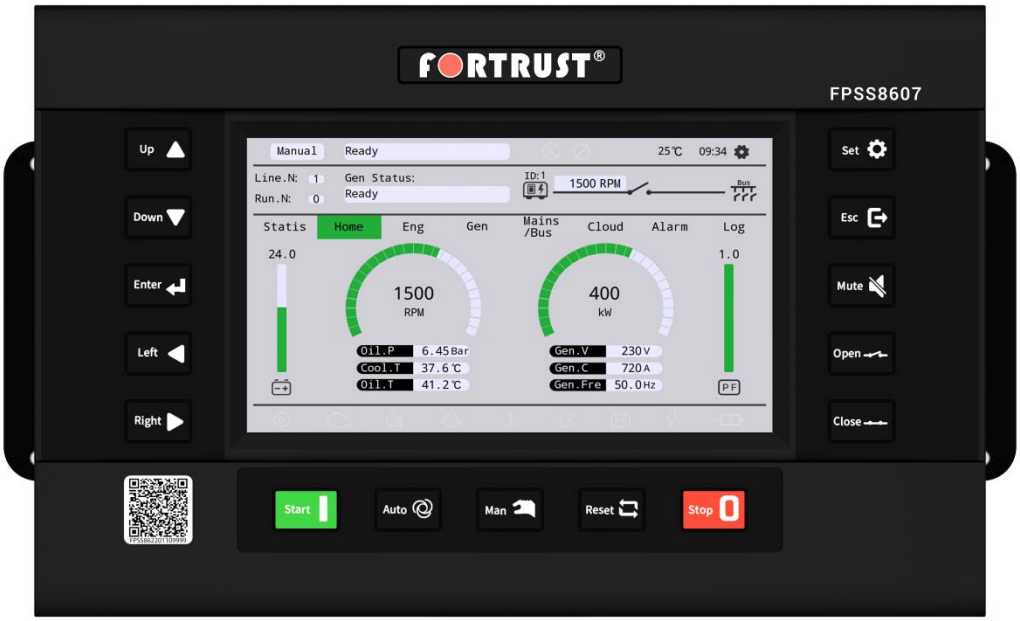


FPSS8607-G50

USER MANUAL

SHANGHAI FORTRUST POWER ELECTRIC CO., LTD

CONTENTS

FOREWORD

Dear:

We are deeply honored that FPSS8607-G50 parallel controller can get your trust. In order to give you a general understanding of our company's products and facilitate your use, we have specially configured this user manual for you, including the performance and characteristics, specification, operation, protection instructions, wiring connection, parameter settings, trial operation, installation, fault finding, etc. Before use, please read the user manual carefully, which will be of great help for you to use the parallel controller effectively. In addition, if you have any questions in the process of using, please call or write emails to inquire and we will try our best to help you.

NOTE : The parallel controller must must be powered by the battery. Direct power supply by built-in charging generators is strictly prohibited.

NOTE: If you have any question about the controller, please scan the cloud service QR code on the panel for more services.

SHANGHAI FORTRUST POWER ELECTRIC CO., LTD

Table 1 Version History

Date	Version	Contents
2020/12/29	V 1.0	Original release.
2022/02/22	V 1.1	1. Modify the product type. 2. Add the functions description.;

1 OVERVIEW

FPSS8607-G50 parallel controller is a manual/automatic parallel system for single or multiple generator sets with the same capacity or different capacity, realizing the functions such as automatic startup/shutdown/parallel operation, data measurement, alarm protection and "three remote". The controller adopts a high-resolution 7-inch color LCD screen displaying Chinese and English, with simple and reliable operation.

With the powerful 32-bit microprocessor, utilizing the GOV (Engine Speed Governor) and AVR (Automatic Voltage Regulator) control function, the controller is able to synchronize and share load automatically. It can be used to parallel with other FPSS8607-G50 controller. FPSS8607-G50 controller also monitors the engine, indicating the operational status and fault conditions accurately. When abnormal condition occurs, it splits bus and shuts down the genset, simultaneously the exact failure mode information is indicated on the latest line of the front panel. SAE J1939 interface enables the controller to communicate with various ECU (ENGINE CONTROL UNIT) which fitted with J1939 interface. It achieves precision parameters measuring, fixed value adjustment, time setting and set value adjusting and etc. The screen is arranged in an array mode, enabling users to accurately find corresponding items, parameter tables, and display values. The main page includes the distribution items of major categories, the display of main parameters, and the closing and opening status. The alarm items are also classified at the bottom of the display screen: engine, generator and maintenance items, which can accurately be located and found problems when corresponding faults occur. It can realize the fastest problem troubleshooting and maintenance with simplest operation in the most professional way.

The FPSS8607-G50 parallel controller can have a built-in network communication module, which enables the genset to access to the Internet. After logging in the cloud server, the data information of the genset can be uploaded to the corresponding cloud server in real time. Users can monitor the genset in real time and query the operating status and historical records of the genset through mobile app, computer and other terminal devices. At the same time, the parameters of the parallel controller can be configured through the cloud server. Furthermore, you can also check the startup, alarm and other curves of the genset, which is convenient to monitor the operation status of the genset.

1.1 HIGHLIGHT INTRODUCTION

- With dual CPU electronic architecture, much stronger performance and more stable operation, meeting the requirements of control reliability and intelligence.
- With 7-inch color LCD, which displays all parameters of the system in the home page, making the graphical interface more intuitive.
- Large area radiator ensures reliable operation in high temperature environment.
- Detect floating charging current to avoid starting battery loss caused by floating charger failure and affect starting reliability.
- Detect and store the change curve of engine parameter within 10 seconds of each start, so as to analyze the factors affecting the start reliability and predict the change trend of start reliability.
- Detect and store the main parameters of the genset within 10 seconds after the fault occurs, with a sampling period of 0.1 seconds, so as to trace and analyze the causal relationship of the fault and quickly locate the fault point.
- Detect load power quality, and display voltage waveform and harmonic waveform to avoid generator heating and burning due to high harmonic content of the motor。
- With total 10 sets of sensor input points of different types, and the maintenance functions of the genset can be expanded according to needs, such as the detection of low oil level and water shortage.
- The full-area operation mode can be expanded as needed, and it can support power limitation in high-altitude and high-heat areas.
- With integrated wiring process design, reduce external wiring and wiring points, and improve process-ability and contact reliability.

2 QUICK USE

2.1 INSTALLATION

Controller is panel built-in design; it is fixed by clips when installed. The controller's overall dimensions and cutout dimensions for panel, please refers to as following:

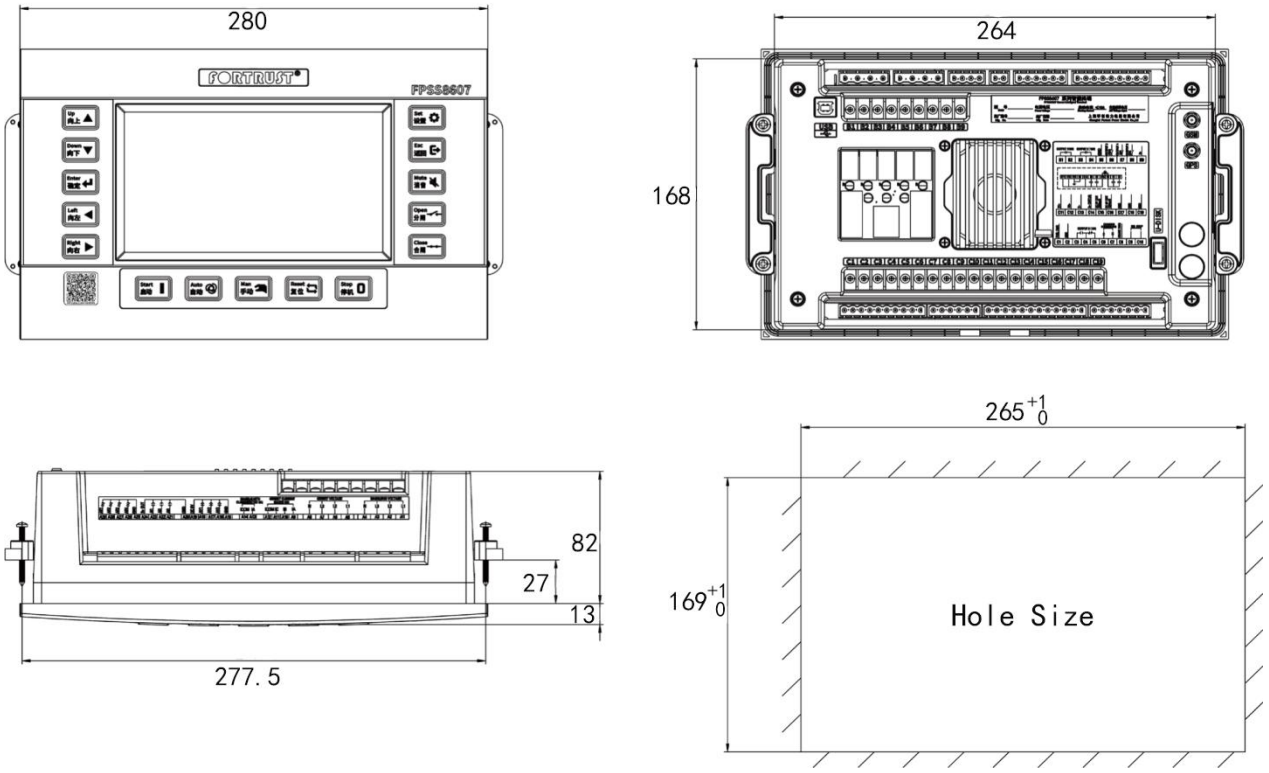


Fig. 1 Overall Dimensions and Panel Cutout

2.2 PARAMATER SETTING

2.2.1 TECHNICAL AGREEMENT

Each controller has a corresponding technical agreement, which provides the basis for the parameter setting of the controller when it leaves the factory. Below is the sample of the technical agreement. See the Appendix I Technical Agreement for more details.

Fig.2 Technical Agreement

2.2.2 CONTROLLER PANEL

If the factory parameters of the controller are different from it in actual usage, you can adjust them by setting the controller parameters.

2.2.3 CLOUD SETTING

If there is no on-site technical personnel to adjust parallel controller parameters, you can scan the QR code at the lower left of the panel to apply for service. After being accepted by the cloud terminal, remote modification can be performed on the cloud terminal to solve onsite problems quickly with low cost.

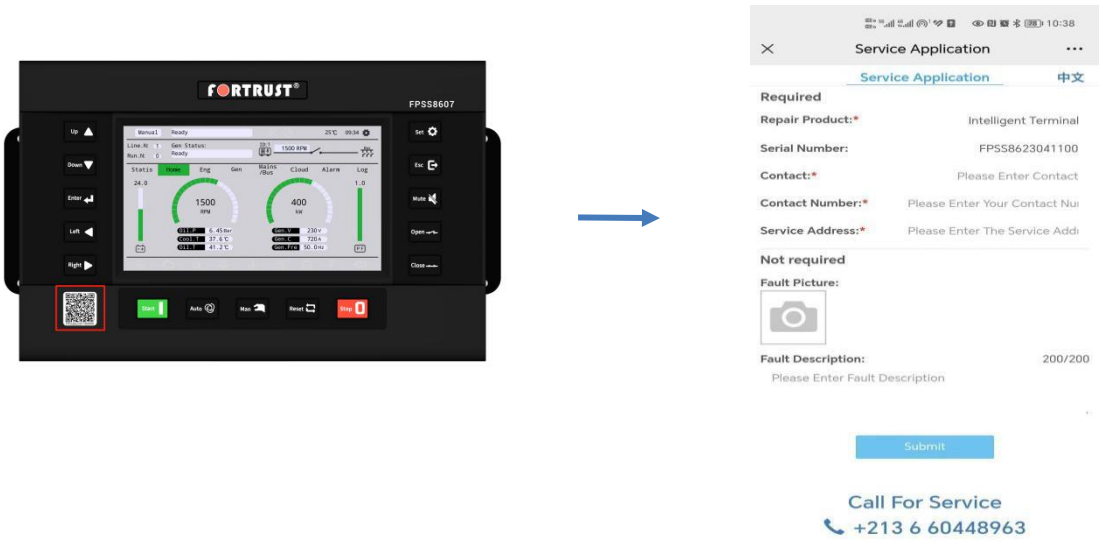


Fig.3 Flow Diagram

2.3 TYPICAL APPLICATION WIRING DIRGRAM

2.3.1 PARALLEL NON-EFI TYPICAL APPLICATION WIRING DIRGRAM

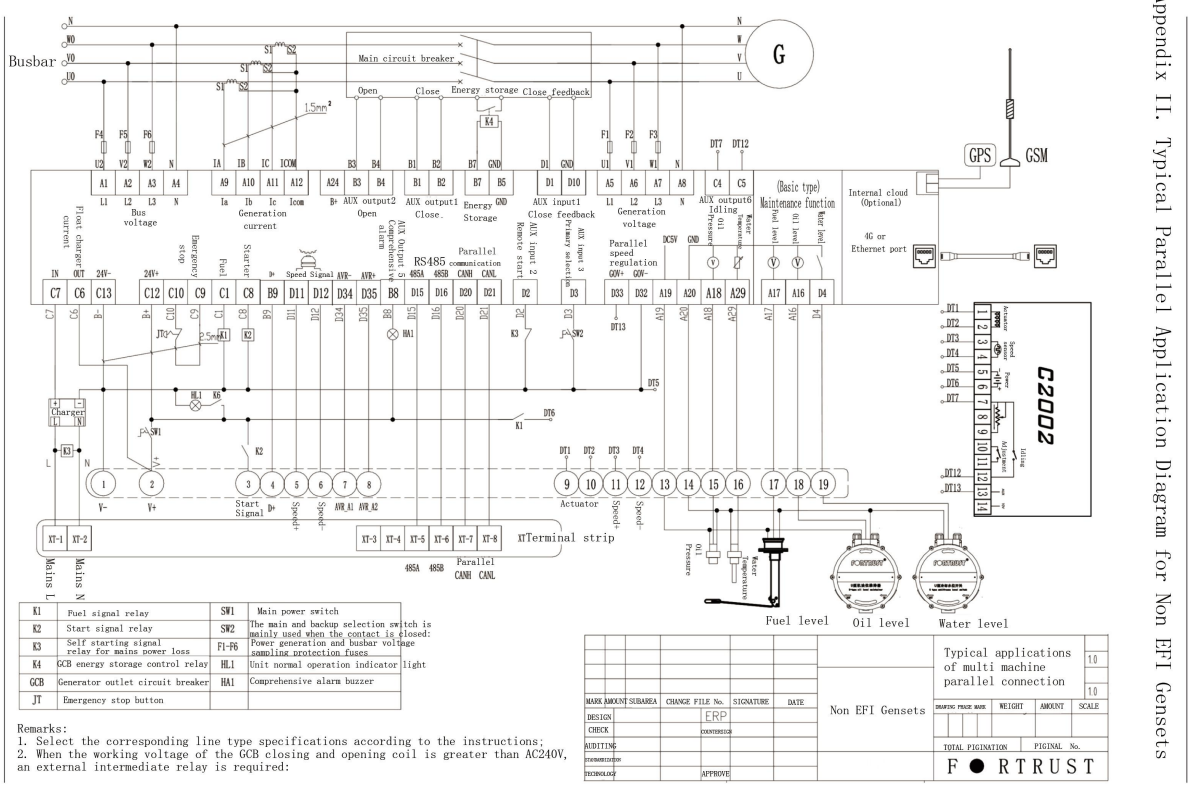
This scheme is applied to multiple parallel scenario. In the case of non-EFI gensets, it can be built according to this typical application diagram. Compared with the general scheme, the scheme with FPSS8607-G50 controller has the following advantages:

The intelligent terminal is designed with shallow integration, reducing external wiring and connection points. The power supply comes with a fuse, reducing external corresponding lines; Equipped with a 5V power supply, it meets the requirements of precision sensor power supply, thus eliminating the need for a 5V voltage module; The emergency stop comes with its own process wiring points to reduce terminal merging; Equipped with multiple GND grounding points to reduce peripheral wiring; Overall improvement of craftsmanship and contact reliability;

Total ten groups of sensor input; The control system can expand the measurement and acquisition of maintenance data.

Integrated the measurement of cloud module, floating charging current and electromagnetic actuator current.

Please refer to Annex II. Parallel non-EFI typical application diagram for more details.



