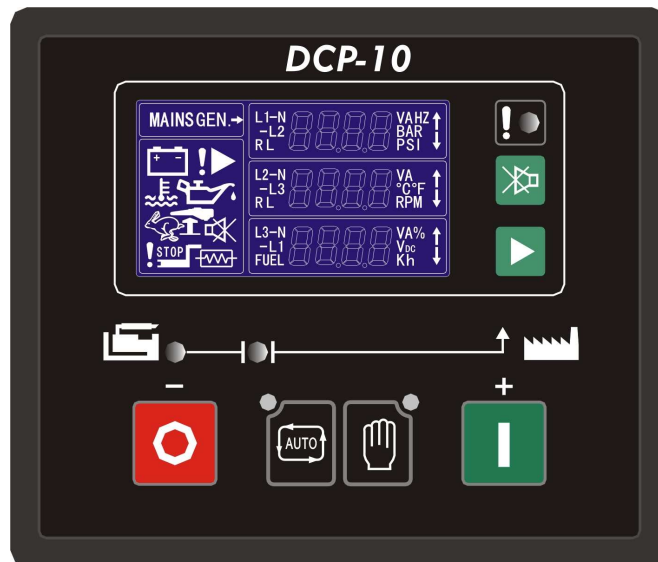





# Manual

## DCP-10 Genset Controller



The interpretation of the Symbol:

 WARNING	<p><b>WARNING:</b> A <b>WARNING</b> indicates a potentially hazardous situation which, if not avoided, could result in death, serious personal injury or property damage.</p>
 CAUTION	<p><b>CAUTION:</b> A <b>CAUTION</b> indicates a potentially hazardous situation which, if not avoided, could result in damage to equipment or property.</p>
	<p><b>NOTE:</b> A <b>NOTE</b> provides other helpful information that does not fall under the warning or caution categories.</p>



**WARNING:**

Read this entire manual pertaining to the work to be performed before installing, operating, or servicing this controller. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

The engine or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An over temperature or low pressure shutdown device may also be needed for safety, as appropriate.



**CAUTION—BATTERY CHARGING**

To prevent damage to a controller that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Controllers contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

Do not disassemble the rear back of controller or touch the components and conductors on a printed circuit board.

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## **1. Description**

The DCP-10 is an Automatic Controller for generator. When running in “AUTO” mode, it starts the Genset after receiving remote start signal and on failure automatically stops the Genset. The generator’s controlling procedure and protection parameters can be modified, which fully meets the Genset’s requirements of automatic start, stop control and basic protection.

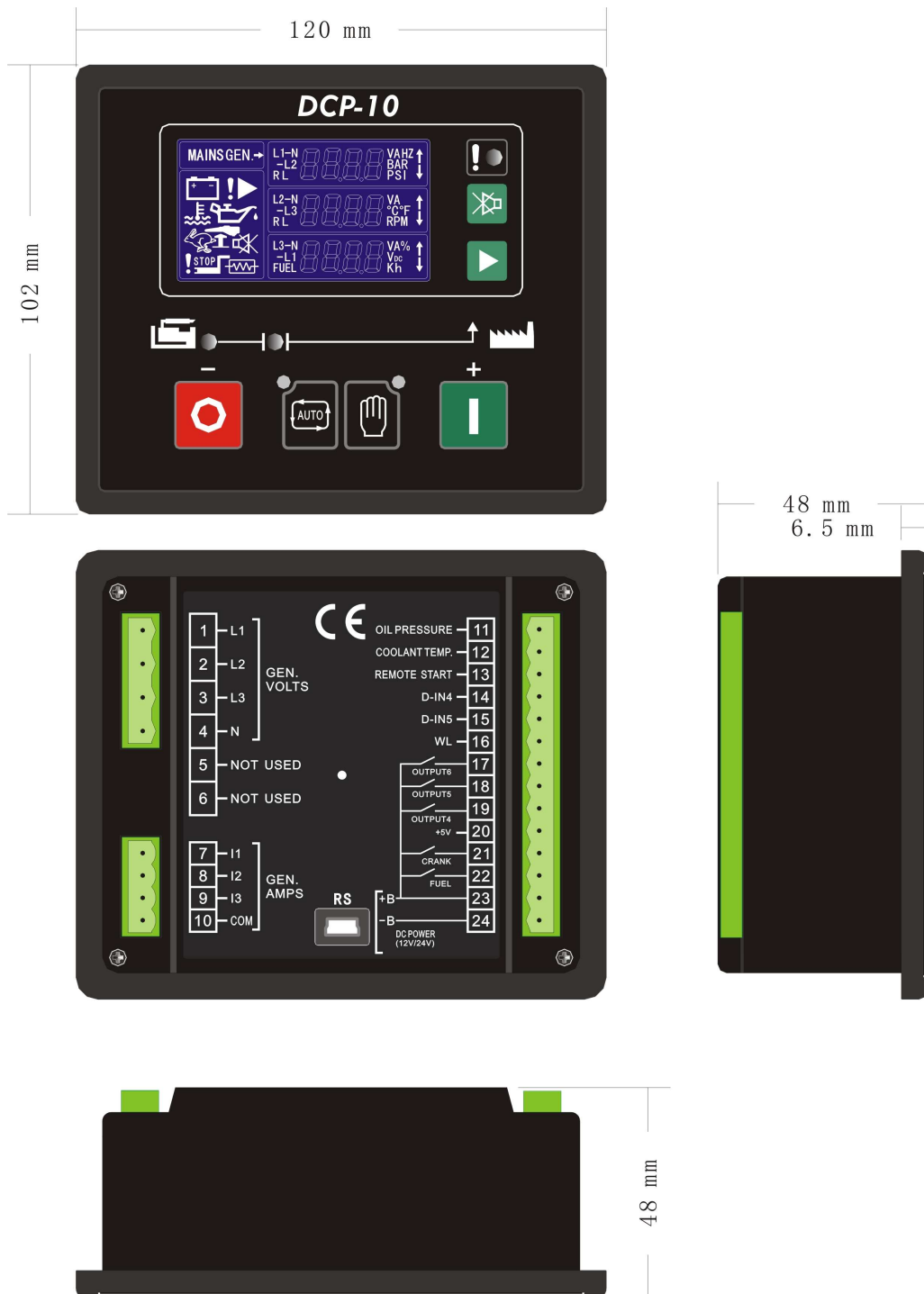
- The module displays fault conditions, operational status and related metering data on panel LCD.
- LCD has a backlight function so that the operator can read running parameters clearly even in the shadow.
- The controller has 2 modes: AUTO and MANUAL. Either can be chosen through the panel push button.
- Measures and displays generator’s output voltage, current, oil pressure, coolant temperature, frequency, DC source voltage, etc.
- True RMS measure of voltage and current, which ensures the data more accurate.
- Control the close/open of generator output switch.
- Equipped with built-in communication interface to configure parameters by PC.
- All connections of controller are by secure plug and socket, for ease and convenience to connect, move, maintain and replace the device.

