Failure at Stop Mode En/Dis	ENABL/DISBL	ENABL	

Mains Failure Detection En/Dis
ENABLE: The module will monitor the incoming AC mains supply. Should the supply go out side of limits the module will initiate its automatic mains failure sequence.
DISABLE: The module will not monitor the AC mains supply for failure. The AC mains instrumentation will still be active however.

Look Mains Failure at Stop Mode En/Dis
ENABLE: As soon as the module detects a mains failure the mains contactor or breaker relay will be opened to remove the supply from the load. This is to prevent damage to the load in case of single-phase failure, especially useful if the load is a 3-phase motor or pump. The supply to the load will then be fed from the gen-set once it is available. In the event of generator failure the module will open the generator relay and remove the supply to the load until either the mains supply is restored or the generator is restarted.
DISABLE: In the event of a mains failure the unit will attempt to maintain the supply to the load for the incoming AC mains supply until the generator is available to go on load. In the event of a generator failure the module will default back to the incoming AC mains supply. This provides a 'fail-safe system', ensuring that in the event of a system failure the load will still be fed from the AC mains supply.

4.2.3 Generator

GENERATOR VOLT LEVEL (*Generator->Volt level*)		Min	Max	Default	Unit
Under volt shutdown	Generator Under Voltage Shutdown	60(dis)	600	320	V~
Under volt prealarm	Generator Under Voltage Pre-Alarm	60(dis)	600	340	V~
Under volt return	Generator Under Voltage Pre-Alarm Return	60	600	350	V~
Over volt shutdown	Generator Over Voltage Shutdown	60	600	440	V~
Over volt prealarm	Generator Over Voltage Pre-Alarm	60(dis)	600	420	V~
Over volt return	Generator Over Voltage Pre-Alarm Return	60	600	400	V~
Shutdown delay time	Generator Voltage Shutdown Delay Time	0.0	10.0	1.0	Sec

GENERATOR FREQ LEVEL (*Generator->Frequency level*)		Min	Max	Default	Unit
Nominal frequency	Nominal Alternator Frequency	30.0	75.0	50.0	Hz
Under freq shutdown	Generator Under Frequency Shutdown	30.0(dis)	75.0	43.0	Hz
Under freq prealarm	Generator Under Frequency Pre-Alarm	30.0(dis)	75.0	45.0	Hz
Under freq return	Generator Under Frequency Pre-Alarm Return	30.0	75.0	46.0	Hz
Over freq shutdown	Generator Over Frequency Shutdown	30.0(dis)	75.0	58.0	Hz
Over freq prealarm	Generator Over Frequency Pre-Alarm	30.0(dis)	75.0	55.0	Hz
Over freq return	Generator Over Frequency Pre-Alarm Return	30.0	75.0	54.0	Hz
Shutdown delay time	Generator Frequency Shutdown Delay Time	0.0	10.0	1.0	Sec

GEN CUR LEVEL & ACT (*Generator->Current level & act.*)		Min	Max	Default	Unit
Under cur set	Generator Under Current Set	0	9999	1	A~
Under cur prealarm	Generator Under Current Pre-Alarm	0(dis)	9999	dis	A~
Under cur return	Generator Under Current Pre-Alarm Return	0	9999	5	A~
Under cur act.	Generator Under Current Actions 0 - Disable 1 - Warning (Alarm Only, No Shutdown) 2 - Electrical Trip (Alarm/Off Load Generator Followed By Shutdown After Cooling) 3 - Shutdown (Alarm And Shutdown)	0(dis)	3	dis	
Under act. delay time	Generator Under Current Actions Delay Time	0	99	2	Sec
Over cur set	Generator Over Current Set	0	9999	9999	A~
Over cur prealarm	Generator Over Current Pre-Alarm	0(dis)	9999	9990	A~
Over cur return	Generator Over Current Pre-Alarm Return	0	9999	9980	A~
Over cur act.	Generator Over Current Actions 0 - Disable 1 - Warning (Alarm Only, No Shutdown) 2 - Electrical Trip (Alarm/Off Load Generator Followed By Shutdown After Cooling) 3 - Shutdown (Alarm And Shutdown)	0(dis)	3	dis	
Over act. delay time	Generator Over Current Actions Delay Time	0	99	2	Sec
Short circuit cur	Generator Short Circuit Current Set	0	9999	9999	A~
Earth fault cur	Generator Earth Fault Current Set	0	9999	100	A~
Earth fault cur act.	Generator Earth Fault Current Actions 0 - Disable 1 - Warning (Alarm Only, No Shutdown) 2 - Electrical Trip (Alarm/Off Load Generator Followed By Shutdown After Cooling) 3 - Shutdown (Alarm And Shutdown)	0(dis)	3	dis	
E.F.Act. delay time	Generator Earth Fault Current Actions Delay Time	0	99	2	Sec

GEN POWER LEVEL (*Generator->Power level*)		Min	Max	Default	Unit
Under power shutdown	Generator Under Power Shutdown	0(dis)	9999	dis	kVA
Under power prealarm	Generator Under Power Pre-Alarm	0(dis)	9999	dis	kVA
Under power return	Generator Under Power Pre-Alarm Return	0	9999	5	kVA
Over power shutdown	Generator Over Power Shutdown	0(dis)	9999	dis	kVA
Over power prealarm	Generator Over Power Pre-Alarm	0(dis)	9999	dis	kVA
Over power return	Generator Over Power Pre-Alarm Return	0	9999	0	kVA
Shutdown delay time	Generator Power Shutdown Delay Time	0	99	2	Sec

GEN WORKING CALENDAR (*Generator->Working calendar*)		Min	Max	Default	Unit
Disable/enable select	Working Calendar Disable or Enable	DISBL/ENABL		DISBL	
Start time on monday	Working Calendar Work Start Time on Monday	0.00	23.59	0.00	H.Min
Stop time on monday	Working Calendar Work Stop Time on Monday	0.00	23.59	23.59	H.Min
Start time on tues.	Working Calendar Work Start Time on Tuesday	0.00	23.59	0.00	H.Min
Stop time on tuesday	Working Calendar Work Stop Time on Tuesday	0.00	23.59	23.59	H.Min
Start time on wednes.	Working Calendar Work Start Time on Wednesday	0.00	23.59	0.00	H.Min
Stop time on wednes.	Working Calendar Work Stop Time on Wednesday	0.00	23.59	23.59	H.Min
Start time on thurs.	Working Calendar Work Start Time on Thursday	0.00	23.59	0.00	H.Min
Stop time on thursday	Working Calendar Work Stop Time on Thursday	0.00	23.59	23.59	H.Min
Start time on friday	Working Calendar Work Start Time on Friday	0.00	23.59	0.00	H.Min
Stop time on friday	Working Calendar Work Stop Time on Friday	0.00	23.59	23.59	H.Min
Start time on satur.	Working Calendar Work Start Time on Saturday	0.00	23.59	0.00	H.Min
Stop time on saturday	Working Calendar Work Stop Time on Saturday	0.00	23.59	23.59	H.Min
Start time on sunday	Working Calendar Work Start Time on Sunday	0.00	23.59	0.00	H.Min
Stop time on sunday	Working Calendar Work Stop Time on Sunday	0.00	23.59	23.59	H.Min

GENERATOR GENERAL (*Generator->General*)		Min	Max	Default	Unit
Sens.option gen.freq	Sensing Options Generator Frq En/Dis	ENABL/DISBL		ENABL	
Sens.opt.pickup&flywh	Sensing Opt Pickup En/Dis & Flywheel	0(dis)	1000	DISBL	
All warning are latch	All Warnings Are Latched En/Dis	ENABL/DISBL		DISBL	

Sensing Options Generator Frq En/Dis
ENABLE: Speed sensing will be derived from the generator output frequency.
DISABLE: Speed sensing not will be derived from the generator output frequency.

Sensing Options Pickup En/Dis & Flywheel
DISABLE: Speed sensing will not be derived from the magnetic pickup.
1-1000: Speed sensing will be derived from the magnetic pickup and the number is flywheel teeth on the engine.

All Warnings Are Latched En/Dis
ENABLE: Warnings and pre-alarms will latched when triggered. To reset the alarm either an external reset must be applied to one of the inputs or the 'Reset' pushbutton operated, once the triggering condition has cleared.
DISABLE: Normal operation, the warnings and pre-alarms (except spare inputs, because they have their latching or non-latching selections) will automatically reset once the triggering condition has cleared.

4.2.4 Engine

ENGINE START OPTIONS (*Engine->Starting options*)		Min	Max	Default	Unit
Au. alarm prior start	Audible Alarm Prior To Starting En/Dis	ENABL/DISBL		DISBL	
Numbr of crank attemp	Number Of Start Attempts	1	10	3	
Cranking time	Cranking Time	1	99	5	Sec
Crank rest time	Crank Rest Time	5	99	10	Sec
Pickup sens fail dely	Pickup Sensor Fail Delay(Pickup)	0.1	10.0	1.0	Sec

Audible Alarm Prior To Starting En/Dis
ENABLE: The audible alarm will sound before the engine starts. The sounder will become active once the start delay is initialised, it will remain active until either the engine reaches crank disconnect speed or pre-heat timers are cancelled.

Number Of Start Attempts
This value is the number of times the module will attempt to start the generator. Should the generator start the module will not attempt further starts. If the generator does not start after the final attempt, the module will give a ‘Fail to start’ alarm.

Cranking Time
This is the maximum amount of time that the module will energise the starter motor for during starting attempts once the starter has engaged.

Crank Rest Time
This is the amount of time the module will wait for between start attempts. This is to allow the starter motor to cool and the starter batteries to recover.

ENG. CRANK DISCONNECT (*Engine->Crank disconnect*)		Min	Max	Default	Unit
Generator frequency	Crank Disconnect On Gen. Frequency	25.0	75.0	30.0	Hz
Engine speed	Crank Disconnect On Engine RPM	500	6000	500	RPM
Generator voltage	Crank Disconnect On Gen. Voltage	60 (dis)	600	300	V~
Charge alt. voltage	Crank Disconnect On Charge Alt. Voltage	6.0 (dis)	30.0	dis	V⎓
Oil pressure	Crank Disconnect On Oil Pressure	1.0 (dis)	60.0	dis	BAR

Note: dis = disable

The parameters in this page are used for engine started signals. If any of the selected signals appears, the unit assumes that the engine has started.

Crank Disconnect On Gen. Frequency
If the generator frequency over than 30.0 Hz, the unit assumes that the engine has started and the unit stop cranking.

Crank Disconnect On Engine RPM
If the generator speed over than 500 Rpm, the unit assumes that the engine has started and the unit stop cranking.

Crank Disconnect On Gen. Voltage
If the generator voltage over than 300 Vac, the unit assumes that the engine has started and the unit stop cranking.

Crank Disconnect On Charge Alt. Voltage
If the charge alternator voltage over than 6.1 Vdc, the unit assumes that the engine has started and the unit stop cranking. **Note:** If the charge generator input (terminal #35) is disconnect, this parameter selected as disabled (6.0 Vdc).

Crank Disconnect On Oil Pressure
If the oil pressure sender over than this value or the oil pressure digital input (terminal #31) is not switched to -Battery, the unit assumes that the engine has started and the unit stop cranking.

ENGINE SPEED SETS (*Engine->Speed settings*)		**Min**	**Max**	**Default**	**Unit**
Nominal speed	Nominal Speed	500	5000	1500	RPM
Under speed shutdown	Engine Under Speed Shutdown	500(dis)	5000	dis	RPM
Under speed prealarm	Engine Under Speed Prealarm	500(dis)	5000	dis	RPM
Under speed return	Engine Under Speed Prealarm Return	500	5000	500	RPM
Over speed shutdown	Engine Over Speed Shutdown	500(dis)	5000	dis	RPM
Over speed prealarm	Engine Over Speed Prealarm	500(dis)	5000	dis	RPM
Over speed return	Engine Over Speed Prealarm Return	500	5000	500	RPM
Shutdown delay time	Engine Speed Shutdown Delay Time	0.0	10.0	1.0	Sec

The parameters in this page are used for the generator speed low and high alarms.

ENGINE PLANT BATTERY (*Engine->Plant battery*)		**Min**	**Max**	**Default**	**Unit**
Under voltage	Battery Undervolts Warning	6.0(dis)	30.0	10.0	V⎓
Under voltage return	Battery Undervolts Warning Return	6.0	30.0	10.5	V⎓
Under voltage delay	Battery Undervolts Volts Delay	0.0	9.9	1.0	Sec
Over voltage	Battery Overvolts Warning	6.0(dis)	30.0	30.0	V⎓
Over voltage return	Battery Overvolts Warning Return	6.0	30.0	29.5	V⎓
Over voltage delay	Battery Overvolts Delay	0.0	9.9	1.0	Sec
Charge alt. warning	Charge Alternator Warning	6.0(dis)	30.0	dis	V⎓

The parameters in this page are used for the battery voltage low and high alarms and the charge alternator voltage warning.