K1	Fuel signal relay	SW1	Main power switch
K2	Start signal relay	SW2	The main and backup selection switch is mainly used when the contact is closed:
K3	Self starting signal relay for mains power loss	F1-F6	Power generation and busbar voltage sampling protection fuses
K4	GCB energy storage control relay	HL1	Unit normal operation indicator light
GCB	Generator outlet circuit breaker	HA1	Comprehensive alarm buzzer
JT	Emergency stop button		

Appendix II. Typical Parallel Application Diagram for Non EFI Gensets

Fig.4 Non-EFI Typical Application Diagram

2.3.2 PARALLEL EFI TYPICAL APPLICATION WIRING DIRGRAM

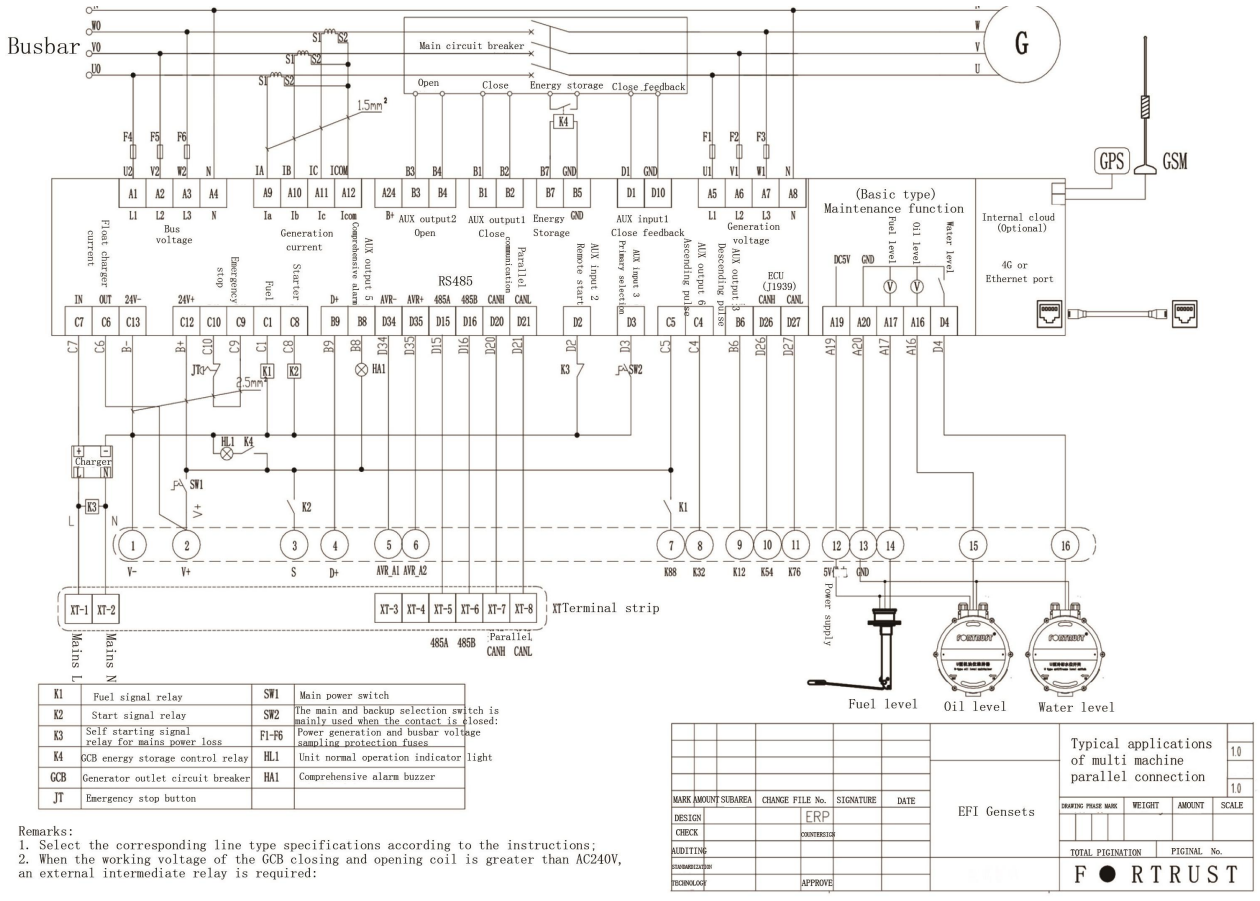
This scheme is applied to multiple parallel scenario. In the case of EFI gensets, it can be built according to this typical application diagram. Compared with the general scheme, the scheme with FPSS8607-G50 controller has the following advantages:

The intelligent terminal is designed with shallow integration, reducing external wiring and connection points. The power supply comes with a fuse, reducing external corresponding lines; Equipped with a 5V power supply, it meets the requirements of precision sensor power supply, thus eliminating the need for a 5V voltage module; The emergency stop comes with its own process wiring points to reduce terminal merging; Equipped with multiple GND grounding points to reduce peripheral wiring; Overall improvement of craftsmanship and contact reliability;

Total ten groups of sensor input; The control system can expand the measurement and acquisition of maintenance data.

Integrated the measurement of cloud module, floating charging current and electromagnetic actuator current.

Please refer to Annex III. Parallel EFI typical application diagram for more details.



K1	Fuel signal relay	SW1	Main power switch
K2	Start signal relay	SW2	The main and backup selection switch is mainly used when the contact is closed:
K3	Self starting signal relay for mains power loss	F1-F6	Power generation and busbar voltage sampling protection fuses
K4	GCB energy storage control relay	HL1	Unit normal operation indicator light
GCB	Generator outlet circuit breaker	HA1	Comprehensive alarm buzzer
JT	Emergency stop button		

Remarks:
1. Select the corresponding line type specifications according to the instructions;
2. When the working voltage of the GCB closing and opening coil is greater than AC240V, an external intermediate relay is required:

						EFI Gensets	Typical applications of multi machine parallel connection
MARK	AMOUNT	SUBAREA	CHANGE FILE No.	SIGNATURE	DATE		1.0
DESIGN			ERP				1.0
CHECK			COUNTERSIGN				DRAWING PHASE MARK / WEIGHT / AMOUNT / SCALE
AUDITING							TOTAL PIGNATION / PIGINAL No.
STANDARDIZATION							
TECHNOLOGY			APPROVE				FORTRUST

Fig.5 EFI Typical Application Diagram

3 PERFORMANCE AND CHARACTERISTICS

Its main features are as follows:

- With ARM-based 32-bit SCM, dual chip processing, high integration of hardware and accurate data, built-in cloud module.
- 7 inch of 1024*600 LCD, more direct graphical data display, Chinese and English optional, which can be directly operated in the interface.
- Silicon buttons for better operation in high/low temperature environment, effectively waterproof and oil proof and high elastic material button with better hand feel.
- RS485 communication ports enable remote control, remote measuring, remote communication via ModBus protocol.
- Fitted with CANBUS port and can communicate with J1939 genset. Not only can you monitor frequently-used data (such as water temperature, oil pressure, engine speed and so on) of ECU machine, but also raising speed and speed droop via CANBUS port.
- Suitable for 3-phase 4-wire, 3-phase 3-wire, single phase 2-wire, and 2-phase 3-wire systems with voltage 120/240V and frequency 50/60Hz.
- Collects and shows 3-phase voltage, current, frequency and power parameter of Gens and BUS.
- With generation voltage waveform display and total harmonic distortion waveform display.
- For Bus, controller has loss of phase and reverse phase sequence detection functions; For generator, controller has over voltage, under voltage, over frequency, under frequency, over current, over imbalance current, under power factor, over power, reverse power, loss of excitation, loss of phase, reverse phase sequence detection functions.
- Synchronization parameters: Voltage Difference Between Bus and Gens, Frequency Difference Between Bus and Gens, Phase Difference Between Bus and Gens.
- Multiple running modes in auto state: with load running, all running or demand running.
- Ramp on and ramp off function.
- With various types of 10 analog input ports, including 4 channels of resistance type, 3 channels of current type, 3 channels of voltage type; By default, it has water temperature, oil pressure, fuel level, and oil temperature. The interface can be set flexibly.
- More kinds of curves of temperature, oil pressure, fuel level can be used directly and users can define the sensor curves by themselves.
- With display functions of floating charger current measurement, electromagnetic actuator working current measurement, oil level measurement, cooling water level measurement.
- With multiple active power supply output to make it easy to match a variety of active sensors.
- All output ports are relay output.
- With USB port to make it convenient for function settings and batch update by PC.
- Internal parameters can be set flexibly. Most function configurations can be modified by pressing the button on the panel and saved in real time to prevent sudden power failure.

- Multiple crank disconnect conditions (speed sensor, oil pressure, generator frequency) are optional.
- Save 100 alarm history records to facilitate fault query and analysis. It has the function of real-time clock internally, and users can set it by themselves.
- Accumulative total running time and total electric energy. Users can reset it as 0 and re-accumulate the value which make convenience to users to count the total value as their wish.
- Automatic control of control engine heater, cooler and fuel pump according to the water temperature and fuel level.
- With characteristic cloud service functions, the built-in cloud module can be selected to realize cloud data display, cloud start and stop , start curve and alarm curve, which is convenient for genset maintenance.
- IP55 protection level can be achieved with the help of rubber-ring gasket between shell and control panel.
- Integrated design, self-extinguishing ABS plastic shell, pluggable terminal, built-in mounting， compact structure with easy installation.
- Strong scalability for parallel application and it can realize parallel operation of the genset with other brand controllers (with RS485 interface) through Fortrust IOTC310-CAN cloud module.

4 SPECIFICATION

Table 2 Technical Parameters

Item	Contents
Working Voltage	DC8. 0V to 35. 0V, uninterruptible power supply
Overall Consumption	<12W(Standby mode<6W)
AC Input: 3 Phase 4 Wire 3 Phase 3 Wire Single Phase 2 Wire 2 Phase 3 Wire	 AC 15V – AC 360V(ph-N) AC 30V – AC 620V(ph-ph) AC 15V – AC 360V(ph-N) AC 15V – AC 360V(ph-N)
Alternator Frequency	50Hz/60Hz
Speed Sensor Voltage	1. 0V to 24V (RMS)
Speed Sensor Frequency	Max. 10000Hz
Start Relay Output	10A DC supply (EM Stop +) output
Fuel Relay Output	10A DC supply (EM Stop +) output
Flexible Relay Output 1	10A passive output
Flexible Relay Output 2	10A passive output
Flexible Relay Output 3	10A DC supply（B+）output
Flexible Relay Output 4	2A DC supply（B+）output
Flexible Relay Output 5	2A DC supply（B+）output
Flexible Relay Output 6	6A passive output（NC/NO）
Overall Dimensions	280mm×180mm×90mm
Panel Cutout	265mm×169mm
CT Secondary Current	Rated 5A
Working Temperature	-20 ~ +70℃
Storage Temperature	-25 ~ +80℃
Protection Level	IP55：Gasket IP42：No Gasket
Insulation Intensity	Object: input/output/power supply Reference standard: IEC688-1992 Test method: AC1.5kV /1min leakage current 3mA
Weight	1.7 kg (not including the cloud module) 1.77 kg (including the cloud module)

5 OPERATION

5.1 INDICATORS

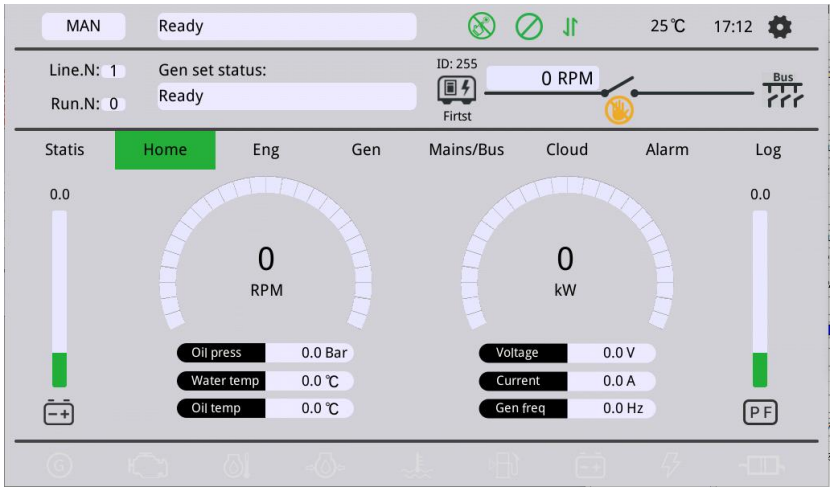


Fig.6 FPSS8607-G50 Home Page

1. Indicators Description

- Gray: Not detected or not used;
- Green: Normal;
- Yellow: There is related alarm;
- Red: There is related alarm shutdown;

Table 3 Alarm Indicator

Icon	Function	Indicator	Function
	Generator Comprehensive Alarm		Fuel Level Alarm
	Engine Comprehensive Alarm		Battery Voltage Alarm
	Oil Temperature Alarm		Charging Generator Voltage Alarm
	Oil Pressure Alarm		Parallel CAN Alarm
	Water Temperature Alarm		

2. Function Indicator Description

Table 4 Function Indicator

Icon	Function	Description
	Inhibit Gen Load	Only displayed when the digital input Gen load prohibition is valid.
	Cloud Communication	Only flashes when the controller gets the communication with the cloud module.
	Inhibit Button	Only displayed when the digital input button prohibition is valid.
	Emergency Mode	Only displayed when the digital input alarm shutdown prohibition is valid.

5.2 KEY FUNCTION DESCRIPTION

Table 5 Key Function Description

Icon	Button	Description
Start	Start	Start genset in Manual mode.
Stop	Stop	Stop running generator in Manual mode. During stopping process, press this button again to stop generator immediately.
Auto	Auto Mode	Press this key to place the controller in automatic mode. In automatic mode, the controller can automatically control the genset. For example, when one of the digital input or dispatch is valid, the genset will automatically run and synchronize . After the synchronization is successful, the load switch will be closed. When the start signal is removed, the controller will automatically execute the shutdown process.
Man	Manual Mode	Press this key and controller enters in Manual mode. In manual mode, the controller starts the genset without load by the start button.
Mute	Mute	Press this key to mute the alarm buzzer and invalid buzzer output.
Reset	Reset	Press this key to clear and remove the triggered alarm.
Close	Close	Close breaker in manual mode.
Open	Open	Open breaker in manual mode.
Set	Setting	Press this key to enter the parameter setting screen.
Esc	Return	Press this key again to return to the previous level of content.
Up	Up/Increase	1) Screen scroll; 2) Up cursor and increase value in setting menu.
Down	Down/Decrease	1) Screen scroll; 2) Down cursor and decrease value in setting menu.
Left	Left	1) Page scroll; 2) Left move cursor in setting menu.
Right	Right	1) Page scroll; 2) Right move cursor in setting menu.
Enter	Confirm	Confirm the information in the setting.

NOTE: Press Man and Start simultaneously in manual mode will force generator to crank. Successful start will not be judged according to crank disconnect conditions, operator will have to crank the starter motor manually. In manual mode, press Stop and hold the button to force the fuel output to supply power to the ECU, and press Stop again to turn off the output.

5.3 LCD DISPLAY

5.3.1 MAIN DISPLAY

Main screen show pages; use Left、Right to scroll the pages and Up、Down to scroll the screen.

★Status, including as below,

Engine running speed, switch status and generator set status.

Number of on-line gensets, number of closing gensets and MSC communication ID.

★Main Screen, including as below,

Gen: voltage, frequency, current, active power, power factor;

Engine: speed, cooling water temperature, oil pressure, oil temperature, charger voltage;

★Engine, including as below,

Engine speed, cooling water temperature, oil pressure, fuel level, oil temperature, charger voltage, engine accumulated run, accumulated start times.

The next page also includes: floating charge current, working current of electromagnetic actuator, oil level, cooling water level, ECU data (intake temperature, exhaust temperature, turbine pressure, fuel consumption, accumulated fuel consumption, etc.);

★Generator, including as below,

Phase voltage, line voltage, frequency, current, total active power (positive and negative), total reactive power (positive and negative), total apparent power, average power factor (positive and negative).

The next page also includes: each phase active power, total active power, each phase reactive power, total reactive power, each phase apparent power, total apparent power, each phase power factor, total power factor, phase angle data display, voltage waveform and total harmonic distortion rate waveform display.

★Bus, , including as below,

Bus phase voltage, Gen phase voltage, voltage difference, frequency difference, phase difference, speed regulation voltage output percentage, voltage regulation output percentage;

Next page include: MSC communication online gensets, closing gensets, generator three phase current, generator frequency, generator active power, generator reactive power, generator actual active power, generator actual reactive power, Bus total active power, Bus total reactive power, Bus rated active power, Bus rated reactive power.

★Cloud Service：

One click repair: collect the data curves of five seconds before and after the repair report with the time accuracy of 0.1S, and upload to the cloud.

Remote parameter adjustment application: apply to the cloud to adjust the parameters of the controller to complete the function modification.

Note: Press 

on the cloud service interface to enter cursor selection, 

and 

are used to select the corresponding function by the up and down cursor and press 

to confirm the function. Press 

to exit the cursor selection to enter normal display operation.

★Alarm:

Displays the current alarm shutdown events.

★Event log

Make records about all alarm shutdown events.

★Statistics：

Accumulated running time, accumulated startup times and accumulated electric energy.

Digital input status and relay output status.

5.3.2 USER MENU AND PARAMATER SETTING

Press 

to enter into the user menu.

- **Parameter**

After entering the correct password (factory default password is 1921) and you can enter parameter settings screen.

- **Language**

Selectable Chinese, English.

- **Controller Information**

Date and time, software version, hardware version.