**This manual is only suitable for DCP-10 Automatic control module, user must carefully read this manual first.**

## 2. Outline Dimension Drawings and Controller Wiring

### 2.1 Following Details:

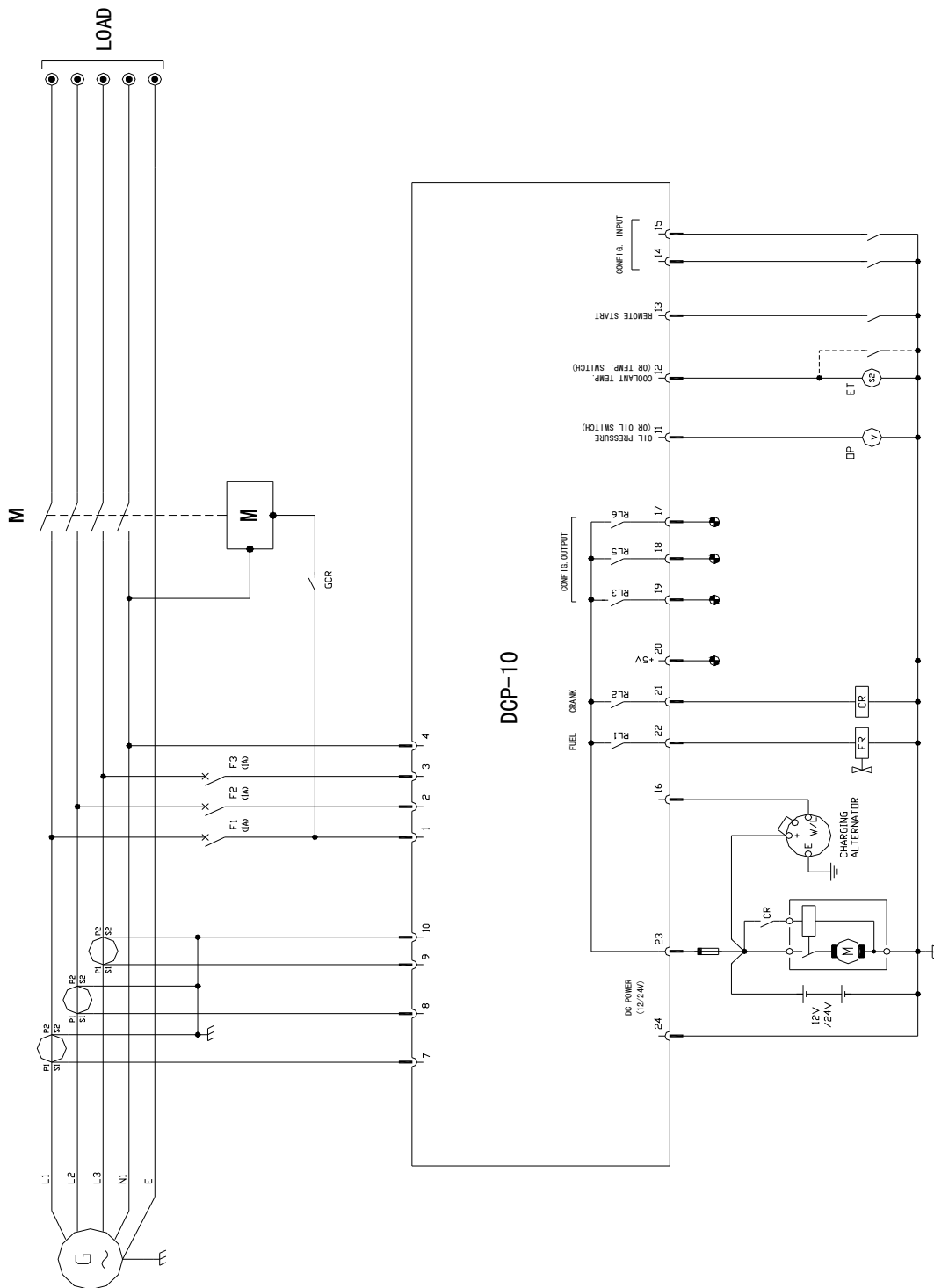
Module Dimensions	W120mm×H102mm
Panel Cutout	W110mm×H92mm
Thickness	D48mm (without connection)



**2.2 Terminal Connections:**

Pin no.	Function Description	Signal	Dim
1	GEN. $V_{L1-N}$ input	0-300Vac	1mm <sup>2</sup>
2	GEN. $V_{L2-N}$ input	0-300Vac	1mm <sup>2</sup>
3	GEN. $V_{L3-N}$ input	0-300Vac	1mm <sup>2</sup>
4	GEN. Neutral		1mm <sup>2</sup>
5	Not used		
6	Not used		
7	I1 Gen current input	0-5A	2.5mm <sup>2</sup>
8	I2 Gen current input	0-5A	2.5mm <sup>2</sup>
9	I3 Gen current input	0-5A	2.5mm <sup>2</sup>
10	Common port for current input	0-5A	2.5mm <sup>2</sup>
11	LOP sensor or switch signal	LOP sensor (<2K $\Omega$ )	1mm <sup>2</sup>
12	HET sensor or switch signal	HET sensor (<2K $\Omega$ )	1mm <sup>2</sup>
13	Configurable digital input signal 1	low level is active	1mm <sup>2</sup>
14	Configurable digital input signal 2	low level is active	1mm <sup>2</sup>
15	Configurable digital input signal 3	low level is active	1mm <sup>2</sup>
16	Charge excitation power output	if not used, do not connect to negative	1mm <sup>2</sup>
17	Configurable relay output 1	N.O. contact, 3A/30Vdc	1mm <sup>2</sup>
18	Configurable relay output 2	N.O. contact, 3A/30Vdc	1mm <sup>2</sup>
19	Configurable relay output 3	N.O. contact, 3A/30Vdc	1mm <sup>2</sup>
20	+5V supply	Max 100mA,	1mm <sup>2</sup>
21	Start (Crank) relay output	N.O. contact, 3A/30Vdc	1mm <sup>2</sup>
22	Fuel solenoid relay output	N.O. contact, 3A/30Vdc	1mm <sup>2</sup>
23	Battery supply (+B)	12V/24V (8-35Vdc continuous)	1mm <sup>2</sup>
24	Battery supply (-B)		1mm <sup>2</sup>

2.3 Typical Wiring Diagram



Fuse protection with a rating of 0.5A must be provided externally to the Controller.










### 3. Panel Operation

The operation panel consists of 3 sections: LCD display indicating measurement parameters, LED indicator for common failure, and push buttons for Genset and selection of control modes.

The LCD circularly displays different measuring parameters. When failure occurs, LCD displays the corresponding fault icon. LCD also has a backlight so that the operator can clearly read information day or night. After pressing any button the backlight will automatically turn off in a certain time.

The LCD display and its control push buttons provide a friendly operation interface for the operator to conveniently read information and parameter setting.

#### 3.1 Control buttons and LEDs

Function Description	Tag
<p><b>Scroll Button</b> Enter into submenu / Modify / confirm modification / scroll menu to display.</p>	
<p><b>MUTE / LAMP TEST Button</b> When failure occurs, alarm buzzer sounds. Pressing mute button will mute the sound. LCD displays mute icon. Press and hold mute button for 2sec, all LEDs illuminate simultaneously.</p>	
<p><b>AUTO Mode Button / LED</b> The push button is used for selecting "AUTO mode". When the controller is running in AUTO mode, the LED above the push button illuminated. The activation and deactivation of the "remote start signal input" controls the starting and stopping of the Genset.</p>	
<p><b>MAN Mode Button / LED</b> The push button is used for selecting "manual mode". When the controller is running in MANUAL mode, the LED above the push button illuminated. The Start and Stop push buttons control the starting and stopping of the Genset..</p>	
<p><b>START / VALUE INCREASE "+" Push Button</b> The push button is used for manually start the Genset .When the controller is in MANUAL mode, press this push button to start the generator.  When in parameter setting mode, this push button is used to increase values.</p>	
<p><b>STOP / RESET / VALUE DECREASE "-" Push Button</b> The push button is used for MANUALLY stops the Genset. When the controller is in MAN mode, press and hold this button more than 2sec to stop the Genset.  If failure occurs, press this button, the shutdown alarm lockout can be cleared.  When in parameter setting mode, this push button is used to decrease values.</p>	
<p><b>COMMEN FAILURE LED</b> LED will flash when pre-alarm (Warning) occurs. LED will illuminate permanently when shutdown alarm occurs.</p>	