Note: dis = disable

CANBUS ECU (*Engine->CanBus ECU*)		Min	Max	Default	Unit
Baud rate	Baud Rate: 0 - 20 1 - 50 2 - 100 3 - 125 4 - 250 5 - 500 6 - 800 7 - 1.000	0	7	4	kBaud
J1939 ECU type	J1939 ECU Type Selection: 0 - Disable 1 - Standard 2 - Volvo EMS2 3 - Volvo EDC4 4 - Perkins	0(dis)	4	0	
Device address	Device Address	0	255	17	
Engine cont. address	Engine Control Address	0	255	0	
ECU remote control	ECU Remote Control via J1939	ENABL/DISBL		DISBL	
Speed control enable	Speed Control via J1939	ENABL/DISBL		DISBL	
Oil pres cont. enab	Oil Pressure Control via J1939	ENABL/DISBL		DISBL	
Temp. control enable	Coolant Temperature Control via J1939	ENABL/DISBL		DISBL	
Speed set point	Speed Set Point Selection	1500 / 1800		1500	RPM
Speed correction	Speed Correction Value	0	100	50	%

Baud Rate
It defines the used Baud rate.
Note: All participants on the CAN bus must use the same Baud rate.

J1939 ECU Type Selection
The J1939 interface of this unit can be operated with different ECUs. This parameter determines the operating mode of the used ECUs.
Note-1: If a Deutz EMR2 or a Deutz EMR3 is utilized, all settings are to be configured as described for the Volvo EDC4 in this manual. And if a Volvo EDC3 or a Volvo EMS1 is utilized, all settings are to be configured as described for the Volvo EMS2 in this manual.
Note-2: If this parameter is selected as “disable”, No messages will be sent or received.

ECU Device Address
The unit sends J1939 request and control messages with this ID. It must be changed for different ECU types according to the following table. The ECU listens only to control messages, if they are sent to the correct address.

Volvo EMS2	*Volvo EDC4*	*Perkins*
17	3	43

Note: Changing above mentioned parameter becomes only effective after restarting the unit.

Engine Control Address
This parameter configures the address of the J1939 ECU, which is controlled.

ECU Remote Control Via J1939
If this parameter is selected as “Enable”, The unit sends remote control messages to the ECU if the selected ECU type is supporting the J1939 Remote control Messages. Available messages are engine start-stop, 50/60 Hz selection or Idle mode. For some ECUs;

Parameter	Volvo EMS2	Volvo EDC4	Perkins	Standard
Remote Start	Yes	No	No	No
Remote Stop	Yes	No	No	No
50/60 Hz Selection	Yes	No	No	No
Idle Mode	Yes	No	No	No

If this parameter is selected as “Disable”, The ECU remote control via the J1939 protocol will be disabled.

Speed Control via J1939
If this parameter is selected as “Enable”, The speed sensing from J1939 ECU will be used for the speed (Rpm) failures.

Oil Pressure Control via J1939
If this parameter is selected as “Enable”, The oil pressure sensing from J1939 ECU will be used for the oil pressure failures and the engine started signal.

Coolant Temperature Control via J1939
If this parameter is selected as “Enable”, The coolant temperature sensing from J1939 ECU will be used for the coolant temperature failures.

Speed Set Point Selection (50/60 Hz)
This parameter used for to select the requested engine speed as 1500Rpm (50Hz) or 1800Rpm (60Hz). **Note:** The scenario; first change the parameter, next wait at least 5 seconds, and then start the engine.

Speed Correction Value
This parameter can be changed between 0 and 100%. The engine should change the speed as follows:

0% = rated speed – speed deviation ECU e.g. 1500 – 120 = 1380rpm
50% = rated speed e.g. = 1500rpm
100% = rated speed + speed deviation ECU e.g. 1500 + 120 = 1620rpm

CANBUS ERROR SET (*Engine->CanBus error set*)		Min	Max	Default	Unit
CAN fault actions	Can Fault Actions: 0- Disable 1- Warning Non-Latching 2- Warning (Alarm Only, No Shutdown) 3- Electrical Trip (Alarm/Off Load Generator Followed By Shutdown After Cooling) 4- Shutdown (Alarm And Shutdown)	0(dis)	4	0	
CAN fault activation	Can Fault Activation: 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	0	
CAN fault delay	Can Fault Delay	2	250	10	Sec
Amber warn.actions	J1939 Amber Warning Lamp Actions: 0- Disable 1- Warning Non-Latching 2- Warning (Alarm Only, No Shutdown) 3- Electrical Trip (Alarm/Off Load Generator Followed By Shutdown After Cooling) 4- Shutdown (Alarm And Shutdown)	0(dis)	4	0	
Amber warn.activation	J1939 Amber Warning Lamp Activation: 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
Amber warn.delay	J1939 Amber Warning Lamp Delay	0	250	2	Sec
Red stop actions	J1939 Red Stop Lamp Actions: 0- Disable 1- Warning Non-Latching 2- Warning (Alarm Only, No Shutdown) 3- Electrical Trip (Alarm/Off Load Generator Followed By Shutdown After Cooling) 4- Shutdown (Alarm And Shutdown)	0(dis)	4	0	
Red stop activation	J1939 Red Stop Lamp Activation: 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
Red stop delay	J1939 Red Stop Lamp Delay	0	250	2	Sec

Note: dis = disable

ENGINE MAINTENANCE (*Engine->Maintenance*)		Min	Max	Default	Unit
Running hour interval	Running Hours Interval	0(dis)	9999	5000	Hour
Maint. date interval	Maintenance Date Interval	0(dis)	12	6	Month
Engine stp when maint	Force Engine Shutdown When Maintenance Is Due En/Dis	ENABL/DISBL		DISBL	
Eng run. hour(lsb)	Engine Running Hour (Lsb)	0	255	0	
Eng running hour	Engine Running Hour	0	255	0	
Eng running hour(msb)	Engine Running Hour(Msb)	0	14	0	
Maintenance okay	Maintenance Okay	YES/NO		NO	

The user can change the engine running hours value by using these parameters (Engine Running Hour (Lsb) , Engine Running Hour and Engine Running Hour (Msb)).

For example; if the engine running hours was changed 75112 hours, the values of these parameters was calculated as follows;

Engine Running Hour (Msb) = 75112 / 65536
= **1**

Intermediate Value = 75112 – (Engine Running Hour (Msb) * 65536)
= 75112 – (1 * 65536)
= 9576.

Engine Running Hour = Intermediate Value / 256
= 9576 / 256
= **37**

Engine Running Hour (Lsb) = Intermediate Value – (Engine Running Hour * 256)
= 9576 – (37 * 256)
= **104**

LOAD TEST (*Engine->Load test*)		Min	Max	Default	Unit
Disable/enable select	Disable, No Load or On Load Selection	0-DISABLE 1-NO LOAD 2-ON LOAD		1-NO LOAD	

Disable, No Load or On Load Selection
DISABLE: Test mode disable.
NO LOAD: The generator will be run without taking the load in test mode.
ON LOAD: The generator will be run with load in test mode.

EXERCISE (*Engine->Exercise*)		Min	Max	Default	Unit
Period	Generator exercise working period on related day	0(dis)	99	dis	Min
Day of week	Generator exercise working day of week	1	7	1	
Start time	Generator exercise work start time on related day	0.0	23.59	0.00	H.Min

Please enter the day of the week for Exercise Function. Example:

Period	(dis)0	The exercise function is disabled.
	(10)	The exercise function is enabled for 10 minutes.
Day of week	1=Monday,2=Tuesday,3=Wednesday,4=Thursday,5=Friday,6=Saturday,7=Sunday	
Start time	12.20	The exercise function is started at 12.20 o'clock (If it is enabled)

Note: dis = disable

ENGINE GENERAL (*Engine->General*)		Min	Max	Default	Unit
Gas/diesel selection	Engine Fuel (Gas/ Diesel) Selection	GAS/DIESEL		DIESEL	
Stop solenoid time	Stop Solenoid Time	5	99	20	Sec
Ignition delay	Ignition Delay	1	99	5	Sec
Gas valve delay	Gas Valve Delay	1	99	5	Sec
Min. ignition speed	Min Ignition Speed	10	1500	200	RPM

Engine Fuel (Gas/ Diesel) Selection
Diesel or Gas engine can be selected.
DIESL: Diesel
GAS: Gas

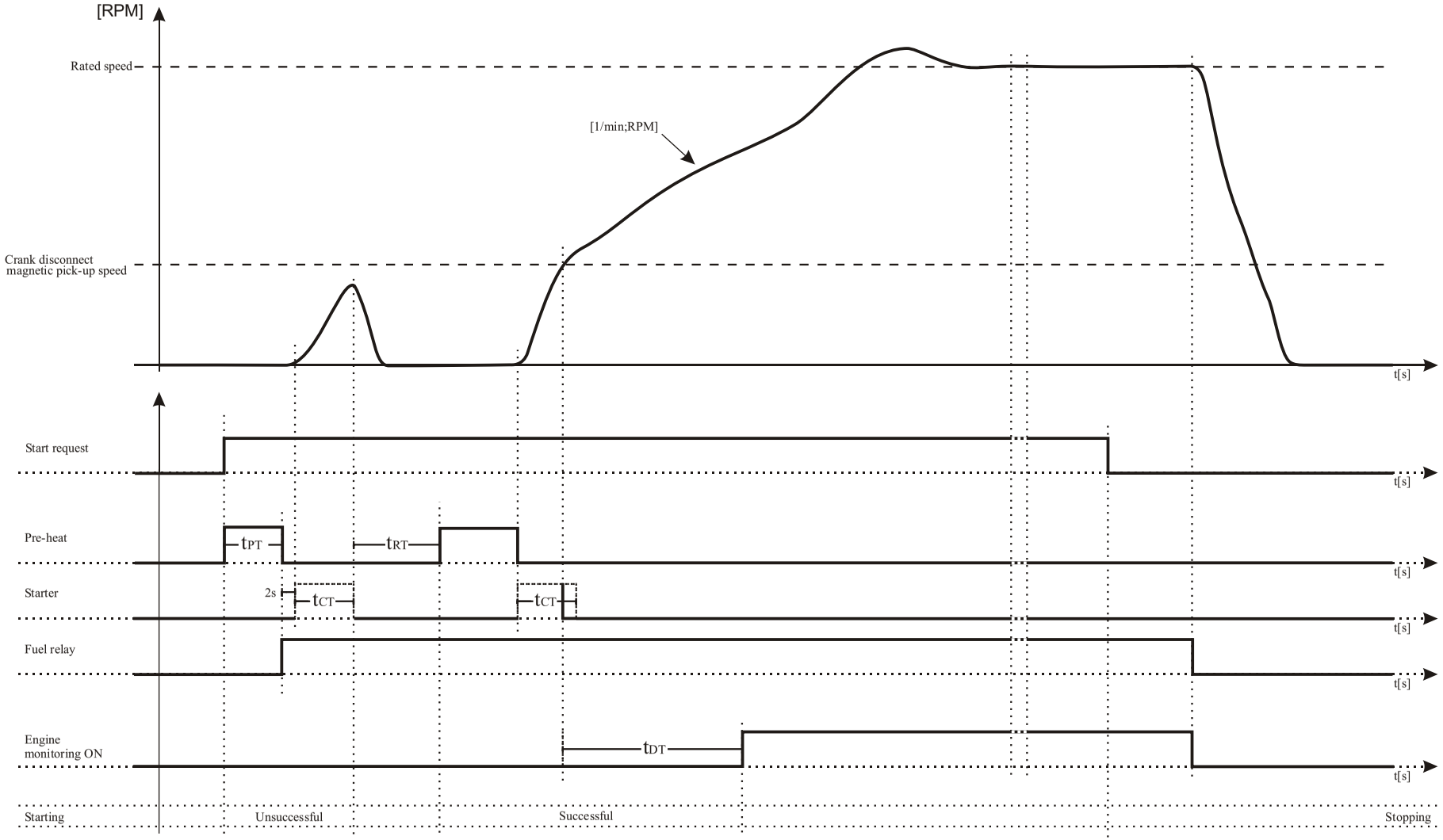
If diesel engine selected:

Stop Solenoid Time
This timer is used if the unit is configured to operate an Energise to stop engine. It dictates the duration that the Stop Solenoid output will remain active after the module has detected the engine has come to rest. If the Stop Solenoid output is not configured, this timer will still operate, preventing an immediate restart.

Example: Start/stop diagram for Diesel Engine.

The formula signs and indices mean:

TPT	Preheating time	[s]
TCT	Engagement time	[s]
TRT	Interval between 2 start attempts	[s]
TDT	Engine delayed monitoring	[s]


[RPM]
Rated speed
[1/min;RPM]
Crank disconnect
magnetic pick-up speed
t[s]
Start request
t[s]
Pre-heat
tPT
tRT
t[s]
Starter
2s
tCT
tCT
t[s]
Fuel relay
t[s]
Engine
monitoring ON
tDT
t[s]
Starting
Unsuccessful
Successful
Stopping

If gas engine selected:

Ignition Delay
With gas engines often a purging operation is desired before starting. With the engaging of the starter the ignition delay is started. If the 'min ignition speed' is reached after expiry of this time, the configurable relay output 'ignition' is set.

