

Installation and Operating Instructions GEN-AUTO FP



Crompton GEN-AUTO FP Installation & Operating Instructions

Important safety information is contained in this manual. Users must familiarise themselves with this information before attempting installation or other procedures.

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1. Introduction

The GEN-AUTO FP provides control and protection in the operation of a generator set. The unit allows starting and stopping of the engine and indicates status and fault conditions. The unit monitors:

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

It controls:

- Engine fuel supply
- Starter motor
- Automatic generator start and stop
- Alarm horn
- Pre-heating

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

- Alternator output Voltage and frequency
- Engine RPM
- Battery voltage
- Elapsed time
- Load current and power
- Oil pressure value
- Coolant system temperature
- Fuel tank level value
- Error indication
- Program parameters

The unit is extensively programmable through the front panel, with password protection on two levels. Operational parameters can also be monitored and controlled from a PC via a built-in RS232 port.

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

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

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

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

Two extra outputs can be configured to indicate any alarm, when the engine is running, when a load transfer can be permitted, or when engine preheating is required.

2. Installation

2.1 Unpacking

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

Check the contents, as follows:

- One GEN-AUTO FP unit.
- Operating Manual.
- Screw clamp electrical connectors
- Panel mounting kit.
- RS232 Cable.

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

2.2 Unit Configuration

The unit can be programmed using the buttons and display on the front panel. Refer to Section 3 Programming for details. Alternatively, the unit can be programmed via the RS232 communication port, using PC based software.

2.3 Mechanical Installation

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

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



During mechanical installation, beware of any sharp burrs on the metal panel aperture. Ensure that the fixing screws are properly tightened. Use shake-proof washers or locking nuts to prevent the fixings becoming loose due to panel vibration.

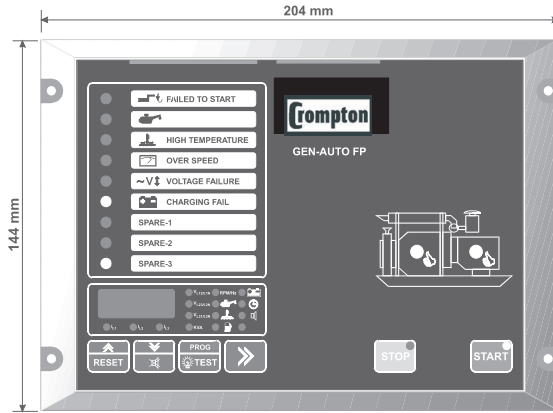


Figure 2.1 Front view.

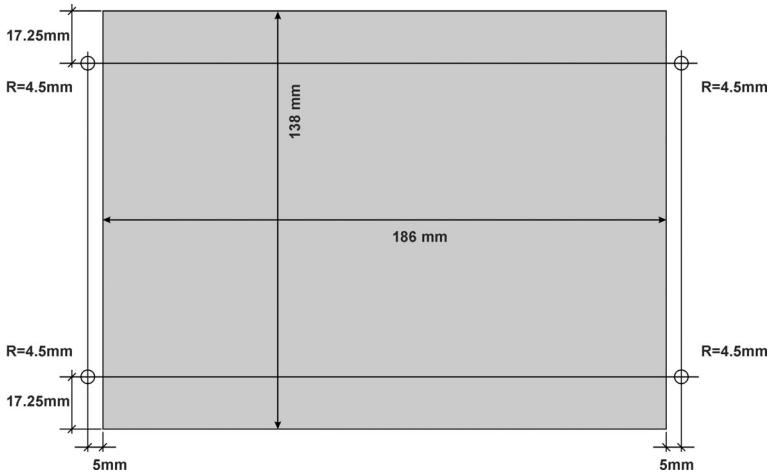
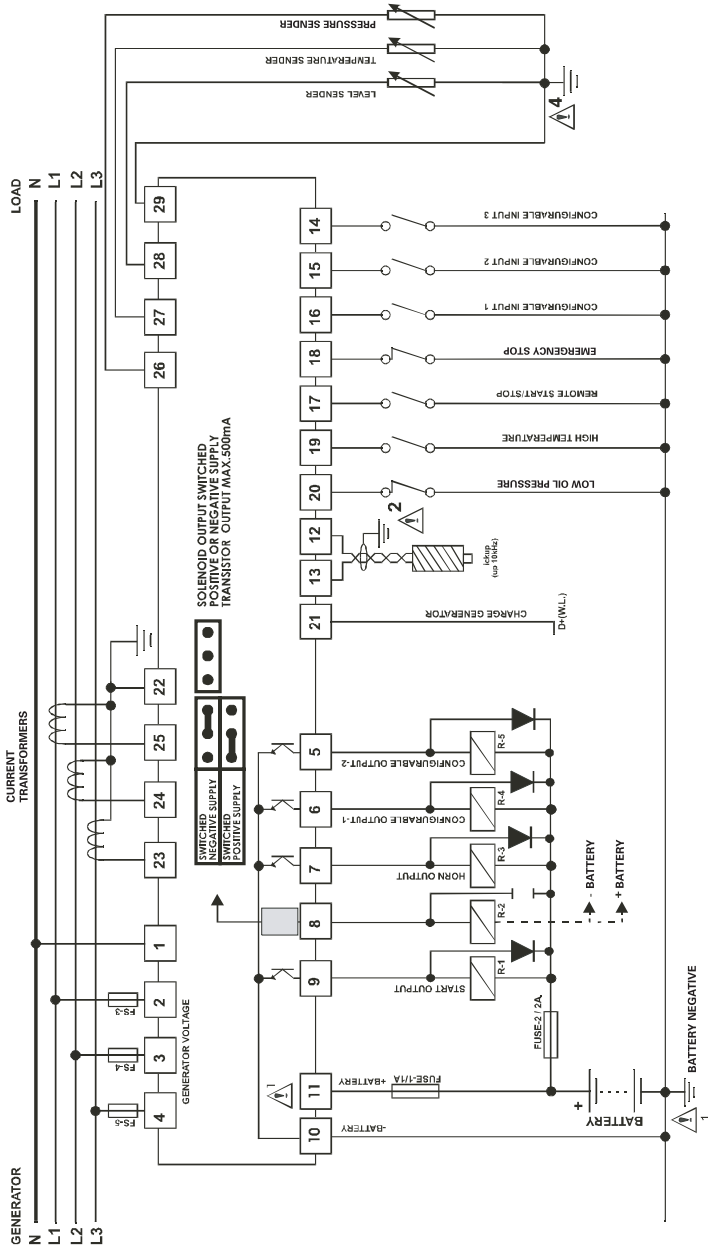


Figure 2.2 Panel cut-out



Figure 2.3 Side view.



Fuse Values: F1 1A
F2 2A
F3-F5 1A

Figure 2.6 GEN-AUTO FP three phase connections schematic.

Table 2.1 shows the connections and recommended cable sizes. Table 2.2 describes the functions of the connections.

Table 2.1 Unit wiring

Pin	Description	Notes
1	Generator Neutral conductor	
2	Generator voltage input (L1)	
3	Generator voltage input (L2)	3 phase applications only.
4	Generator voltage input (L3)	3 phase applications only.
5	Configurable output - 2	500 mA transistor output.
6	Configurable output - 1	500 mA transistor output.
7	Output to alarm horn	500 mA transistor output.
8	Output to fuel relay or stop solenoid	500 mA transistor output.
9	Output to start / cranking relay	500 mA transistor output.
10	- Battery supply to GEN-AUTO.FP and transistor outputs common.	DC Supply to unit.
11	+ Battery supply to GEN-AUTO.FP	DC Supply to unit.
12	Input from magnetic pick-up	
13		
14	Configurable failure input - 3	Switch to "0" volt.
15	Configurable failure input - 2	Switch to "0" volt.
16	Configurable failure input - 1	Switch to "0" volt.
17	Remote inhibit input	Switch to "0" volt.
18	Emergency stop input	Normally closed to "0" volt, open circuit for emergency stop.
19	Input from high temperature switch	Switch to "0" volt.
20	Input from low oil pressure switch	Switch to "0" volt.
21	Input from charge generator	
22	Current measuring input common	
23	Current measuring input for IL3	Analogue input
24	Current measuring input for IL2	Analogue input
25	Current measuring input for IL1	Analogue input
26	Pressure sender input	Analogue input
27	Temperature sender input	Analogue input
28	Level sender input	Analogue input
29	Sender common	








Table 2.2 Unit wiring description

Pin	Function	
1	Generator Neutral conductor to GEN-AUTOFP	
2	L1	Generator voltage inputs. Pins 3 and 4 not used on single phase applications.
3	L2	
4	L3	
5	Configurable failure output - 2.	Can be programmed to provide transistor output closure when: alarm occurs, engine is running, unit is ready for automatic operation or preheat function. (via external relay)
6	Configurable failure output - 1.	Can be programmed to provide transistor output closure when: alarm occurs, engine is running, unit is ready for automatic operation or preheat function. (via external relay)
7	Transistor output to horn. Max 500 mA. Alarm output. (via external relay)	
8	Transistor output to fuel / stop relay. Max 500 mA. Controls fuel to engine or controls engine stopping. (via external relay and +V or -V selection link)	
9	Transistor output to start relay. Controls starter motor. (via external relay)	
10	V- Battery input. Supplies GEN-AUTOFP and transistor outputs common.	
11	V+ Battery input. Supplies GEN-AUTOFP	
12	Input from magnetic pick-up. Unit can be programmed for number of teeth detected on the flywheel, and nominal RPM.	
13		
14	Configurable failure input - 3. Normally open. When switched to 0V, can be programmed to sound the horn and flash indicator on panel.	
15	Configurable failure input - 2. Normally open. When switched to 0V, can be programmed to sound the horn and flash indicator on panel.	
16	Configurable failure input - 1. Normally open. When switched to 0V, can be programmed to sound the horn and flash indicator on panel.	
17	Input from remote Start switch. Normally open contact. Closed to 0V to start engine. Open switch to stop engine.	
18	Input from the emergency stop switch. Normally closed contact, Switch to 0V. When the switch opens, the engine stops and an alarm sounds.	
19	Input from temperature switch. Switched to 0V when the engine temperature exceeds thermostat setting.	
20	Input from low oil switch. The oil pressure switch must be the type that opens when oil pressure is normal, and closes on low oil pressure. (Failure condition or engine stopped.)	
21	Input from charge generator, which can be used to detect when the engine has started. If not used, this terminal should be connected to V+.	
22	Current measuring input common.	
23	Current measuring input for calculated power on load phase IL3.	
24	Current measuring input for calculated power on load phase IL2.	
25	Current measuring input for calculated power on load phase IL1.	
26	Analogue input for oil pressure measuring.	
27	Analogue input for engine temperature measuring.	
28	Analogue input for fuel tank level measuring.	
29	Sender input common.	