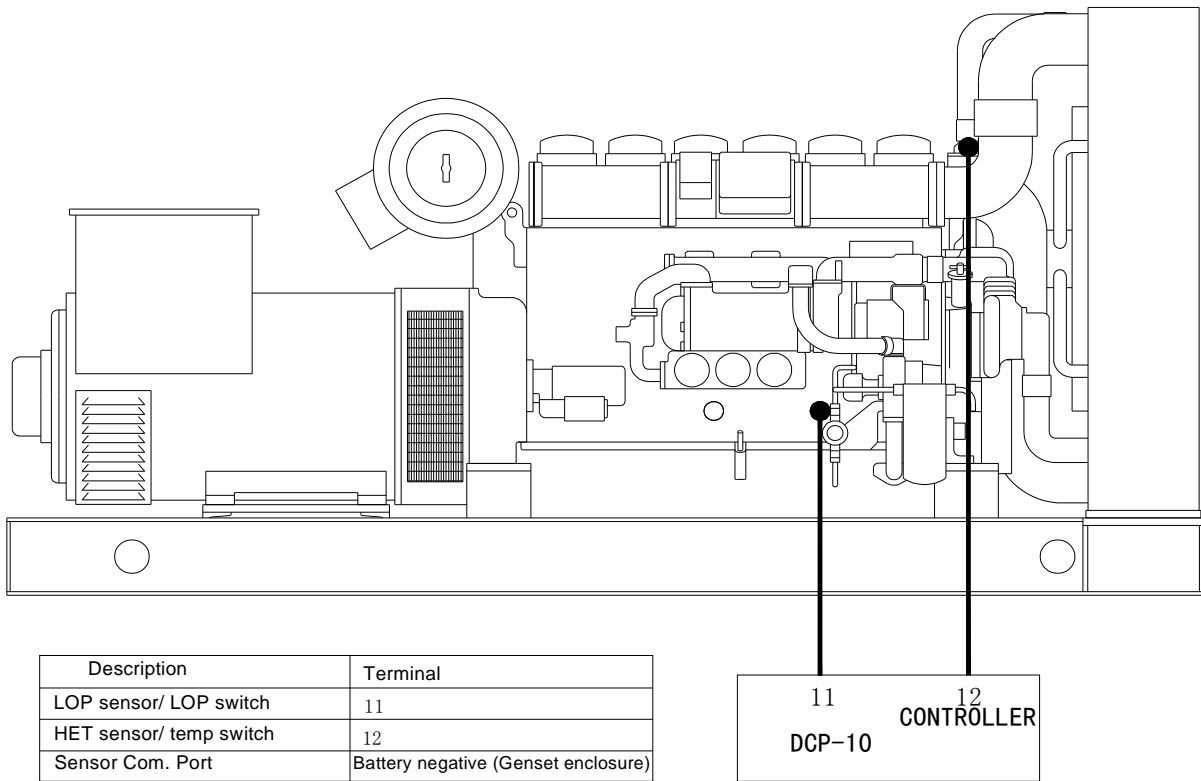
**4. Installation Guide**


**4.1 The cutout dimensional drawing installed on panel as above attached.**

The controller is fixed by 2 special fittings. The shock-proof equipment must be mounted if the enclosure is mounted on Genset or other heavy vibrant device. A readily accessible disconnect device shall be incorporated external to the equipment.

**4.2 Please refer to the above Typical Wiring Diagram 2.3 for connection.**

**4.3 Installation of engine LOP and HET sensors:**





**CAUTION**



**CAUTION:**

- Pin no. “11” and “12” is for “LOP sensor or switch signal” and “HET sensor or switch signal” input respectively. Either switch or sensor can be chosen. When sensor is used, according to the actual situation, increase the cross section area of cable to reduce the cable resistance from controller to engine, which ensures the accuracy of measured values for both oil pressure and engine temperature.
- If both switches and sensors are required for oil pressure and engine temperature, connect Pin no. “11” and “12” as above, and connect 2 configurable inputs to the switches of oil pressure and temperature, then configure parameters by setting.

## 5. Control and Operation Instruction

### 5.1 Operation Mode Setting:

The controller has 2 modes: AUTO and MANUAL.

Operation	Description
Press and hold the "AUTO" button for 2sec, the LED above the button is illuminated; the controller is running in "AUTO" mode.	
Press and hold the "MAN" button for 2sec, the LED above the button is illuminated; the controller is running in "MAN" mode.	

**NOTE:** Only 1 mode can be selected from above 2 modes.

### 5.2 AUTO control Sequence:

Controller is running in "AUTO" mode.

First of all, one of configurable inputs must be defined as **Remote Start Signal**.

When the remote start signal is active, the controller implements following procedure:

The Start delay timer is activated, when it times out the Preheat relay output is energized (if preheat function selected), the timer starts. When it times out, the fuel relay output is energized, and operates the fuel solenoid of the engine. After 300ms delay, the start (crank) relay output is energized; the start motor engages and begins to crank. When the engine speed reaches the crank cutout RPM, the start relay output is de-energized and the safety-on delay starts. When the safety-on times out, if the controller detects that the parameters of the Genset such as voltage, frequency, oil pressure, coolant temperature are normal, and no other failure is detected this indicates the Genset has successfully started and running normally. The LCD displays the Genset Measurement parameters.

When the voltage and frequency of Generator is normal, Gen. Normal LED illuminates, the timer for Gen. On delay is activated, when it times out, GCB close/open relay closes, the transfer switch switches on Gen. The Gen Aux. Switch's contact feeds back a signal to a configurable input on our controller. GCB closed LED illuminates.



**NOTE:**

- When remote signal is active, the start-delay timer is activated. During this period, if remote start signal is inactive, the start delay timer terminates immediately; the controller will recover to the original standby status.
- During cranking or idle period, if remote start signal is inactive, controller stops the start procedure and recovers to original standby status.

**NOTE:**

- While cranking, engine ignites. The start motor will power off when the output frequency of generator reaches the preset value (configurable crank cutout value), or if there are one of the following conditions occur:
  - A. Generator's voltage reaches 80% of rated voltage;
  - B. Cranking time's up,
  - C. LOP switch is opened and the delay time's up.
  - D. Oil pressure switch is opened or oil pressure is higher than **crank cutout value**.
  - E. Cutout P-delay time's up.
- Controller can not implement crank procedure if the frequency of generator reaches the preset value (configurable cranking cutout value) or LOP switch is opened.

**CAUTION****CAUTION:**

- To avoid damage to the start motor please make sure the generator's voltage is higher than the measurable value of controller while cranking, since the crank cutout signal is sensed from the generator voltage and frequency.

**NOTE:**

- Above control procedure, assumes that one of configurable inputs has been configured as **Gen Aux. Switch Closed** and connects the switch's N.O. Aux. contact signal to this port. If you do not configure an input as **Gen Aux. Switch Closed**, then the GCB closed LED illuminates is only an indication that the GCB close/open relay should have been closed.

If you have selected idle function, the idle relay will be closed at the same time as the crank relay is closed. The timers of idle and safety-on delay will begin counting down at the same time, and in priority to display the shorter one on the LCD, and the following procedure is the same as above.

During the crank period, if the engine can not ignite and controller will not output start signal during crank rest, Fail to Start icon on LCD flashes at this time. Once crank rest timer times out the start relay energizes once again and will attempt to start engine again.