Press 

to enter into time setting, press 

and 

to select the cursor, press 

and 

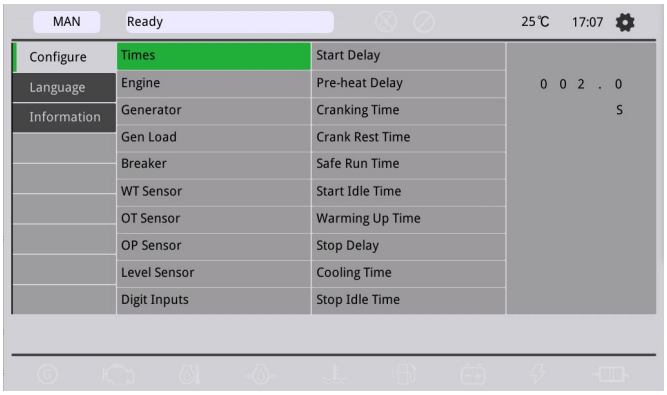
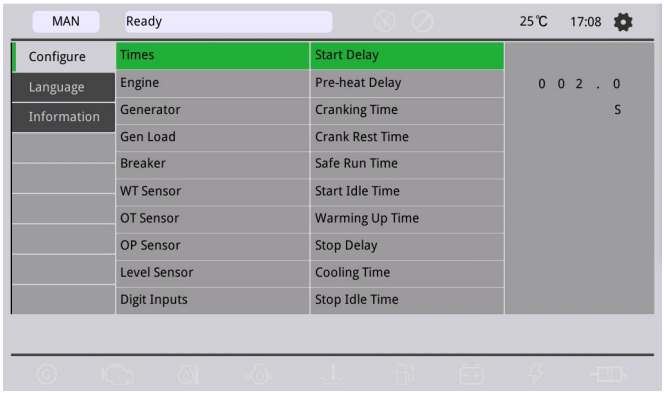
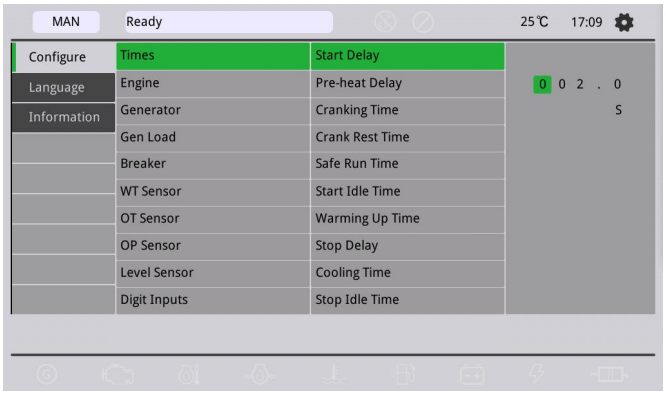
to modify the value, press 

to confirm the setting.

Parameter setting includes:

- Timer settings
- Engine settings
- Generator settings
- Load settings
- Breaker settings
- Water temperature sensor settings
- Oil temperature sensor settings
- Oil pressure sensor settings
- Liquid level sensor settings
- Digital input settings
- Digital output settings
- Module settings
- Maintenance settings
- Synchronization settings
- GOV settings
- AVR settings

Example:

	Press Up、Down to scroll settings, Enter to confirm to the next menu, Esc to exit the setting menu and return to the previous menu.
	Press Up、Down to scroll settings, Enter to enter the settings, Esc to exit the setting menu and return to the previous menu.
	Press Left、Right to select the cursor, Up、Down to modify the value, Enter to confirm the value setting, Esc to exit the setting menu and return to the previous menu.

5.4 AUTO START/STOP OPERATION

Auto mode is selected by pressing 

button.

Automatic Start Sequence:

1) When "Remote Start" is active, "Start Delay" timer is initiated.
2) "Start Delay" countdown will be displayed on LCD.
3) When start delay is over, preheat relay energizes (if configured), "preheat delay XX s" information will be displayed on LCD.
4) After the preheat delay, the fuel supply output (if configured) , and fuel relay output(if no configured, then fuel relay and start relay are both energized), then the start relay output energizes; if the engine fails to fire during this cranking attempt then the fuel relay and start relay are disengaged for the pre-set rest period; "crank rest time" begins and wait for the next crank attempt.
5) Should this start sequence continue beyond the set number of attempts, the start sequence will be terminated, and Fail to Start fault will be displayed on LCD alarm page.
6) In case of successful crank attempt, the "Start Override" timer is activated, Low Oil Pressure, High Temperature, Under speed and Charge Alternator Failure inputs are all inactive. As soon as this delay is over, "idle warming" delay is initiated (if configured).
7) During "idle warming" delay, under speed, under frequency, under voltage alarms are inhibited. When this delay is over, "Speed Raise" delay is initiated (if configured).
8) During "Speed Raise" delay, when the speed reaches the rated speed, "Warming Up Time" delay is initiated (if configured); if no, the controller will initiate "Speed Raise and Drop" failure and shutdown alarm.
9) In the case of a single generator system, after the "warming up" delay, if genset reaches operation speed, the generator indicator will be illuminated. If generator voltage and frequency have reached on-load requirements, then the generator close relay will be energized; genset will take load; closing switch and Bus indicator will illuminate and generator will enter into Normal Running status. If voltage or frequency is abnormal, the controller will initiate shutdown alarm (alarm information will be displayed on LCD)
10) In case of running in parallel, after the warming up delay:

a) If bus has no voltage, then the controller will send a closing signal to other waiting parallel gensets and generator close relay will activate, this prevents other sets in the system from attempting to close their own breakers at the same time.
b) If bus has voltage or other gensets are already closed, the controller will adjust speed and voltage through GOV and AVR to synchronize the gensets to the bus; when synchronism requirements has been achieved, breaker close signal will be initiated and the genset will be paralleled with the bus. Once they are paralleled, the controller will control the generator to gradually accelerate and share load with other paralleled gensets.

NOTE: When started via "Remote Start (off Load)" input, same procedures as above but generator close relay deactivated, moreover, genset off load. When started via "Remote Start (Demand)" input, the genset will start, synchronize, parallel and share load automatically according to the pre-set priority order.

Automatic Stop Sequence:

1) When the "Remote Start" signal is removed, the Stop Delay is initiated.
2) Once this "stop delay" has expired, the module will ramp the load from the generator to remaining set. The Generator Breaker will open and the "Cooling Delay" is then initiated. Should the Remote Start signal be re-activated during the cooling down period, the set will return parallel status. Once the "Cooling Delay" expires, the "Idle Cooling" delay is initiated.
3) "ETS Solenoid Hold" begins, ETS relay is energized while fuel relay is de-energized, complete stop is detected automatically. If the engine speed does not drop below the set speed during this period, fail to stop alarm is initiated.
4) When generator is stop completely, "Wait to stop" is initiated.
5) Generator is placed into its standby mode after its "Wait to stop" delay.

5.5 MANUAL START/STOP OPERATION

1) Manual Start: Manual mode is selected by pressing the 

button; manual mode will be displayed to confirm the operation; then press 

button to start the gen-set; can detect crank disconnect condition and generator accelerates to high-speed running automatically. With high temperature, low oil pressure, over speed and abnormal voltage during generator running, controller can protect genset to stop quickly (please refer to No.3~9 of Automatic Start Sequence for detail procedures).

2) Manual Stop: Press 

can shuts down the running generators. (Please refer to No.2~5 of Automatic Start Sequence for detail procedures).

NOTE: In "manual mode", the procedures of ATS please refer to Switch Control Procedure of generator in this manual.

5.6 SWITCH CONTROL PROCEDURES

5.6.1 MANUAL CONTROL PROCEDURE

When controller is in Manual mode, the switch control procedures will start through manual transfer procedures. Users can control the loading transfer of ATS via pressing button to switch on or off.

Closing Operation： During genset normal running, press 

if generator voltage and frequency have reached on-load requirements.

a) If bus has no voltage, then the controller will send a closing signal to other waiting parallel gensets and generator close relay will activate, this prevents other sets in the system from attempting to close their own breakers at the same time.

b) If bus has voltage or other gensets are already closed, the controller will adjust speed and voltage through GOV and AVR to synchronize the gensets to the bus; when synchronism requirements has been achieved, breaker close signal will be initiated and the genset will be paralleled to the bus. Once they are paralleled, the controller will control the generator to gradually accelerate and share load with other paralleled gensets.

Opening operation: Press 

1) In case of single unit running, the controller sends open breaker signal.
2) During parallel operation, controller first transfers load to other generators, and then sends an opening signal.

5.6.2 AUTO CONTROL PROCEDURE

When controller is in auto mode, the switch control procedure is automatic control procedure.

NOTE: The auxiliary close input should be configured necessarily and make sure the connection is correct.

6 PROTECTION

6.1 WARNING

When controller detects warning signals, it only sends warning but not shuts down generator.

Table 6 Warning Alarm

No.	Type	Description
GEN		
1	Gen A Phase Under Voltage	When the controller detects that the genset A phase voltage has fallen below the pre-set value, it will initiate a warning alarm.
2	Gen A Phase Over Voltage	When the controller detects that the genset A phase voltage has exceeded the pre-set value, the controller will initiate a warning alarm.
3	Gen B Phase Under Voltage	When the controller detects that the genset B phase voltage has fallen below the pre-set value, it will initiate a warning alarm.
4	Gen B Phase Over Voltage	When the controller detects that the genset B phase voltage has exceeded the pre-set value, the controller will initiate a warning alarm.
5	Gen C Phase Under Voltage	When the controller detects that the genset C phase voltage has fallen below the pre-set value, it will initiate a warning alarm.
6	Gen C Phase Over Voltage	When the controller detects that the genset C phase voltage has exceeded the pre-set value, the controller will initiate a warning alarm.
7	Gen Under Frequency	When the controller detects that the genset frequency has fallen below the pre-set value, it will initiate a warning alarm.
8	Gen Over Frequency	When the controller detects that the genset frequency has exceeded the pre-set value, the controller will initiate a warning alarm.
9	Gen Reverse Phase Sequence	When the controller detects a phase rotation error, it will initiate a warning alarm.
10	Gen Over Active Power	If over power detection is enabled, when the controller detects that the power value (power is positive) has exceeded the pre-set value and the action selects “warn”, it will initiate a warning alarm.
11	Gen Over Inactive Power	When the controller detects that the inactive power value (power is negative) has exceeded the pre-set value and the action selects “warn”, it will initiate a warning alarm.

No.	Type	Description
12	Gen Over Apparent Power	When the controller detects that the apparent power value has exceeded the pre-set value and the action selects "warn", it will initiate a warning alarm.
13	Gen Reverse Power	When the controller detects that the reverse power value has exceeded the pre-set value and the action selects "warn", it will initiate a warning alarm.
14	Loss of Excitation	When the controller detects that the genset negative reactive power has exceeded the pre-set value, and the action selects "warn", it will initiate a warning alarm.
15	Fail to sync	When the controller does not detect synchronization signal within the pre-set synchronization time, it will initiate a warning alarm.
16	Gen A Phase Over Current	If over current detection is enabled, when the controller detects that the A phase current value has exceeded the pre-set value and the action selects "warn", it will initiate a warning alarm.
17	Gen B Phase Over Current	If over current detection is enabled, when the controller detects that the B phase current value has exceeded the pre-set value and the action selects "warn", it will initiate a warning alarm.
18	Gen C Phase Over Current	If over current detection is enabled, when the controller detects that the C phase current value has exceeded the pre-set value and the action selects "warn", it will initiate a warning alarm.
19	Gen A Phase Over Current	If over current detection is enabled, when the controller detects that the A phase current value has exceeded the pre-set value and the action selects "warn", it will initiate a warning alarm.
20	Gen B Phase Over Current	If over current detection is enabled, when the controller detects that the B phase current value has exceeded the pre-set value and the action selects "warn", it will initiate a warning alarm.
21	Gen C Phase Over Current	If over current detection is enabled, when the controller detects that the C phase current value has exceeded the pre-set value and the action selects "warn", it will initiate a warning alarm.
22	Earth Fault	If earth fault detection is enabled, when the controller detects that the earth fault current has exceeded the pre-set value and the action select "warn", it will initiate a warning alarm.
23	Gen Imbalance Current	When the controller detects the imbalance current has exceeded the pre-set value and the action selects "warn", it will initiate a warning alarm.
24	Gen Loss of A Phase	If loss of phase detection is enabled, When controller detects the generator A phase loss , it will initiate a warning alarm.

No.	Type	Description
25	Gen Loss of B Phase	If loss of phase detection is enabled, When controller detects the generator B phase loss , it will initiate a warning alarm.
26	Gen Loss of C Phase	If loss of phase detection is enabled, When controller detects the generator C phase loss , it will initiate a warning alarm.
ENGINE		
27	Under Speed	When the controller detects that the genset speed has fallen below the pre-set value, it will initiate a warning alarm.
28	Over Speed	When the controller detects that the genset speed has exceeded the pre-set value, it will initiate a warning alarm.
29	Fail to speed	When the controller detects that when speed up, the genset speed not arrives the pre-set value of the rated speed, or when speed down, the genset speed is not lower than the pre-set value of the idle speed, it will initiate a warning alarm.
30	High Cooling Temperature	When the controller detects that cooling temperature has exceeded the pre-set value, it will initiate a warning alarm.
31	High Temperature	When the controller detects that engine temperature has exceeded the pre-set value, it will initiate a warning alarm.
32	Low Oil Pressure	When the controller detects that the oil pressure has fallen below the pre-set value, it will initiate a warning alarm.
33	Low Fuel Level	When the controller detects that the fuel level has fallen below the pre-set value, it will initiate a warning alarm.
34	Low Charger Voltage	When the controller detects that charger voltage has fallen below the pre-set value, it will initiate a warning alarm.
35	Battery Over Volt	When the controller detects that start battery voltage has exceeded the pre-set value, it will initiate a warning alarm.
36	Battery Under Volt	When the controller detects that start battery voltage has fallen below the pre-set value, it will initiate a warning alarm.
37	Water Temperature Sensor Fault	When the controller detects that the water temperature value has exceeded the pre-set Max value or fallen below the pre-set Min value, and the internal parameter water temperature input channel is less than 30, and the open circuit action selects “Warn”, it will initiate a warning alarm.
38	Oil Temperature Sensor Fault	When the controller detects that the oil temperature value has exceeded the pre-set Max value or fallen below the pre-set Min value, and the internal parameter oil temperature input channel is less than 30, and the open circuit action selects “Warn”, it will initiate a warning alarm.

No.	Type	Description
39	Oil Pressure Sensor Fault	When the controller detects that the oil pressure value has exceeded the pre-set Max value or fallen below the pre-set Min value, and the internal parameter oil pressure input channel is less than 30, and the open circuit action selects "Warn", it will initiate a warning alarm.
40	Fuel Level Sensor Fault	When the controller detects that the fuel level value has exceeded the pre-set Max value or fallen below the pre-set Min value, and the internal parameter fuel level input channel is less than 30, and the open circuit action selects "Warn", it will initiate a warning alarm.
41	MSC Too Few Sets	When the controller detects fewer modules on the MSC link than the minimum number configured in the unit, it will initiate a warning. There are 2 possible reasons: a) Communication line between the controllers disconnects, which interrupts communication. b) Other parallel gen-sets controllers have not been powered on.
42	Speed Sensor Fault	When the controller detects that the speed value has exceeded the pre-set Max value or fallen below the pre-set Min value, and the speed is equal to 0, and the open circuit action selects "Warn", it will initiate a warning alarm.
43	Maintenance Due	When count down time is 0 and the action selects "Warn" it will initiate a warning alarm.
44	Loss of Speed Signal	When the controller detects that the engine speed is 0 and the action selects "Warn", it will initiate a warning alarm.

6.2 SHUTDOWN

When controller detects shutdown alarm, it will send signal to open breaker and shuts down generator.

Table 7 Shutdown Alarm

No.	Type	Description
1	Gen Over Frequency	When the controller detects that the genset frequency has exceeded the pre-set value, it will initiate a shutdown alarm.
2	Over Speed	When the controller detects that the generator speed has exceeded the pre-set value, it will initiate a shutdown alarm.
3	Fail to Stop	When the controller is in the energized shutdown output stage, the

		speed has not fallen to the stop speed, it will initiate a shutdown alarm.
4	Emergency Stop	When the controller detects an emergency stop alarm signal, it will initiate a shutdown alarm.

6.3 TRIP AND SHUTDOWN

On initiation of the trip and stop condition the controller will de-energize the "Close Generator Output to remove the load from the generator. Once this has occurred the controller will allow the generator to shut down after high-speed cooling.