3 Programming

3.1 Procedure

Many of the unit functions can be set by programming. Programming can be carried out only while the unit is in **STOP** mode. Proceed as follows:

1. Press the  button. If the engine is running, it will stop and the integrated LED indicates the engine has stopped.
2. Press the  button and hold it, for 10 seconds, until the **PROG** LED illuminates.
3. The display shows **Opr.**
4. You may enter either an Operator password or a Technician password.
 - The Operator password restricts access to the primary programming functions P00 to P08 and P49 only.
 - The Technician password gives access to all programming functions.
5. If you wish to enter the Operator password only, press  button. Go to step 7.
6. To enter Technician password, press  for 10 seconds until display shows **TEC**
7. Use the  and  keys to increment and decrement the display until it shows the correct password. When the unit is initially supplied, the password for both Operator and Technician is **0000**. To prevent unauthorised access, use parameter P49 to change the Operator password and parameter P50 to change the Technician password. The Technician password is only accessible if you have entered as a technician.
8. Press  to confirm your password entry. **IF THE PASSWORD IS INCORRECT, THE UNIT WILL DROP OUT OF PROGRAM MODE.** If the password is correct, the display will show the first programmable parameter-(P00). You are now in program mode.



If no keys are pressed for a period of 20 seconds, the unit will return to the normal operating mode.







9. To view or change a parameter, press  repeatedly until the display shows the required parameter number and then press  to select it. The display will show the current value of the selected parameter.
10. Use the  and  keys to set the parameter to the required value.
11. Press  to accept the displayed value. The new value will be saved automatically. The display will show the number of the next parameter in the sequence.
12. To exit the programming mode, press . The unit will return to normal operating mode with new parameters. The **PROG** LED switches off.

Table 4 Programmable function definitions

Prg No	Definition of parameter	Unit	Lower / Upper Limit	Default	
P00	Alternator Voltage Lower Limit	VAC	60-600	300	
P01	Alternator Voltage Upper Limit	VAC	60-600	440	
P02	Speed Lower Limit	Hz.	30.0-75.0	47.0	
P03	Speed Upper Limit	Hz.	30.0-75.0	53.0	
P04	Battery Voltage Lower Limit	VDC	7.2-24.0	8.0	
P05	Battery Voltage Upper Limit	VDC	12.0-32.0	32.0	
P06	Over current limit	A	1-9999	1000	
P07	Periodic Maintenance Hour Set Value	Hour	0-9999	5000	
P08	Periodic Maintenance Hour Reset	Press DECREMENT Button For Reset			
P09	Horn Duration	Second	0 = Cont. 1-999	60	
P10	Preheat / Post-heat time	Second	0 - 99	10	
P11	Single/Three Phase Selection	1 = Single 2 = Two 3 = Three 4 = Series delta	1/2/3/4	3	
P12	Nominal Alternator Frequency	Hz.	0=50, 1=60	0	
P13	Nominal Speed (Rpm)	Rpm	500-5000	3000	
P14	Tooth Number	Number	1-1000	100	
P15	Current transformer ratio	Number	1-2000	500	
P16	Speed Sensing Input Selection	Number	0-Alternator Signal (Internal) 1-Magnetic Pickup	0	
P17	Stop/Fuel Solenoid Selection	Stop / Fuel	Stop / Fuel	Fuel	
P18	Stop Magnet Energising Time	Second	0-99	20	
P19	Remote Start Time Delay	Second	0-60	10	
P20	Remote Stop Time Delay	Minute	0-60	5	
P21	Engine Started Signal		0: No 1: Yes		
	P21.0	Charge Generator		0/1	1
	P21.1	Speed		0/1	0
	P21.2	Alternator Voltage		0/1	1
	P21.3	Oil Pressure		0/1	0
P22	Battery Voltage Weak Limit	VDC	6.0-14.4	7.0	
P23	Battery Voltage Weak Control Time	Second	1-99	3	
P24	Alternator Voltage Limit For Crank Disconnection	VAC	40-360	300	
P25	Speed Limit For Crank Disconnection	Hz.	20.0-45.0	40.0	
P26	Number Of Starting Attempts	Number	1-10	3	
P27	Starting Attempt Duration	Second	5-99	5	

Prg No	Definition of parameter	Unit	Lower / Upper Limit	Default
P28	Oil Pressure Bypass Time	Second	0-99	30
P29	Warm Up Delay	Second	0-99	10
P30	"Fast Loading" selection		0=Disable,1=Enable	0
P31	"Control On" Delay	Second	0-99	10
P32	Alternator Voltage Fault Control Delay	Second	0.0-10.0	5.0
P23	Speed Fault Control Delay	Second	0.0-10.0	5.0
P34	Engine Cooling Time	Minute	0 = Disable Cooling 1-99	3
P35	Engine Running Time Reset	Enter Technician password to reset time to "0" (zero)		
P36	Configurable Failure Input - 1	Number	0 / 1 / 2 / 3 / 4	0
	0 Status Indication Only			
	1 Fire Switch			
	2 Momentary Alarm			
	3 Latched Alarm			
4 Engine Stop				
P37	Configurable Failure Input - 2	Number	0 / 1 / 2 / 3 / 4	0
	0 Status Indication Only			
	1 Fire Switch			
	2 Momentary Alarm			
	3 Latched Alarm			
4 Engine Stop				
P38	Configurable Failure Input - 3	Number	0 / 1 / 2 / 3 / 4	0
	0 Status Indication Only			
	1 Fire Switch			
	2 Momentary Alarm			
	3 Latched Alarm			
4 Engine Stop				
P39	Configurable Failure Inputs Observation Function Selection	Number	0-Continuously monitored 1-While Engine Running only	
	P39. 0 Configurable Failure Input - 1		0 / 1	0
	P39. 1 Configurable Failure Input - 2		0 / 1	0
	P39. 2 Configurable Failure Input - 3		0 / 1	0

Prg No	Definition of parameter	Unit	Lower / Upper Limit	Default
P40	Configurable Output 1	Number	0-16	0
	0 Alarm Output			
	1 Engine running			
	2 Load transfer permit			
	3 Preheat for time period (P10)			
	4 Over speed shut-down output			
	5 Over current alarm			
	6 Low fuel level alarm			
	7 High temperature alarm			
	8 Low oil pressure alarm			
	9 Maintenance due alarm			
	10 Failed to start alarm			
	11 Over/Under speed alarm			
	12 Voltage failure alarm			
	13 Charging fail alarm			
	14 Low battery alarm			
	15 High battery alarm			
16 Weak battery alarm				
P41	Configurable Output 2	Number	0-16	0
	0 Alarm Output			
	1 Engine running			
	2 Load transfer permit			
	3 Preheat for time period (P10)			
	4 Over speed shut-down output			
	5 Over current alarm			
	6 Low fuel level alarm			
	7 High temperature alarm			
	8 Low oil pressure alarm			
	9 Maintenance due alarm			
	10 Failed to start alarm			
	11 Over/Under speed alarm			
	12 Voltage failure alarm			
	13 Charging fail alarm			
	14 Low battery alarm			
	15 High battery alarm			
16 Weak battery alarm				

Prg No	Definition of parameter	Unit	Lower / Upper Limit	Default
P42	Switch or sender selection for Oil pressure signal source and failure		0=Switch 1=Sender	0
P43	Oil pressure lower limit	Bar/PSI	0.0	3.0
P44	Oil pressure alarm configuration	Number	0 / 1 / 2	1
	0 Disable the analogue input			
	1 Pre-Alarm			
	2 Shut-down			
P45	Coolant temperature upper limit	°C/°F	0	80
P46	Coolant temperature alarm configuration	Number	0 / 1 / 2	1
	0 Disable the analogue output			
	1 Pre-Alarm			
	2 Shut-down			
P47	Fuel level lower limit	%	0= minimum fuel level select 0 - 100	25
P48	Fuel level alarm configuration	Number	0 / 1 / 2	1
	0 Disable analogue input			
	1 Pre-Alarm			
	2 Shut-down			
P49	Operator Password(P00..P10 and P49)	Number	0000 - 9990	0000
P50	Technician Password(P00...P50)	Number	0000 - 9990	0000

3.2 Program functions:

3.2.1 Alternator Voltage / System Configuration

- P00** Alternator voltage lower limit
- P01** Alternator voltage upper limit
- P32** Alternator voltage fault control delay
- P11** Single phase / three phase selection

A fault will be reported if the alternator output voltage goes outside the window defined by the upper and lower limits for more than the time defined as the **Alternator voltage fault control delay** (P32). The fault will only occur after the engine has been running for the period defined as the **Control on delay** (P31). This failure immediately stops the generating set, without cool-down delay.