The above procedure will be repeated until engine successfully ignites or reaches the preset number of crank attempt. However, if any shutdown alarm occurs during crank, controller will stop cranking immediately and only can be restarted after clearing failure and reset.

**Fail to Start:** when the above procedure repeats again and again and reaches the preset number of crank attempt, the crank relay output is then de-energized. The failure LED illuminates and the LCD displays **Fail to Start**.

**CAUTION****CAUTION:**

- If Fail to Start occurs, operator must check the whole Genset system to find out failure reason, only after clearing the failure can press "STOP/RESET" button to relieve fault lock out status, and restart the Genset.

**Generator shutdown sequence:**

When the remote start signal is deactivated, the timer for cool down is activated, When it times out, the fuel relay de-energizes, the timer for cool down is activated,

**Stop Failure:** When cool down times out, the fuel relay opens and the timer for Stop delay begins. When it times out, if controller detects that the voltage and frequency of generator or oil pressure of engine are greater than the preset values, the **Fail to stop** LED illuminates and the LCD displays Fail to stop.



**NOTE:**

- After stop failure, the controller will not energize the crank relay output if the failure has not been removed and the controller reset.

**5.3 MAN control sequence:**

Controller is in “MANUAL” mode.

**Generator starting sequence:**

Pressing “START” button the fuel relay energises, and operates the fuel solenoid of engine. After 300ms delay, the start relay output is energized, the start motor engages and begins to crank. When the engine speed reaches the crank cutout RPM, the start relay output is de-energized and the safety-on delay starts. When the safety-on times out, if the controller detects that the parameters of the Genset such as voltage, frequency, oil pressure and coolant temperature are normal, and no other failure is detected this indicates the Genset has successfully started and running normally. The LCD displays the Genset Measurement parameters.

When generator is running normally, GCB close/open relay will not close automatically. Manually close the Gen switch, Gen is on load, the Gen Aux. Switch’s contact feeds back the signal to a configurable input on our controller, Gen. Normal LED illuminates.



**NOTE:**

- When the controller is in “MANUAL” mode and Gen. Normal LED illuminates, you must define one configurable input as **Gen Aux. Switch Closed** and connect the switch’s N.O. Aux. contact signal to this port, otherwise the GCB closed LED will not illuminate.

**5.4 The start and stop sequence of engine whose fuel solenoid is N. O. type:**

**Start control sequence:**

During the starting sequence, the fuel relay of controller will not energize, fuel solenoid is no power, so no signal is required for fuel solenoid to activate.

**Stop control sequence:**

During the stopping sequence, the fuel relay energizes, fuel solenoid is on power and energizes, and the engine begins to stop. After a delay (same as stop delay) fuel relay de-energizes, disconnecting the supply for the fuel solenoid.

**Other control sequence is same as engine whose fuel solenoid is N. C. type.**

### 5.5 Idle function:

For **idle** function configure one of the configurable outputs as **idle**.

Refer to the flow chart **5.7** for start and stop for **idle** control flows.

### 5.6 Preheat function:

For **Preheat** function, configure one of the configurable outputs as **Preheat**. The controller has 3 selectable preheat control modes as below:

Mode 1 — during preheat time, preheat relay output energizes.

Mode 2 — during preheat time, preheat relay output energizes until the successful ignition.

Mode 3 — during preheat time, preheat relay output energizes until safety-on delay times out.

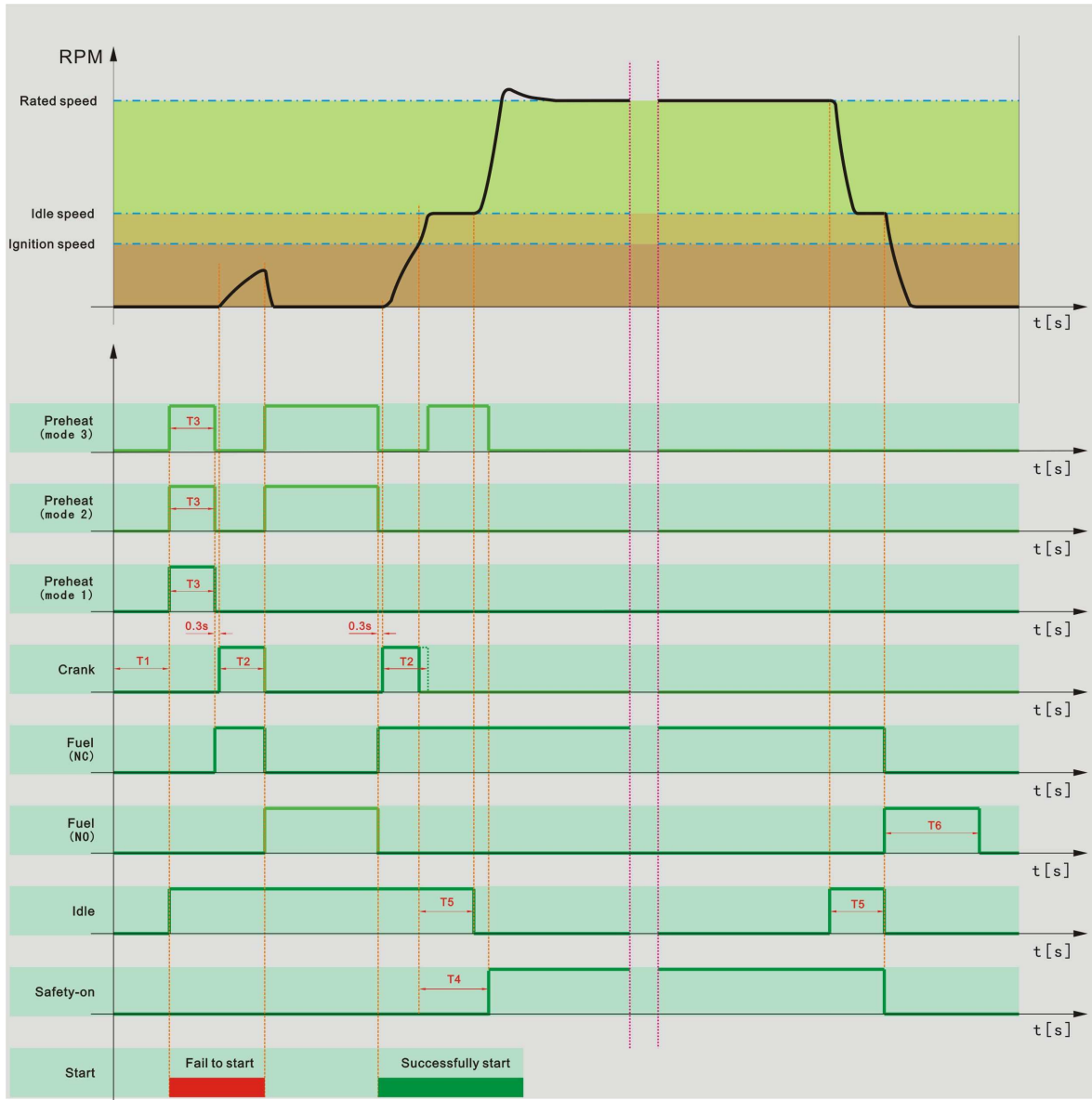
During crank period, the Preheat relay output will not energize in any of above modes.

Refer to the flow chart **5.7** for start and stop for **Preheat** control flows.

When the Preheat relay output energizes, LCD displays the icon of preheat operating status:



5.7 Flow chart for start and stop



- T1 – start delay
- T2 – crank time
- T3 – pre-heat time
- T4 – safety-on delay
- T5 – idle time
- T6 – stop delay



**NOTE:**

- If T4 is longer than T5, low oil pressure protection is ignored during T5.
- If T4 is shorter than T5, low oil pressure protection becomes effective after T4 in T5.