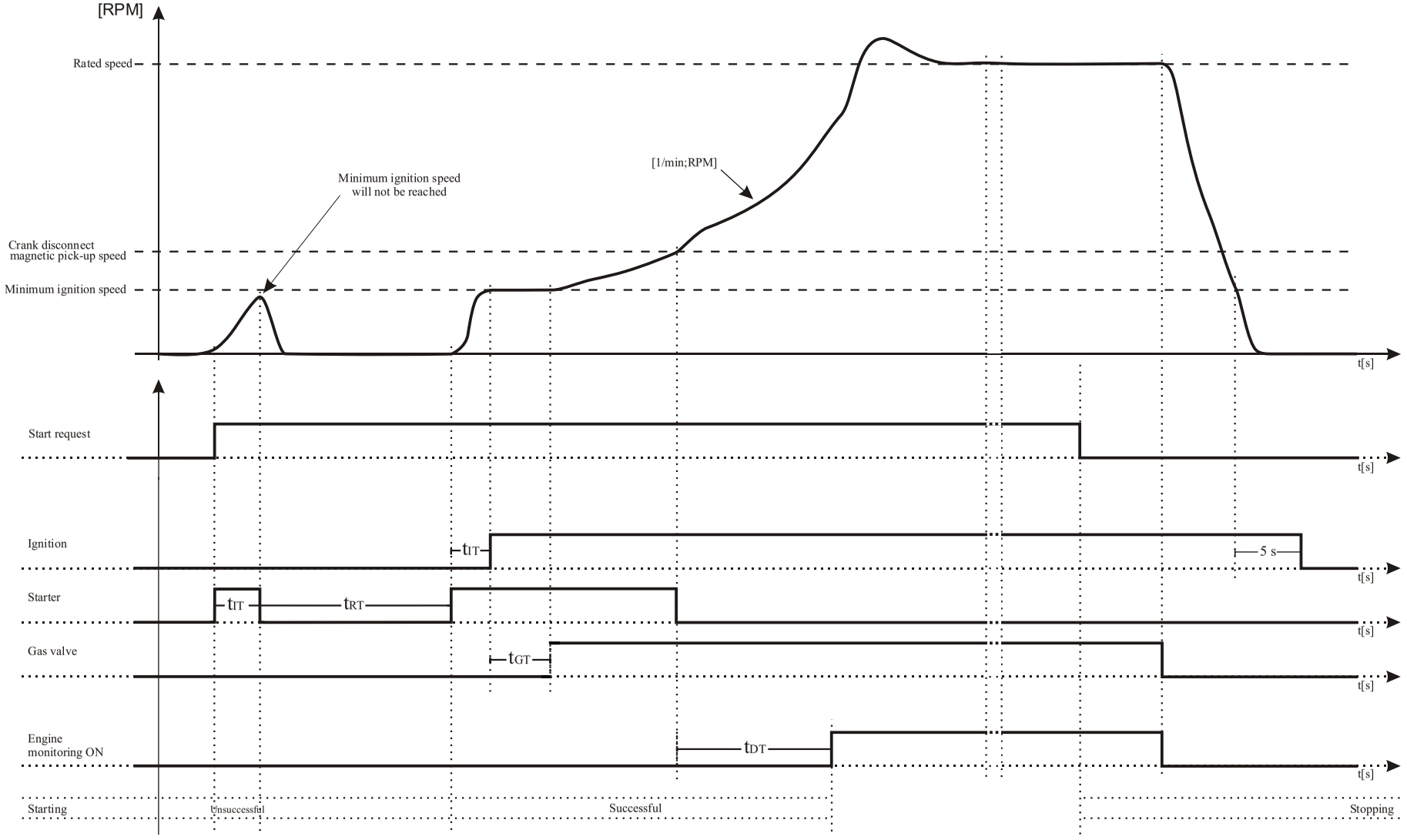
Gas Valve Delay
By setting the ignition relay the gas valve delay is started. After the expiry of the set time as long as the number of revolutions is higher than the minimum ignition speed, the gas valve is set. When the necessary engine shutdown process, gas valve is de-energised.

Minimum Ignition Speed
After expiry of the ignition delay the number of revolutions set must be reached, so that the configurable relay output 'ignition' will be set.

Example: Start/stop diagram for Gas Engine.

The formula signs and indices mean:

TRT	Interval between 2 start attempts	[s]
TIT	Ignition delay	[s]
TGT	Gas valve delay	[s]
TDT	Engine delayed monitoring	[s]


[RPM]
Rated speed
Minimum ignition speed
will not be reached
[1/min;RPM]
Crank disconnect
magnetic pick-up speed
Minimum ignition speed
t[s]
Start request
t[s]
Ignition
tIT
5 s
t[s]
Starter
tIT
tRT
t[s]
Gas valve
tGT
t[s]
Engine
monitoring ON
tDT
t[s]
Starting
Unsuccessful
Successful
Stopping

4.2.5 Inputs

SENDER INPUTS (*Inputs->Sender inputs*)		Min	Max	Default	Unit
Oil pressure unit	Oil Pressure Unit	BAR/PSI/KPA		BAR	
Oil press. input type	Oil Pressure Input Type	0 - Not Used (Disable) 1 - Digital NC 2 - Digital NO 3 - VDO 5 BAR 4 - VDO 10 BAR 5 - DATCON 5 BAR 6 - DATCON 7 BAR 7 - MURPHY 7 BAR 8 - User Configured		0 (dis)	
Oil pressure prealarm	Oil Pressure Pre-Alarm	0.0 (dis)	60.0	1.2	BAR
Oil pressure return	Oil Pressure Pre-Alarm Return	0.0	60.0	1.4	BAR
Oil pressure shutdown	Oil Pressure Shutdown	0.0	60.0	1.0	BAR
Temperature unit	Coolant Temperature Unit	ºC/ºF		ºC	
Temp. input type	Coolant Temperature Input Type	0 - Not Used (Disable) 1 - Digital NC 2 - Digital NO 3 - VDO 120 ºC 4 - VDO 150 ºC 5 - DATCON 6 - MURPHY 7 - PT100 8 - User Configured		0 (dis)	
High temp.prealarm	High Temperature Pre-Alarm	0 (dis)	300	90	℃
High temp. return	High Temp. Pre-Alarm Return	0	300	88	℃
High temp. shutdown	High Temperature Shutdown	0	300	95	℃
Low temp. warning	Low Temperature Warning	0 (dis)	70	0 (dis)	℃
Level input type	Level Input Type	0 - Not Used (Disable) 1 - Digital NC 2 - Digital NO 3 - VDO OHM (10-180) 4 - VDO TUBE (90-0) 5 - US OHM (240-33) 6 - GM OHM (0-90) 7 - FORD (73-10) 8 - User Configured		0 (dis)	
Low level prealarm	Level Pre-Alarm	0 (dis)	300	0 (dis)	%
Low level return	Level Pre-Alarm Return	0	300	90	%
Low level shutdown	Level Shutdown	0 (dis)	300	0 (dis)	%
Fuel pump on	Fuel Pump On	0 (dis)	300	0 (dis)	%
Fuel pump off	Fuel Pump Off	0	300	75	%
Oil temperature unit	Oil Temperature Unit	ºC/ºF		ºC	
Oil temp. input type	Oil Temperature Input Type	0 - Not Used (Disable) 1 - Digital NC 2 - Digital NO 3 - VDO 120 ºC 4 - VDO 150 ºC 5 - DATCON 6 - MURPHY 7 - PT100 8 - User Configured		0 (dis)	
Oil temp.high preal	Oil Temp. High Pre-Alarm	0 (dis)	300	90	℃
Oil temp.high return	Oil Temp. High Pre-Alarm Return	0	300	88	℃
Oil temp.high shutdwn	Oil Temp. High Shutdown	0	300	95	℃

Oil Pressure Input Type
This section is used to configure the Oil Pressure sender input.
0-NOT USED: The Oil Pressure input will not be monitored.
1-DIGITAL NC: The Oil pressure input is fed from an engine mounted digital pressure switch. This switch returns a closed signal during low oil pressure conditions (and engine at rest), once oil pressure is established the switch will open.
2-DIGITAL NO: The Oil pressure input is fed from an engine mounted digital pressure switch. This switch returns an open signal during low oil pressure conditions (and engine at rest), once oil pressure is established the switch will close.
3, 4, 5, 6, 7 and 8: Oil pressure input is connected to a resistive type engine mounted oil pressure transducer. If this parameter selected as "**8-USER CONFIGURED"**, the user can input the data manually according to the sensor curve.

Temperature Input Type
This section is used to configure the Coolant Temperature sender input.
0-NOT USED: The Coolant Temperature input will not be monitored.
1-DIGITAL NC: The Coolant Temperature input is fed from an engine mounted digital temperature switch. This switch returns a closed signal during low temperature, should the temperature rise above the switch manifacturers trip point the switch contact will open.
2-DIGITAL NO: The Coolant Temperature input is fed from an engine mounted digital temperature switch. This switch returns an open signal during low temperature, should the temperature rise above the switch manifacturers trip point the switch contact will close.
3, 4, 5, 6, 7 and 8: The Coolant Temperature input is connected to a resistive type engine mounted temperature transducer. If this parameter selected as "**8-USER CONFIGURED"**, the user can input the data manually according to the sensor curve.

Level Input Type
This section is used to configure the Fuel Level sender input.
0-NOT USED: The Fuel Level input will not be monitored.
1-DIGITAL NC: open for low fuel level.
2-DIGITAL NO: close for low fuel level.
3, 4, 5, 6, 7 and 8: The Fuel Level input is connected to a resistive type engine mounted temperature transducer. If this parameter selected as "**8-USER CONFIGURED"**, the user can input the data manually according to the sensor curve.

Oil Temperature Input Type
This section is used to configure the Oil Temperature sender input.
0-NOT USED: The Oil Temperature input will not be monitored.
1-DIGITAL NC: The Oil Temperature input is fed from an engine mounted digital temperature switch. This switch returns a closed signal during low temperature, should the temperature rise above the switch manifacturers trip point the switch contact will open.
2-DIGITAL NO: The Oil Temperature input is fed from an engine mounted digital temperature switch. This switch returns an open signal during low temperature, should the temperature rise above the switch manifacturers trip point the switch contact will close.
3, 4, 5, 6, 7 and 8: The Oil Temperature input is connected to a resistive type engine mounted temperature transducer. If this parameter selected as "**8-USER CONFIGURED"**, the user can input the data manually according to the sensor curve.

SENDER LINEARISATION (*Inputs->Sender linearisation*)		Min	Max	Default	Unit
Oil pressure sender 1	Oil Pressure Sender Point-1	0	1300	15	R
Oil pressure 1	Oil Pressure Point-1	0.0	60.0	0.0	BAR
Oil pressure sender 2	Oil Pressure Sender Point-2	0	1300	31	R
Oil pressure 2	Oil Pressure Point-2	0.0	60.0	1.0	BAR
Oil pressure sender 3	Oil Pressure Sender Point-3	0	1300	49	R
Oil pressure 3	Oil Pressure Point-3	0.0	60.0	2.0	BAR
Oil pressure sender 4	Oil Pressure Sender Point-4	0	1300	66	R
Oil pressure 4	Oil Pressure Point-4	0.0	60.0	3.0	BAR
Oil pressure sender 5	Oil Pressure Sender Point-5	0	1300	85	R
Oil pressure 5	Oil Pressure Point-5	0.0	60.0	4.0	BAR
Oil pressure sender 6	Oil Pressure Sender Point-6	0	1300	101	R
Oil pressure 6	Oil Pressure Point-6	0.0	60.0	5.0	BAR
Oil pressure sender 7	Oil Pressure Sender Point-7	0	1300	117	R
Oil pressure 7	Oil Pressure Point-7	0.0	60.0	6.0	BAR
Oil pressure sender 8	Oil Pressure Sender Point-8	0	1300	132	R
Oil pressure 8	Oil Pressure Point-8	0.0	60.0	7.0	BAR
Oil pressure sender 9	Oil Pressure Sender Point-9	0	1300	149	R
Oil pressure 9	Oil Pressure Point-9	0.0	60.0	8.0	BAR
Oil pressure sender 10	Oil Pressure Sender Point-10	0	1300	178	R
Oil pressure 10	Oil Pressure Point-10	0.0	60.0	10.0	BAR
Temperature sender 1	Temperature Sender Point-1	0	1300	579	R
Temperature 1	Temperature Point-1	0	300	28	ºC
Temperature sender 2	Temperature Sender Point-2	0	1300	404	R
Temperature 2	Temperature Point-2	0	300	35	ºC
Temperature sender 3	Temperature Sender Point-3	0	1300	342	R
Temperature 3	Temperature Point-3	0	300	40	ºC
Temperature sender 4	Temperature Sender Point-4	0	1300	250	R
Temperature 4	Temperature Point-4	0	300	50	ºC
Temperature sender 5	Temperature Sender Point-5	0	1300	179	R
Temperature 5	Temperature Point-5	0	300	60	ºC
Temperature sender 6	Temperature Sender Point-6	0	1300	136	R
Temperature 6	Temperature Point-6	0	300	70	ºC
Temperature sender 7	Temperature Sender Point-7	0	1300	103	R
Temperature 7	Temperature Point-7	0	300	80	ºC
Temperature sender 8	Temperature Sender Point-8	0	1300	77	R
Temperature 8	Temperature Point-8	0	300	90	ºC
Temperature sender 9	Temperature Sender Point-9	0	1300	67	R
Temperature 9	Temperature Point-9	0	300	95	ºC
Temperature sender 10	Temperature Sender Point-10	0	1300	63	R
Temperature 10	Temperature Point-10	0	300	98	ºC
Level sender 1	Level Sender Point-1	0	1300	10	R
Level 1	Level Point-1	0	300	0	
Level sender 2	Level Sender Point-2	0	1300	30	R
Level 2	Level Point-2	0	300	11	
Level sender 3	Level Sender Point-3	0	1300	50	R
Level 3	Level Point-3	0	300	22	
Level sender 4	Level Sender Point-4	0	1300	70	R
Level 4	Level Point-4	0	300	33	
Level sender 5	Level Sender Point-5	0	1300	90	R
Level 5	Level Point-5	0	300	44	