There are four possible system types

- P11 = 1** Single phase system. Set parameters P00 and P01 as line to neutral voltage.
- P11 = 2** Single phase three wire, with 180 degree phase shift between the phases. Parameters P00 and P01 are line to line voltage.
- P11 = 3** Three phase four wire. Parameters P00 and P01 are line to line voltage.
- P11 = 4** Series delta three phase four wire. A delta configuration where neutral is a tap between two phases. Parameters P00 and P01 are line to line voltage.

3.2.2 Alternator Frequency

- P02** Speed lower limit
- P03** Speed upper limit
- P33** Speed fault control delay

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

3.2.3 Battery Voltage

- P04** Battery voltage lower limit
- P05** Battery voltage upper limit

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

3.2.4 Load Current Limit (P06)

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

3.2.5 Maintenance Indication

P07 Periodic Maintenance Hour Set Value

P08 Periodic Maintenance Hour Reset

To ensure reliability, the generator must be serviced at regular intervals. The GEN-AUTO FP can be set to indicate when a service is due. Set P07 to the number of running hours between services. Use P08 to reset the hours counter at each service. When the engine has run for the defined number of hours, the **Alarm LED** will flash and, when the **Alarm** display option is selected, the display will indicate error message **SErv** (service due). Setting P07 to zero will disable this feature.

3.2.6 Pre-Heat / Post-Heat Time (P10)

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

3.2.7 Speed sensing

P13 Nominal Speed (RPM)

P14 Number of Teeth

P16 Speed sensing input selection

P25 Speed limit for crank disconnect

Parameter P16 specifies the method by which the unit monitors generator speed. The choice is between alternator frequency and external magnetic pick-up. Speed is monitored so as to detect when the engine has started. See Sections 3.2.2 Alternator Frequency, 3.2.13 Engine started signals (P21) and 3.2.15 Engine Starting. Where alternator frequency is used, parameter P25 should be set to the frequency that must be achieved at start-up. Where the magnetic pick-up is to be used, parameters P13 and P14 can be used to set the nominal speed and number of teeth on the flywheel that actuates the magnetic pick-up. Parameters P13 and P14 are used to compute alternator RPM or frequency. If P16 is set to "0" (alternator signal), the unit uses P13 and P14 to calculate RPM from the measured frequency of the alternator output. If P16=1 (magnetic pick-up), the unit uses P13 and P14 to calculate alternator output frequency from the measured RPM.

3.2.8 Current Transformer Ratio (P15)

The Primary/Secondary ratio value for the current transformers is stored in parameter P15. When set, this ensures that current is displayed in the primary value. Example:
If the CT is 50:5A, set P15 = 10.

3.2.9 Stop/Fuel Solenoid selection (P17)

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

3.2.10 Stop magnet energising time (P18)

This parameter sets the period for which the Stop solenoid is energised to stop the engine. It applies only where parameter P17 is set to Stop Solenoid.

3.2.11 Remote Start Time Delay (P19)

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

3.2.12 Remote Stop Time Delay (P20)

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

3.2.13 Engine started signals (P21)

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

- 0 - Charge generator excitation current. This current falls to zero once the engine has started.
- 1 - Engine speed, as selected by parameter (P16) Speed sensing input selection
- 2 - Alternator voltage, as selected by parameter (P24) Voltage Limit for Crank Disconnection
- 3 - Oil pressure. The oil pressure switch should open when the oil pressure is sufficient. The oil pressure sender can also be used as an engine started signal if it is selected (P42).

Any or all of these signals can be selected for use. It is advisable to select at least two of them, preferably 1-Engine speed, via magnetic pick-up, and either 0-Charging generator or 2-Alternator voltage or 3-Oil pressure. If any of the selected signals appear, the unit assumes that the engine has started.

If a charge generator is not available, ensure that the input terminal is connected to V+ and that this input is disabled by setting parameter P21.0 = 0.

3.2.14 Battery Voltage

P22 Battery Voltage Weak Limit

P23 Battery Voltage Weak Control Time

If the battery voltage drops below the level specified by the **Battery Voltage Weak Limit** parameter for more than the **Battery Voltage Weak Control Time** during engine cranking, an alarm occurs. The message bAT2 (Weak Battery) is displayed on the LED display. Use the reset button to clear the alarm indication.

3.2.15 Engine Starting

P26 Number of starting attempts

P27 Starting attempt duration

When the GEN-AUTO FP receives an Engine Start command, it energises the start solenoid to drive the starter motor and energises the Fuel solenoid (if selected – check Stop/Fuel Solenoid selection P17) to provide fuel for the engine. If the GEN-AUTO FP detects that the engine has started, it de-energises the starter motor. Engine start signals are defined by parameter P21 – see Section 3.2.13 Engine started signals.

Parameter P27 **Starting attempt duration** defines the maximum period for which drive will be applied to the starter motor. If the GEN-AUTO FP does not detect engine starting within this period, it cuts off the drive to the starter motor. It then makes a new attempt after a rest-time period, equal in length to the crank time period.

Parameter P26 **Number of starting attempts** defines the number of unsuccessful tries that the GEN-AUTO FP will make before abandoning the attempts. If all these attempts fail, GEN-AUTO FP operations are locked out and a **Failed to start** indication is displayed. The unit remains locked until the reset button has been pressed.

3.2.16 Oil pressure bypass time (P28)

This sets the delay before a **Low Oil Pressure** warning will be generated. The **Low Oil Pressure** fault indicator will light if the oil pressure switch contact remains closed, while the engine is running, after the period defined by parameter P28. This by-pass time is also used for the analogue oil pressure sender limit (P43 & P44) if enabled and configured to shut down the engine.

3.2.17 Warm-Up Delay (P29)

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

3.2.18 Fast-Loading Selection (P30)

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

3.2.19 Control on delay (P31)

During the initial period after the engine has been started, there can be fluctuations in engine speed and alternator output that could generate spurious fault indications. Parameter P31 defines a period during which any fault indications, except High Temperature, will be ignored by the GEN-AUTO FP. The period begins when the GEN-AUTO FP has detected engine starting and has cut off the drive to the starter motor.

3.2.20 Engine cooling time (P34)

When operating under heavy load, the engine can get very hot and is only prevented from overheating by circulating coolant. If the engine is stopped abruptly under these conditions, it can overheat as the coolant flow is cut off. Where the GEN-AUTO FP controls the load via one of the configurable outputs, it can ensure that the engine continues to run after the load has been removed. Parameter P34 defines the duration of this cooling-off period.

3.2.21 Configurable Failure Inputs

P36 Configurable Failure Inputs 1

P37 Configurable Failure Inputs 2

P38 Configurable Failure Inputs 3

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

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

3.2.22 Configurable relay outputs

P40 Configurable relay output 1

P41 Configurable relay output 2

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

- 0 Alarm output. Active when any fault is reported. Can be used for either audible or visual alert
- 1 Engine running. Active while the engine is running.
- 2 Load transfer permitted. The output is active while the alternator output voltage is between the upper and lower limit defined by parameters P00 and P01. This output can be used to control a contactor that transfers the load to the alternator once the generator set is up and running.
- 3 Preheat function. On starting the generator this output is active for time period defined in “preheat time P10” prior to running the starter motor.
- 4 Over Speed Shut-down Output. The fault will only occur after the engine has been running for the period defined in P33 and P03. This failure immediately stops the generating set, without a cool-down delay and activates this output.
- 5 Over Current Alarm output. Active when an over current fault is reported.
- 6 Low Fuel Level Alarm output. Active when a low fuel level fault is reported.
- 7 High Temperature Alarm output. Active when a high temperature fault is reported.
- 8 Low Oil Pressure Alarm output. Active when a low oil pressure fault is reported.
- 9 Maintenance Due Alarm output. Active when the maintenance due alarm (service) is reported.
- 10 Failed To Start Alarm output. Active when failed to start fault is reported.
- 11 Over/Under Speed Alarm output. Active when over or under speed fault is reported.
- 12 Voltage Failure Alarm output. Active when an alternator voltage fault is reported.
- 13 Charging Fail Alarm output. Active when a charging fail fault is reported.
- 14 Low Battery Voltage Alarm output. Active when the low battery voltage fault is reported.
- 15 High Battery Voltage Alarm output. Active when the high battery voltage fault is reported.
- 16 Weak Battery Alarm output. Active when the weak battery fault is reported.

3.2.23 Oil Pressure Signal Source Selection (P42)

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

3.2.24 Oil Pressure Lower Limit (P43)

The Minimum Oil pressure value for normal engine operation.

3.2.25 Oil Pressure Alarm Configuration (P44)

Parameter (P44) defines the function of the alarm when the measured oil pressure value is lower than the value of (P43). If the parameter value is "0" then analogue pressure input is disabled. If the parameter value is "1" then it activates a pre-alarm (warning). If the parameter value is "2" then it activates the shut down alarm.

3.2.26 Coolant Temperature Upper Limit (P45)

The Maximum temperature value for normal engine operation.

3.2.27 Coolant Temperature Alarm Configuration (P46)

Parameter (P46) defines the function of the alarm when the measured temperature value is higher than the value of (P45). If the parameter value is "0" then analogue temperature input is disabled. If the parameter value is "1" then it activates a pre-alarm (warning). If the parameter value is "2" then it activates the shut down alarm.