## **6. Measure and Display Data**

Gen phase voltage **L1-N L2-N L3-N**

Gen line voltage **L1-L2 L2-L3 L3-L1**

Generator current **I1 I2 I3**

Generator frequency **Hz**

Engine speed **RPM** (signal derived from generator frequency)

Engine oil pressure **BAR / PSI** (signal from engine LOP sensor)

Engine coolant temperature **°C / °F** (signal from engine HET sensor)

Battery voltage **Vdc**

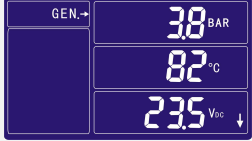
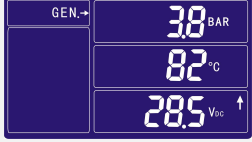
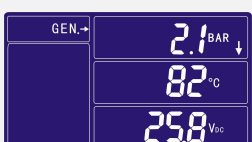
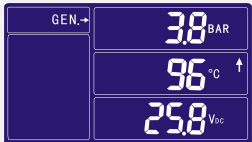
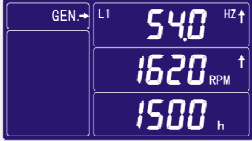
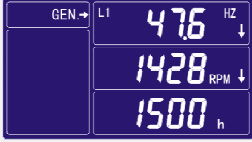
Genset Running hour **Hour**

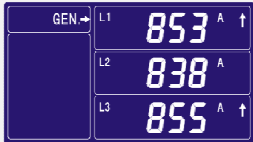
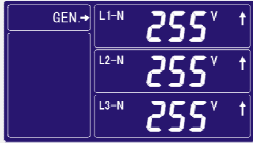
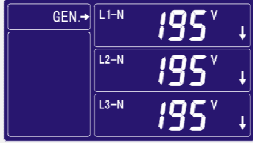
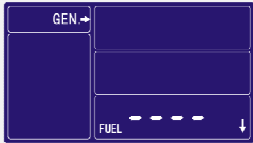
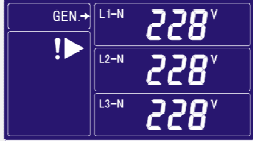



## 7. Pre-alarm and Shutdown Alarm


### 7.1 Pre-alarm (Warning)


**NOTE:** (Pre-alarms are non-critical failure conditions and do not affect the operation of the generator system, they serve for drawing the operators' attention to an undesirable condition so they can remove it to ensure continuous running of the system. When Pre-alarms occur, the LED indicator flashes, but failure will not be locked out and the unit will not shutdown. Once the Pre-alarm failure is removed the Pre-alarm LED will automatically turn off.)

Pre-alarm / Description	LCD Display
<p><b>CHARGE FAILURE:</b> After safety-on times up, if the charging voltage from the excitation contact of alternator is lower than the "charge V Pre-alarm", the common failure LED indicator ( ) flashes, the LCD displays Charge failure icon:</p>	
<p><b>BATT. UNDER VOLT:</b> if controller detects that battery voltage has fallen below the "Batt. Under volt", common failure LED indicator flashes. For example, "Batt. Under volt" preset as: 23.6V, when battery voltage falls below this value, LCD flashing low value icon:</p>	
<p><b>BATT. OVER VOLT:</b> if controller detects that battery voltage has exceeded the "Batt. Over volt", common failure LED indicator flashes. For example, "Batt. Over volt" preset as preset as: 28.2V, when battery voltage exceeds this value, LCD flashing high value icon:</p>	
<p><b>LOW OIL PRESS:</b> if controller detects that the engine oil pressure has fallen below the "Oil-P low preALM" after the safety-on timer expired, common failure LED indicator flashes. For example, "Oil-P low preALM" preset as: 2.2BAR, when engine oil pressure falls below this value, LCD flashing low value icon:</p>	
<p><b>HIGH TEMP:</b> if controller detects that engine coolant temperature has exceeded the "high temp pre-alarm", common failure LED indicator flashes. For example, "high temp pre-alarm" preset as: 95°C, when engine coolant temperature exceeds this value, LCD flashing high value icon:</p>	
<p><b>OVER SPEED:</b> if engine speed exceeds the "Over SP preALM", common failure LED indicator flashes. For example, "Over SP preALM" preset as: 1600RPM, when engine speed exceeds this value, LCD flashing high value icon:</p>	
<p><b>UNDER SPEED:</b> if engine speed falls below the "Under SP preALM" after the safety-on timer has expired, common failure LED indicator flashes. For example, "Under SP preALM" preset as: 1440RPM, when engine speed falls below this value, LCD flashing low value icon:</p>	

<p><b>OVER CURRENT:</b> if any phase output current of generator exceeds the “over current pre-alarm” after the safety-on timer has expired, common failure LED indicator flashes. For example, “over current pre-alarm” preset as: 850A, when any phase output current of generator exceeds this value, LCD flashing high value icon for corresponding phase:</p>	
<p><b>GEN. OVER VOLT:</b> if controller detects that any phase output voltage of generator has exceeded the “GEN-V over preALM” after the safety-on timer has expired, common failure LED indicator flashes. For example, “Rated ph-voltage” preset as: 220V, “GEN-V over preALM” preset as: 115%, when any phase output voltage of generator exceeds this value, LCD flashing high value icon for corresponding phase:</p>	
<p><b>GEN. UNDER VOLT:</b> if controller detects that any phase output voltage of generator has fallen below the “GEN-V under preALM” after the safety-on timer has expired, common failure LED indicator flashes. For example, “Rated ph-voltage” preset as: 220V, “GEN-V under preALM” preset as: 90%, when any phase output voltage of generator falls below this value, LCD flashing low value icon for corresponding phase:</p>	
<p><b>LOW FUEL LEVEL:</b> If a configurable input has been defined as <b>low fuel level</b>, when the input signal is active, common failure LED indicator flashes, LCD displaying low fuel level icon:</p>	
<p><b>AUXILIARY PRE-ALARM:</b> if a configurable input is defined as pre-alarm, when the input signal is active, common failure LED indicator flashes. LCD displaying Aux. pre-alarm icon:</p>	

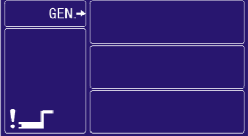
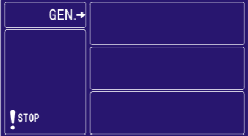
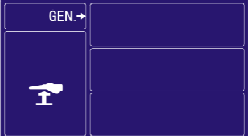
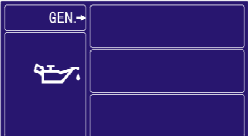
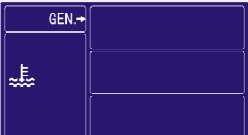
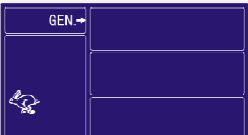
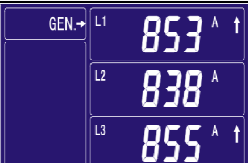
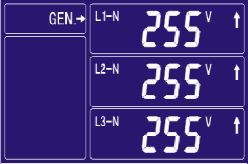
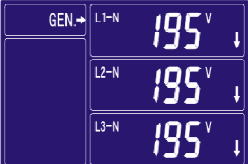
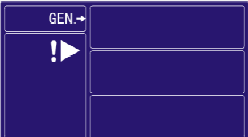
	<p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>● To make “low oil pressure” and “high temperature” pre-alarm active, you must use LOP sensor and HET sensor, if you only use LOP and HET switches, both pre-alarms are inactive.</li> </ul>
---	---

	<p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>● Controller continuously detects battery voltage during standby and <b>Battery Low/High Voltage</b> pre-alarms are active.</li> <li>● <b>Battery Low Voltage</b> pre-alarm is inactive during cranking.</li> </ul>
---	--

 <p><b>CAUTION</b></p>	<p><b>CAUTION:</b></p> <ul style="list-style-type: none"> <li>● Under the period of safety-on delay, some pre-alarms (e.g.: under speed, low voltage and low oil pressure) are inactive, the safety-on delay must be carefully and properly set to make Genset have full protection.</li> </ul>
---	---

7.2 Shutdown Alarm

**NOTE:** (shutdown alarm failures immediately lock out the system and stop the Genset. The failure must be removed and the controller reset before restarting the Genset.)