Table 8 Shutdown Alarm

No.	Type	Description
GEN		
1	Gen A Phase Under Voltage	When the controller detects that the genset A phase voltage has fallen below the pre-set value, it will initiate a shutdown alarm.
2	Gen A Phase Over Voltage	When the controller detects that the genset A phase voltage has exceeded the pre-set value, the controller will initiate a shutdown alarm.
3	Gen B Phase Under Voltage	When the controller detects that the genset B phase voltage has fallen below the pre-set value, it will initiate a shutdown alarm.
4	Gen B Phase Over Voltage	When the controller detects that the genset B phase voltage has exceeded the pre-set value, the controller will initiate a shutdown alarm.
5	Gen C Phase Under Voltage	When the controller detects that the genset C phase voltage has fallen below the pre-set value, it will initiate a shutdown alarm.
6	Gen C Phase Over Voltage	When the controller detects that the genset C phase voltage has exceeded the pre-set value, the controller will initiate a shutdown alarm.
7	Gen Under Frequency	When the controller detects that the genset frequency has fallen below the pre-set value, it will initiate a shutdown alarm.
8	Gen Reverse Phase Sequence	When the controller detects a phase rotation error, it will initiate a shutdown alarm.
9	Gen Over Active Power	If over power detection is enabled, when the controller detects that the power value (power is positive) has exceeded the pre-set value and the action selects "Shutdown", it will initiate a shutdown alarm.
10	Gen Over Inactive Power	When the controller detects that the inactive power value (power is

No.	Type	Description
		negative) has exceeded the pre-set value and the action selects “Shutdown”, it will initiate a shutdown alarm.
11	Gen Over Apparent Power	When the controller detects that the apparent power value has exceeded the pre-set value and the action selects “Shutdown”, it will initiate a shutdown alarm.
12	Gen Reverse Power	When the controller detects that the reverse power value has exceeded the pre-set value and the action selects “shutdown”, it will initiate a shutdown alarm.
13	Loss of Excitation	When the controller detects that the genset negative reactive power has exceeded the pre-set value, and the action selects “Shutdown”, it will initiate a shutdown alarm.
14	Fail to sync	When the controller does not detect synchronization signal within the pre-set synchronization time, it will initiate a shutdown alarm.
15	Gen A Phase Over Current	If over current detection is enabled, when the controller detects that the A phase current value has exceeded the pre-set value and the action selects “Shutdown”, it will initiate a shutdown alarm.
16	Gen B Phase Over Current	If over current detection is enabled, when the controller detects that the B phase current value has exceeded the pre-set value and the action selects “Shutdown”, it will initiate a shutdown alarm.
17	Gen C Phase Over Current	If over current detection is enabled, when the controller detects that the C phase current value has exceeded the pre-set value and the action selects “Shutdown”, it will initiate a shutdown alarm.
18	Gen A Phase Over Current	If over current detection is enabled, when the controller detects that the A phase current value has exceeded the pre-set value and the action selects “Shutdown”, it will initiate a shutdown alarm.
19	Gen B Phase Over Current	If over current detection is enabled, when the controller detects that the B phase current value has exceeded the pre-set value and the action selects “Shutdown”, it will initiate a shutdown alarm.
20	Gen C Phase Over Current	If over current detection is enabled, when the controller detects that the C phase current value has exceeded the pre-set value and the action selects “Shutdown”, it will initiate a shutdown alarm.
21	Earth Fault	If earth fault detection is enabled, when the controller detects that the earth fault current has exceeded the pre-set value and the action selects “Shutdown”, it will initiate a shutdown alarm.
22	Gen Imbalance Current	When the controller detects the imbalance current has exceeded the pre-set value and the action selects “Shutdown” it will initiate a shutdown alarm.

No.	Type	Description
23	Fail to Close	When in synchronization, if the closing times has exceeded the pre-set max times, the controller will initiate a shutdown alarm.
24	Fail to Open	When in the starting output or power open output, when the controller detects that closing feedback signal or failure open operation, it will initiate a shutdown alarm.
25	Fail to Close and Open Feedback	When the controller doesn't detect the close feedback signal, it will initiate a shutdown alarm.
ENGINE		
26	Under Speed	When the controller detects that the genset speed has fallen below the pre-set value, it will initiate a shutdown alarm.
27	Fail to Start	When the controller starting times has exceeded or equal to the pre-set value, and the genset has not reached the cranking condition, it will initiate a shutdown alarm.
28	Fail to Speed	When the controller detects that when speed up, the genset speed not arrives the pre-set value of the rated speed, or when speed down, the genset speed is not lower than the pre-set value of the idle speed, it will initiate a shutdown alarm.
29	High Cooling Temperature	When the controller detects that cooling temperature has exceeded the pre-set value, it will initiate a shutdown alarm.
30	High Oil Temperature	When the controller detects that oil temperature has exceeded the pre-set value, it will initiate a shutdown alarm.
31	Low Oil Pressure	When the controller detects that the oil pressure has fallen below the pre-set value, it will initiate a shutdown alarm.
32	Low Cooling Level	When the controller detects that the cooling level has fallen below the pre-set value, it will initiate a shutdown alarm.
33	Water Temperature Sensor Fault	When the controller detects that the water temperature value has exceeded the pre-set Max value or fallen below the pre-set Min value, and the internal parameter water temperature input channel is less than 30, and the open circuit action selects "Shutdown", it will initiate a shutdown alarm.
34	Oil Temperature Sensor Fault	When the controller detects that the oil temperature value has exceeded the pre-set Max value or fallen below the pre-set Min value, and the internal parameter oil temperature input channel is less than 30, and the open circuit action selects "Shutdown", it will initiate a shutdown alarm.
35	Oil Pressure Sensor Fault	When the controller detects that the oil pressure value has exceeded the pre-set Max value or fallen below the pre-set Min

No.	Type	Description
		value, and the internal parameter oil pressure input channel is less than 30, and the open circuit action selects "Shutdown", it will initiate a shutdown alarm.
36	Fuel Level Sensor Fault	When the controller detects that the fuel level value has exceeded the pre-set Max value or fallen below the pre-set Min value, and the internal parameter fuel level input channel is less than 30, and the open circuit action selects "Shutdown", it will initiate a shutdown alarm.
37	MSC ID Error	When the controller detects the same ID on the MSC Bus, it will initiate a shutdown alarm.
38	MSC Mode Fault	When the controller checks the setting in the parallel mode , it will initiate a shutdown alarm when the following situations occur. 1. The controller detects the parallel communication, and the internal parameter system mode is not parallel mode; 2. The time balancing/active/standby selection function is not configured on the local device, and the time balancing/active/standby selection function is configured on the parallel communication network. 3. The time balancing function has been configured on the controller, but the time balancing scheduling time is 0.
39	MSC Too Few Sets	When the controller detects fewer modules on the MSC link than the minimum number configured in the unit, it will initiate a shutdown alarm. There are 2 possible reasons: a) Communication line between the controllers disconnects, which interrupts communication. b) Other parallel gen-sets controllers have not been powered on.
40	Speed Sensor Fault	When the controller detects that the speed value has exceeded the pre-set Max value or fallen below the pre-set Min value, and the speed is equal to 0, and the open circuit action selects "Shutdown", it will initiate a shutdown alarm.
41	Maintenance Due	When count down time is 0 and the action selects "Shutdown", it will initiate a shutdown alarm.
42	Loss of Speed Signal	When the controller detects that the engine speed is 0 and the action selects "Shutdown", it will initiate a shutdown alarm.

6.4 TRIP ALARM

On initiation of the trip and stop condition the controller will de-energize the "Close Generator" Output to remove the load from the generator. Once this has occurred the controller will allow the generator to shut down after high-speed cooling.

Table 9 Trip Alarm

No.	Type	Description
1	Gen A Phase Over Current	When the controller detects that the genset A phase current has exceeded the pre-set value and the action selects "Trip", it will initiate a trip alarm.
2	Gen B Phase Over Current	When the controller detects that the genset B phase current has exceeded the pre-set value and the action selects "Trip", it will initiate a trip alarm.
3	Gen C Phase Over Current	When the controller detects that the genset C phase current has exceeded the pre-set value and the action selects "Trip", it will initiate a trip alarm.
4	Earth Fault	If earth fault detection is enabled, when the controller detects that the earth fault current has exceeded the pre-set value and the action selects "Trip", it will initiate a trip alarm.
5	Gen Imbalance Current	When the controller detects the imbalance current has exceeded the pre-set value and the action selects "Trip", it will initiate a trip alarm.
6	Reverse Power	If reverse power detection is enabled, when the controller detects that the reverse power value (power is negative) has fallen below the pre-set value and the action selects "Trip", it will initiate a trip alarm.
7	Over Power	If over power detection is enabled, when the controller detects that the power value (power is positive) has exceeded the pre-set value and the action selects "Trip", it will initiate a trip alarm.
8	Loss of Excitation	When the controller detects that the genset negative reactive power has exceeded the pre-set value, it will initiate a trip alarm.

7. WIRING CONNECTION

FPSS8607-G50 back panel is as following.

Note: Before wiring connection, please confirm that the terminal can carry current and nameplate content (model, operating voltage, starting relay current, generation sampling input voltage, factory number, factory date);

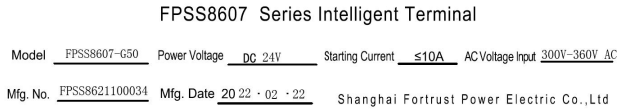


Fig.7-1 FPSS8607-G50 Nameplate

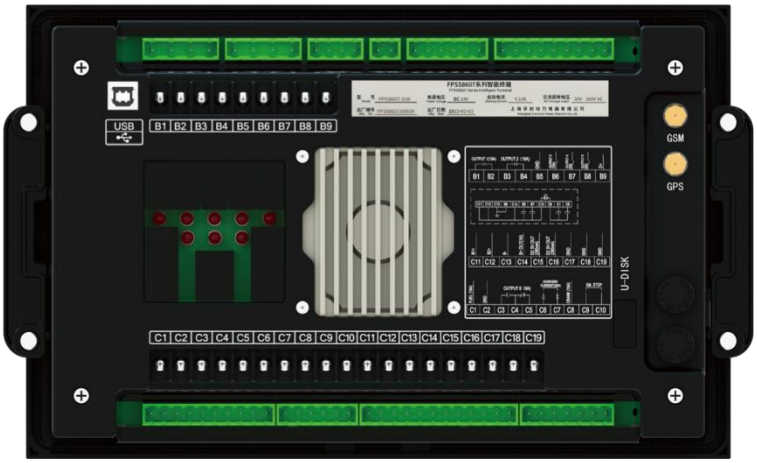


Fig. 7-2 FPSS8607-G50 Back Panel

Table 10 Terminal Connection Description

No.	Functions	Cable Size	Remark
A			
A1	Mains/Bus voltage R	1.0 mm2	Connected to A-phase of bus
A2	Mains/Bus voltage S	1.0 mm2	Connected to B-phase of bus
A3	Mains/Bus voltage T	1.0 mm2	Connected to C-phase of bus
A4	Mains/Bus voltage N1	1.0 mm2	Connected to N-wire of bus
A5	Gen voltage U	1.0 mm2	Connected to A-phase of generator
A6	Gen voltage V	1.0 mm2	Connected to B-phase of generator
A7	Gen voltage W	1.0 mm2	Connected to C-phase of generator
A8	Gen voltage N2	1.0 mm2	Connected to N-wire of generator
A9	Gen current A	1.5 mm2	Outside connected to secondary coil of current transformer (rated 5A)

A10	Gen current B	1.5 mm2	Outside connected to secondary coil of current transformer (rated 5A)
A11	Gen current C	1.5 mm2	Outside connected to secondary coil of current transformer (rated 5A)
A12	Gen current COM	1.5 mm2	Outside connected to common wiring of secondary coil of current transformer
A13	Mains current A	1.5 mm2	Outside connected to secondary coil of mains current transformer
A14	Mains current COM	1.5 mm2	Outside connected to common wiring of secondary coil of current transformer
A15	GND	1.0 mm2	Common ground
A16	Aux. sensor - voltage AV3	1.0 mm2	Channel 26
A17	Aux. sensor - voltage AV2	1.0 mm2	Channel 25
A18	Aux. sensor - voltage AV1	1.0 mm2	Channel 24 （default oil pressure, can be set and modified ）
A19	DC 5V	1.0 mm2	5V power output
A20	GND	1.0 mm2	Common ground of 5V power output
A21	Aux. sensor - current AI3	1.0 mm2	Channel 19
A22	Aux. sensor - current AI2	1.0 mm2	Channel 18
A23	Aux. sensor - current AI1	1.0 mm2	Channel 17
A24	B+	1.0 mm2	B+ power output
A25	GND	1.0 mm2	Common ground of power output
A26	Aux. sensor - Resistance AR4	1.0 mm2	Channel 23
A27	Aux. sensor - Resistance AR3	1.0 mm2	Channel 22
A28	Aux. sensor - Resistance AR2	1.0 mm2	Channel 21（default fuel level sensor, can be set and modified ）
A29	Aux. sensor - Resistance AR1	1.0 mm2	Channel 20 （default water temperature sensor, can be set and modified）
B			
B1	Aux. Output 1-（default Gen closing A）	1.5 mm2	Passive- rated 10A
B2	Aux. Output 1-（default Gen closing B）	1.5 mm2	Passive- rated 10A
B3	Aux. Output 2-（default Gen opening A）	1.5 mm2	Passive- rated 10A
B4	Aux. Output 2-（default Gen opening B）	1.5 mm2	Passive- rated 10A
B5	GND	1.5 mm2	COM ground of B6-B8
B6	Aux. Output 3-（default pre-heat output）	1.5 mm2	（B+）DC power supply output-rated 10A
B7	Aux. Output 4-（default Gen normal output）	1.5 mm2	（B+） DC power supply output-rated 2A
B8	Aux. Output 5-（default	1.5 mm2	（B-） DC power supply output-rated 2A

	common alarm output)		
B9	Charger D+	1.5 mm2	
C			
C1	Fuel output	1.5 mm2	（EM Stop+）DC power supply output -rated 10A
C2	GND	1.5 mm2	COM ground of C1，C8
C3	Aux. Output 6-（default rated control output NO）	1.5 mm2	Passive - rated 6A
C4	Aux. Output 6-（default rated control output COM）	1.5 mm2	Relay common point，passive - rated 6A
C5	Aux. Output 6-（default rated control output NC）	1.5 mm2	Passive - rated 6A
C6	Charging Current OUT	2.5 mm2	Rated 20A
C7	Charging Current IN	2.5 mm2	Rated 20A
C8	Start Output	1.5 mm2	（EM Stop+）DC power supply output -rated 10A
C9	EM Switch 1	2.5 mm2	Outside connected to EM switch, effective when C9 and C10 disconnect.
C10	EM Switch 2	2.5 mm2	
C11	DC Power Input - Battery 1	2.5 mm2	Connected with positive of starter battery. With 16A fuse.
C12	DC Power Input - Battery 2	2.5 mm2	Connected with positive of starter battery. With 16A fuse.
C13	DC Power Input -GND	2.5 mm2	Connected with negative of starter battery.
C14	B+	1.5 mm2	Rated 1A
C15	DC 5V OUT	1.0 mm2	Rated 200mA
C16	DC 5V OUT	1.0 mm2	Rated 200mA
C17	GND	1.5 mm2	Common ground（C14）
C18	GND	1.5 mm2	Common ground（C15）
C19	GND	1.5 mm2	Common ground（C16）
D			
D1	Aux. Input 1（default Gen closing feedback input）	1.0 mm2	Ground connected is active (D10)
D2	Aux. Input 2（default remote start load input）	1.0 mm2	Ground connected is active (D10)
D3	Aux. Input 3（default primary and auxiliary input）	1.0 mm2	Ground connected is active (D10)
D4	Aux. Input 4	1.0 mm2	Ground connected is active (D10)
D5	Aux. Input 5	1.0 mm2	Ground connected is active (D10)
D6	Aux. Input 6	1.0 mm2	Ground connected is active (D10)
D7	Aux. Input 7	1.0 mm2	Ground connected is active (D10)
D8	Aux. Input 8	1.0 mm2	Ground connected is active (D10)
D9	Aux. Input 9	1.0 mm2	Ground connected is active (D10)

D10	Aux. Input Common Ground	1.0 mm2	Common ground
D11	SPEED+	0.5 mm2	Connect to the speed sensor
D12	SPEED-	0.5 mm2	Connect to the speed sensor
D13	Speed Sensor Input GND	1.0 mm2	Speed sensor shielding ground
D14	RS485 COM 1	0.5 mm2	RS485 1 channel of ground
D15	RS485 A 1	0.5 mm2	RS485 1 channel of A
D16	RS485 B 1	0.5 mm2	RS485 1 channel of B
D17	RS485 COM 2	0.5 mm2	RS485 2 channels of ground
D18	RS485 A 2	0.5 mm2	RS485 2 channels of A
D19	RS485 B 2	0.5 mm2	RS485 2 channels of B
D20	MSC CAN H	0.5 mm2	Impedance-120Ω shielding wire is recommended, its single-end earthed.
D21	MSC CAN L	0.5 mm2	
D22	MSC CAN COM	0.5 mm2	
D23	MSC CAN H	0.5 mm2	
D24	MSC CAN L	0.5 mm2	
D25	MSC CAN COM	0.5 mm2	
D26	ECU CAN H	0.5 mm2	Impedance-120Ω shielding wire is recommended, its single-end earthed.
D27	ECU CAN L	0.5 mm2	
D28	ECU CAN COM	0.5 mm2	
D29	CAN COM	0.5 mm2	None
D30	CAN H	0.5 mm2	
D31	CAN L	0.5 mm2	
D32	GOV-	0.5 mm2	Shielding line is recommended. Shielding layer connect to earth at GOV end.
D33	GOV+	0.5 mm2	
D34	AVR-	0.5 mm2	Shielding line is recommended. Shielding layer connect to earth at AVR end.
D35	AVR+	0.5 mm2	