3.2.28 Fuel Level Alarm Lower Limit (P47)

The Minimum fuel tank level value.

3.2.29 Fuel Level Alarm Configuration (P48)

Parameter (P48) defines the function of the alarm when the measured fuel tank level value is lower than the value of (P47). If the parameter value is "0" then analogue fuel level input is disabled. If the parameter value is "1" then it activates a pre-alarm (warning). If the parameter value is "2" then it activates the shut down alarm.

3.2.30 Operator password (P49)

Use this option to change the Operator password. This password allows access to program parameters P00 to P10 and P49.

3.2.31 Technician Password (P50)

Use this option to change the Technician password. It allows access to all the program parameters (P00 to P50)

4. Commissioning

1. Check that the unit is correctly wired and that the wiring is of a standard and rating compatible with the system.
2. Check that the correct fuses are fitted.
3. Program the unit as detailed in Section 3 Programming.
4. Take temporary steps to prevent the engine from starting. For example, disable the fuel solenoid.
5. After a visual inspection to ensure it is safe to proceed, connect the battery supply.
6. Ensure that the GEN-AUTO FP display switches on.
7. Press the **START** button. The associated LED will illuminate.
8. Check that the engine start sequence commences. The starter motor should run for the programmed period (P26) for the pre-set (P27) number of times.
9. Check that the **Start Failure** LED flashes.
10. Check that the alarm horn sounds. Press the **SILENCE ALARM** button.
11. Restore the engine to operational state (reconnect the fuel solenoid).
12. Press the **RESET** button. The **Start Failure** LED will switch off.
13. Press the **START** button. The associated LED will illuminate.
14. Check the start sequence, as follows:
 - The starter motor runs
 - The engine starts
 - The starter motor disengages once the engine is running

If not, check that the engine is fully operational (fuel available etc.) and check the wiring and programming to the GEN-AUTO FP.
15. Check that the engine runs up to its operating speed. If not, and an alarm is present, check that the alarm is valid and then check the input wiring.
16. Press the **STOP** button. The engine should stop. Allow time for the engine to come to rest.
17. Operate the remote Start switch (if fitted) and check that the engine starts.

5. Operation

5.1 Controls and Indicators

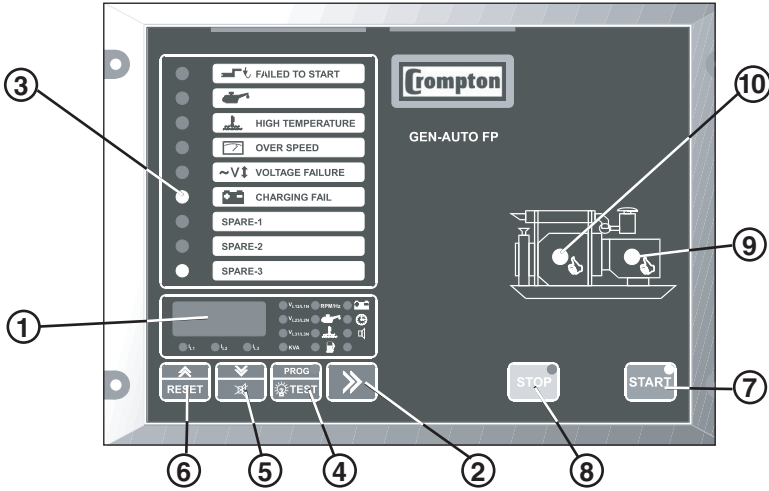


Figure 5.1 Front Panel (Controls and Indicators)

Number	Comment
1	Four-digit, seven-segment LED display. This displays the selected parameter from the list alongside. Use the Display scroll button (2) to select which parameter is to be displayed, as indicated by the adjacent LEDs.
2	The Display Scroll Button is used to step through all of the measured parameters.
3	Failure indicators – These LEDs flash continually in the event of a fault.
4	Programming / Lamp Test. Lights all the LEDs on the panel so that you can see if any are not working. Holding the button pressed for ten seconds puts the unit into Programming mode.
5	Down/Silence Alarm. Silences the audible alarm. The Decrement (down arrow) button is used in Programming mode as detailed in Section 3 Programming.
6	Up/Reset. Restores unit operation after it has latched in a fault condition. The Increment (up arrow) function is used in Programming mode as detailed in Section 3 Programming.
7	Start button. Starts the engine. A green LED in the corner shows that the button has been pressed.
8	Stop button. Stops the engine. A red LED in the corner shows that the button has been pressed.
9	Alternator LED. The green LED illuminates to indicate that alternator output is available and within the defined operating limits.
10	Engine running LED. The green LED illuminates when the engine is running.

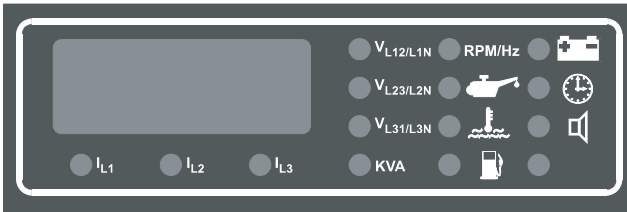


Figure 5.2 Display Mode Indicators

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

- Alternator voltage L1-L2, prefix L
- Alternator voltage L1-N, prefix n
- Alternator voltage L2-L3, prefix L
- Alternator voltage L2-N, prefix n
- Alternator voltage L3-L1, prefix L
- Alternator voltage L3-N, prefix n
- Alternator L1 current (A)
- Alternator L2 current (A)
- Alternator L3 current (A)
- Alternator power output (kVA) into load. This is the sum of voltage x current for all phases.
- Alternator RPM, as measured by alternator frequency or magnetic pick-up, as selected by program parameters P16.
- Alternator frequency (Hz), prefix H
- Oil pressure
- Temperature
- Fuel level
- Battery voltage (DC V)
- Engine running time in hours – since last reset via program parameter P35. This is a six-digit number. The first three (high) digits are shown in the first display – prefixed *H* – and the second three digits are shown in the second (low) display prefixed *L*.

- The Alarm LED will flash continually if the unit detects any fault. When the Display Select button is pressed so as to select this option, the display will show the cause of the fault indication. If more than one error condition is present, repeated pressing of the button will show each in turn. Possible error messages are:

- ESStP** – Emergency Stop
- bAT1** – Low Battery Voltage Alarm
- bAT2** – Weak Battery Alarm
- bAT3** – High Battery Voltage Alarm
- ocr** – Over Current Alarm
- SErv** – Routine maintenance due info
- LOPr** – Low Oil Pressure Alarm
- HItE** – High Coolant Temperature Alarm
- LoFL** – Low Fuel Level Alarm

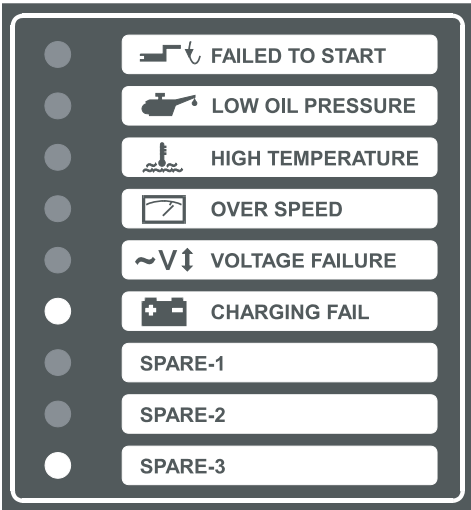


Figure 5.3 Fault Indicators

Fault indicators – LEDs flash continually in the event of a fault.

Failed To Start: Flashes if the engine fails to start after the programmed number of attempts. The unit must be reset (by pressing the **RESET** button) before a further attempt is made.

Low Oil Pressure: The sensor that is connected to the Unit via Pin 20 is Normally Closed. The contact will open when Oil Pressure in the engine reaches its normal level. During engine starting, if the contact has not opened by the end of time period determined by Parameter P28, the LED flashes and the engine shuts-down without any cool-down period. The alarm sounds.

High Temperature: Engine temperature is excessive, according to the signal from the high temperature thermostatic switch on the engine.

Low / High Engine / Alternator Speed: According to the alternator output frequency or a magnetic pick-up, as programmed by parameter P16. In this case the LED flashes, the engine shuts down without any cool-down period and the alarm sounds.

Generator Voltage Failure. The alternator voltage is monitored against the upper and lower limit values determined by parameters P00 and P01. If the measured voltage is out of limits, the generator contactor is released and the alarm sounds.

Charge Generator Failure. The unit checks + Voltage which comes from the battery charging generator via Pin 21 after the engine has started. If the voltage is not present, the Charge Generator Failure LED flashes and the alarm sounds.

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

5.2 Starting the Engine

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

- The starter motor runs
- The engine starts

Once the engine is running,

- The starter motor disengages.
- The green engine and alternator LEDs (7) and (8) should both be illuminated after the control on delay period (P31)
- All alarm indicators should remain off.

5.3 Stopping the Engine

When the **STOP** button is pressed, or the Remote Start input is released, the alternator voltage available LED (7) will switch off and the contactor will release, but the engine will continue running for the duration of the engine cooling time period (P34). At the end of the cooling period, the engine will stop.

6. Fault Finding

6.1 General

Failure annunciators on the front panel will flash if a fault is detected. See Section 4. Fault conditions latch so that further operation is prevented. If a fault is indicated, proceed as follows:

1. Find and fix the fault.
2. Press the **RESET** button to enable a restart.
3. Press the **START** button.

In addition to the annunciators, the **ALARM** LED will flash in the event of a fault. To discover the fault being reported by the **ALARM** LED, press the display scroll button repeatedly until the **ALARM** option has been selected. The display will indicate the fault condition.