Shutdown Alarm / Description	LCD Display
<p><b>START FAILURE:</b> if engine does not fire after the preset number of crank attempt has been made, the Shutdown alarm LED illuminates. LCD displays "start failure" icon:</p>	
<p><b>STOP FAILURE:</b> if engine does not stop after the stop delay expired, the Shutdown alarm LED illuminates. LCD displays stop failure icon:</p>	
<p><b>EMERGENCY STOP:</b> Configure a configurable input as emergency stop, when the input signal is active, controller immediately stops all relay control outputs except alarm, Genset is shut down, the Shutdown alarm LED illuminates, LCD displays emergency stop icon:</p>	
<p><b>LOW OIL PRESS:</b> if controller detects that the oil pressure level still falls below "Oil-P low Alarm" or LOP switch closes after the safety-on timer has expired, engine stops immediately, the Shutdown alarm LED illuminates. LCD displays low oil pressure icon:</p>	
<p><b>ENGINE HIGH TEMP:</b> if controller detects that engine coolant temperature has exceeded the "Coolant Alarm" or HET switch closes, engine stops immediately, the Shutdown alarm LED illuminates. LCD displays high temperature icon:</p>	
<p><b>OVER SPEED:</b> if controller detects that engine speed exceeds "Over SP Alarm", engine stops immediately, the Shutdown alarm LED illuminates. LCD displays over speed icon:</p>	
<p><b>OVER CURRENT:</b> After safety-on delay time out, if controller detects that any phase output current of generator exceeds the "over current alarm", the Genset will be shut down immediately, the Shutdown alarm LED illuminates.</p>	
<p><b>GEN. OVER VOLT:</b> After safety-on delay times out, if controller detects that one of the phase voltage exceeds the "GEN-V over Alarm", the engine will be shut down immediately, the Shutdown alarm LED illuminates.</p>	
<p><b>GEN. UNDER VOLT:</b> After safety-on delay times up, if controller detects that any phase output voltage is lower than the "Vac low alarm", the engine will be shut down immediately, common failure LED illuminates.</p>	
<p><b>AUXILIARY FAILURE:</b> If a configurable input has been defined as Shutdown Alarm, when the input signal is active, common failure LED illuminates. LCD displays Aux. shutdown alarm icon:</p>	

Code Table for Failure:

Name	Code
CHARGE FAILURE	8888
BATT. UNDER VOLT	8888
BATT. OVER VOLT	8888
START FAILURE	8888
STOP FAILURE	8888
EMERGENCY STOP	8888
LOW OIL PRESS	8888

Name	Code
ENGINE HIGH TEMP	8888
OVER SPEED	8888
UNDER SPEED	8888
OVER CURRENT	8888
GEN. OVER VOLT	8888
GEN. UNDER VOLT	8888
P-SENSOR OPEN	8888



**NOTE:**

- Engine speed signal is derived from the frequency of generator output voltage, it is used for control and failure protection parameters, for the convenience of user, some data is expressed by RPM,  $RPM = Hz * 60 / \text{pair of poles}$ .
- While the Genset is running, if there are high coolant temperature, low oil pressure or over speed failure occurs, the controller will shutdown it immediately without delay. During the cool down period, if there is low oil pressure failure, the alarm will be active no matter if there is idle function.



**CAUTION:**

- During the period of safety-on delay, low oil pressure protection is inactive. To avoid starting an engine with no oil, you must make sure the oil levels are normal and the safety-on delay shall be carefully and properly set for the first commissioning.

## 8. Parameters Setting

### 8.1 System Parameters:

NO.	Items		Preset	Value Range
1.1	CT ratio	8888	100	1-2000
1.2	VT ratio	8888	1.0	1.0-100.0
1.3	Rated ph-voltage	8888	220	45-9999Vac
1.4	AC voltage	8888	2	1,3 (3 for 3 phase 4 wire, 1 for signal phase 2 wire)
1.5	Startup mode	8888	0	0-1 / 0 (MAN) / 1 (AUTO)
1.6	Oil pressure unit	8888	0	0-1 (0-BAR,1-PSI)
1.7	Temperature unit	8888	0	0-1 (0-°C,1-°F)
1.8	Comm. Address	8888	1	1-247
1.9	Default settings	8888		
1.10	On-line update	8888		
1.11	Scroll time	8888	0S	0-10 S / 0 (not used)



#### NOTE:

- For 1.5 Startup Mode, When parameter is configured as “1”, the controller will be in AUTO mode when it is powered on; When parameter is configured as “0”, the controller will be in Manual mode when it is powered on.
- After the oil pressure and temperature units changed, the corresponding failure alarm value must be reset according to actual situation.
- Engine speed is calculated by the number of “pair of poles”.  $RPM = Hz * 60 / \text{pair of poles}$ , when rated frequency is 50 Hz, if pair of poles set as “2”, then running speed is 1500 RPM, if pair of poles set as “1”, then running speed is 3000 RPM.

### 8.2 Generator Parameters:

NO.	Items		Preset	Value Range
2.1	V under Alarm	8888	0	20-200% / 0 (not set)
2.2	V under preALM	8888	90%	20-200% / 0 (not set)
2.3	V over preALM	8888	115%	20-200% / 9999 (not set)
2.4	V over Alarm	8888	9999	20-200% / 9999 (not set)
2.5	Hz low alarm	8888	45.0Hz	10.0-100.0Hz / 0 (not set)
2.6	Hz high alarm	8888	57.0Hz	10.0-100.0Hz / 999.9 (not set)
2.7	Over current pre-alarm	8888	100%	0-200%
2.8	Over current alarm	8888	150%	0-200%
2.9	Over current action	8888	0	0-1 (0- electrical tripping, 1-shutdown alarm)
2.10	Alarm delay	8888	10S	0-600 S
2.11	Gen. On delay	8888	5S	1-9999 S
2.12	GCB opening delay	8888	5S	1-9999 S