8. SCOPES AND DEFINITIONS OF PROGRAMMABLE PARAMETERS

8.1 CONTENTS AND SCOPES OF PARAMETERS

Table 11 Contents and Scopes of Parameters

No.	Items	Parameters	Defaults	Description
Timer				
1	Start Delay	(0 - 3600) S	5 S	Time from start signal is active to start genset.
2	Preheat Time	(0 - 3600) S	0 S	Time of pre-powering heat plug before starter is powered up.
3	Cranking Time	(3 - 60) S	8 S	Time of starter power on.
4	Crank Rest Delay	(3 - 60) S	10 S	The waiting time before second power up when engine start fail.
5	Start Override Delay	(0 - 3600) S	10 S	During this time, the alarms for low oil pressure, high temperature, under speed, under frequency, under voltage, and charging failure are all invalid.
6	Idle Warming Up Delay	(0 - 3600) S	10 S	Idle running time of genset when starting.
7	High-speed Warming Up Delay	(0 - 3600) S	10 S	Warming up time between genset switch on and high speed running.
8	Stop Delay	(0 - 3600) S	1 S	Time from start signal is inactive to stop genset.
9	High-speed Cooling Delay	(0 - 3600) S	10 S	Radiating time before genset stop, after it unloads.
10	Idle Cooling Delay	(0 - 3600) S	10 S	Idle running time when genset stop.
11	ETS Solenoid Hold Delay	(0 - 3600) S	20 S	Stop electromagnet's power on time when genset is stopping.
12	After Stop Delay	(0 - 3600) S	2 S	Time between genset stopped and standby.
13	Speed Raise Pulse	(0.1 – 20) S	0.2 S	Speed raise pulse output time.
14	Speed Drop Pulse	(0.1 – 20) S	0.2 S	Speed drop pulse output time.
Engine				
15	Engine Type	(0 - 40)	0	Default: Conventional Engine (not J1939)

No.	Items	Parameters	Defaults	Description
				When connected to J1939 engine, choose the corresponding type.
16	Flywheel Teeth	(10 - 300)	118	Tooth number of the engine, for judging of starter separation conditions and inspecting of engine speed.
17	Rated Speed	(0 - 6000) RPM	1500 RPM	Offer standard to judge over/under/loading speed.
18	Loading Speed	(0 - 100) %	90 %	Setting value is percentage of rated speed. Controller detects when it is ready to load. When the speed is lower than the loaded speed, the closing operation cannot be carried out and the genset enters the normal stage.
19	Manual Start Attempts	(1 - 10)	1	Max. Crank times of crank attempts in manual mode. When reach this number, controller will send start failure signal.
20	Manual Start Enable	(0 - 1)	0	0：Disable； 1：Enable； Long press the start button to start the genset, release the start button to stop the start output；
21	Auto Start Attempts	(1 - 10)	3	Max. Crank times of crank attempts in auto mode. When reach this number, controller will send start failure signal.
22	Crank Disconnect	(1 - 7)	1	See Table 15. Meet the conditions of disconnecting starter with engine to separate the starter and engine.
23	Disconnect Engine Speed	(0 - 200) %	30 %	When generator speed higher than the set value, starter will be disconnected.
24	Disconnect Oil Pressure	(0 - 1000) kPa	200 kPa	When generator oil pressure higher than the set value, starter will be

No.	Items	Parameters	Defaults	Description
				disconnected.
25	Disconnect Generator Freq.	(0 - 200) %	30 %	When generator frequency higher than the set value, starter will be disconnected.
26	Battery Rated Voltage	(0 – 60.0) V	24.0 V	Standard for detecting of over/under voltage of battery.
27	Battery Over Volts Alarm Enable	(0 - 1)	0	0：Disable； 1：Enable；
28	Battery Over Volts	(0 - 200) %	120 %	Setting value is percentage of rated voltage of battery, offer standard for detecting of over voltage warning.
29	Battery Over Volts Low Limit	(0 - 200) %	115 %	Setting value is percentage of rated voltage of battery, offer standard for detecting of over voltage warning automatic elimination.
30	Battery Over Volts Delay	(0 - 3600) S	60 S	Time for triggering and automatically eliminating the battery over voltage alarm.
31	Battery Under Volts Alarm Enable	(0 - 1)	1	0：Disable； 1：Enable；
32	Battery Under Volts	(0 - 200) %	85 %	Setting value is percentage of rated voltage of battery, offer standard for detecting of under voltage warning.
33	Battery Under Volts High Limit	(0 - 200) %	90 %	Setting value is percentage of rated voltage of battery, offer standard for detecting of under voltage warning automatic elimination.
34	Battery Under Volts Delay	(0 - 3600) S	60 S	Time for triggering and automatically eliminating the battery under voltage alarm.
35	Charge Alt Fail Alarm Enable	(0 - 1)	1	0：Disable； 1：Enable；
36	Charge Alt Fail	(0 - 60.0) V	8.0 V	In normal running, when charger D+(WL) voltage under this value, charging under voltage alarms.

No.	Items	Parameters	Defaults	Description
37	Charge Alt Fail High Limit	(0 - 60.0) V	10.0 V	In normal running, when charger D+(WL) voltage over this value, charging under voltage alarms.
38	Charge Alt Fail Delay	(0 - 3600) S	10 S	Time for triggering and automatically eliminating the charging under voltage alarms.
39	Over Speed Stop	(0 - 200) %	114 %	Setting value is percentage of rated speed, offer standard for detecting of over speed alarm shutdown triggering.
40	Over Speed Stop Delay	(0 - 3600) S	2 S	Time for over speed alarm shutdown triggering.
41	Under Speed Stop Enable	(0 - 1)	1	0: Disable; 1: Enable;
42	Under Speed Stop	(0 - 200) %	80 %	Setting value is percentage of rated speed, offer standard for detecting of under speed alarm shutdown triggering.
43	Under Speed Stop Delay	(0 - 3600) S	60 S	Time for under speed alarm shutdown triggering.
44	Over Speed Warn	(0 - 200) %	110 %	Setting value is percentage of rated speed, offer standard for detecting of over speed alarm triggering.
45	Over Speed Warn Low Limit	(0 - 200) %	108 %	Setting value is percentage of rated speed, offer standard for detecting of over speed alarm automatic elimination.
46	Over Speed Warn Delay	(0 - 3600) S	60 S	Time for over speed alarm triggering and automatic elimination.
47	Under Speed Warn Enable	(0 - 1)	1	0: Disable; 1: Enable;
48	Under Speed Warn	(0 - 200) %	86 %	Setting value is percentage of rated speed, offer standard for detecting of under speed alarm triggering.
49	Under Speed Warn	(0 - 200) %	90 %	Setting value is percentage of rated

No.	Items	Parameters	Defaults	Description
	High Limit			speed, offer standard for detecting of under speed alarm automatic elimination.
50	Under Speed Warn Delay	(0 - 3600) S	60 S	Time for under speed alarm triggering and automatic elimination.
51	Loss of Speed Signal Delay	(0 - 3600) S	3 S	When the controller detects that the engine speed is 0 and the sensor not detect the disconnect, the speed triggering action delay can not be detected.
52	Loss of Speed Signal Action	(0 - 1)	0	0: Warn; 1: Shutdown
Generator				
53	AC System	(1 - 4)	4	1：1P2W； 2：2P3W； 3：3P3W； 4：3P4W；
54	Poles	(1 - 32)	2	Numbers of generator pole, used for calculating starter rotate speed when without speed sensor.
55	Rated Voltage	(30 - 30000) V	230 V	To offer standards for detecting of gens' over/under voltage and loading voltage. (It is primary voltage when using voltage transformer; it is line voltage when AC system is 3P3W while it is phase voltage when using other AC system).
56	Loading Voltage	(0 - 200) %	90 %	Setting value is percentage of generator rated voltage. When the Gen voltage is lower than the loading voltage, the closing operation cannot be carried out to enter the normal stage.

No.	Items	Parameters	Defaults	Description
57	Rated Frequency	(10.0 - 600.0) Hz	50.0 Hz	To offer standards for detecting of over/under/load frequency.
58	Loading Frequency	(0 - 200) %	90 %	Setting value is percentage of generator rated frequency. When the Gen frequency is lower than the loading frequency, the closing operation cannot be carried out to enter the normal stage.
59	Volt. Trans.(PT) Enable	(0 - 1)	0	0：Disable； 1：Enable；
60	Primary Voltage	(30 - 30000) V	100 V	Primary voltage of the voltage transformer；
61	Secondary Voltage	(30 - 1000) V	100 V	Secondary voltage of the voltage transformer；
62	Loss of Phase Enable	(0 - 1)	1	0：Disable； 1：Enable；
63	Reverse Phase Sequence Enable	(0 - 1)	1	0：Disable； 1：Enable；
64	Gen Over Voltage Warn Enable	(0 - 1)	1	0：Disable； 1：Enable；
65	Gen Over Voltage Warn	(0 - 200) %	110 %	Setting value is percentage of rated voltage, offer standard for triggering over voltage alarm.
66	Gen Over Voltage Warn Low Limit	(0 - 200) %	105 %	Setting value is percentage of rated voltage, offer standard for detecting of over voltage alarm automatic elimination.
67	Gen Over Voltage Warn Delay	(0 - 3600) S	5 S	Time for over voltage alarm triggering and automatic elimination.
68	Gen Under Voltage Warn Enable	(0 - 1)	1	0：Disable； 1：Enable；
69	Gen Under Voltage Warn	(0 - 200) %	84 %	Setting value is percentage of rated voltage, offer standard for triggering under voltage alarm.
70	Gen Under Voltage Warn High Limit	(0 - 200) %	86 %	Setting value is percentage of rated voltage, offer standard for detecting

No.	Items	Parameters	Defaults	Description
				of under voltage alarm automatic elimination.
71	Gen Under Voltage Warn Delay	(0 - 3600) S	5 S	Time for under voltage alarm triggering and automatic elimination.
72	Gen Over Voltage Shutdown Enable	(0 - 1)	1	0：Disable； 1：Enable；
73	Gen Over Voltage Shutdown	(0 - 200) %	120 %	Setting value is percentage of rated voltage, offer standard for triggering over voltage shutdown.
74	Gen Over Voltage Shutdown Delay	(0 - 3600) S	3 S	Time for over voltage shutdown triggering.
75	Gen Under Voltage Shutdown Enable	(0 - 1)	1	0：Disable； 1：Enable；
76	Gen Under Voltage Shutdown	(0 - 200) %	80 %	Setting value is percentage of rated voltage, offer standard for triggering under voltage shutdown.
77	Gen Under Voltage Shutdown Delay	(0 - 3600) S	3 S	Time for under voltage shutdown triggering.
78	Gen Over Frequency Warn Enable	(0 - 1)	1	0：Disable； 1：Enable；
79	Gen Over Frequency Warn	(0 - 200) %	110 %	Setting value is percentage of rated frequency , offer standard for triggering over frequency alarm.
80	Gen Over Frequency Warn Low Limit	(0 - 200) %	108 %	Setting value is percentage of rated frequency, offer standard for detecting of over frequency alarm automatic elimination.
81	Gen Over Frequency Warn Delay	(0 - 3600) S	5 S	Time for over frequency alarm triggering and automatic elimination.
82	Gen Under Frequency Warn Enable	(0 - 1)	1	0：Disable； 1：Enable；
83	Gen Under Frequency Warn	(0 - 200) %	84 %	Setting value is percentage of rated frequency , offer standard for triggering under frequency alarm.
84	Gen Under Frequency	(0 - 200) %	86 %	Setting value is percentage of rated

No.	Items	Parameters	Defaults	Description
	Warn High Limit			frequency, offer standard for detecting of under frequency alarm automatic elimination.
85	Gen Under Frequency Warn Delay	(0 - 3600) S	5 S	Time for under frequency alarm triggering and automatic elimination.
86	Gen Over Frequency Shutdown Enable	(0 - 1)	1	0：Disable； 1：Enable；
87	Gen Over Frequency Shutdown	(0 - 200) %	114 %	Setting value is percentage of rated frequency , offer standard for triggering over frequency alarm.
88	Gen Over Frequency Shutdown Delay	(0 - 3600) S	3 S	Time for over frequency alarm triggering and automatic elimination.
89	Gen Under Frequency Shutdown Enable	(0 - 1)	1	0：Disable； 1：Enable；
90	Gen Under Frequency Shutdown	(0 - 200) %	80 %	Setting value is percentage of rated frequency , offer standard for triggering under frequency alarm.
91	Gen Under Frequency Shutdown Delay	(0 - 3600) S	3 S	Time for under frequency alarm triggering and automatic elimination.
Generator Load				
92	Current Trans.	(5 - 6000) /5	500 /5	The ratio of external CT.
93	Full Current Rating	(5 - 6000) A	500 A	Generator's rated current, standard of load current.
94	Full kW rating	(1 - 6000) kW	276 kW	Generator's full-load active power, standard of load power.
95	Current Protection Enable	(0 - 1)	1	0：Disable； 1：Enable；
96	Over Current	(0 - 200) %	120 %	Setting value is percentage of generator rated current, offer standard for triggering over current alarm.
97	Over Current Delay Type	(0 - 1)	0	0：DMT； 1：IDMT；

No.	Items	Parameters	Defaults	Description
98	Over Current DMT Action	(0 - 3)	1	0：Warning 1：Alarm Shutdown 2：No Action 3：Trip Alarm
99	Over Current DMT Delay	(0 - 3600) S	10 S	Time for over current DMT alarm triggering.
100	Over Current IDMT Action	(0 - 3)	1	0：Warning 1：Alarm Shutdown 2：No Action 3：Trip Alarm
101	Over Current IDMT Delay	(0 - 3600) S	2 S	Time when it reaches twice the rated current. The inverse time curve is determined by this delay.
102	Over Power Protection Enable	(0 - 1)	1	0：Disable； 1：Enable；
103	Over Power	(0 - 200) %	110 %	Setting value is percentage of generator rated power, offer standard for triggering over power alarm.
104	Over Power Action	(0 - 3)	1	0：Warning 1：Alarm Shutdown 2：No Action 3：Trip Alarm
105	Over Power Action Delay	(0 - 3600) S	30 S	Time for over power alarm triggering.
106	Reverse Power Protection Enable	(0 - 1)	1	0：Disable； 1：Enable；
107	Reverse Power	(0 - 200) %	10 %	Setting value is percentage of generator rated power, offer standard for triggering reverse power alarm.
108	Reverse Power Action	(0 - 3)	1	0：Warning 1：Alarm Shutdown 2：No Action 3：Trip Alarm
109	Reverse Power Action Delay	(0 - 3600) S	10 S	Time for reverse power alarm triggering.