6.2 Fault indications

6.2.1 Low Oil Pressure LED

This LED flashes if the Oil Pressure Switch on the engine indicates low oil pressure while the engine is running. To obtain this indication, the engine must have been running for at least the period specified by the **Oil Pressure Bypass** Time parameter P28. If this fault occurs, the GEN-AUTO FP will stop the engine without any cool-down period.

6.2.2 High Temperature LED

This LED flashes if the thermostatic switch on the engine indicates high temperature, while the engine is running. If this fault occurs, the GEN-AUTO FP will stop the engine without any cool-down period.

6.2.3 Start Failure LED

This LED flashes if the engine has not started after the programmed number of starting attempts (P26). The unit must be reset, by pressing the **RESET** button, before a fresh attempt can be made.

6.2.4 Charge Generator Failure LED

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

6.2.5 Low/High Speed LED

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

6.2.6 Generator Voltage Failure LED

This LED flashes if the alternator output fails to reach the value specified by the **Alternator Voltage Lower Limit** parameter P00 within the period defined by the **Control On Delay** parameter P31. This failure immediately stops the generating set, without any cool-down period.

6.2.7 EStP – Emergency Stop

The remote Emergency Stop button has been pressed and has shut down the engine. Press **RESET** to remove the indication and restore GEN-AUTO FP operation.

6.2.8 bAT1 - Low Battery Voltage message

This message appears if, while the engine is running, the battery voltage falls below the value specified by the **Battery voltage lower limit** parameter P04. The GEN-AUTO FP measures battery voltage at the rear terminals. Depending on the size and length of the cable to the battery, this may be somewhat less than the voltage as measured at the battery.

6.2.9 bAT2 - Weak Battery Alarm message

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

6.2.10 bAT3 - High Battery Voltage message

This message appears if, while the engine is running, the battery voltage rises above the value specified by the **Battery voltage upper limit** parameter P05. The GEN-AUTO FP measures battery voltage at the rear terminals.

6.2.11 SErv – Routine Maintenance Due

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

6.2.12 ocr – Over Current Failure Message

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

6.2.13 LoPr – Low Oil Pressure Alarm

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

6.2.14 HItE – High Coolant Temperature Alarm

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

6.2.15 LoFL – Low Fuel Level Alarm

The analogue fuel level sensor is connected to the Unit via Pin 29. Parameter (P48) defines the course of events when the measured fuel tank level is lower than the value of (P47) Fuel Level Lower Limit. Depending on the programming, the engine will shut down and/or the alarm will sound.

Table 6.1 Fault finding

Symptom	Possible remedy
Unit is inoperative.	Check the battery and wiring to the unit.
	Check the DC supply. (measure voltage between Pins 10 and 11)
	Check the DC fuse.
Low oil pressure fault after engine has started.	Check engine oil level and pressure.
	Check oil pressure switch, analogue pressure sensor and wiring.
	Check that oil pressure switch is of the normally closed type (opens on oil pressure).
High engine temperature. Fault after engine has started.	Check engine temperature and cooling systems.
	Check switch, analogue sensor and wiring.
	Check that temperature switch is of normally open type (closes on high temperature).
Failed to Start fault. Engine failed to start after Pre-set number of Attempts.	Check fuel solenoid and wiring, fuel and battery. Reset the GEN-AUTO FP and restart the engine.
	Check the signals that the GEN-AUTO FP is using to determine if the engine has started. Refer to engine manual.
Starter motor inoperative.	Check wiring to starter solenoid.
	Check battery supply.
	Check engine started signal P21 are not preventing the motor from operating.

7. Specification & Ratings

Equipment use:	Electrical control equipment for generating sets.
Housing & Mounting:	144 mm x 204 mm x 37 mm (including connectors), plastic housing for panel mounting. Panel Cut Out is 138 mm x 186 mm.
Protection:	IP65 at front, IP20 at rear.
Weight:	Approximately 0.7 Kg.
Environmental rating:	Standard, indoor at an altitude of less than 2000 meters with non-condensing humidity.
Operating/Storage Temperature:	-25°C to +70°C / -40°C to +85°C
Humidity:	93% max. (non condensing)
Installation over voltage Category:	III distribution level, fixed installation category
Pollution Degree:	II, Normal office or workplace, non-conductive pollution
Mode of operation:	Continuous
EMC:	BS EN 50081-2, EMC Generic Emission Standard for industrial equipment. BS EN 50082-2, EMC Generic Immunity Standard for industrial equipment.
Electrical Safety:	EN 61010-1, Safety Requirements for electrical equipment for measurement, control and laboratory use.
DC Battery Supply Voltage:	8 to 32 VDC, max operating current (without output transistors activated) 400 mA.
Cranking Dropouts:	Battery voltage can be "0" VDC for max. 100 ms during cranking (battery voltage should be at least nominal voltage before cranking)
Battery Voltage Measurement:	0 to 32 VDC, Accuracy : 1% FS, Resolution : 0.1V
Generator Voltage Measurement:	35 to 300 Vac L-N, 10 to 110 Hz., Accuracy : 1% FS, Resolution : 1V
Generator Speed (Frequency):	Selectable speed signal source from alternator voltage or magnetic pickup. Alternator voltage: 10.0 to 110.0 Hz. (min.35 Vac L-N) Accuracy : 0.25% FS, Resolution : 0.1 Hz Magnetic pickup :35 to 10000 Hz. (3 to 35 volt peak continuously.) Accuracy : 0.25 % FS.

Load Current Measurement:	With current transformer three phase. 0 to 5A, Accuracy: 1 % FS
Generator power calculating:	For three phase = $(V1\ L-N \times I1) + (V2\ L-N \times I2) + (V3\ L-N \times I3)$ For single phase = $V1\ L-N \times I1$
Charge Generator Excitation:	12VDC or 24VDC, 200mA, maximum 3W
Display:	4 digits, 7 segments, LED display showing: Alternator Voltage (L-L, L-N), Alternator frequency, Alternator Current, Engine Speed, Battery voltage, Engine running time, Programme parameters, Power, Fuel level, Temperature and Pressure.
Failure Indicators:	Failed to Start, High temperature, Low oil pressure, Low/High speed, Generator voltage failure, Charge generator failure, Configurable failure inputs - 1, 2 and 3.
Status Indicators:	Engine start LED, Engine stop LED, Engine running LED, Generator ready LED, Program/Lamp Test LED.
Transistor Outputs:	Start output (max. 500 mA transistor), Fuel output (max. 500 mA transistor), Horn output(max. 500 mA transistor), Configurable output 1 (max. 500 mA transistor) Configurable output 2 (max. 500 mA transistor)
Other Outputs:	RS232 serial communication output.
Contact Sensing Inputs:	Emergency Stop (NC), Oil Pressure switch (NC), Temperature Switch (NO), Remote Start/Stop input (NO), Configurable 1, 2 and 3 inputs (NO)
Analogue Inputs:	Suitable for resistive senders, range: 10-650Ω Pressure 0.0-99.9 display range, 2% FS accuracy, 0.1 resolution. Temperature 0-300° range, 2% FS accuracy, 1° resolution. Fuel Level 0-300 range, 2% FS accuracy and 1.0 Resolution.

8. PC Interface

8.1.1 PC Interface

The PC interface comprises of a 9 pin D connector/FCC68(4 pin) connection lead with 2 meters of cable and GEN-SOFT Communication software (CD)

8.1.1.1 Technical Specifications

RS232 non-isolated serial interface

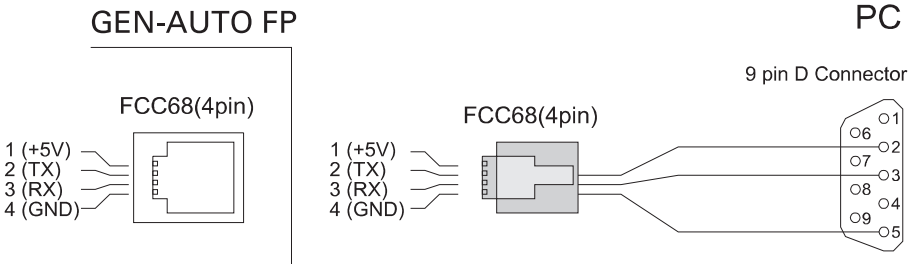
9600 Baud Rate

8 data bits, No Parity, 1 Stop Bit

Maximum allowable cable length is 10 meters

8.1.1.2 9 pin D connector/FCC68(4 pin) connection lead

9 pin D connector/FCC68(4 pin) connection lead



8.1.2 INSTALLATION INSTRUCTION

8.1.2.1 Minimum system requirements

Processor:	486 66MHz
Operating Systems:	Windows95/98, Windows NT
RAM:	16 Mbyte
Monitor:	14" SVGA (640x480 resolution)
Fixed Disk Free Space:	1 Mbyte
Disk Drive:	CD-ROM
Communication:	RS232 communication port is needed to communicate with the GEN-AUTO FP Unit

8.1.2.2 Installing GEN-AUTO FP

Insert the software CD into the CD-ROM drive on the PC

Double click on MyComputer

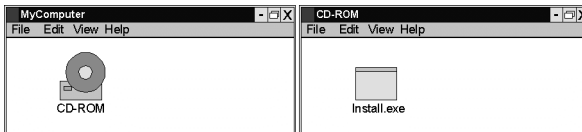
Then double click on CD-ROM drive

There will be a short delay while the CD-ROM is accessed, then the disk contents will be displayed.

Locate the GEN-AUTO FP directory, and double click to enter this directory.