## 8.3 Engine Parameters:

NO.	Items		Preset	Value Range
3.1	Pair of poles	8888	2	1-4
3.2	Fuel mode	8888	0	0-1 / 0(NC) / 1 (NO)
3.3	T-sensor type	8888	12	0-15 / 0 (not used)
3.4	P-sensor type	8888	11	0-15 / 0 (not used)
3.5	Start delay	5888	10S	0-300 S
3.6	Crank attempt	8888	3 times	1-10 times
3.7	Crank time	8888	5S	0-30 S
3.8	Crank rest	8888	10S	0-300 S
3.9	Crank cutout RPM	8888	300RPM	1-9999 RPM
3.10	Crank cutout Oil-P	8888	1.0BAR	0.1-150.0BAR/999.9(not set)
3.11	cutout P-delay	8888	0	1-60 S / 0(not set)
3.12	Idle delay	8888	0	0-9999 S
3.13	Preheat delay	8888	3S	0-300 S
3.14	Preheat mode	8888	1	1-3
3.15	Safety-on delay	8888	10S	0-600 S
3.16	Cool down delay	8888	300S	0-600 S
3.17	Stop delay	8888	20S	0-60 S
3.18	Under SP Alarm	8888	0RPM	0-9999 RPM / 0 (not set)
3.19	Under SP preALM	8888	1440RPM	0-9999 RPM / 0 (not set)
3.20	Over SP preALM	8888	1600RPM	1-9999 RPM / 9999 (not set)
3.21	Over SP Alarm	8888	1710RPM	1-9999 RPM / 9999 (not set)
3.22	Oil-P low Alarm	8888	1.1BAR	0-45.0 BAR
3.23	Oil-P low preALM	8888	1.4BAR	0-45.0 BAR
3.24	Coolant preALM	8888	92°C	70-320°C / 9999 (not set)
3.25	Coolant Alarm	8888	100°C	70-320°C / 9999 (not set)
3.26	Batt. Undervolt.	8888	8.0V	1.0-25.0V / 0 (not set)
3.27	Batt. overvolt.	8888	28.0V	1.0-35.0V / 99.9 (not set)
3.28	charge V Pre-alarm	8888	8.0V	1.0-25.0V / 0 (not set)

## 8.4 Configurable Inputs and Outputs:

NO.	Items		Preset	Value Range
4.1	Configurable input 1	8888	8	0-12 (define code as 8.7)
4.2	Configurable input 2	8888	7	0-12 (define code as 8.7)
4.3	Configurable input 3	8888	12	0-12 (define code as 8.7)
4.4	Input 1 delay	8888	2S	0-60 S
4.5	Input 2 delay	8888	2S	0-60 S
4.6	Input 3 delay	8888	2S	0-60 S
4.7	Configurable relay 1	8888	2	0-80 (define code as 8.8)
4.8	Configurable relay 2	8888	3	0-80 (define code as 8.8)
4.9	Configurable relay 3	8888	5	0-80 (define code as 8.8)

**NOTE:** D-Input Delay is only for 1 to 4 codes in 8.7.

8.5 Calibration Menu:

NO.	Items		Preset	Value Range
5.1	GEN. V1 offset	8888		±10.0%
5.2	GEN. V2 offset	8888		±10.0%
5.3	GEN. V3 offset	8888		±10.0%
5.4	Current I1 offset	8888		±10.0%
5.5	Current I2 offset	8888		±10.0%
5.6	Current I3 offset	8888		±10.0%
5.7	Pressure offset	8888		±10.0%
5.8	Temperature offset	8888		±10.0%
5.9	Batt. V offset	8888		±10.0%

8.6 The optional items for P/T-sensor:

Code	The brand model of LOP sensor	The brand model of HET sensor
0	not used	not used
1	close for low oil pressure	close for high temperature
2	open for low oil pressure	open for high temperature
3	VDO 5 bar	VDO 120 °C
4	VDO 10 bar	VDO 150 °C
5	Datcon 7 bar	Datcon
6	Murphy 7 bar	Murphy
7	Pre-set 1	PT100
8	Pre-set 2	Pre-set 1
9	Pre-set 3	Pre-set 2
10	Pre-set 4	Pre-set 3
11	configured by user	Pre-set 4
12		configured by user



**NOTE:**

- When the controller leaves factory, the optional types and functions of LOP sensor and HET sensor have been preset as the above table. If the using sensor is not listed in this table, the user can select “configurable”, and write sensor parameters to controller via software.

- LOP sensor parameter addendum:

**VDO 5 bar:**

P (Bar)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5
P (PSI)	0	7.3	14.5	21.8	29.0	36.3	43.5	50.8	58.0	65.3	72.5
R (Ω)	11	29	47	65	82	100	117	134	151	167	184

**VDO 10 bar:**

P (Bar)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
P (PSI)	0	14.5	29.0	43.5	58.0	72.5	87.0	101.5	116.0	130.5	145.0
R (Ω)	10	31	52	71	90	106	124	140	155	170	184



**Datcon 7 bar:**

P (Bar)	0.0	0.7	1.4	2.1	2.8	3.4	4.1	4.8	5.5	6.2	6.9
P (PSI)	0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0
R (Ω)	240	200	165	135	115	95	78	63	48	35	25

**Murphy 7 bar:**

P (Bar)	0.0	0.7	1.4	2.1	2.8	3.4	4.1	4.8	5.5	6.2	6.9
P (PSI)	0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0
R (Ω)	240	205	171	143	123	103	88	74	60	47	33

**Pre-set 1:**

P (Bar)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
P (PSI)	0	14.5	29.0	43.5	58.0	72.5	87.0	101.5	116.0	130.5	145.0
R (Ω)	15	31	49	66	85	101	117	132	149	164	178

**Pre-set 2:**

P (Bar)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
P (PSI)	0	14.5	29.0	43.5	58.0	72.5	87.0	101.5	116.0	130.5	145.0
R (Ω)	30	41	65	88	110	115	145	150	172	185	190

**Pre-set 3:**

P (Bar)	0.0	1.7	3.4	5.2	6.9	8.6	10.3			
P (PSI)	0	25	50	75	100	125	150			
R (Ω)	21	36	52	72	84	100	120			

**Pre-set 4:**

P (Bar)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	6.5	7.0	8.0	9.0
P (PSI)	0	14.5	29.0	43.5	58.0	72.5	87.0	94.3	101.5	116.0	130.5
R (Ω)	251	195	155	127	107	88	72	65	61	54	48

**Type 11:**

P (Bar)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
R (Ω)	21.5	25	27.6	30.2	33.5	36.8	40.3	43.2	46.9	50.6
V	0.48	0.55	0.6	0.65	0.71	0.77	0.83	0.88	0.94	1.0

● HET sensor parameter addendum:

**VDO 120°C:**

T (°C)	40	50	60	70	80	90	100	110	120	130	140
T (°F)	104	122	140	158	176	194	212	230	248	266	284
R (Ω)	291	197	134	97	70	51	38	29	22	18	15

**VDO 150°C:**

T (°C)	50	60	70	80	90	100	110	120	130	140	150
T (°F)	122	140	158	176	194	212	230	248	266	284	302
R (Ω)	322	221	155	112	93	62	47	37	29	23	19



**Datcon:**

T(°C)	40	50	60	70	80	90	100	110	120	130	140
T(°F)	104	122	140	158	176	194	212	230	248	266	284
R(Ω)	900	600	400	278	200	141	104	74	50	27	4

**Murphy:**

T(°C)	40	50	60	70	80	90	100	110	120	130	140
T(°F)	104	122	140	158	176	194	212	230	248	266	284
R(Ω)	1029	680	460	321	227	164	120	89	74	52	40

**PT100:**

T(°C)	-100	-50	0	20	40	60	80	100	150	200	300
T(°F)	-148	-58	32	68	104	140	176	212	302	392	572
R(Ω)	60	81	100	108	116	123	131	139	157	176	212

**Pre-set 1:**

T(°C)	20	30	40	50	60	70	80	90	100	110	120
T(°F)	68	86	104	122	140	158	176	194	212	230	248
R(Ω)	900	600	420	282	152	113	86	62	48	40	30

**Pre-set 2:**

T(°C)			30	50	60	70	80	90	100	110	120
T(°F)			86	122	140	158	176	194	212	230	248
R(Ω)			980	400	265	180	125	90	65	50	38

**Pre-set 3:**

T(°C)	20	30	40	50	60	70	80	90	100	110	120
T(°F)	68	86	104	122	140	158	176	194	212	230	248
R(Ω)	805	540	380	260	175	118	83	58	42	30	21