No.	Items	Parameters	Defaults	Description
110	Imbalance Current Enable	(0 - 1)	1	0：Disable； 1：Enable；
111	Imbalance Current	(0 - 200) %	20 %	Setting value is percentage of generator rated current, offer standard for triggering imbalance current alarm.
112	Imbalance Current Warn Low Limit	(0 - 200) %	15 %	Setting value is percentage of generator rated current, offer standard for imbalance current alarm automatic elimination.
113	Imbalance Current Action Delay	(0 - 3600) S	5 S	Time for imbalance current alarm triggering and automatic elimination .
114	Imbalance Current Action	(0 - 3)	1	0：Warning 1：Alarm Shutdown 2：No Action 3：Trip Alarm
115	Loss of Excitation Protection Enable	(0 - 1)	1	0：Disable； 1：Enable；
116	Loss of Excitation	(0 - 200) %	20 %	Setting value is percentage of generator rated power, offer standard for loss of excitation alarm triggering and automatic elimination.
117	Loss of Excitation Action	(0 - 3)	1	0：Warning 1：Alarm Shutdown 2：No Action 3：Trip Alarm
118	Loss of Excitation Action Delay	(0 - 3600) S	5 S	Time for loss of excitation alarm triggering and automatic elimination .
Switch				
119	Close Time	(0 - 20.0) S	5.0 S	Pulse width of mains/generator switch on. When it is 0, means output constantly.
120	Open Time	(0 - 20.0) S	3.0 S	Pulse width of mains/ generator

No.	Items	Parameters	Defaults	Description
				switch off.
Water Temp. Sensor				
121	Water Temp. Input Port	(0 -11)	5	0-Not use 1-ECU 2-AI1 3-AI2 4-AI3 5-AR1 6-AR2 7-AR3 8-AR4 9-AV1 10-AV2 11-AV3
122	Curve Type	(0 - 12)	8	Euro III. See Table 14.
123	Open Circuit Action	(0 - 2)	0	0：Warn； 1：Alarm Shutdown； 2：No action;
124	Over Water Temp. Shutdown Enable	(0 - 1)	1	0：Disable； 1：Enable；
125	Over Water Temp. Shutdown	(0 - 160) ℃	98 ℃	Setting value offer standard for over water temperature shutdown triggering.
126	Over Water Temp. Shutdown Delay	(0 - 3600) S	3 S	Time for over water temperature shutdown triggering.
127	Over Water Temp. Warn Enable	(0 - 1)	1	0：Disable； 1：Enable；
128	Over Water Temp. Warn	(0 - 160) ℃	95 ℃	Setting value offer standard for over water temperature alarm triggering.
129	Over Water Temp. Warn Low Limit	(0 - 160) ℃	93 ℃	Setting value offer standard for over water temperature alarm automatic elimination.
130	Over Water Temp. Warn Delay	(0 - 3600) S	5 S	Time for over water temperature alarm triggering and automatic elimination.
131	Water Cycle Heating Enable	(0 - 1)	1	0：Disable； 1：Enable；

No.	Items	Parameters	Defaults	Description
132	Heating Control Open	(0 - 160) ℃	50 ℃	Temperature when the heater open.
133	Heating Control Close	(0 - 160) ℃	55 ℃	Temperature when the heater close.
134	Max Heating Time	(0 - 6000) S	600 S	Max working time for heater.
135	Cooling Enable	(0 - 1)	1	0：Disable； 1：Enable；
136	Cooling Control Open	(0 - 160) ℃	80 ℃	Temperature when the cooler turn on.
137	Cooling Control Close	(0 - 160) ℃	75 ℃	Temperature when the cooler turn off.
138	Max Cooling Time	(0 - 3600) S	5 S	Max working time for cooler.
Oil Temp. Sensor				
139	Oil Temp. Input Port	(0 -11)	7	0-Not use 1- ECU 2-AI1 3-AI2 4-AI3 5-AR1 6-AR2 7-AR3 8-AR4 9-AV1 10-AV2 11-AV3
140	Curve Type	(0 - 12)	8	Euro III. See Table 14.
141	Open Circuit Action	(0 - 2)	0	0：Warn； 1：Alarm Shutdown； 2：No action;
142	Over Oil Temp. Shutdown	(0 - 160) ℃	95 ℃	Setting value offer standard for over oil temperature shutdown triggering.
143	Over Oil Temp. Shutdown Delay	(0 - 3600) S	3 S	Time for over oil temperature shutdown triggering.
144	Over Oil Temp. Warn	(0 - 160) ℃	90 ℃	Setting value offer standard for over oil temperature shutdown triggering and automatic elimination.
145	Over Oil Temp. Warn	(0 - 3600) S	5 S	Time for over oil temperature

No.	Items	Parameters	Defaults	Description
	Delay			shutdown triggering and automatic elimination.
Oil Pressure Sensor				
146	Oil Pressure Input Port	(0 -11)	9	0-Not use 1-ECU 2-AI1 3-AI2 4-AI3 5-AR1 6-AR2 7-AR3 8-AR4 9-AV1 10-AV2 11-AV3
147	Curve Type	(0 - 12)	7	Euro III. See Table 14.
148	Open Circuit Action	(0 - 2)	0	0：Warn； 1：Alarm Shutdown； 2：No action;
149	Under Oil Pressure Shutdown Enable	(0 - 1)	1	0：Disable； 1：Enable；
150	Under Oil Pressure Shutdown	(0 - 1000) kPa	103 kPa	Setting value offer standard for under oil pressure shutdown triggering.
151	Under Oil Pressure Shutdown Delay	(0 - 3600) S	3 S	Time for under oil pressure shutdown triggering.
152	Under Oil Pressure Warn Enable	(0 - 1)	1	0：Disable； 1：Enable；
153	Under Oil Pressure Warn	(0 - 1000) kPa	124 kPa	Setting value offer standard for under oil pressure warning triggering.
154	Under Oil Pressure High Limit	(0 - 1000) kPa	138 kPa	Setting value offer standard for under oil pressure warning automatic elimination.
155	Under Oil Pressure Warn Delay	(0 - 3600) S	5 S	Time for under oil pressure warning triggering.
Fuel Level Sensor				

No.	Items	Parameters	Defaults	Description
156	Fuel Level Input Port	(0 -11)	6	0-Not Use 1-ECU 2-AI1 3-AI2 4-AI3 5-AR1 6-AR2 7-AR3 8-AR4 9-AV1 10-AV2 11-AV3
157	Curve Type	(0 - 9)	0	SGH. See Table 14.
158	Open Circuit Action	(0 - 2)	0	0：Warn； 1：Alarm Shutdown； 2：No action;
159	Under Fuel Level Warn Enable	(0 - 1)	1	0：Disable； 1：Enable；
160	Under Fuel Level Warn	(0 - 100) %	10 %	Setting value offer standard for under fuel level warning triggering.
161	Under Fuel Level Warn High Limit	(0 - 100) %	15 %	Setting value offer standard for under fuel level warning automatic elimination.
162	Under Fuel Level Warn Delay	(0 - 3600) S	5 S	Time for under fuel level warning triggering and automatic elimination.
163	Fuel Pump Output Enable	(0 - 1)	1	0：Disable； 1：Enable；
164	Fuel Pump Open	(0 - 100) %	10 %	Fuel level when fuel pump turn on.
165	Fuel Pump Close	(0 - 100) %	80 %	Fuel level when fuel pump turn off.
166	Max Fuel Pump	(0 - 3600) S	60 S	Max working time for fuel pump.
Digital Input Port				
167	Digital Input Port 1 Function	(0 - 48)	17	Default: Gen closing feedback, see Table 13.
168	Digital Input Port 1 Polarity	(0 - 1)	1	0：Open effective； 1：Close effective;
169	Digital Input Port 2	(0 - 48)	26	Default: remote start (on load) , see

No.	Items	Parameters	Defaults	Description
	Function			Table 13.
170	Digital Input Port 2 Polarity	(0 - 1)	1	0：Open effective; 1：Close effective;
171	Digital Input Port 3 Function	(0 - 48)	40	Default: primary selection, see Table 13.
172	Digital Input Port 3 Polarity	(0 - 1)	1	0：Open effective; 1：Close effective;
173	Digital Input Port 4 Function	(0 - 48)	48	Reserved, see Table 13.
174	Digital Input Port 4 Polarity	(0 - 1)	1	0：Open effective; 1：Close effective;
175	Digital Input Port 5 Function	(0 - 48)	48	Reserved, see Table 13.
176	Digital Input Port 5 Polarity	(0 - 1)	1	0：Open effective; 1：Close effective;
177	Digital Input Port 6 Function	(0 - 48)	48	Reserved, see Table 13.
178	Digital Input Port 6 Polarity	(0 - 1)	1	0：Open effective; 1：Close effective;
179	Digital Input Port 7 Function	(0 - 48)	48	Reserved, see Table 13.
180	Digital Input Port 7 Polarity	(0 - 1)	1	0：Open effective; 1：Close effective;
181	Digital Input Port 8 Function	(0 - 48)	48	Reserved, see Table 13.
182	Digital Input Port 8 Polarity	(0 - 1)	1	0：Open effective; 1：Close effective;
183	Digital Input Port 9 Function	(0 - 48)	48	Reserved, see Table 13.
184	Digital Input Port 9 Polarity	(0 - 1)	1	0：Open effective; 1：Close effective;
Digital Output Port				
185	Digital Output Port 1 Function	(0 - 52)	22	Default: Gen closing output, see Table 12.
186	Digital Output Port 1 Polarity	(0 - 1)	0	0：Normally open outputs; 1：Normally close outputs;
187	Digital Output Port 2	(0 - 52)	23	Default: Gen opening output, see

No.	Items	Parameters	Defaults	Description
	Function			Table 12.
188	Digital Output Port 2 Polarity	(0 - 1)	0	0：Normally open outputs; 1：Normally close outputs;
189	Digital Output Port 3 Function	(0 - 52)	21	Default: Pre-heat output, see Table 12.
190	Digital Output Port 3 Polarity	(0 - 1)	0	0：Normally open outputs; 1：Normally close outputs;
191	Digital Output Port 4 Function	(0 - 52)	30	Default: Gen normal output, see Table 12.
192	Digital Output Port 4 Polarity	(0 - 1)	0	0：Normally open outputs; 1：Normally close outputs;
193	Digital Output Port 5 Function	(0 - 52)	50	Default: general alarm output, see Table 12.
194	Digital Output Port 5 Polarity	(0 - 1)	0	00：Normally open outputs; 1：Normally close outputs;
195	Digital Output Port 6 Function	(0 - 52)	26	Default: rated control output, see Table 12.
196	Digital Output Port 6 Polarity	(0 - 1)	0	0：Normally open outputs; 1：Normally close outputs;
Module				
197	Power On Mode	(0 - 1)	0	0：Manual mode； 1：Auto mode；
198	Module Address 1	(1 - 254)	1	Controller's RS485-1 address during remote monitoring.
199	Module Address 2	(1 - 254)	1	Controller's RS485-2 address during remote monitoring.
200	Start Screen Extinction Enable	(0 - 1)	0	0：Disable； 1：Enable；
Maintenance				
201	Maintenance Enable	(0 - 1)	0	0：Disable； 1：Enable；
202	Maintenance Time	(0 - 5000) h	30 h	Setting value for maintenance countdown time. When the controller reaches this value internally, it sends the signal to action.
203	Maintenance Due	(0 - 2)	0	0：Warn；

No.	Items	Parameters	Defaults	Description
				1：Alarm Shutdown； 2：No action；
204	Reset Maintenance Time	(0 - 1)	0	0：No action； 1.：Reset the internal maintenance countdown of the controller and start the timer again according to the reset maintenance time. Automatically reset to zero after setting this value.
205	Scheduled Run	(0 - 1)	0	0：Disable； 1：Enable；
206	Load	(0 - 1)	0	0：No load； 1：Load；
207	Circle	(0 - 3)	0	0：Every month； 1：Every week； 2：Every day；
208	Start Time (Day)	(0 - 31)	0	Circle every week; 0-6 means Sunday- Saturday;
209	Start Time (Hour)	(0 - 23)	0	
210	Start Time (Minute)	(0 - 59)	0	
211	Continuous Operation Time	(0 - 30000) min	30	Effective continuous operation time for scheduled run.
212	Scheduled Not Run	(0 - 1)	0	0：Disable； 1：Enable；
213	Circle	(0 - 3)	0	0：Every month； 1：Every week； 2：Every day；
214	Start Time (Day)	(0 - 31)	0	le every week; 0-6 means Sunday- Saturday;
215	Start Time (Hour)	(0 - 23)	0	
216	Start Time (Minute)	(0 - 59)	0	
217	Continuous Operation Time	(0 - 30000) min	30	Effective continuous operation time for scheduled no run.
Sync				
218	Dead Bus Volt	(10 - 50) V Ph-N	30 V	It is considered Bus no power when Bus voltage is lower than dead Bus

No.	Items	Parameters	Defaults	Description
				voltage.
219	Voltage Difference	(0 - 30) V	3 V	It is considered voltage synchronization when the voltage difference between Generator and Bus is lower than synchronization voltage difference.
220	Positive Freq. Difference	(0 - 2.0) Hz	0.2 Hz	It is considered frequency synchronization when the frequency difference between Generator and Bus is less than sync positive frequency difference.
221	Negative Freq. Difference	(0 - 2.0) Hz	0.1 Hz	It is considered frequency synchronization when the frequency difference between Generator and Bus is more than sync negative frequency difference.
222	Phase Angle Difference	(0 - 20) °	10 °	It is considered Check Phase Angle when the initial phase difference is lower than synchronization phase difference.
223	Slip Frequency Sync	(0.0 - 1.00) Hz	0.1 Hz	Adjust generator frequency and enable it greater than Bus frequency.
224	MSC ID	(1 - 32)	1	It is the ID mark of the MSC communication internet. All the MSC ID should be unique. Smaller values represent higher priorities.
225	Full kW Rating	(1 - 6000) kW	276 kW	Used for load sharing.
226	Full kvar Rating	(1 - 6000) kvar	210 kvar	Used for load sharing.
227	Communication Rate	(1 - 1000) kbps	250 kbps	set value is the specific value of the communication rate, which can be set according to the following conditions: 0：500kbps；1：250kbps； 2：125kbps；3：50kbps。
228	Scheduled Run PCT	(0 - 100) %	80 %	Schedule the load value of other genset when start on demand.

No.	Items	Parameters	Defaults	Description
229	Scheduled Stop PCT	(0 - 100) %	30 %	Schedule the load value of other genset when start on demand.
230	Load Ramp Rate	(0.1 - 100.0) %/S	3.0 %/S	Speed rate(%/s) of genset upload/unload.
231	Starting Options	(0 - 1)	1	0: Start All Sets; 1: Start Sets on Demand;
232	MSC Modules	(1 - 32)	2	The number of modules connected on the parallel communication network , offer standard for triggering MSC module warnings.
233	MSC Too Few Modules Action	(0 - 2)	0	0：Warning; 1： Alarm shutdown; 2：No action;
234	Balance Engine Enable	(0 - 1)	1	When the input is active, the controller will start/stop the genset automatically according to the running time and the pre-set balanced running time.
235	Balance Engine Time	(0 - 60000) min	180 min	When reach the set balance engine time, it will automatically start scheduling the parallel operation of the genset.
236	Fail to Sync Delay	(5 - 300) S	60 S	When the controller detects no Sync signal during the preset delay, it will send corresponding alarm signal.
237	NEL Trip Enable	(0 - 1)	0	0：Disable; 1：Enable;
238	NEL Trip 1	(0 – 200) %	90 %	NEL1 trip output value;
239	NEL Trip Delay 1	(0 - 3000) S	5 S	NEL1 trip output delay;
240	NEL Trip 2	(0 – 200) %	100 %	NEL2、3 trip output value;
241	NEL Trip Delay 2	(0 - 3000) S	1 S	NEL2、3 trip output delay;
242	NEL Auto Reconnection Enable	(0 - 1)	0	0：Disable; 1：Enable;
243	NEL Auto Reconnection	(0 – 200) %	50 %	NEL1、2、3 trip elimination value;
244	NEL Auto	(0 - 3000) S	5 S	NEL1、2、3 trip elimination delay;

No.	Items	Parameters	Defaults	Description
	Reconnection Delay			
245	NEL Load Shedding Number	(1 - 3)	3	See Table 13
GOV				
246	Output Reverse Enable	(0 - 1)	1	0: Disable; 1: Enable;
247	Load Action	(0 - 2)	1	0: None; 1: Adjust to Rated Frequency; 2: Adjust to Center Point;
248	Center Voltage SW1	(0 - 10) V	0 V	The voltage at the center point.
249	Voltage Range SW2	(0 - 10) V	2 V	±2.0 V voltage range;
250	Sync Freq. Gain(P)	(0 - 1000)	200	Adjust and control before paralleling.
251	Sync Freq. Stability(I)	(0 - 1000)	450	Adjust and control before paralleling.
252	Sync Freq. Change Rate(D)	(0 - 1000)	0	Adjust and control before paralleling.
253	Active Gain(P)	(0 - 1000)	100	Adjust and control after paralleling.
254	Active Stability(I)	(0 - 1000)	450	Adjust and control after paralleling.
255	Active Change Rate(D)	(0 - 1000)	0	Adjust and control after paralleling.
AVR				
256	Output Reverse Enable	(0 - 1)	0	0: Disable; 1: Enable;
257	Load Action	(0 - 2)	1	0: None; 1: Adjust to Rated Frequency; 2: Adjust to Center Point;
258	Center Voltage SW1	(0 - 10) V	0 V	The voltage at the center point.
259	Voltage Range SW2	(0 - 10) V	2 V	±2.0 V voltage range;
260	Sync Voltage Gain(P)	(0 - 1000)	200	Adjust and control before paralleling.
261	Sync Voltage Stability(I)	(0 - 1000)	260	Adjust and control before paralleling.
262	Sync Voltage Change Rate(D)	(0 - 1000)	0	Adjust and control before paralleling.
263	Inactive Gain(P)	(0 - 1000)	190	Adjust and control after paralleling.
264	Inactive Stability(I)	(0 - 1000)	310	Adjust and control after paralleling.
265	Inactive Change	(0 - 1000)	0	Adjust and control after paralleling.

No.	Items	Parameters	Defaults	Description
	Rate(D)			
Selective Configuration				
266	AC System	(1 - 4)	4	1：1P2W； 2：2P3W； 3：3P3W； 4：3P4W；
267	Rated Voltage	(30 - 30000) V	230 V	To offer standards for detecting of gens' over/under voltage and loading voltage. (It is primary voltage when using voltage transformer; it is line voltage when AC system is 3P3W while it is phase voltage when using other AC system).
268	Rated Freq.	(10.0 - 600.0) Hz	50.0 Hz	To offer standards for detecting of over/under/load frequency.
269	Rated Full Load Current	(5 - 6000) A	500 A	Rated current, to offer standards for detecting of load.
270	Rated Speed	(0 - 6000) RPM	1500 RPM	To offer standards for detecting of over/under/load speed.
271	Full kW Rating	(1 - 6000) kW	276 kW	Used for load sharing.
272	Full kvar Rating	(1 - 6000) kvar	210 kvar	Used for load sharing.
273	GOV Center Voltage SW1	(0 - 10) V	0 V	The voltage at the center point.
274	AVR Center Voltage SW1	(0 - 10) V	0 V	The voltage at the center point.

NOTE: overcurrent setting details about DMT and IDMT.

DMT: overcurrent delay is definite time delay. Different overcurrent value has corresponding delay.