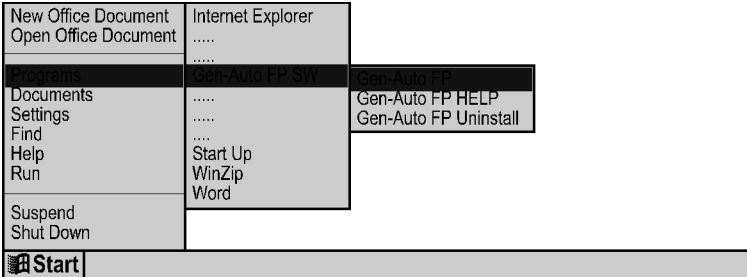
Double click on "Install.exe".

GEN-AUTO FP will be installed automatically on to your PC in its own folder(directory). It will also create "START MENU" items.



8.1.2.3 To Run GEN-AUTO FP communication software

Press the START icon. Then select Programs GEN-AUTO FP SW(Folder) GEN-AUTO FP. Then click on GEN-AUTO FP



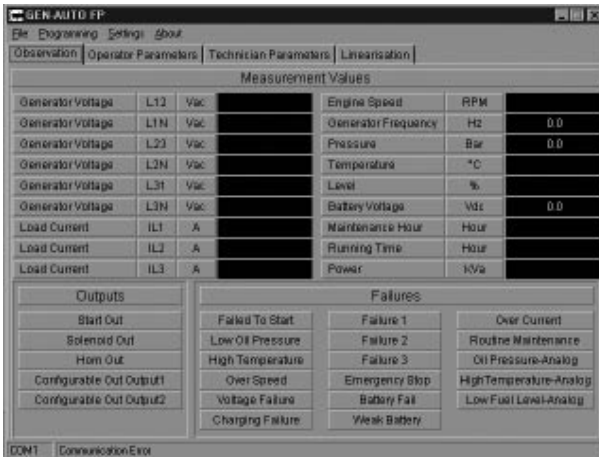
8.1.3 DESCRIPTION

GEN-AUTO FP unit communicates with the PC by means of the RS232 interface cable. With the software installed, the GEN-AUTO FP unit’s parameters and status information can be accessed with the PC. Operator and Technician parameters can be viewed. Parameters are password protected.

There are four windows in GEN-AUTO FP/SW:

- Observation Window
- Operator Parameters
- Technician Parameters
- Linearisation Parameters

8.1.3.1 Observation Window



In the observation window, the following values can be observed:

Measurement Values

Generator Voltages
 Load Currents
 Power
 Engine Speed
 Generator Frequency
 Oil Pressure
 Temperature
 Fuel Level
 Battery Voltage
 Maintenance Timer
 Running Time

Failures

Failed to start
 Over speed
 Low oil pressure
 Over Current
 Voltage Failure
 Charging Failure
 High Temperature
 Battery Failure
 Emergency Stop
 Weak Battery
 Routine Maintenance
 Failure Inputs 1-2-3
 Oil Pressure-Analogue
 High Temperature-Analogue
 Low Fuel Level-Analogue

Outputs

Configurable Output 1
 Configurable Output 2
 Start out
 Solenoid out
 Horn out

Operator Parameters Window

Operator can reach the parameters in this window. Parameters are password protected. When the operator password is entered, it is compared with operator password that is registered on the GEN-AUTO FP unit. The factory default is '0'.

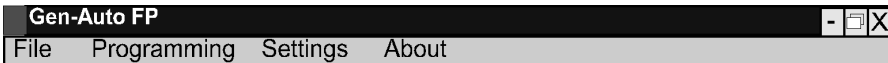
Technician Parameters Window

All parameters can be viewed in this window. Parameters are password protected. When the technician password is entered, it is compared with technician password that is registered on GEN-AUTO FP unit. The factory default is '0'.

Linearisation Window

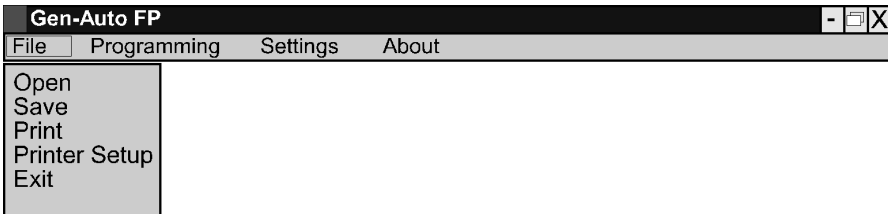
There are three sections in the Linearisation window: Oil Pressure, Temperature and Fuel Tank Level. See section 9 for full details about sender linearisation table.

8.1.4 MAIN MENU



FILE

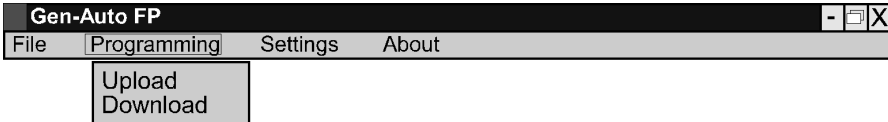
This menu allows the user to save configuration files to the disc, read from disc and write to disc.



- Open: Load a previously saved product configuration file from a disk into the program.
- Save: Save the product configuration to disk, using a descriptive file name.
- Print : This menu allows the user to print the product parameters.
- Printer Setup: This menu allows the user to select the printer that is connected to network or PC and change the configuration.
- Exit : Exit from the GEN-AUTO FP/SW.

PROGRAMMING

This menu is active only when the Operator or Technician Parameter Windows are open. The user can load parameters from GEN-AUTO FP into the PC or from the PC into GEN-AUTO FP.

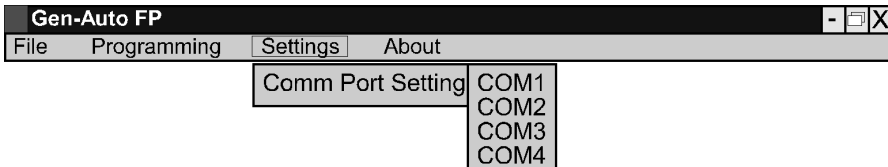


Download: This command allows the user to download program parameters and linearisation values from PC into the GEN-AUTO FP.

Upload: This command allows the user to upload the parameters and linearisation values stored within the GEN-AUTO FP unit into PC.

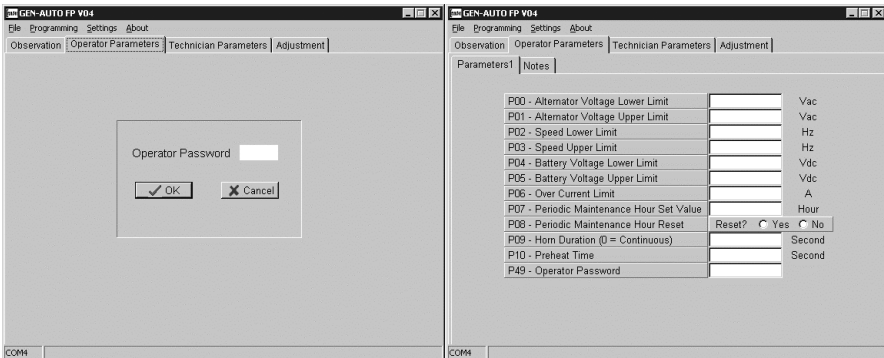
SETTINGS

Communication Port Settings: The user can select the appropriate PC serial port.



8.1.5 ENTERING THE OPERATOR PARAMETERS WINDOW

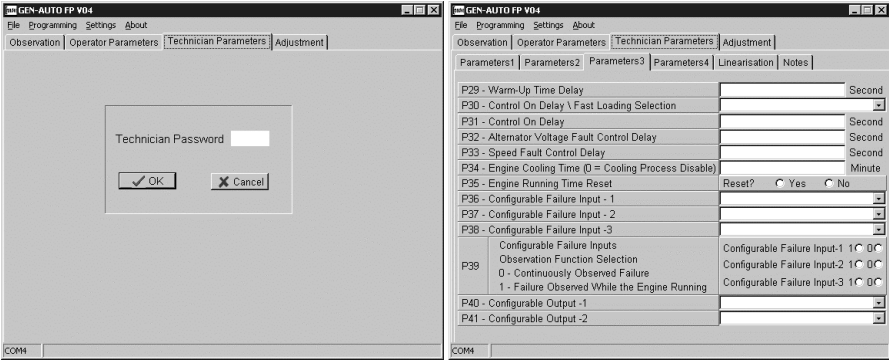
Click the Operator Parameters tab



Enter the Operator Parameter password. (factory default is zero '0'). If the password is correct, operator parameters will be viewed.

8.1.6 ENTERING THE TECHNICIAN PARAMETERS WINDOW

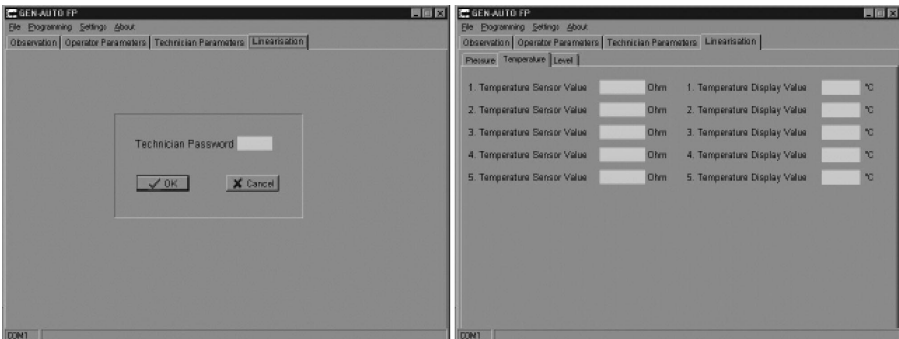
Click Technician Parameter tab.