Level sender 6	Level Sender Point-6	0	1300	110	R
Level 6	Level Point-6	0	300	55	
Level sender 7	Level Sender Point-7	0	1300	130	R
Level 7	Level Point-7	0	300	66	
Level sender 8	Level Sender Point-8	0	1300	150	R
Level 8	Level Point-8	0	300	77	
Level sender 9	Level Sender Point-9	0	1300	170	R
Level 9	Level Point-9	0	300	88	
Level sender 10	Level Sender Point-10	0	1300	190	R
Level 10	Level Point-10	0	300	100	
Oil temp. sender 1	Oil temperature Sender Point-1	0	1300	579	R
Oil temperature 1	Oil temperature Point-1	0	300	28	ºC
Oil temp. sender 2	Oil temperature Sender Point-2	0	1300	404	R
Oil temperature 2	Oil temperature Point-2	0	300	35	ºC
Oil temp. sender 3	Oil temperature Sender Point-3	0	1300	342	R
Oil temperature 3	Oil temperature Point-3	0	300	40	ºC
Oil temp. sender 4	Oil temperature Sender Point-4	0	1300	250	R
Oil temperature 4	Oil temperature Point-4	0	300	50	ºC
Oil temp. sender 5	Oil temperature Sender Point-5	0	1300	179	R
Oil temperature 5	Oil temperature Point-5	0	300	60	ºC
Oil temp. sender 6	Oil temperature Sender Point-6	0	1300	136	R
Oil temperature 6	Oil temperature Point-6	0	300	70	ºC
Oil temp. sender 7	Oil temperature Sender Point-7	0	1300	103	R
Oil temperature 7	Oil temperature Point-7	0	300	80	ºC
Oil temp. sender 8	Oil temperature Sender Point-8	0	1300	77	R
Oil temperature 8	Oil temperature Point-8	0	300	90	ºC
Oil temp. sender 9	Oil temperature Sender Point-9	0	1300	67	R
Oil temperature 9	Oil temperature Point-9	0	300	95	ºC
Oil temp. sender 10	Oil temperature Sender Point-10	0	1300	63	R
Oil temperature 10	Oil temperature Point-10	0	300	98	ºC

CONF. INPUT-1 (*Inputs->Conf. input-1*)		Min	Max	Default	Unit
Dis,user conf.or list	0- Disable 1- User Configured 2- Select From List	0(dis)	2	2	
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	1	
Indication	If User Configured 0- Status 1- Warning Non-Latching 2- Warning Latching 3- Electrical Trip 4- Shutdown	0	4	0	
Activation	If User Configured 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
Select from list	If Select From List 0-Remote Start On Load 1-Remote Start Off Load 2-Auxiliary Mains Fail 3-Simulate Lamp Test Button 4-Simulate Horn Reset Button 5-Simulate Alarm Reset Button 6-Simulate Auto Button 7-Simulate Test Button 8-Simulate Manual Button 9-Simulate Start Button 10-Simulate Stop Button 11-Generator Closed Auxiliary 12-Generator Load Inhibit 13-Mains Closed Auxiliary 14-Mains Load Inhibit 15-Auto Restore Inhibit 16-Auto Start Inhibit 17-Panel Lock 18-Scheduled Runs Inhibited 19-Priority Select 20-Transfer To Generator/Open Mains 21-Transfer To Mains/Open Generator 22-Remote Inhibit 23-Reserved 24-Generator is Supplying the Load in STOP Mode 25-Emergency Stop	0	25	25	
Active delay	Input active delay	0	250	0	Sec

Note: dis = disable

CONF. INPUT-2 (*Inputs->Conf. input-2*)		Min	Max	Default	Unit
Dis,user conf.or list	0- Disable 1- User Configured 2- Select From List	0(dis)	2	1	
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Indication	If User Configured 0- Status 1- Warning Non-Latching 2- Warning Latching 3- Electrical Trip 4- Shutdown	0	4	0	
Activation	If User Configured 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
Select from list	If Select From List 0-Remote Start On Load 1-Remote Start Off Load 2-Auxiliary Mains Fail 3-Simulate Lamp Test Button 4-Simulate Horn Reset Button 5-Simulate Alarm Reset Button 6-Simulate Auto Button 7-Simulate Test Button 8-Simulate Manual Button 9-Simulate Start Button 10-Simulate Stop Button 11-Generator Closed Auxiliary 12-Generator Load Inhibit 13-Mains Closed Auxiliary 14-Mains Load Inhibit 15-Auto Restore Inhibit 16-Auto Start Inhibit 17-Panel Lock 18-Scheduled Runs Inhibited 19-Priority Select 20-Transfer To Generator/Open Mains 21-Transfer To Mains/Open Generator 22-Remote Inhibit 23-Reserved 24-Generator is Supplying the Load in STOP Mode	0	24	3	
Active delay	Input active delay	0	250	5	Sec

Note: dis = disable

CONF. INPUT-3 (*Inputs->Conf. input-3*)		Min	Max	Default	Unit
Dis,user conf.or list	0- Disable 1- User Configured 2- Select From List	0(dis)	2	1	
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Indication	If User Configured 0- Status 1- Warning Non-Latching 2- Warning Latching 3- Electrical Trip 4- Shutdown	0	4	0	
Activation	If User Configured 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
Select from list	If Select From List 0-Remote Start On Load 1-Remote Start Off Load 2-Auxiliary Mains Fail 3-Simulate Lamp Test Button 4-Simulate Horn Reset Button 5-Simulate Alarm Reset Button 6-Simulate Auto Button 7-Simulate Test Button 8-Simulate Manual Button 9-Simulate Start Button 10-Simulate Stop Button 11-Generator Closed Auxiliary 12-Generator Load Inhibit 13-Mains Closed Auxiliary 14-Mains Load Inhibit 15-Auto Restore Inhibit 16-Auto Start Inhibit 17-Panel Lock 18-Scheduled Runs Inhibited 19-Priority Select 20-Transfer To Generator/Open Mains 21-Transfer To Mains/Open Generator 22-Remote Inhibit 23-Reserved 24-Generator is Supplying the Load in STOP Mode	0	24	4	
Active delay	Input active delay	0	250	5	Sec

Note: dis = disable

CONF. INPUT-4 (*Inputs->Conf. input-4*)		Min	Max	Default	Unit
Dis,user conf.or list	0- Disable 1- User Configured 2- Select From List	0(dis)	2	2	
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Indication	If User Configured 0- Status 1- Warning Non-Latching 2- Warning Latching 3- Electrical Trip 4- Shutdown	0	4	0	
Activation	If User Configured 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
Select from list	If Select From List 0-Remote Start On Load 1-Remote Start Off Load 2-Auxiliary Mains Fail 3-Simulate Lamp Test Button 4-Simulate Horn Reset Button 5-Simulate Alarm Reset Button 6-Simulate Auto Button 7-Simulate Test Button 8-Simulate Manual Button 9-Simulate Start Button 10-Simulate Stop Button 11-Generator Closed Auxiliary 12-Generator Load Inhibit 13-Mains Closed Auxiliary 14-Mains Load Inhibit 15-Auto Restore Inhibit 16-Auto Start Inhibit 17-Panel Lock 18-Scheduled Runs Inhibited 19-Priority Select 20-Transfer To Generator/Open Mains 21-Transfer To Mains/Open Generator 22-Remote Inhibit 23-Reserved 24-Generator is Supplying the Load in STOP Mode 25-Low Oil Pressure	0	25	25	
Active delay	Input active delay	0	250	0	Sec

Note: dis = disable

CONF. INPUT-5 (*Inputs->Conf. input-5*)		Min	Max	Default	Unit
Dis,user conf.or list	0- Disable 1- User Configured 2- Select From List	0(dis)	2	2	
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Indication	If User Configured 0- Status 1- Warning Non-Latching 2- Warning Latching 3- Electrical Trip 4- Shutdown	0	4	0	
Activation	If User Configured 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
Select from list	If Select From List 0-Remote Start On Load 1-Remote Start Off Load 2-Auxiliary Mains Fail 3-Simulate Lamp Test Button 4-Simulate Horn Reset Button 5-Simulate Alarm Reset Button 6-Simulate Auto Button 7-Simulate Test Button 8-Simulate Manual Button 9-Simulate Start Button 10-Simulate Stop Button 11-Generator Closed Auxiliary 12-Generator Load Inhibit 13-Mains Closed Auxiliary 14-Mains Load Inhibit 15-Auto Restore Inhibit 16-Auto Start Inhibit 17-Panel Lock 18-Scheduled Runs Inhibited 19-Priority Select 20-Transfer To Generator/Open Mains 21-Transfer To Mains/Open Generator 22-Remote Inhibit 23-Reserved 24-Generator is Supplying the Load in STOP Mode 25-High Temperature	0	25	25	
Active delay	Input active delay	0	250	0	Sec

Note: dis = disable

CONF. INPUT-6 (*Inputs->Conf. input-6*)		Min	Max	Default	Unit
Dis,user conf.or list	0- Disable 1- User Configured 2- Select From List	0(dis)	2	1	
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Indication	If User Configured 0- Status 1- Warning Non-Latching 2- Warning Latching 3- Electrical Trip 4- Shutdown	0	4	0	
Activation	If User Configured 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
Select from list	If Select From List 0-Remote Start On Load 1-Remote Start Off Load 2-Auxiliary Mains Fail 3-Simulate Lamp Test Button 4-Simulate Horn Reset Button 5-Simulate Alarm Reset Button 6-Simulate Auto Button 7-Simulate Test Button 8-Simulate Manual Button 9-Simulate Start Button 10-Simulate Stop Button 11-Generator Closed Auxiliary 12-Generator Load Inhibit 13-Mains Closed Auxiliary 14-Mains Load Inhibit 15-Auto Restore Inhibit 16-Auto Start Inhibit 17-Panel Lock 18-Scheduled Runs Inhibited 19-Priority Select 20-Transfer To Generator/Open Mains 21-Transfer To Mains/Open Generator 22-Remote Inhibit 23-Reserved 24-Generator is Supplying the Load in STOP Mode	0	24	7	
Active delay	Input active delay	0	250	5	Sec

Note: dis = disable

CONF. INPUT-7 (*Inputs->Conf. input-7*)		Min	Max	Default	Unit
Dis,user conf.or list	0- Disable 1- User Configured 2- Select From List	0(dis)	2	1	
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Indication	If User Configured 0- Status 1- Warning Non-Latching 2- Warning Latching 3- Electrical Trip 4- Shutdown	0	4	0	
Activation	If User Configured 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
Select from list	If Select From List 0-Remote Start On Load 1-Remote Start Off Load 2-Auxiliary Mains Fail 3-Simulate Lamp Test Button 4-Simulate Horn Reset Button 5-Simulate Alarm Reset Button 6-Simulate Auto Button 7-Simulate Test Button 8-Simulate Manual Button 9-Simulate Start Button 10-Simulate Stop Button 11-Generator Closed Auxiliary 12-Generator Load Inhibit 13-Mains Closed Auxiliary 14-Mains Load Inhibit 15-Auto Restore Inhibit 16-Auto Start Inhibit 17-Panel Lock 18-Scheduled Runs Inhibited 19-Priority Select 20-Transfer To Generator/Open Mains 21-Transfer To Mains/Open Generator 22-Remote Inhibit 23-Reserved 24-Generator is Supplying the Load in STOP Mode	0	24	8	
Active delay	Input active delay	0	250	5	Sec