IDMT: overcurrent delay decrease with the increase of overcurrent. Different overcurrent value has corresponding delay. And the delay is dynamically calculated with the accumulated time of overcurrent.

8.2 ENABLE DEFINITION OF PROGRAMMABLE OUTPUT PORTS

Table 12 Enable Definition of Programmable Output Ports

No.	Type	Description
0	Not use	
1	Reserved	
2	Reserved	
3	Reserved	
4	Reserved	
5	Reserved	
6	Reserved	
7	Reserved	
8	Reserved	
9	Reserved	
10	Reserved	
11	Reserved	
12	Reserved	
13	Air Flap Control	Action when triggering quick shutdown alarm.
14	Buzzer Alarm	Action when warning, shutdown, trips. Can be connected annunciator externally. When “alarm mute” configurable input port is active, it can remove the alarm.
15	Louver Control	Action when genset starting and disconnect when genset stopped completely.
16	Fuel Pump Control	It is controlled by fuel pump of level sensor’s limited threshold.
17	Heater Control	It is controlled by heating of temperature sensor’s limited threshold.
18	Cooler Control	It is controlled by cooler of temperature sensor’s limited threshold.
19	Oil Pre-supply Output	Action from “crank on” to “crank override”
20	Generator Excite	Charging excitation time when the engine speed reaches the charging excitation speed.
21	Pre-Lubricate	Actions in period of “pre-heating” to “crank override”.
22	Close Gen Output	Control generator to take load.
23	Open Gen Output	Control generator to off load.
24	Start Relay	Action when start output.
25	Fuel Relay	Action when genset is starting and disconnect when stop

No.	Type	Description
		is completed.
26	Rated Control	No action before high-speed heating, action when entering the speed up output, and no action after idle cooling.
27	Energize to Stop	Used for engines with ETS electromagnet. Action when entering energize to stop output, and no action after engine stop.
28	Speed Drop Pulse	Pulse width time when entering idle cooling, used for control part of ECU dropping to idle speed.
29	Speed Raise Pulse	Pulse width time when entering speed up output, used for control part of ECU dropping to idle speed.
30	Generator Normal	Action when generator is normal.
31	Generator Load Available	Action when all conditions of generator load are met.
32	Remote Control	Control this output port by PC.
33	Speed Raise	Action when speed up warming.
34	Speed Drop	Action from “idle cooling” to “wait for stop”.
35	Aux. Input 1 Active	Action when input port 1 is active.
36	Aux. Input 2 Active	Action when input port 2 is active.
37	Aux. Input 3 Active	Action when input port 3 is active.
38	Aux. Input 4 Active	Action when input port 4 is active.
39	Aux. Input 5 Active	Action when input port 5 is active.
40	Aux. Input 6 Active	Action when input port 6 is active.
41	Aux. Input 7 Active	Action when input port 7 is active.
42	Aux. Input 8 Active	Action when input port 8 is active.
43	Aux. Input 9 Active	Action when input port 9 is active.
44	NEL1 Trip	See Table 13.
45	NEL2 Trip	
46	NEL3 Trip	
47	ECU Power Supply	No action from “ energize to stop” to “ wait for stop”, action in other time.
48	ECU Stop	Action from “ energize to stop” to “ wait for stop”.
49	Synchronizing	Action when controller is synchronizing.
50	Common Alarm	Action when genset common warning, common shutdown, common trips alarm.
51	Common Trip	Action when common trips alarm occurs.
52	Common Shutdown	Action when common shutdown alarm occurs.

No.	Type	Description
53	Common Warn	Action when common warning alarm occurs.
54	Battery Over Voltage	Action when battery over voltage warning alarm occurs.
55	Battery Under Voltage	Action when battery under voltage warning alarm occurs.
56	Charging Failure	Action when charging fail warning alarms.
57	Emergency Stop	Action when emergency stop alarm occurs.
58	Fail to Start	Action when failed start alarm occurs.
59	Fail to Stop	Action when failed stop warn occurs.
60	Under Speed Warn	Action when under speed alarm occurs.
61	Under Speed Shutdown	Action when under speed shuts down occurs.
62	Over Speed Warn	Action when over speed warn occurs.
63	Over Speed Shutdown	Action when over speed shutdown alarm occurs.
64	Gen Over Freq. Warn	Action when generator over frequency warning occurs.
65	Gen Over Freq. Shutdown	Action when generator over frequency shutdown alarm occurs.
66	Gen Over Volt Warn	Action when generator over voltage warning occurs.
67	Gen Over Volt Shutdown	Action when generator over voltage shutdown alarm occurs.
68	Gen Under Freq. Warn	Action when generator under frequency warning occurs.
69	Gen Under Freq. Shutdown	Action when generator under frequency shutdown occurs.
70	Gen Under Volt. Warn	Action when generator under voltage warning occurs.
71	Gen Under Volt. Shutdown	Action when generator under voltage shutdown occurs.
72	Gen Loss of Phase	Action when generator loss phase occurs.
73	Gen Reverse Phase Sequence	Action when generator reverse phase occurs.
74	Over Power Warn	Action when generator over power warning occurs.
75	Over Power Shutdown	Action when generator over power shutdown occurs.
76	Reverse Power Warn	Action when reverse power warning occurs.
77	Reverse Power Shutdown	Action when reverse power shutdown occurs.
78	Over Current Warn	Action when over current warning occurs.
79	Over Current Shutdown	Action when over current shutdown occurs.
80	Over Water Temp Warn	Action when over water temperature warning occurs.
81	Under Water Temp Warn	Action when under water temperature warning occurs.
82	Over Water Temp Shutdown	Action when over water temperature shutdown occurs.
83	Under Oil Pressure Warn	Action when under oil pressure warning occurs.
84	Under Oil Pressure Shutdown	Action when under oil pressure shutdown occurs.

No.	Type	Description
85	OP Sensor Open Circuit	Action when oil pressure sensor is open circuit.
86	Under Fuel Level Warn	Action when under fuel level warning occurs.
87	PWM Voltage Raise	
88	PWM Voltage Drop	
89	PWM Speed Raise	
90	PWM Speed Drop	

8.3 DEFINED CONTENTS OF PROGRAMMABLE INPUT PORTS (ALL GND (B-) CONNECTED ACTIVE)

Table 13 Defined Contents of Programmable Input Ports

No.	Type	Description
0	Reserved	
1	Reserved	
2	Reserved	
3	Reserved	
4	Reserved	
5	Reserved	
6	Reserved	
7	Reserved	
8	Reserved	
9	Alarm Mute	Can prohibit “Buzzer Alarm” output when input is active.
10	Reset Alarm	Can reset shutdown alarm and trip alarm when input is active.
11	60Hz Select	Can adjust the controller rated speed as 1800RPM and rated frequency as 60Hz when the input is active.
12	Panel Lock	All buttons in panel is inactive except up, down, left, right, confirm, exit, set and there is icon in the right of first row in LCD when input is active.
13	Low Speed Mode	Under voltage/frequency/speed protection is inactive.
14	Inhibit Auto Stop	In Auto mode, during generator normal running, when input is active, prohibit generator shutdown automatically.
15	Inhibit Auto Start	In Auto mode, prohibit generator start automatically when input is active.

No.	Type	Description
16	Inhibit Scheduled	In Auto mode, prohibit scheduled start genset when input is active.
17	Gen Closing Feedback	When the input is active, prohibit genset closing and icon of prohibit load will be displayed.
18	Inhibit Gen Load	Prohibit genset switch on when input is active.
19	Auto Mode Lock	When input is active, controller enters into Auto mode; All the keys are inactive except up, down, left, right, confirm, exit, set, mute and reset. When input is inactive, controller enters into Manual mode.
20	Auto Mode Invalid	When input is active, controller won't work under Auto mode. Auto key and simulate auto key input does not work.
21	Inhibit Alarm Stop	All shutdown alarms are prohibited except emergence stop.
22	Aux Instrument Mode	All outputs are prohibited in this mode.
23	Reset Maintenance	Controller will set maintenance time and date as default when input is active.
24	Aux. High Temp	Connected sensor digital input.
25	Aux. Low OP	Connected sensor digital input.
26	Remote Start (Closing)	In Auto mode, when input active, genset can be started and with load after genset is normally operation; when input inactive, genset will stop automatically.
27	Remote Start (No Closing)	In Auto mode, when input active, genset can be started and with no load after genset is normally operation; when input inactive, genset will stop automatically.
28	Aux. Manual Start	In Manual mode, when input active, genset will start automatically; when input inactive, genset will stop automatically.
29	Remote Start (On Demand)	In Auto mode, when input active, all genset that need to be paralleled will start according to the priority and calling other generator according to the load.
30	External Stop key	An external button (not self-lock) can be connected and pressed as simulate panel.
31	External Manual key	
32	External Auto key	
33	External Start key	
34	External G-Load key	This is simulate G-close key when FPSS8607-G50 controller is applied.
35	External M-Load key	This is simulate M-close key when FPSS8607-G50 controller is applied.
36	NEL Manual Trip	See Table 13.
37	NEL Manual Recon	
38	Power Management Mode	

No.	Type	Description
39	Reserved	
40	First Priority	It is the highest priority when the input is active. Used for main/standby genset selection.
41	Alternative Configuration	The alternative configuration is active when the input is active. Users can set different parameters to make it easy to select current configuration via input port.
42	Reserved	
43	Reserved	
44	Reserved	
45	Reserved	
46	Low Coolant Level	Connect with water level sensor digital input port.
47	Reserved	
48	Prohibit Start	When input is active, prohibit to start genset by the controller.
49	Not Use	

8.4 SELECTION OF SENSORS

Table 14 Selection of Sensors

No.	Type	Description	Remark
1	Temperature Sensor	0 VDO_Weichai 1 SGH_140C 2 SGD_180C 3 Curtis_140 4 Datcon_140C 5 VOLVO_EC_120C 6 SGX_140C 7 PT100 8 EURO-3 9 VDO_163C 10 Weichai 0672 11 Reserved 12 Custom Temp Sensor Curve	Defined resistance-type input resistance's range is 0~6KΩ, default is EURO-III sensor.
2	Pressure Sensor	0 VDO_10Bar 1 SGH_10Bar	Defined voltage-type input voltage's range is 0.5-4.5 V, default is EURO-III

No.	Type	Description	Remark
		2 SGD_10Bar 3 Curtis_10Bar 4 Datcon_10Bar 5 VOLVO_EC_10Bar 6 SGX_10Bar 7 EURO-3 8-11 Reserved 12 Custom Pressure Sensor Curve	sensor.
3	Liquid Level Sensor	0 SGH 1 SGD 2 YW-ES-8-25 3 YW-ES-12-25 4 ZHM 5-7 Reserved 8 Custom Liquid Sensor Curve	Defined resistance-type input resistance's range is 0~6KΩ, default is SGH sensor.

Note: If the default analog input type of the controller needs to be changed, you can select the programmable input port not used on the controller in More Settings.

8.5 CONDITIONS OF CRANK DISCONNECT SELECTION

Table 15 Crank Disconnect Conditions Selection

No.	Setting Description
1	Speed
2	Oil pressure
3	Speed+Oil pressure
4	Gen frequency
5	Speed+Gen frequency
6	Oil pressure+Gen frequency
7	Speed+Oil pressure+Gen frequency

NOTE:

1) There are 3 conditions to make starter disconnected with engine, that is, speed sensor, generator frequency and engine oil pressure. They all can be used separately or combined.

2) The setting value of crank disconnect condition cannot exceed the range in the table. Otherwise, the failure to start alarm will stop, and the long-term starting output will cause damage to the starting motor.

3) When set as speed sensor, must ensure that the number of flywheel teeth is as same as setting. Otherwise,

the displayed speed may not be consistent with the actual running speed and “over speed stop” or “under speed stop” may be caused.

4) The calculation method of speed should be set correctly (sensor, EFI communication, frequency conversion), otherwise there will be an alarm for failure to start, and the long-time of starting output will cause damage to the starting motor.

5) If genset without oil pressure sensor, please don’t select corresponding items. Otherwise there will be an alarm for failure to start, and the long-time of starting output will cause damage to the starting motor.

9 PARAMETERS SETTING

- **CAUTION:** Please change the controller parameters when generator is in standby mode only (e. g. Start conditions selection, configurable input, configurable output, various delay), otherwise, alarming to stop and other abnormal conditions may happen.
- **NOTE:** Maximum set value must over minimum set value in case that the condition of too high as well as too low will happen.
- **NOTE:** When setting the warning alarm, please set the correct maximum/ minimum value; otherwise, maybe there is abnormal alarm. When setting the maximum value, the low limit value must less than setting; when setting the minimum value, the high limit value must over setting.
- **NOTE:** Please set the generator frequency value as low as possible when cranking, in order to make the starter be separated quickly as soon as crank disconnect.
- **NOTE:** Configurable input could not be set as same items; Otherwise, the implementation of the function will be based on the higher serial number of the input port. Configurable output can be set as same items. Output at the same time when set to the same item.
- **NOTE:** When the alarm content of the controller contains the calibration data fault alarm, it is necessary to check whether the key parameter settings exceed the limit (power supply system mode, generator rated voltage, generator rated frequency, engine type, engine tooth number, custom sensor curve, and various action values). If the key parameter settings are abnormal, the genset cannot be started normally.

10 SENSORS SETTING

1) When select sensors, the controller will adopt the stored sensor curve with standard value. For example, if pressure sensor is Euro-III (1 Mpa voltage-type), its sensor curve is Euro-III (1 Mpa voltage-type); if select the SGD (1 Mpa resistor type), the pressure sensor curve is SGD curve;

2) If the sensor type used is not saved to the internal curve data of the controller, you can customize the sensor curve and set it according to the used sensor curve data;

3) When you enter the resistance value/voltage value curve of the sensor, the resistance value/voltage value must be set in ascending order. Otherwise, incorrect values may be displayed;

4) If the corresponding sensor has only an alarm switch, the sensor fault action must be set to "none", otherwise there may be an alarm stop or warning;

5) The number of sampling points of the custom sensor is 10, and the value beyond the set range is automatically calculated as the minimum/maximum value, and the final sensor curve is customized. As shown below:

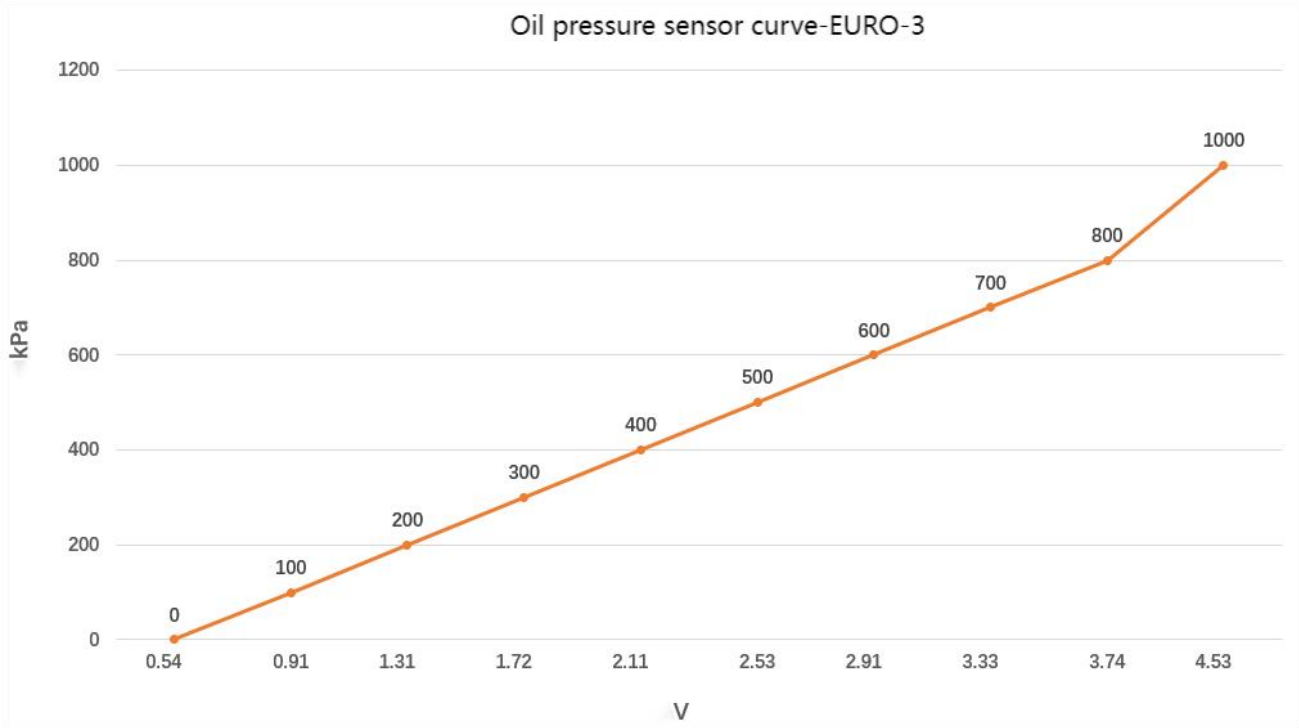


Fig.8 Euro-III Sensor Curve

11 COMMISSIONING

11.1 PREPARATION

1) Check the brand and model of engine. When using an ECU engine, you need to confirm whether the engine's speed control function has been turned on. It is also necessary to confirm whether the wiring between the engine ECU and the controller is correct.
2) When using a non-ECU engine, you need to know the brand and model of the governor, the connection method between the speed controller and the generator controller, and the corresponding center point voltage and range voltage set in the controller.
3) Check whether the fuel, oil and cooling water of the engine are normal, and whether the battery power is sufficient;

11.2 STEP 1: SINGLE UNIT DEBUGGING

1) In manual mode, check if engine and generator data is normal;
2) When the speed control wiring is not connected, the genset should run at the rated frequency when no-load and not closed. If no, just adjust the speed fine-tuning of the speed controller;
3) When the speed control wiring is connected, when the genset runs without load and not closed, the speed regulation output percentage of the controller shall be as close as possible to 0% after the genset reaches the rated frequency;
4) Increase the rated frequency of 2.5 Hz, then start the genset, and the genset should first run to 50 Hz corresponding to the center point, and then increase the speed to 52.5 Hz; reduce the rated frequency of 2.5 Hz, then start the genset, the genset should first run to 50 Hz corresponding to the center point, then slow down to 47.5 Hz;
5) Increase the rated voltage by 10%, then start the genset, and the genset should first run to 230 V corresponding to the center point, and then boost to 253 V; reduce the rated voltage by 10%, then start the genset, and the genset should first run to 230 V corresponding to the center point, then step down to 207 V;
6) After the speed regulation and voltage regulation function is confirmed, in manual mode, check if switch opens and closes normally.
7) Manually start the engine with load, and observe if the power factor, active power, and reactive power are normal. If abnormally displayed, check the phase sequence of the power generation voltage and current, the incoming line direction and the secondary current dotted terminal of the current transformer.
8) In manual mode do performance tests according to the national standards.