Enter the Technician Parameter password (factory default is zero '0'). If the password is correct, all parameters will be viewed.

8.1.7 ENTERING TO LINEARISATION WINDOW

Click Linearisation tab



Enter the Technician Parameter password. If the password is correct, pressure, temperature and level sections will be viewed.

8.1.8 LOAD THE CONFIGURATION FILE FROM DISK

Click 'Open' in the File menu. Choose a configuration file that includes the desired operator or technician parameters in Open Dialog Box. When you click the 'Open' button on the Dialog Box, the parameters will be transferred to the PC window.

8.1.9 SAVE THE CONFIGURATION FILE TO DISK

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

8.1.10 UPLOAD

To upload parameters from GEN-AUTO FP into the PC, follow the steps below.

If you are in the operator parameters window, only the operator parameters will be displayed.

If you are in the Technician Parameters Window, all parameters will be displayed.

Press 'Upload' in the Program menu.

The cursor changes to the hour-glass symbol while the parameters are uploading. Please wait for the upload to complete.

8.1.11 DOWNLOAD

To download parameters from the PC into GEN-AUTO FP, follow the steps below.

If you are in the operator parameters window, only the operator parameters will be downloaded.

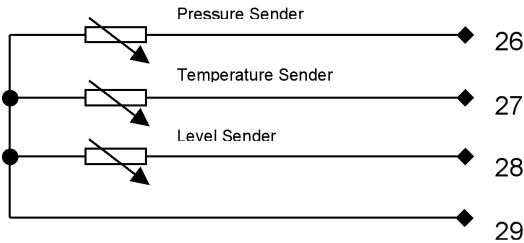
If you are in the Technician Parameters Window, all parameters will be downloaded.

Press 'Download' in the Program menu.

The cursor changes to the hour-glass symbol while the parameters are downloading. Please wait for the download to complete.

9. Analogue Inputs

GEN-AUTO FP will accept three inputs from resistive analogue senders, and the unit will measure and display the values for fuel level, water temperature and oil pressure. Warnings and alarms levels can be programmed for each parameter so that the operator can be advised of a problem. The unit can be programmed to shut down the engine if these sender values exceed their set operating limits.



Analogue Senders

Any brand of analogue senders can be used, so long as the resistive value does not exceed 650Ω. Since many of these senders can have a non-linear response, the unit can be programmed to compensate for the non-linearity, and when correctly set will maintain a high degree of accuracy for the displayed value.

The product has individual linearisation look up tables values for each sender, and these values can be adjusted to suit senders having positive or negative coefficients.

9.1 Temperature Senders

The value of resistance will change proportionally with the temperature. For some sender types, the resistance value will increase as the temperature increases, so the sender has a positive coefficient. However, some senders have negative coefficients, meaning that the resistance value will decrease as the temperature increases. The product can be configured to display temperature in °C or °F.

The temperature display range is 0 to 300°.

9.2 Pressure Senders

The value of resistance will change in proportion with the pressure. The product can be configured to display pressure in bar or PSI.

The pressure display range is 0.0 to 99.9

9.3 Fuel Level Senders

The value of resistance will change in proportion to the position of a float inside the fuel tank. The float arm is linked to a variable resistor in such a way that the resistance value can be used to determine the amount of fuel remaining. The linearity of the sender is often determined by the shape of the fuel tank, and if the sender is mounted at the top, bottom or side of the tank. The product can be configured to display level in %, litres or gallons.

The fuel level display range is 0 to 300.

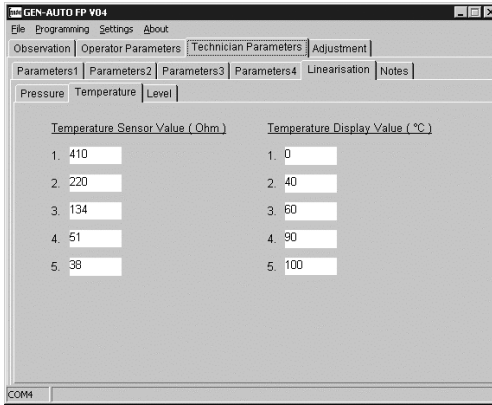
Programming the product to use a temperature sensor

Where possible, use the sensor manufacturers' data sheets to obtain accurate resistance values at particular points in its operating range. For example, the temperature sensor may have the following characteristics:

Resistance	Temperature
410 Ω	0°C
220 Ω	40°C
134 Ω	60°C
51 Ω	90°C
38 Ω	100°C

Five calibration points are required for correct operation. If the manufacturer provides less than five calibration values, try extrapolating additional points from the available data. Alternatively, characterise the sensor by taking your own resistance measurements at various temperatures. For example, immerse the sender tip into ice cold water (0°C) and take a resistance reading. Then immerse the sender tip into boiling water (100°C) and take a resistance reading. Carry out additional tests at the intermediate points, or extrapolate this data from your measurements. You may only need to carry out this procedure when changing sender suppliers, or where batches of senders are not repeatable.

Using the PC Software, enter these calibration values and download them to the product. Go to the 'Linearisation' screen, select 'Temperature' and then enter the data.



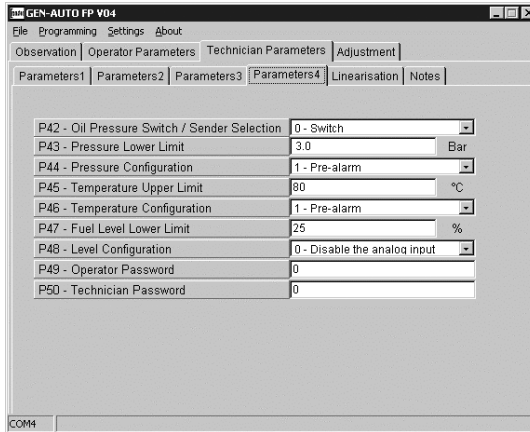
Note 1: All five values must be entered.

Note 2: The linearisation parameters can only be entered using the PC software.

Note 3: The temperature display will not exceed the minimum or maximum temperature values in this linearisation table, irrespective of the actual resistance value presented.

Note 4: To display temperature in °F, simply enter the required display reading value against each sensor value.

To start using the temperature sender, you will need to switch on the analogue measurement feature so that the temperature is displayed. Go to the 'Technician parameter' screen.



Parameter (P45) allows you to enter the maximum operating temperature, an 'Over-temperature setpoint'. The setting relates to the displayed value (in °C or °F)

Parameter (P46) allows you to choose the course of action when the operating temperature exceeds your maximum limit. There are 3 choices:

- 0 Disable the analog input. Temperature will not be displayed or monitored.
- 1 Pre-alarm. The alarm will sound, but the engine will keep running.
- 2 The engine will shut down.

Parameters (P45) and (P46) can be programmed using the PC software, or accessed through the front panel controls.

Testing

Connect an adjustable decade resistance box (or variable resistor) to the temperature sender input on the product. Using the decade box, set resistance values in accordance with the calibration table, checking that the correct temperature is displayed in each case. When the resistance value exceeds that corresponding to the maximum specified temperature, the alarm will sound or the engine will shut down.

For example, if the resistance value reaches that equivalent the alarm setpoint temperature of 80°C, the alarm horn will sound. The 'Alarm' annunciator will flash, and the display will indicate 'HitE', meaning 'High Temperature'.

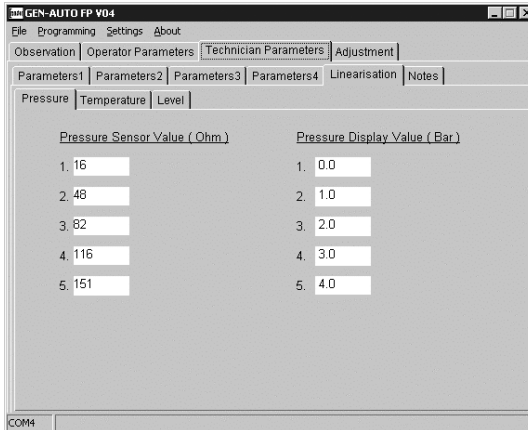
Programming the product to use a pressure sensor

Where possible, use the sensor manufacturers' data sheets to obtain accurate resistance values at particular points in its operating range. For example, the pressure sensor may have the following characteristics:

Nominal Resistance	Pressure
16 Ω	0 bar
48 Ω	1 bar
82 Ω	2 bar
116 Ω	3 bar
151 Ω	4 bar
184 Ω	5 bar

Five calibration points are required for correct operation. If the manufacturer provides less than five calibration values, try extrapolating additional points from the available data. Alternatively, characterise the sensor by taking your own resistance measurements at various pressures. You may only need to carry out this procedure when changing sender suppliers, or where batches of senders are not repeatable. If the manufacturer supplies more than five calibration points, choose only those points that are likely to be useful in your application. Sometimes a manufacturer will give a range of resistance values for a particular pressure. If so, you should use an average or intermediate value.

Using the PC Software, enter these calibration values and download them to the product. Go to the 'Linearisation' screen, select 'Pressure' and then enter the data.



Note 1: All five values must be entered.

Note 2: The linearisation parameters can only be entered using the PC software.

Note 3: The pressure display will not exceed the minimum or maximum pressure values in this linearisation table, irrespective of the actual resistance value presented.

Note 4: Pressure can be displayed in bar or PSI. Simply enter the required display reading against the sender resistance value.