Note: dis = disable

CONF. EXP. INPUT-1 (*Inputs->Conf. exp. input-1*)		Min	Max	Default	Unit
Dis,user conf.or list	0- Disable 1- User Configured 2- Select From List	0(dis)	2	1	
Hardware type	0-> -Ve (Switched To Battery -) 1-> +Ve (Switched To Battery +)	0	1	0	
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Indication	If User Configured 0- Status 1- Warning Non-Latching 2- Warning Latching 3- Electrical Trip 4- Shutdown	0	4	0	
Activation	If User Configured 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
Select from list	If Select From List 2-Auxiliary Mains Fail 3-Simulate Lamp Test Button 4-Simulate Horn Reset Button 5-Simulate Alarm Reset Button 6-Simulate Auto Button 7-Simulate Test Button 8-Simulate Manual Button 9-Simulate Start Button 10-Simulate Stop Button 11-Generator Closed Auxiliary 12-Generator Load Inhibit 13-Mains Closed Auxiliary 14-Mains Load Inhibit 15-Auto Restore Inhibit 16-Auto Start Inhibit 17-Panel Lock 18-Scheduled Runs Inhibited 19-Priority Select 20-Transfer To Generator/Open Mains 21-Transfer To Mains/Open Generator	2	21	2	
Active delay	Input active delay	0	250	5	Sec

CONF. EXP. INPUT-2 (*Inputs->Conf. exp. input-2*)		Min	Max	Default	Unit
Dis,user conf.or list	The same as Expansion Config. Input-1 options	0(dis)	2	1	
Hardware type	The same as Expansion Config. Input-1 options	0	1	0	
Polarity	The same as Expansion Config. Input-1 options	0	1	0	
Indication	The same as Expansion Config. Input-1 options	0	4	0	
Activation	The same as Expansion Config. Input-1 options	0	2	2	
Select from list	The same as Expansion Config. Input-1 options	2	21	2	
Active delay	Input active delay	0	250	5	Sec

CONF. EXP. INPUT-3 (*Inputs->Conf. exp. input-3*)		Min	Max	Default	Unit
Dis,user conf.or list	The same as Expansion Config. Input-1 options	0(dis)	2	1	
Hardware type	The same as Expansion Config. Input-1 options	0	1	0	
Polarity	The same as Expansion Config. Input-1 options	0	1	0	
Indication	The same as Expansion Config. Input-1 options	0	4	0	
Activation	The same as Expansion Config. Input-1 options	0	2	2	
Select from list	The same as Expansion Config. Input-1 options	2	21	2	
Active delay	Input active delay	0	250	5	Sec

CONF. EXP. INPUT-4 (*Inputs->Conf. exp. input-4*)		Min	Max	Default	Unit
Dis,user conf.or list	The same as Expansion Config. Input-1 options	0(dis)	2	1	
Hardware type	The same as Expansion Config. Input-1 options	0	1	0	
Polarity	The same as Expansion Config. Input-1 options	0	1	0	
Indication	The same as Expansion Config. Input-1 options	0	4	0	
Activation	The same as Expansion Config. Input-1 options	0	2	2	
Select from list	The same as Expansion Config. Input-1 options	2	21	2	
Active delay	Input active delay	0	250	5	Sec

CONF. EXP. INPUT-5 (*Inputs->Conf. exp. input-5*)		Min	Max	Default	Unit
Dis,user conf.or list	The same as Expansion Config. Input-1 options	0(dis)	2	1	
Hardware type	The same as Expansion Config. Input-1 options	0	1	0	
Polarity	The same as Expansion Config. Input-1 options	0	1	0	
Indication	The same as Expansion Config. Input-1 options	0	4	0	
Activation	The same as Expansion Config. Input-1 options	0	2	2	
Select from list	The same as Expansion Config. Input-1 options	2	21	2	
Active delay	Input active delay	0	250	5	Sec

CONF. EXP. INPUT-6 (*Inputs->Conf. exp. input-6*)		Min	Max	Default	Unit
Dis,user conf.or list	The same as Expansion Config. Input-1 options	0(dis)	2	1	
Hardware type	The same as Expansion Config. Input-1 options	0	1	0	
Polarity	The same as Expansion Config. Input-1 options	0	1	0	
Indication	The same as Expansion Config. Input-1 options	0	4	0	
Activation	The same as Expansion Config. Input-1 options	0	2	2	
Select from list	The same as Expansion Config. Input-1 options	2	21	2	
Active delay	Input active delay	0	250	5	Sec

CONF. EXP. INPUT-7 (*Inputs->Conf. exp. input-7*)		Min	Max	Default	Unit
Dis,user conf.or list	The same as Expansion Config. Input-1 options	0(dis)	2	1	
Hardware type	The same as Expansion Config. Input-1 options	0	1	0	
Polarity	The same as Expansion Config. Input-1 options	0	1	0	
Indication	The same as Expansion Config. Input-1 options	0	4	0	
Activation	The same as Expansion Config. Input-1 options	0	2	2	
Select from list	The same as Expansion Config. Input-1 options	2	21	2	
Active delay	Input active delay	0	250	5	Sec

CONF. EXP. INPUT-8 (*Inputs->Conf. exp. input-8*)		Min	Max	Default	Unit
Dis,user conf.or list	The same as Expansion Config. Input-1 options	0(dis)	2	1	
Hardware type	The same as Expansion Config. Input-1 options	0	1	0	
Polarity	The same as Expansion Config. Input-1 options	0	1	0	
Indication	The same as Expansion Config. Input-1 options	0	4	0	
Activation	The same as Expansion Config. Input-1 options	0	2	2	
Select from list	The same as Expansion Config. Input-1 options	2	21	2	
Active delay	Input active delay	0	250	5	Sec

Note: dis = disable

CONFIGURABLE INPUTS SELECTIONS

0 REMOTE START ON LOAD
In AUTO mode, if one of the configurable inputs are selected as 0 (Remote Start On Load), the unit doesn't perform the mains failure control in order to start the generator. In AUTO mode, if one of the configurable inputs are selected as 0 (Remote Start On Load) and this input is active, then the unit will perform the start sequence and transfer load to the generator. If the input is passive, the unit will perform the stop sequence.

1 REMOTE START OFF LOAD
If this input is active, operation will be similar to the 'Remote Start On Load' function except that the generator will not be instructed to take the load. This function can be used where an engine only run is required e.g. for exercise.

2 AUXILIARY MAINS FAIL
The unit will monitor the incoming single or three phase supply for Over Voltage, Under Voltage, Over Frequency or Under Frequency. It may be required to monitor a different mains supply or some aspect of the incoming mains not monitored by the unit. If the devices providing this additional monitoring are connected to operate this input, the unit will operate as if the incoming mains supply has fallen outside of limits, the generator will be instructed to start and take load. Removal of the input signal will cause the unit to act if the mains has returned to within limits.

3 SIMULATE LAMP TEST BUTTON
This input mimic's the operation of the 'Lamp Test' button and is used to provide a remotely located Lamp Test push button.

4 SIMULATE HORN RESET BUTTON
This input mimic's the operation of the 'Horn Reset' button and is used to provide a remotely located Horn Reset push button.

5 SIMULATE ALARM RESET BUTTON
This input mimic's the operation of the 'Alarm Reset' button and is used to provide a remotely located Alarm Reset push button.

6 SIMULATE AUTO BUTTON
This input mimic's the operation of the 'Auto' button and is used to provide a remotely located Auto mode push button.

7 SIMULATE TEST BUTTON
This input mimic's the operation of the 'Test' button and is used to provide a remotely located Test mode push button.

8 SIMULATE MANUAL BUTTON
This input mimic's the operation of the 'Manual' button and is used to provide a remotely located Manual mode push button.

9 SIMULATE START BUTTON
This input mimic's the operation of the 'Start' button and is used to provide a remotely located start push button.

10 SIMULATE STOP BUTTON
This input mimic's the operation of the 'Stop' button and is used to provide a remotely located Stop push button.

11 GENERATOR CLOSED AUXILIARY
This input is used to provide feedback to allow the unit to give true indication of the contactor or circuit breaker switching status. It should be connected to the generator load switching device auxiliary contact.

12 GENERATOR LOAD INHIBIT
This input is used to prevent the unit from loading the generator. If the generator is already on load, activating this input will cause the unit to unload the generator. Removing the input will allow the generator to be loaded again. **Note:** This input only operates to control the generator-switching device if the unit load switching logic is attempting load the generator. It will not control the generator-switching device when the mains is on load.

13 MAINS CLOSED AUXILIARY
This input is used to provide feedback to allow the unit to give true indication of the contactor or circuit breaker switching status. It should be connected to the generator load switching device auxiliary contact.

14 MAINS LOAD INHIBIT
This input is used to prevent the unit from loading the mains supply. If the manis supply is already on load, activating this input will cause the unit to unload the mains supply. Removing the input will allow the mains to be loaded again. **Note:** This input only operates to control the mains-switching device if the unit load switching logic is attempting to load the mains. It will not control the mains-switching device when the generator is on load.

15 AUTO RESTORE INHIBIT
When module in the AUTO mode. In the event of a remote start / mains failure the generator will be instructed to start and take load. On removal of the remote start signal / mains return the module will continue to run the generator on load until this AUTO RESTORE INHIBIT input is removed. Once the input is removed the unit will transfer the load back to the mains supply and follow a normal generator stop sequence. This input allows the module to be fitted as part of a system where the manual restoration to mains is controlled remotely or by an automated system.

16 AUTO START INHIBIT
This input is used to provide an over-ride function to prevent the unit from starting the generator in the event of a remote start / mains out of limits condition occurring. If this input is active and a remote start signal / mains failure occurs the unit will not give a start command to the generator. If this input signal is then removed, the unit will operate as if a remote start / mains failure has occurred, starting and loading the generator. This function can be used to give an 'AND' function so that a generator will only be called to start if the mains fails and another condition exists whish requires the generator to run. If the 'Auto Start Inhibit' signal become active once more it will be ignored until the unit has returned the mains supply on load and shutdown.

17 PANEL LOCK
This input is used to provide security to the installation. If the panel lock input is active, the unit will not respond to operation of the mode select or start buttons. This allows the unit to be placed into a spesific mode (such as Auto) and than secured. The operation of the unit is not affected and the operator will still be able to view the various instrumentation pages etc. **Note:** External control sources (i.e. Simulate Start Button) are not affected by the panel lock input and will continue to operate normally.

18 SCHEDULED RUNS INHIBITED
This input is used to prevent the generator for starting in the event of a programmed scheduled run occurring. While the input is active no scheduled runs will occur. If the input is active when a schedule run is called for, and is removed during the running period the gen-set will start and complete any remaining scheduled running time.

19 PRIORITY SELECT
This input is used to determine the generator that is working at dual set application.

20 TRANSFER TO GENERATOR/OPEN MAINS
This input is used to transfer the load to the generator when running in Manual mode.

21 TRANSFER TO MAINS/OPEN GENERATOR
This input is used to transfer the load to the mains supply when running in Manual mode.

22 REMOTE INHIBIT
In AUTO mode, if one of the configurable inputs are selected as 22 (Remote Inhibit) and this input is active, the module will inhibit the generator for starting. In the other hand, if this input is active while the generator was starting, the module will stop the generator.

23 RESERVED

24 GENERATOR IS SUPPLYING THE LOAD IN OFF MODE
If this input is active when the unit is in STOP mode, the power is calculated. If the input is not active, the power is not calculated.