**Pre-set 4:**

T(°C)	28	35	40	50	60	70	80	90	95	98	
T(°F)	82	95	104	122	140	158	176	194	203	208	
R(Ω)	579	404	342	250	179	136	103	77	67	63	

**Type 12:**

T(°C)	150	130	110	90	80	70	50	25	0	0
R(Ω)	6.9	10.8	17.7	30.6	41.1	56.3	111.8	300	964.4	964.4

**8.7 The optional items for configurable input:**

Code	Optional Function	NOTE
0	not used	
1	Pre-alarm (active immediately)	low level is active
2	Shutdown Alarm(active immediately)	low level is active
3	Pre-alarm (active after safety-on delay)	low level is active
4	Shutdown Alarm(active after safety-on delay)	low level is active

5	LOP switch	low level is active
6	HET switch	low level is active
7	Emergency stop	low level is active
8	Remote start signal	low level is active
9	Reserved	low level is active
10	Gen Aux. Switch closed	low level is active
11	Low fuel level	low level is active
12	Lamp test	low level is active

**8.8 The optional items for configurable output:**

Code	Failure Type Define	Code	Failure Type Define
0	Not used	1	Over current tripping
2	Alarm	3	Pre-alarm
4	Idle 0 (N.C.)	5	Preheat
6	Speed up	7	Reserved
8	Fuel pump control	9	Running
10	System in AUTO mode	11	Reserved
12	System in MAN mode	13	Reserved
14	Idle 1 (N.O.)	15	Reserved
16	GCB failure (within 5s)	17	Fail to start



**NOTE:**

- If define one configurable relay as **Speed up**, the relay will close after the engine has successfully started. If there is idle function, the relay will close after idle timer times out.

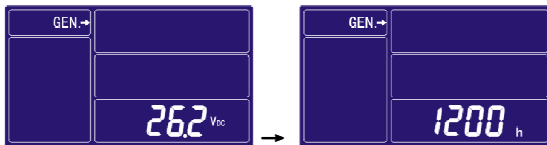
## 9. LCD Display and Menu System

Using a backlit TN type LCD to display data and information. After pressing any push button the backlight will automatically turn off in a preset time. In normal operating status, you can set the page scroll time to circularly display each page of measuring data. Press “▶” manually scrolls to view each measuring data. When failure occurs, LCD displays the corresponding failure icon.

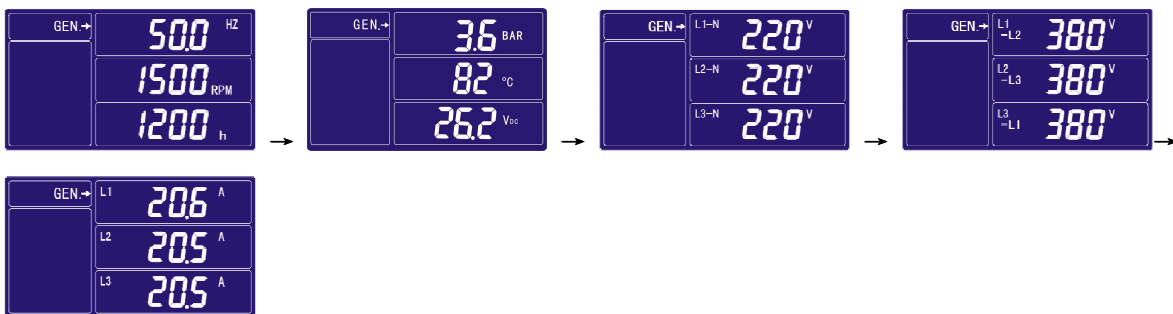
Press and hold “▶” button 2sec to enter into parameters setting menu, then use “◀” or “▶” to scroll page, press “▶” again to select the required modify item, press “◀” or “▶”, LCD displays 0000 when prompted to enter password, then use “◀” or “▶” to modify the first digital value, press “▶” move to modify the next one, after this, the first digital value will be displayed as “H”. Press “▶” to confirm after the password is set as 2213, then you can modify parameters. Otherwise it will prompt to key in password again. Press and hold “▶” for more than 2sec to quit parameters setting mode after finishing configuration.

### 9.1 Static LCD displays

Controller is in standby status, circularly displays each measuring data:



Controller is normally running, circularly displays each measuring data:









**NOTE:**






- When T-sensor or P-sensor is set as “not used”, LCD will not display related measuring data.

### 9.2 Setting running parameters





For example: (setting CT ratio at 1000/5, then CT should be configured as 200)

Operation	Description
Press and hold "▶" 2sec, enter into parameters setting menu, then LCD displays:	
press "▶", then LCD displays:	
Press "⬆", prompted enter password, then LCD displays:	
Press "⬆" or "⬇" prompted enter password: (2213), then press "▶" again, press "⬆" or "⬇" to change parameter, change at 200, then LCD displays:	
Press "▶" to confirm, then press "⬇", then LCD displays:	
Press "▶" again to quit, or press and hold "▶" more than 2s also can quit, then LCD displays:	





For example: (setting controller crank attempt at 2)

Operation	Description
Press and hold "▶" 2sec, enter into parameters settings menu, then LCD displays:	
Press "⬆" 28 times and then press "▶", then LCD displays:	
press "⬆" prompted enter password, then LCD displays:	
Key in password: (2213), press "▶", then LCD displays:	
Press "⬇" or "⬆" change parameter, change at 2, Press "▶" to confirm change, and then press and hold "▶" for more than 2sec will quit parameter settings menu.	

For example: (resume parameters of controller to factory default)

Operation	Description
Press and hold "▶" 2sec, enter into parameter settings menu, then LCD displays:	
Press "↑" 8 times, then LCD displays:	
press "▶" prompted enter password, then key in password: (2213)	
Press "▶" to recover default, press and hold "▶" for more than 2sec will quit parameters setting menu.	

For example: (configure controller as online program mode)

Operation	Description
Press and hold "▶" 2sec, enter into parameter settings menu, then LCD displays:	
Press "↑" 9 times and then LCD displays:	
press "▶" prompted enter password, then key in password: (3132)	
Press "▶" again to enter into online program mode, use the communication cable and the software to program, please make sure the power supply is normal during programming, the controller will reset automatically after programming. If you have entered into this mode already, but you do not program, you need to turn the controller off to exit this mode.	

## **10. Preparation before Starting the Controller**

**10.1** Make sure the controller is correctly installed to meet the ambient requirements.

**10.2** Confirm all wiring connections of the controller meet the correct electric specification and corresponding to "2.3 typical wiring diagram". Ensure the correct polarity of the DC supply source and that it has been protected by an external fuse. Otherwise damage to the controller may occur.

**10.3** We recommend mounting an "Emergency Stop" button externally. The emergency stop input could be connected to N.O. contact of emergency stop push button, and the other contactor point be connected to the battery negative.

**10.4** Switch on DC working power, make sure the preset parameters meet practical operating conditions, such as P-sensor mode, T-sensor mode, etc.

## **11. Technical Specification**

DC working power

Voltage range: 12V/24V (8-35V continuous)

Cranking drop outs: 0V for 100mS, assuming dc supply was at least 10V before dropout and recovers to 5V

Max. operating current: @12V 180mA, @24V 90mA

Standby current: TBA

AC input voltage: phase voltage 15-300Vac RMS (AC frequency  $\geq$  40 Hz)

AC input frequency: 3-70Hz (voltage  $\geq$  15V)

Accuracy: 1%

Aux Control relay output: 3A/30Vdc

Start relay output: 3A/30Vdc

Fuel relay output: 3A/30Vdc

Protection: IP65 (when correctly installed)

Operating ambient temperature: -20 to 70°C

Storage ambient temperature: -30 to 80°C