To start using the pressure sender, you will need to switch on the analogue measurement feature so that the pressure is displayed. Go to the 'Technician parameter' screen.

Parameter (P43) allows you to enter the minimum working pressure, an 'Under-Pressure setpoint'.

Parameter (P44) allows you to choose the course of action when the pressure drops below your minimum limit. There are 3 choices:

- 0 Disable the analog input. Pressure will not be displayed or monitored.
- 1 Pre-alarm. The alarm will sound, but the engine will keep running.
- 2 The engine will shut down.

Note: Option 1 and 2 are only operative if the engine is running.

Parameters (P43) and (P44) can be programmed using the PC software, or accessed through the front panel controls.

Testing

Connect an adjustable decade resistance box (or variable resistor) to the pressure sender input on the product. Using the decade box, set resistance values in accordance with the calibration table, checking that the correct pressure is displayed in each case.

With the engine running, set the resistance box to a value proportional to a trigger the low oil pressure alarm or shutdown, and verify that this operates correctly. The 'Alarm' annunciator will flash, and the display will indicate '**LoPr**', meaning 'Low Oil Pressure'.

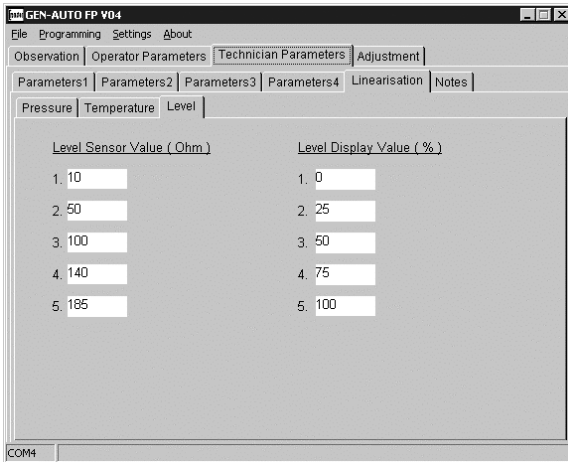
Programming the product to use a fuel level sender

Fuel level senders will have a resistance value proportional to the fuel quantity in the fuel tank. The shape of the fuel tank and the length of the float arm will affect the linearity of the sender. To characterise the sender and tank, measurements will need to be made with different fuel quantities. Start by taking readings with an empty tank, and then add quantities of fuel until the tank is full. Write the result in a table, for example:

Resistance	Level
10 Ω	0% (Empty)
50 Ω	25%
100 Ω	50%
140 Ω	75%
185 Ω	100% (Full)

Using the PC Software, enter these calibration values and download them to the product. Go to the 'Linearisation' screen, select 'Level' and then enter the data.

To display the fuel level in litres or gallons, simply enter the required display value against the sensor resistance value in the calibration table.



To start using the level sender, you will need to switch on the analogue measurement feature so that the level is displayed. Go to the 'Technician parameter' screen.

Parameter (P47) allows you to enter the low fuel warning level.

Parameter (P48) allows you to choose the course of action when the fuel is level below your minimum limit. There are 3 choices:

- 0 Disable the analog input. Fuel level will not be displayed or monitored.
- 1 Pre-alarm. The alarm will sound, but the engine will keep running.
- 2 The engine will shut down.

Parameters (P47) and (P48) can be programmed using the PC software, or accessed through the front panel controls.

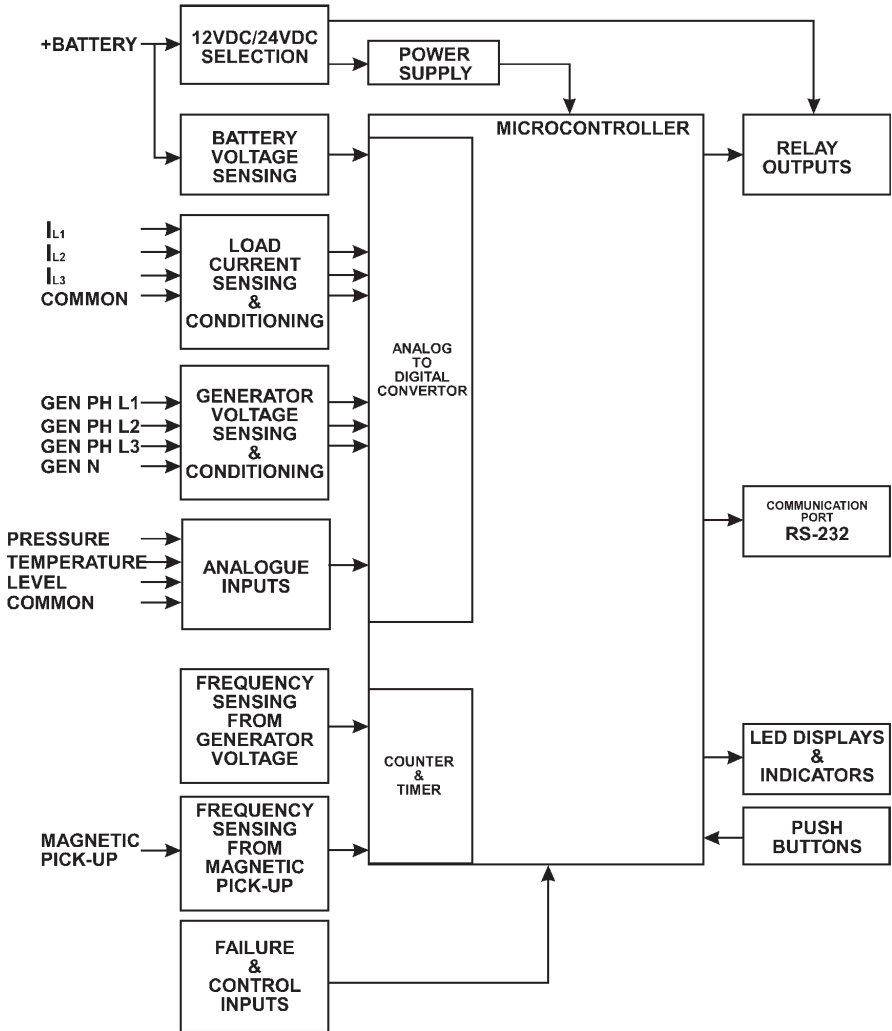
Testing

Connect an adjustable decade resistance box (or variable resistor) to the pressure sender input on the product. Using the decade box, set resistance values in accordance with the calibration table, checking that the correct level is displayed in each case.

For example, if the resistance value reaches that equivalent to the alarm setpoint level, the alarm horn will sound. The 'Alarm' annunciator will flash, and the display will indicate '**LoFE**', meaning 'Low Fuel'

10. Block Diagram

GEN-AUTO FP:



Programming Reference Sheet:

Prog No	Definition of Parameter	User Defined Parameter
P00	Alternator Voltage Lower Limit	
P01	Alternator Voltage Upper Limit	
P02	Speed Lower Limit	
P03	Speed Upper Limit	
P04	Battery Voltage Lower Limit	
P05	Battery Voltage Upper Limit	
P06	Over current limit	
P07	Periodic Maintenance Hour Set Value	
P08	Periodic Maintenance Hour Reset	
P09	Horn Duration	
P10	Pre-heat/Post-heat time	
P11	Single/Three Phase Selection	
P12	Nominal Alternator Frequency	
P13	Nominal Speed (Rpm)	
P14	Tooth Number	
P15	Current transformer ratio	
P16	Speed Sensing Input Selection	
P17	Stop/Fuel Solenoid Selection	
P18	Stop Magnet Energising Time	
P19	Remote start time delay	
P20	Remote stop time delay	
P21	Engine Started Signal	
P22	Battery Voltage Weak Limit	
P23	Battery Voltage Weak Control Time	
P24	Alternator Voltage Limit For Crank Disconnection	
P25	Speed Limit For Crank Disconnection	
P26	Number Of Starting Attempts	
P27	Starting Attempt Duration	
P28	Oil Pressure Bypass Time	
P29	Warm Up" Delay	
P30	"Fast Loading" selection	
P31	"Control On" Delay	
P32	Alt. Voltage Fault Control Delay	
P33	Speed Fault Control Delay	
P34	Engine Cooling Time	
P35	Engine Running Time Reset	
P36	Configurable Failure Input-1	
P37	Configurable Failure Input-2	
P38	Configurable Failure Input-3	
P39	Configurable Failure Inputs Observation Function Selection	

Prog No	Definition of Parameter	User Defined Parameter
P40	Configurable Output 1	
P41	Configurable Output 2	
P42	Switch or sender selection for low oil pressure failure.	
P43	Oil pressure lower limit	
P44	Oil pressure alarm configuration	
P45	Coolant temperature upper limit	
P46	Coolant temperature alarm configuration	
P47	Fuel level lower limit	
P48	Fuel level alarm configuration	
P49	Operator Password (P00..P08 and P49)	
P50	Technician Password (P00...P50)	

	Pressure Sender		Temperature Sender		Level Sender	
	Type:		Type:		Type:	
	Sensor Value (Ω)	Display Value (bar)	Sensor Value (Ω)	Display Value (°C)	Sensor Value (Ω)	Display Value (%)
1						
2						
3						
4						
5						

The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product. However, Tyco Electronics has no control over the field conditions which influence product installation.

It is the user's responsibility to determine the suitability of the installation method in the user's field conditions. Tyco Electronics' only obligations are those in Tyco Electronics' standard Conditions of Sale for this product and in no case will Tyco Electronics be liable for any other incidental, indirect or consequential damages arising from the use or misuse of the products. Crompton is a trade mark.



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