25 EMERGENCY STOP (FOR CONFIGURABLE INPUT-1)
This input is used as the emergency stop input.

25 LOW OIL PRESSURE (FOR CONFIGURABLE INPUT-4)
This input is used as the oil pressure failure input.

25 HIGH TEMPERATURE (FOR CONFIGURABLE INPUT-5)
This input is used as the temperature failure input.

4.2.6 Outputs

CONF. OUTPUT-1 (*Outputs->Conf. output-1*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	0-NOT USED 1-AIR FLAP CONTROL 2-ALARM RESET 3-AUDIBLE ALARM 4-AUTO START INHIBIT 5-AUXILIARY MAINS FAILURE 6-BATTERY HIGH VOLTAGE 7-BATTERY LOW VOLTAGE 8-CALLING FOR SCHEDULED RUN 9-CAN ECU POWER 10-CAN ECU STOP 11-CHARGE ALTERNATOR FAILURE 12-COMMON ALARM 13-COMMON ELECTRICAL TRIP ALARM 14-COMMON SHUTDOWN ALARM 15-COMMON WARNING ALARM 16-COOLING FAN AFTER START 17-COOLING FAN AFTER STOP 18-COOLANT TEMPERATURE HIGH PRE-ALARM 19-COOLANT TEMPERATURE HIGH SHUTDOWN 20-COOLING DOWN TIMER IN PROGRESS 21-CRANK RELAY ENERGISED 22-DELAYED ALARMS ACTIVE 23-DIGITAL INPUT1 ALARM 24-DIGITAL INPUT2 ALARM 25-DIGITAL INPUT3 ALARM 26-DIGITAL INPUT4 ALARM 27-DIGITAL INPUT5 ALARM 28-DIGITAL INPUT6 ALARM 29-DIGITAL INPUT7 ALARM 30-EXPANSION INPUT1 ALARM 31-EXPANSION INPUT2 ALARM 32-EXPANSION INPUT3 ALARM 33-EXPANSION INPUT4 ALARM 34-EXPANSION INPUT5 ALARM 35-EXPANSION INPUT6 ALARM 36-EXPANSION INPUT7 ALARM 37-EXPANSION INPUT8 ALARM 38-EARTH FAULT 39-EMERGENCY STOP 40-FAIL TO START ALARM 41-FAIL TO STOP ALARM 42-FUEL PUMP CONTROL 43-FUEL RELAY ENERGISED 44-GAS ENGINE IGNITION OUTPUT 45-GENERATOR AT REST 46-GENERATOR AVAILABLE 47-GENERATOR CLOSED AUXILIARY 48-GENERATOR FAILED TO CLOSE 49-GENERATOR FAILED TO OPEN 50-GENERATOR HIGH FREQUENCY PRE-ALARM 51-GENERATOR HIGH FREQUENCY SHUTDOWN 52-GENERATOR HIGH VOLTAGE PRE-ALARM 53-GENERATOR HIGH VOLTAGE SHUTDOWN 54-GENERATOR LOAD INHIBIT 55-GENERATOR LOW FREQUENCY PRE-ALARM 56-GENERATOR LOW FREQUENCY SHUTDOWN 57-GENERATOR LOW VOLTAGE PRE-ALARM 58-GENERATOR LOW VOLTAGE SHUTDOWN 59-GENERATOR STOPPING 60-GENERATOR OPEN BREAKER 61-HORN OUTPUT LATCHED 62-HORN OUTPUT PULSED 63-LAMP TEST 64-LEVEL PREALARM 65-LOSS OF MAGNETIC PICK-UP SPEED SIGNAL 66-LOW TEMPERATURE 67-MAINTENANCE DUE ALARM 68-MAINS CLOSED AUXILIARY 69-MAINS FAILED TO CLOSE 70-MAINS FAILED TO OPEN 71-MAINS FAILURE 72-MAINS HIGH FREQUENCY 73-MAINS HIGH VOLTAGE 74-MAINS LOAD INHIBIT 75-MAINS LOW FREQUENCY 76-MAINS LOW VOLTAGE 77-MAINS OPEN BREAKER 78-NO LOADING COMMAND 79-OIL PRESSURE LOW PRE-ALARM 80-OIL PRESSURE LOW SHUTDOWN 81-OIL TEMPERATURE HIGH PRE-ALARM 82-OIL TEMPERATURE HIGH SHUTDOWN 83-OVER CURRENT PRE-ALARM 84-OVER CURRENT 85-OVER POWER PRE-ALARM 86-OVER POWER SHUTDOWN 87-OVERSPEED PRE-ALARM 88-OVERSPEED SHUTDOWN 89-PANEL LOCK 90-PRE-HEAT(during preheat timer) 91-PRE-HEAT(until end of cranking) 92-PRE-HEAT(until end of warming) 93-PRE-HEAT(until end safety on) 94-REMOTE START PRESENT 95-REMOTE STOP DELAY IN PROGRESS 96-SHORT CIRCUIT 97-SMOKE LIMITING 98-STARTING ALARM 99-STARTING ALARMS ARMED 100-STOP RELAY ENERGISED 101-SYSTEM IN AUTO MODE 102-SYSTEM IN MANUAL MODE 103-SYSTEM IN STOP MODE 104-SYSTEM IN TEST MODE 105-UNDER CURRENT PRE-ALARM 106-UNDER CURRENT 107-UNDER POWER PRE-ALARM 108-UNDER POWER SHUTDOWN 109-UNDERSPEED PRE-ALARM 110-UNDERSPEED SHUTDOWN 111-WAITING FOR GENERATOR 112-DUAL COMMUNICATION ERROR 113-LOAD SUPPLY FROM GENERATOR 114-LOAD SUPPLY FROM MAINS	0	114	43	

CONF. OUTPUT-2 (*Outputs->Conf. output-2*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	21	

CONF. OUTPUT-3 (*Outputs->Conf. output-3*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	62	

CONF. OUTPUT-4 (*Outputs->Conf. output-4*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	9	

CONF. OUTPUT-5 (*Outputs->Conf. output-5*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	10	

CONF. OUTPUT-6 (*Outputs->Conf. output-6*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	12	

CONF. EXP. OUTPUT-1 (*Outputs->Conf. exp. output-1*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	12	

CONF. EXP. OUTPUT-2 (*Outputs->Conf. exp. output-2*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	12	

CONF. EXP. OUTPUT-3 (*Outputs->Conf. exp. output-3*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	12	

CONF. EXP. OUTPUT-4 (*Outputs->Conf. exp. output-4*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	12	

CONF. EXP. OUTPUT-5 (*Outputs->Conf. exp. output-5*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	12	

CONF. EXP. OUTPUT-6 (*Outputs->Conf. exp. output-6*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	12	

CONF. EXP. OUTPUT-7 (*Outputs->Conf. exp. output-7*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	12	

CONF. EXP. OUTPUT-8 (*Outputs->Conf. exp. output-8*)		Min	Max	Default	Unit
Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
Function	The same as Configurable Output-1 options	0	114	12	

CONFIGURABLE OUTPUTS SELECTIONS

0 NOT USED
Output is not used

1 AIR FLAP CONTROL
Normally used to control an air flap, this output becomes active upon an Engine shutdown failure situation. Inactive when the set has come to rest.

2 ALARM RESET
The output indicates that an alarm reset being performed. Once the alarm reset has been completed, the output become inactive again. The output could be used to give an external reset signal to external systems.

3 AUDIBLE ALARM
The output indicates that the internal sounder is operating. It may be use for external sounder.

4 AUTO START INHIBIT
This output indicates that a digital input that has been configured as 'auto start inhibit' is active.

5 AUXILIARY MAINS FAILURE
This output indicates that a digital input that has been configured as 'auxiliary mains failure' is active.

6 BATTERY HIGH VOLTAGE
This output indicates that a battery high voltage alarm has occurred.

7 BATTERY LOW VOLTAGE
This output indicates that a battery low voltage alarm has occurred.

8 CALLING FOR SCHEDULED RUN
This output indicates that a scheduled run has been called for. If the unit is in the 'auto' and mains okay, the unit will change mode to 'test' and the generator will run if no shutdown alarms are present.

9 CAN ECU POWER
This output normally used to turn on the ECU (sometimes via an external slave relay). Some engine ECUs are permanently powered in which case the ECU Power output is used to give input to a Run (or similarly named) input on the ECU.

10 CAN ECU STOP
This output used to give input to a Stop (or similarly named) input on the ECU. This is used as a backup stop system should the ECU Data link fail. In this instance, it is not possible to stop the engine using a data command as the link is not operative. As a backup, the STOP signal is given to the engine via a separate hardwired connection.

11 CHARGE ALTERNATOR FAILURE
This output indicates that a charging alternator failure has occurred.

12 COMMON ALARM
This output indicates that a warning, electrical trip or shutdown alarm has been activated.

13 COMMON ELECTRICAL TRIP ALARM
This output indicates that an electrical trip alarm has been activated. This output can only be reset by removal of the fault and by then pressing the RESET button.

14 COMMON SHUTDOWN ALARM
This output indicates that a shutdown alarm has been activated. This output can only be reset by removal of the fault and by then pressing the RESET button or by using an external 'alarm reset' input.

15 COMMON WARNING ALARM
This output indicates that a warning alarm has been activated. This output is normally self-resetting on removal of the fault.

16 COOLING FAN AFTER START
This output should energise as soon as engine has started so the fan should be running when the engine is running. This output should continue to operate for Cooling Fan Time parameter after engine has stopped.

17 COOLING FAN AFTER STOP
This output indicates that can be made to energise for Cooling Fan Time parameter after the engine shuts down (to run an electric cooling fan on the radiator).

18 COOLANT TEMPERATURE HIGH PRE-ALARM
This output indicates that a high engine coolant temperature warning (pre-alarm) has occurred.

19 COOLANT TEMPERATURE HIGH SHUTDOWN
This output indicates that a high engine coolant temperature shutdown has occurred.

20 COOLING DOWN TIMER IN PROGRESS
This output source will be active when the cooling off-load timer is running.

21 CRANK RELAY ENERGISED
The output mimics the operation of the crank relay. Can be used to control external logic circuitry.

22 DELAYED ALARMS ACTIVE
The output indicates that the delayed alarms now enabled. Can be used to control external logic circuitry.

23 DIGITAL INPUT1 ALARM
This output indicates that digital input 1 alarm has occurred.

24 DIGITAL INPUT2 ALARM
This output indicates that digital input 2 alarm has occurred.

25 DIGITAL INPUT3 ALARM
This output indicates that digital input 3 alarm has occurred.

26 DIGITAL INPUT4 ALARM
This output indicates that digital input 4 alarm has occurred.

27 DIGITAL INPUT5 ALARM
This output indicates that digital input 5 alarm has occurred.

28 DIGITAL INPUT6 ALARM
This output indicates that digital input 6 alarm has occurred.

29 DIGITAL INPUT7 ALARM
This output indicates that digital input 7 alarm has occurred.

30 EXPANSION CONFIGURABLE INPUT1 ALARM
This output indicates that expansion configurable input 1 alarm has occurred.

31 EXPANSION CONFIGURABLE INPUT2 ALARM
This output indicates that expansion configurable input 2 alarm has occurred.

32 EXPANSION CONFIGURABLE INPUT3 ALARM
This output indicates that expansion configurable input 3 alarm has occurred.

33 EXPANSION CONFIGURABLE INPUT4 ALARM
This output indicates that expansion configurable input 4 alarm has occurred.

34 EXPANSION CONFIGURABLE INPUT5 ALARM
This output indicates that expansion configurable input 5 alarm has occurred.

35 EXPANSION CONFIGURABLE INPUT6 ALARM
This output indicates that expansion configurable input 6 alarm has occurred.

36 EXPANSION CONFIGURABLE INPUT7 ALARM
This output indicates that expansion configurable input 7 alarm has occurred.

37 EXPANSION CONFIGURABLE INPUT8 ALARM
This output indicates that expansion configurable input 8 alarm has occurred.

38 EARTH FAULT
This output indicates that the unit has detected that an earth fault exists on the generator output.

39 EMERGENCY STOP
This output indicates that an emergency stop alarm has occurred.

40 FAIL TO START ALARM
This output indicates that the engine has not started after the specified number of attempts.

41 FAIL TO STOP ALARM
This output indicates that the generator has failed to stop within the selected time

42 FUEL PUMP CONTROL
Becomes active when the Fuel level falls below the "FUEL PUMP ON" setting and is normally used to transfer fuel from the bulk tank to the day tank. If the output is already active it will become inactive when the Fuel level is above the "FUEL PUMP OFF" settings.

43 FUEL RELAY ENERGISED
The output mimics the operation of the fuel relay. It can be used to control external logic circuitry.

44 GAS ENGINE IGNITION OUTPUT
With the engaging of the starter the ignition delay is started. If the ‘minimum ignition speed’ is reached after expiry of this time, the configurable relay output ‘ignition’ is set. When the necessary engine shutdown process, firstly gas valve is de-energised. Then ignition output is de-energised that after 5 seconds when the engine speed become lower than ‘minimum ignition speed’

45 GENERATOR AT REST
The output indicates that the generator is not running.

46 GENERATOR AVAILABLE
This output indicates when the generator is ready to accept load, i.e. after safety on and warm up timers have timed out.

47 GENERATOR CLOSED AUXILIARY
This output indicates that a digital input that has been configured as 'generator closed auxiliary' is active.

48 GENERATOR FAILED TO CLOSE
This output source has intended to be used to indicate a failure of the generator contactor or breaker. It can only be used if the unit is configured to use 'generator closed auxiliary' feedback.

49 GENERATOR FAILED TO OPEN
This output source has intended to be used to indicate a failure of the generator contactor or breaker. It can only be used if the unit is configured to use 'generator closed auxiliary' feedback.

50 GENERATOR HIGH FREQUENCY PRE-ALARM
This output indicates that a generator high frequency warning (pre-alarm) has occurred.

51 GENERATOR HIGH FREQUENCY SHUTDOWN
This output indicates that a generator high frequency shutdown has occurred.

52 GENERATOR HIGH VOLTAGE PRE-ALARM
This output indicates that a generator high voltage warning (pre-alarm) has occurred.

53 GENERATOR HIGH VOLTAGE SHUTDOWN
This output indicates that a generator high voltage shutdown has occurred.

54 GENERATOR LOAD INHIBIT
This output indicates that a digital input has been configured as 'generator load inhibit' is active.

55 GENERATOR LOW FREQUENCY PRE-ALARM
This output indicates that a generator low frequency warning (pre-alarm) has occurred.

56 GENERATOR LOW FREQUENCY SHUTDOWN
This output indicates that a generator low frequency shutdown has occurred.

57 GENERATOR LOW VOLTAGE PRE-ALARM
This output indicates that a generator low voltage warning (pre-alarm) has occurred.

58 GENERATOR LOW VOLTAGE SHUTDOWN
This output indicates that a generator low voltage shutdown has occurred.

59 GENERATOR STOPPING
This output indicates that the engine has been instructed to stop but has not come to rest.

60 GENERATOR OPEN BREAKER
This output used to control the load switching device. For Details see: "BREAKERS Page" section.

61 HORN OUTPUT LATCHED
This output indicates that the latched horn alarm has occurred.

62 HORN OUTPUT PULSED
This output indicates that the pulsed horn alarm has occurred.

63 LAMP TEST
This output indicates that the module is performing a lamp test. Once the lamp test completed, the output will become inactive again. The output can be used to feed a lamp test on external modules or panel lamps.

64 LEVEL PREALARM
This output indicates that a level warning (pre-alarm) has occurred.

65 LOSS OF MAGNETIC PICK-UP SPEED SIGNAL
This output indicates that the magnetic pick up signal is not sufficient to be used by the unit for speed monitoring. The alarm can only operate if the speed signal fails to appearduring cranking. It is disabled if ‘multiple attempts to engage’ is selected. If the MPU fails during engine running this would result in an under speed alarm.

66 LOW TEMPERATURE
This output indicates that a low temperature warning has occurred.

67 MAINTENANCE DUE ALARM
This output indicates that the generator is now due for maintenance either because it has used all the available running hours or the periodic maintenance time has expired. To clear the output a maintenance reset must be performed.

68 MAINS CLOSED AUXILIARY
This output indicates that a digital input that has been configured as 'mains closed auxiliary' is active.

69 MAINS FAILED TO CLOSE
This output source has intended to be used to indicate a failure of the mains contactor or breaker. It can only be used if the unit is configured to use 'mains closed auxiliary' feedback.

70 MAINS FAILED TO OPEN
This output source has intended to be used to indicate a failure of the mains contactor or breaker. It can only be used if the unit is configured to use 'mains closed auxiliary' feedback.

71 MAINS FAILURE
This output indicates that the unit has sensed that a failure of the incoming AC mains supply. This output will become active whenever the mains voltage or frequency goes out of limits, or if the auxiliary mains failure input active (if used) and the mains transient timer has expired.

72 MAINS HIGH FREQUENCY
This output indicates that the unit has sensed that the incoming AC mains supply frequency has exceeded the frequency limit setting.

73 MAINS HIGH VOLTAGE
This output indicates that the unit has sensed that the incoming AC mains supply voltage has exceeded the voltage limit setting.

74 MAINS LOAD INHIBIT
This output indicates that a digital input has been configured as 'mains load inhibit' is active.

75 MAINS LOW FREQUENCY
This output indicates that the unit has sensed that the incoming AC mains supply frequency has fallen below the frequency setting.

76 MAINS LOW VOLTAGE
This output indicates that the unit has sensed that the incoming AC mains supply voltage has fallen below the voltage limit setting.

77 MAINS OPEN BREAKER
This output used to control the load switching device. For Details see: "BREAKERS Page" section.

78 NO LOADING COMMAND
This output indicates that the unit is not calling of the generator contactor or breaker to be closed. Should the unit close the generator contactor this output will become inactive.

79 OIL PRESSURE LOW PRE-ALARM
This output indicates that a low oil pressure warning (pre-alarm) has occurred.

80 OIL PRESSURE LOW SHUTDOWN
This output indicates that a low oil pressure shutdown has occurred.

81 OIL TEMPERATURE HIGH PRE-ALARM
This output indicates that a high oil temperature warning (pre-alarm) has occurred.

82 OIL TEMPERATURE HIGH SHUTDOWN
This output indicates that a high oil temperature shutdown has occurred.

83 OVER CURRENT PRE-ALARM
This output indicates that the over current pre-alarm has been reached.

84 OVER CURRENT ALARM
This output indicates that the over current trip level has been reached.

85 OVER POWER PRE-ALARM
This output indicates that the over power pre-alarm has been reached.

86 OVER POWER SHUTDOWN
This output indicates that the over power shutdown has been reached.

87 OVER SPEED PRE-ALARM
This output indicates that the over speed warning (pre-alarm) has occurred.

88 OVER SPEED SHUTDOWN
This output indicates that the over speed shutdown has occurred.

89 PANEL LOCK
This output indicates that the unit ‘panel lock’ is active. If the panel lock input is active, the unit will not respond to operation of the Mode select or start buttons. This allows the unit to be placed into a specific mode (such as auto) and then secured.

90 PRE-HEAT(during preheat timer)
The output controls the pre-heater. Pre-heat output is available for the duration of pre-heat timer, which terminates prior to cranking.

91 PRE-HEAT(until end of cranking)
The output controls the pre-heater. As 'Pre-heat (during pre-heat timer)' mode but pre-heat is also available during cranking.

92 PRE-HEAT(until end of warming)
The output controls the pre-heater. As 'Pre-heat (until safety on)' but pre-heat continues to be available until the warm-up timer has elapsed.

93 PRE-HEAT(until end safety on)
The output controls the pre-heater. As 'Pre-heat (until end of cranking)' but pre-heat is also available while waiting for the delayed alarms to become active.

94 REMOTE START PRESENT
This output indicates that a digital input that has been configured as 'remote start' is active. This output could be used to pass the remote start signal on to else where in the control system.

95 REMOTE STOP DELAY IN PROGRESS
This output source will be active to indicate that the return timer is running.

96 SHORT CIRCUIT
This output indicates that the module has detected a short circuit on the generator output.

97 SMOKE LIMITING
This output is used to supply a smoke-limiting signal to an Electronic Governor to limit smoke emissions on start-up. It is used in conjunction with the Smoke limit timer (Idle mode timer) settings. Once the timer has expired, the Smoke limit output will cease to operate allowing the engine to accelerate to normal running speed.

98 STARTING ALARM
This output is used to supply an external sounder with a signal that the engine is about to start. The output will be active during the start delay and pre-heat timer (if used).

99 STARTING ALARMS ARMED
The output indicates that the starting alarms are now enabled. It can be used to control external logic circuitry. Starting alarms are armed as soon as the unit commences starting of the engine and remain armed until the engine at rest.

100 STOP RELAY ENERGISED
The output mimics the operation of the stop relay. Can be used to control external logic circuitry.

101 SYSTEM IN AUTO MODE
The output indicates that the unit is in the Auto mode.

102 SYSTEM IN MANUAL MODE
The output indicates that the unit is in the Manual mode.

103 SYSTEM IN STOP MODE
The output indicates that the unit is in the Stop mode.

104 SYSTEM IN TEST MODE
The output indicates that the unit is in the Test mode.

105 UNDER CURRENT PRE-ALARM
This output indicates that the under current pre-alarm has been reached.

106 UNDER CURRENT ALARM
This output indicates that the under current trip level has been reached.

107 UNDER POWER PRE-ALARM
This output indicates that the under power pre-alarm has been reached.

108 UNDER POWER SHUTDOWN
This output indicates that the under power shutdown has been reached.

109 UNDER SPEED PRE-ALARM
This output indicates that an under speed warning (pre-alarm) has occurred.

110 UNDER SPEED SHUTDOWN
This output indicates that an under speed shutdown has occurred.

111 WAITING FOR GENERATOR
This output indicates that the engine has been instructed to start but has not yet become available. Once the generator becomes available this output will be in-active.

112 DUAL COMMUNICATION ERROR
This output indicates that an dual communication alarm has occurred.

113 LOAD SUPPLY FROM GENERATOR
This output indicates that the load is supplying from generator.

114 LOAD SUPPLY FROM MAINS
This output indicates that the load is supplying from mains.

4.2.7 Timers

START TIMERS (*Timers->Start timers*)		Min	Max	Default	Unit
Mains transient delay	Mains Transient Delay	0.0	20.0	2.0	Sec
Mains fail start dely	Mains Fail Start Delay	0	9999	0	Sec
Remote start delay	Remote Start Delay	0	3600	4	Sec
Pre-heat	Pre-Heat	0	250	3	Sec
Pre-heat bypass	Pre-Heat Bypass	0	250	0	Min
Safety on delay	Safety On Delay	0	99	8	Sec
Warming up time	Warmup Time	0	250	3	Sec
Horn duration	Horn Duration	0 (dis)	999	60	Sec
Charg.excitation time	Charge Excitation Time	0	99(cont)	15	Sec
Cooling fan time	Cooling Fan Time	0	250	180	Sec
Idle mode time	Idle Mode Time (Smoke Limiting)	0 (dis)	3600	dis	Sec
Idle mode time off	Idle Mode Time Off (Smoke Limiting Off)	0	250	5	Sec

Mains Transient Delay
The unit uses this parameter to decide the mains fail.

Mains Fail Start Delay
This timer dictates how long the unit will wait after it has received a mains failure signal before it will attempt to start. This prevent un-necessary starting on a fluctuating mains supply etc.

Remote Start Delay
This timer dictates how long the unit will wait after it has received a remote start signal before it will attempt to start. This prevent un-necessary starting on a fluctuating mains supply etc.

Pre-Heat
This timer dictates the duration that the pre-heat output will be active before an attempt is made to start the engine. Once this timer is expired cranking will commence.

Pre-Heat Bypass
This feature allows the unit to start a hot engine without performing an un-necessary pre-heat delay. The bypass timer is triggered by the generator starting and actually being loaded. If the generator started but does not achieve loading then the timer will not be triggered. The bypass timer is initiated once the engine has come to rest. If any attempts to start are requested within the duration of the bypass timer the start sequence will bypass the pre-heat timer.

Safety On Delay
This timer dictates how long the unit will ignore the Low Oil Pressure, High Engine Temperature, Underspeed, Undervolts and any other inputs configured as active from safety on. It allows the values such as oil pressure to rise to their operating values on starting without triggering an alarm. Once the timer has expired all alarm conditions are monitored again. If configured to use 'fast loading', should all the monitored conditions, such as oil pressure, come to expected state prior to the end of the safety on timer, the timer will be terminated prematurely ensuring maximum protection as soon as possible.

Warmup Time
This timer is initiated once the engine is up and running. It delays loading the generator until it has stabilised. Once this timer is expired the 'Close generator' signal will be given and the generator is available to be loaded.

Horn Duration
This timer dictates how long the horn will work after the last error detected. Once after this timer ended unit will do horn reset.

Charge Excitation Time
Charge excitation was selectable as momentary / continuous operation.This timer dictates how long the Charge excitation will active.

Note: dis = disable cont = continuous

Cooling Fan Time
This timer dictates how long the Cooling Fan will continue to operate.

Idle Mode Time (Smoke Limiting)
This is the amount of time that the smoke limiting output will remain active for once the engine has started. While the smoke limiting output is active the engine will be held at a reduced speed to minimise smoke emissions on start-up. (Only if fitted with an appropriate Electronic Control Module). Once the timer has expired the engine will be allowed to accelerate up to its normal operating speed.

Idle Mode Time Off (Smoke Limiting Off)
This timer is started after the Idle mode timer (smoke limit timer) was expired. This is to allow the engine to accelerate to its normal running speed without triggering an underspeed alarm, etc.

STOPPING TIMERS (*Timers->Stopping timers*)		**Min**	**Max**	**Default**	**Unit**
Mains return delay	Mains Return Delay	0	3600	5	Sec
Remote stop delay	Remote Stop Delay	0	250	4	Sec
Cooling time	Cooling Time	0 (dis)	3600	60	Sec
Fail to stop delay	Fail To Stop Time	15	99	30	Sec

Mains Return Delay
This timer dictates how long the unit will wait before it will un-load the generator (back to the mains supply if AMF) and initialise it's run-on and shutdown cycle. This is ensure that the mains supply has stabilised before transferring the load back to mains.

Remote Stop Delay
This timer dictates how long the unit will wait after it has received a remote stop signal before it will attempt to stop. This prevent un-necessary stopping on a fluctuating mains supply etc.

Cooling Timer
This is the time the generator is to run off-load once the load transfer signal has ceased. This gives the engine time to cool down before shutdown.

Fail To Stop Time
Once the unit has given a shutdown signal to the engine it expects the engine to come to rest. It monitors the Oil pressure and speed sensing sources and if they still indicate engine movement when this timer expires a 'Fail To Stop' alarm signal is generated.

4.2.8 Expansion Modules

IO (1-8) MODULE (*Expansion modules->IO (1-8)*)		**Min**	**Max**	**Default**	**Unit**
Disable/enable select	Expansion I/O Module Selection	ENABL/DISBL		DISBL	

DIAL-UP & ETHERNET (*Expansion modules->Dial-up & Ethernet*)		**Min**	**Max**	**Default**	**Unit**
Disable/enable select	Expansion Dal-up&Ethernet Module Selection	ENABL/DISBL		DISBL	
Call back selection	Call Back Selection	ENABL/DISBL		DISBL	

GSM MODULE (*Expansion modules->GSM*)		**Min**	**Max**	**Default**	**Unit**
Disable/enable select	Expansion GSM Module Selection	ENABL/DISBL		DISBL	
Call back selection	Call Back Selection	ENABL/DISBL		DISBL	
SMS	SMS Feature Enable or Disable	ENABL/DISBL		DISBL	

GPRS MODULE (*Expansion modules->GPRS*)		**Min**	**Max**	**Default**	**Unit**
Disable/enable select	Expansion GPRS Module Selection	ENABL/DISBL		DISBL	
Call back selection	Call Back Selection	ENABL/DISBL		DISBL	

Note: dis = disable

DUAL SET MODULE (*Expansion modules->Dual set*)		Min	Max	Default	Unit
Disable/enable select	Expansion Dual Set Module Selection	ENABL/DISBL		DISBL	
Node ID	Node Address	1	2	1	
Working period	Dual Working Period	0:00	9:59	1:00	H.Min
Early start time	Early Start Time	0	250	15	Sec
Remote priority selct	Remote Priority Selection: 0- Disable, 1- Priority, 2- None Priority	0(dis)	2	dis	

4.2.9 User Adjustment

MAINS VOLTAGE OFFSET (*User adjustment->Mains voltage offset*)		Min	Max	Default	Unit
Mains V1 offset	Mains V1 Offset	-20	20	0	V~
Mains V2 offset	Mains V2 Offset	-20	20	0	V~
Mains V3 offset	Mains V3 Offset	-20	20	0	V~

GEN. VOLTAGE OFFSET (*User adjustment->Gen. voltage offset*)		Min	Max	Default	Unit
Gen. V1 offset	Generator V1 Offset	-20	20	0	V~
Gen. V2 offset	Generator V2 Offset	-20	20	0	V~
Gen. V3 offset	Generator V3 Offset	-20	20	0	V~

CURRENT OFFSET (*User adjustment->Current offset*)		Min	Max	Default	Unit
Current I1 offset	Current I1 Offset	-20	20	0	A~
Current I2 offset	Current I2 Offset	-20	20	0	A~
Current I3 offset	Current I3 Offset	-20	20	0	A~
Earth current offset	Earth current I3 Offset	-20	20	0	A~

BATTERY&CHRG GEN.VOL (*User adjustment->Battery&chrg gen.vol*)		Min	Max	Default	Unit
Battery V offset	Battery Voltage Offset	-5.0	5.0	0	V⎓
Charge gen. V offset	Charge Generator Voltage Offset	-5.0	5.0	0	V⎓

SENDER INPUTS OFFSET (*User adjustment->Sender inputs offset*)		Min	Max	Default	Unit
Oil Pressure offset	Oil Pressure Offset	-2.0	2.0	0.0	BAR
Temperature offset	Coolant Temperature Offset	-20	20	0	ºC
Level offset	Level Offset	-20	20	0	%
Oil temper. offset	Oil Temperature Offset	-20	20	0	ºC

Error Messages And Explanations:

Amber warning lamp! : Amber warning lamp error
Battery high error! : Battery High Error
Battery low error! : Battery Low Error
Can bus error! : Can Bus Error
Charge alterntr err! : Caharge Alternator Fail
Dual communicat. err! : Dual Communication Error
Earth fault el.trip! : Earth Fault Electrical Trip
Earth fault error! : Earth Fault Error
Earth fault warning! : Earth Fault Warning
Emergency stop! : Emergency Stop Error
Exp.spare-1 error! : Expansion Spare 1 Error
Exp.spare-2 error! : Expansion Spare 2 Error
Exp.spare-3 error! : Expansion Spare 3 Error
Exp.spare-4 error! : Expansion Spare 4 Error
Exp.spare-5 error! : Expansion Spare 5 Error
Exp.spare-6 error! : Expansion Spare 6 Error
Exp.spare-7 error! : Expansion Spare 7 Error
Exp.spare-8 error! : Expansion Spare 8 Error
Fail to start alarm! : Failed to Start Alarm
Gen br.not clos.alr! : Generator Breaker Not Closed alarm
Gen br.not open.alr! : Generator Breaker Not Opened alarm
Generator stop err! : Generator Stop Error
Gen over frq.prealr! : Generator Over Frequency Prealarm
Gen over frq.shutdwn! : Generator Over Frequency Shutdown
Gen over vol.prealr! : Generator Over Voltage Prealarm
Gen over vol.shutdwn! : Generator Over Voltage Shutdown
Gen phase seq.wrong! : Generator Phase Sequence Wrong
Gen under frq.preal! : Generator Under Frequency Prealarm
Gen under frq.shtdwn! : Generator Under Frequency Shutdown
Gen under vol.preal! : Generator Under Voltage Prealarm
Gen under vol.shtdwn! : Generator Under Voltage Shutdown
High temp.prealarm! : High Temperature Prealarm
High temp.shutdown! : High Temperature Shutdown
Level error! : Fuel Level Error
Level prealarm! : Fuel Level Prealarm
Low temperature! : Low Temperature Warning
Mains br.not cl.alr! : Mains Breaker Not Closed alarm
Mains br.not op.alr! : Mains Breaker Not Opened alarm
Maintenance error! : Maintenance Error
Oil press.shutdown! : Oil Pressure Shutdown
Oil temp.prealarm! : Oil Temperature Prealarm
Oil temp.shutdown! : Oil Temperature Shutdown
Over currnt el.trip! : Over Current Electrical Trip
Over current error! : Over Current Error
Over current prealr! : Over Current Prealarm
Over current warnng! : Over Current Warning
Over power error! : Over Power Error
Over power prealarm! : Over Power Prealarm
Over speed error! : Over Speed Error
Over speed prealarm! : Over Speed Prealarm
Pressure prealarm! : Oil Pressure Prealarm
Red stop lamp! : Red Stop Lamp Error
Short circuit error! : Short Circuit Error
Spare-1 error! : Spare 1 Error
Spare-2 error! : Spare 2 Error
Spare-3 error! : Spare 3 Error
Spare-4 error! : Spare 4 Error
Spare-5 error! : Spare 5 Error
Spare-6 error! : Spare 6 Error
Spare-7 error! : Spare 7 Error
Speed loss error! : Magnetic Pickup Loss of Speed Error

Error Messages And Explanations:

Under currnt el.trip! : Under Current Electrical Trip
Under current error! : Under Current Error
Under current prealr! : Under Current Prealarm
Under current warnng! : Under Current Warning
Under power error! : Under Power Error
Under power prealarm! : Under Power Prealarm
Under speed error! : Under Speed Error
Under speed prealarm! : Under Speed Prealarm

Event Messages And Explanations:

Amber warning lamp: Amber warning lamp error
Battery high error: Battery High Error
Battery low error: Battery Low Error
Can bus error: Can Bus Error
Changed mode to stop: Changed mode to stop
Changed mode to man: Changed mode to manual
Changed mode to test: Changed mode to test
Changed mode to auto: Changed mode to auto
Charge alterntr fail: Caharge Alternator Fail
Dual communicat. err : Dual Communication Error
Earth fault alarm: Earth Fault Alarm
Emergency stop: Emergency Stop Error
Exp.spare-1 error: Expansion Spare 1 Error
Exp.spare-2 error: Expansion Spare 2 Error
Exp.spare-3 error: Expansion Spare 3 Error
Exp.spare-4 error: Expansion Spare 4 Error
Exp.spare-5 error: Expansion Spare 5 Error
Exp.spare-6 error: Expansion Spare 6 Error
Exp.spare-7 error: Expansion Spare 7 Error
Exp.spare-8 error: Expansion Spare 8 Error
Fail to start alarm: Failed to Start Alarm
Gen br.not clos.alr: Generator Breaker Not Closed alarm
Gen br.not open.alr: Generator Breaker Not Opened alarm
Generator stop error: Generator Stop Error
Gen over frq.prealr: Generator Over Frequency Prealarm
Gen over frq.shutdwn: Generator Over Frequency Shutdown
Gen over vol.prealr: Generator Over Voltage Prealarm
Gen over vol.shutdwn: Generator Over Voltage Shutdown
Gen phase seq.wrong: Generator Phase Sequence Wrong
Gen under frq.preal: Generator Under Frequency Prealarm
Gen under frq.shtdwn: Generator Under Frequency Shutdown
Gen under vol.preal: Generator Under Voltage Prealarm
Gen under vol.shtdwn: Generator Under Voltage Shutdown
GPRS reset fail: GPRS reset fail
GPRS IP not found: GPRS no IP alarm
High temp.prealarm: High Temperature Prealarm
High temp.shutdown: High Temperature Shutdown
Level error: Fuel Level Error
Level prealarm: Fuel Level Prealarm
Low temperature: Low Temperature Warning
Mains br.not cl.alr: Mains Breaker Not Closed alarm
Mains br.not op.alr: Mains Breaker Not Opened alarm
Maintenance error: Maintenance Error
Maintenance warning: Maintenance Warning
Modem response: error: GPRS error response alarm
No respons.from modem: GPRS no response alarm
Oil press.shutdown: Oil Pressure Shutdown
Oil temp.prealarm: Oil Temperature Prealarm
Oil temp.shutdown: Oil Temperature Shutdown
Over current alarm: Over Current Alarm
Over current prealr: Over Current Prealarm

Event Messages And Explanations:

Over power error: Over Power Error
Over power prealarm: Over Power Prealarm
Over speed prealarm: Over Speed Prealarm
Over speed shutdown: Over Speed Shutdown
Pressure prealarm: Oil Pressure Prealarm
Red stop lamp: Red Stop Lamp Error
Short circuit alarm: Short Circuit Alarm
SMS was sent: SMS was successfully sent
SMS was not sent: SMS wasn't sent
Spare-1 error: Spare 1 Error
Spare-2 error: Spare 2 Error
Spare-3 error: Spare 3 Error
Spare-4 error: Spare 4 Error
Spare-5 error: Spare 5 Error
Spare-6 error: Spare 6 Error
Spare-7 error: Spare 7 Error
Speed loss error: Magnetic Pickup Loss of Speed Error
Under current error: Under Current Error
Under current prealr: Under Current Prealarm
Under power error: Under Power Error
Under power prealarm: Under Power Prealarm
Under speed prealarm: Under Speed Prealarm
Under speed shutdown: Under Speed Shutdown

5. Specifications

Equipment use	: Electrical control equipment for generating sets.
Housing & Mounting	: 229 mm x 152 mm x 41 mm. (including connectors). Plastic housing for panel mounting.
Panel Cut-Out	: 182mm x 135mm.
Protection	: IP65 at front panel.
Weight	: Approximately 0,53 Kg.
Environmental rating	: Standard, indoor at an altitude of less then 2000 meters with non-condensing humidity.
Operating/Storage Temperature	: -20°C to +70°C / -30°C to +80°C
Operating/Storage Humidity	: 90 % max. (non-condensing)
Installation Over Volt. Category	: II Appliances, portable equipment
Pollution Degree	: II, Normal office or workplace, non conductive pollution
Mode of Operation	: Continuous.
DC Battery Supply Voltage	: 8 to 32 V ⎓. Max. operating current is 360 mA.
Cranking Dropouts	: Battery voltage can be “0” VDC for max. 50 ms during cranking (battery voltage should be at least nominal voltage before cranking).
Battery Voltage Measurement	: 8 to 32 V ⎓, accuracy: 1 % FS, resolution: 0,1 V
Mains Voltage Measurement	: 3 to 300 VAC Ph-N, 5 to 99.9 Hz. Accuracy: 1 % FS, Resolution: 1 V.
Mains Frequency	: 5 to 99.9Hz (min. 20 VAC Ph-N) Accuracy: 0,25 % FS, Resolution: 0,1 Hz.
Generator Voltage Measurement	: 3 to 300 VAC Ph-N, 5 to 99.9 Hz. Accuracy: 1 % FS, Resolution: 1 V.
Generator Frequency	: 5 to 99.9Hz (min. 20 VAC Ph-N) Accuracy: 0,25 % FS, Resolution: 0,1 Hz.
Magnetic Pickup Input	: 35 to 10000 Hz (4 to 35 volts peak continuously). Accuracy: 0,25 % FS.
CT secondary	: 5A.
Charge Generator Excitation	: 210mA @12V, 105mA @24V. Nominal 2.5W.
Charge Gen. Vol. Measurement	: 8 to 32 V ⎓, accuracy: 1 % FS, resolution: 0,1 V.
Sender Measurement	: 0 to 1300 ohm, accuracy: 1 % FS, resolution: 1 ohm.
Communication interface	: USB programming and communication port, CanBus communication with 1939 ECU
Optional Expansion I/O Module	: Expansion I/O module including 8 inputs and 8 outputs.
Optional Comm. Modules	: Ethernet/Dial-up, GSM/GPRS and Dual Set modules.