11.3 STEP 2: MANUAL PARALLEL OPERATION OFF-LOAD

1) Check to ensure that all controllers have been connected to the MSC communication line successfully. If the number of online units detected is less than the set number of communication nodes, that means an MSC communication failure. Then determine the cause of the fault by connecting the MSCs one by one.
2) Manually close parallel sets, check that the unit synchronization is balanced and breaker close impulse current is not too high;
3) During parallel operation off load, check that there is no high circumfluence on current screen;
4) During parallel operation off load, check if the output of active and reactive power is equal to zero; if it is not, then check if there is power oscillation; if there is, adjust the gain and stability values of controller, or adjust engine GOV or generator AVR gain and stability potentiometer to avoid active and reactive power oscillation; output close to 0.

11.4 STEP 3: MANUAL PARALLEL OPERATION ON-LOAD

1) During manual parallel, perform on-load test and check if active and reactive power is evenly distributed between all the gensets;
2) During manual parallel, perform ramp on-load test to see if there is high overshoot or power oscillation during this period; if there is, regulate Load Ramp via PC software;
3) During manual parallel, perform ramp off-load test to see if gen-set breaker opens after reaching minimum set value (%);
4) During manual parallel, perform impact load test and damp load test to check if there is power oscillation.

11.5 STEP 4: AUTOMATIC PARALLEL OPERATION

When the controller is in auto status, if digital input "remote start on-load (on demand)" is active, it will carry out automatic parallel, start and stop operation. There are 3 ways of automatic parallel operation:

1) Start on demand: the module with the highest priority starts firstly. When load exceeds the pre-set start maximum percentage, the second according to the priority module will start the gen-set, synchronize and share load. When load is lower than the preset minimum stop percentage, after stop delay the second module breaker will be open and the module will be cooled down and stopped.
2) Start all sets initially: all the modules start at the same time; the first module to reach load condition closes first; when other modules reach load condition, they synchronize one by one. After

that the modules monitors the load. If load value falls below module pre-set shutdown minimum percentage, the module with lowest priority enters stop delay and then cools down and stops. If load exceeds the preset start maximum percentage, the generators that are at rest will all start again.

3) Balanced engine running time: genset with the lowest total engine run time starts first. When the running gen-set total run time exceeds the other gen-set balanced running time, then the gen-set with the next lowest total run time starts (both "start on demand" or "start all sets initially" modes are possible); other gen-sets enter parallel operation after synchronizing. Opening breaker, unloading and stop is performed automatically. All the gen-sets are repeatedly started and stopped according to their total run time.

12 CLOUD SERVICE DESCRIPTION

Note: This function is optional and the controller is not equipped with built-in cloud module by default.

12.1 GENSET REMOTE MONITORING

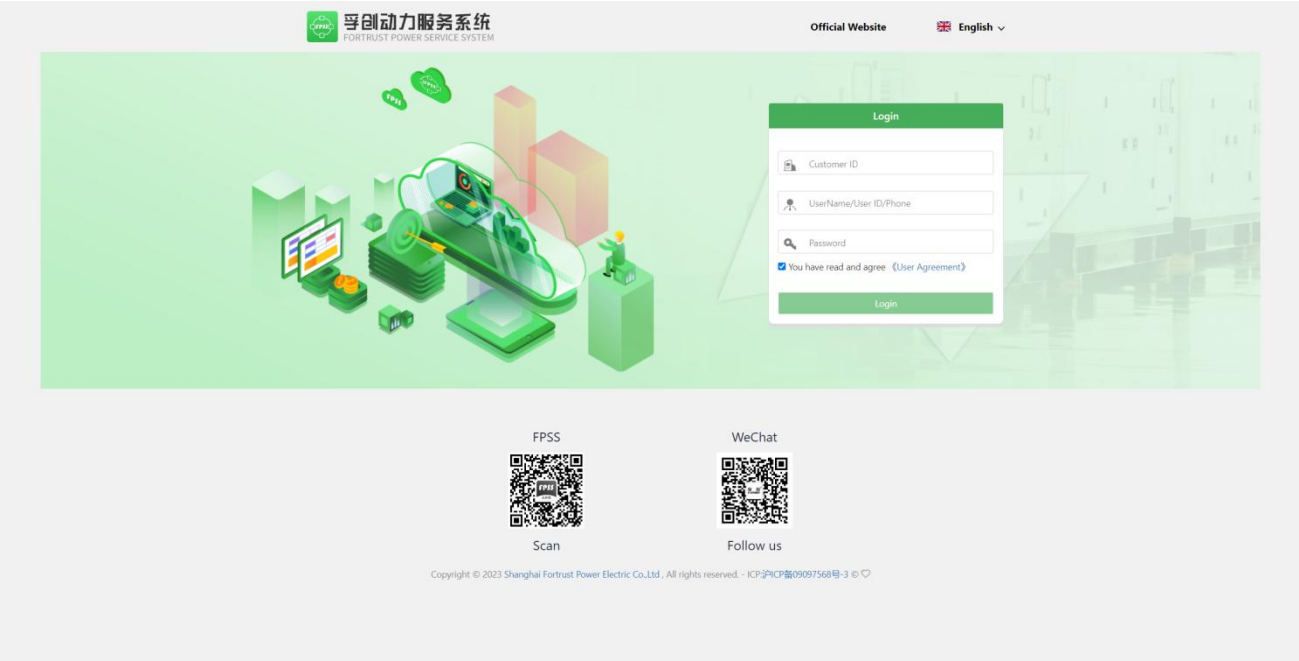


Fig. 9 Cloud Login Page

If the FPSS8607-G50 controller is equipped with a 4G cloud module, you can log in to the FPSS Fortrust Power Service System to monitor the equipment remotely. The monitoring content includes: real-time data, real-time status, remote control operations and other basic monitoring functions.

12.2 REMOTE PARAMETERS SETTING APPLICATION

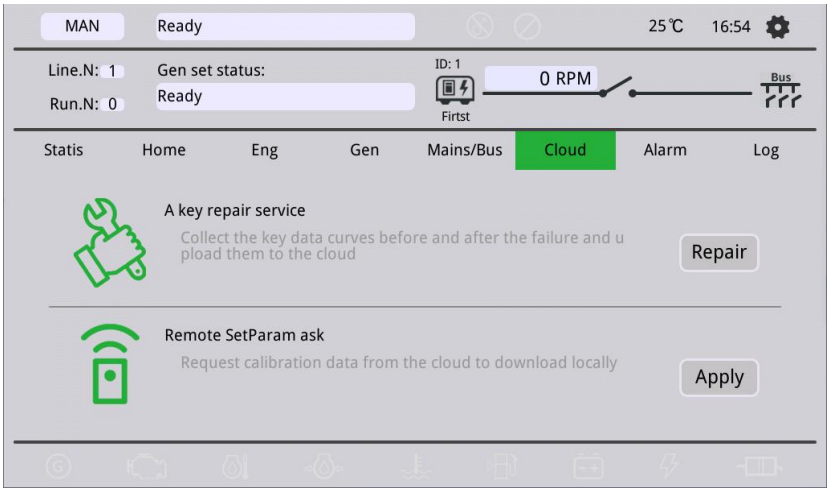


Fig. 10 Controller Remote Parameter Setting Application

Press the button when the controller is in the cloud service interface as shown in the figure, press the button to select up and down. When select " Remote Parameter Setting Application", press the button to confirm, and press the button to exit the cursor selection and enter into the normal operation.

After completing the above remote parameter setting, log in to the FPSS Power Service System and remotely adjust the parameters of controller in the "Remote Parameter Setting".

12.3 ONE-CLICK REPAIR

Press the button when the controller is in the cloud service interface as shown in the figure, press the button to select up and down. When select " One-click repair", press the button to confirm, and press the button to exit the cursor selection and enter into the normal operation.

After completing the above remote parameter setting, the controller will collect the 0.1s data of 5S before and after the one-button repair report and upload it to the cloud. Log in to the FPSS Power Service system and check the curves in the “One-click Repair Record” in the “ Genset Records”.

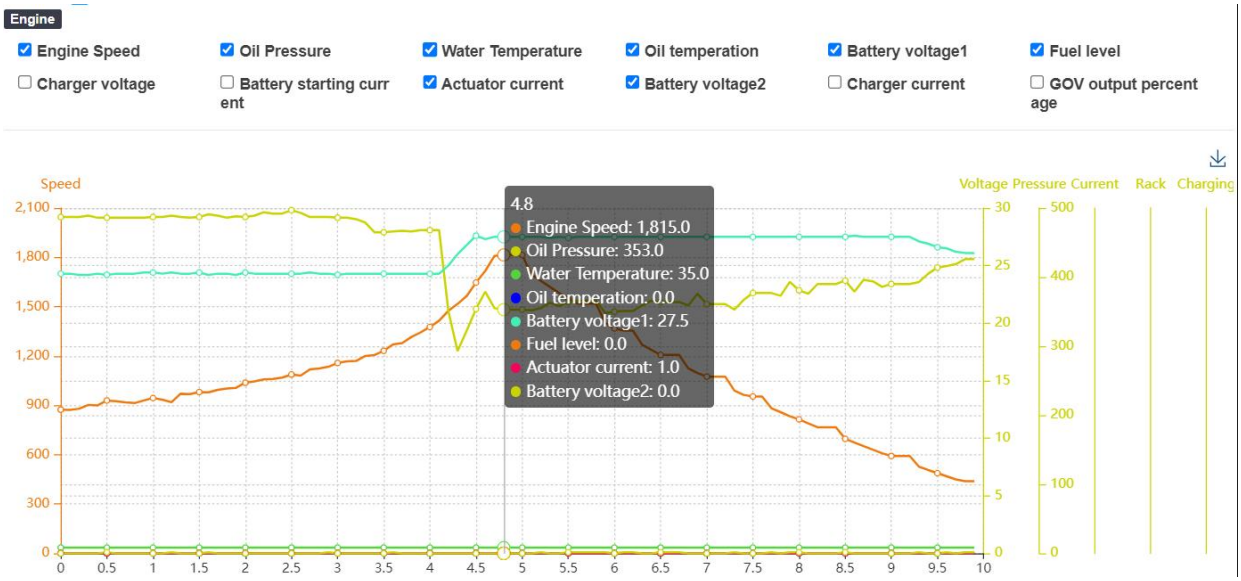


Fig. 11 Engine Curve

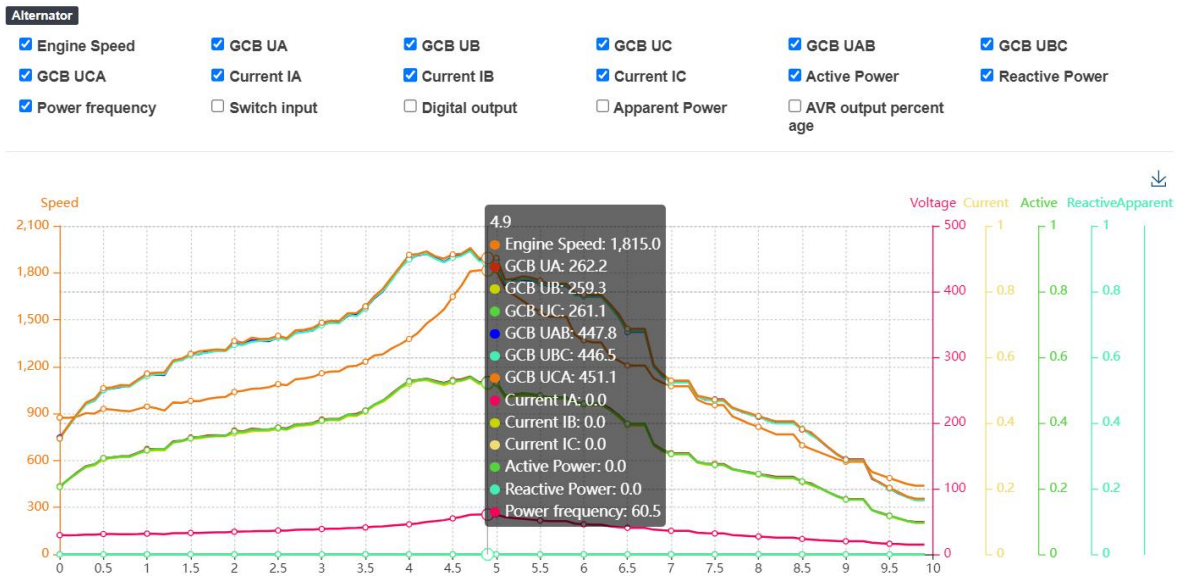


Fig. 12 Generator Curve

12.4 STARTING CURVE

FPSS8607-G50 controller will collect the 0.1s starting data when the genset starts. Log in to the FPSS Power Service system and check the curves in the " Starting Curve Record" in the " Genset Records".

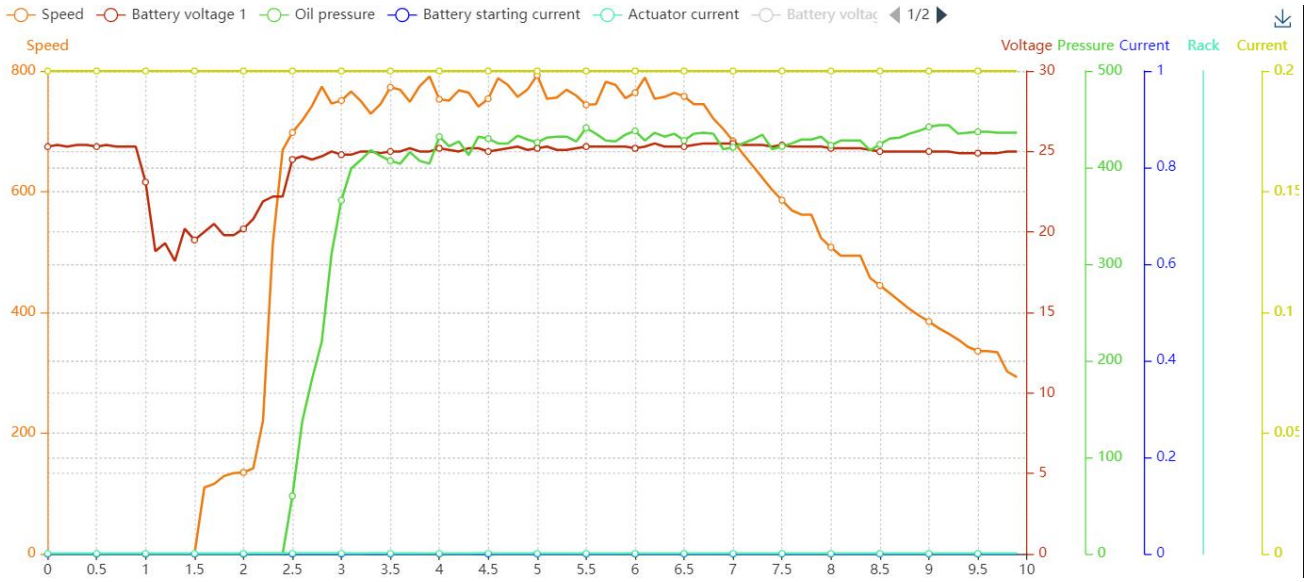


Fig. 13 Starting Curve

12.5 ALARM CURVE

FPSS8607-G50 will collect the 0.1s alarm data when the genset fails. Log in to the FPSS Power Service system and check the curves in the " Alarm Curve Record" in the " Genset Records".

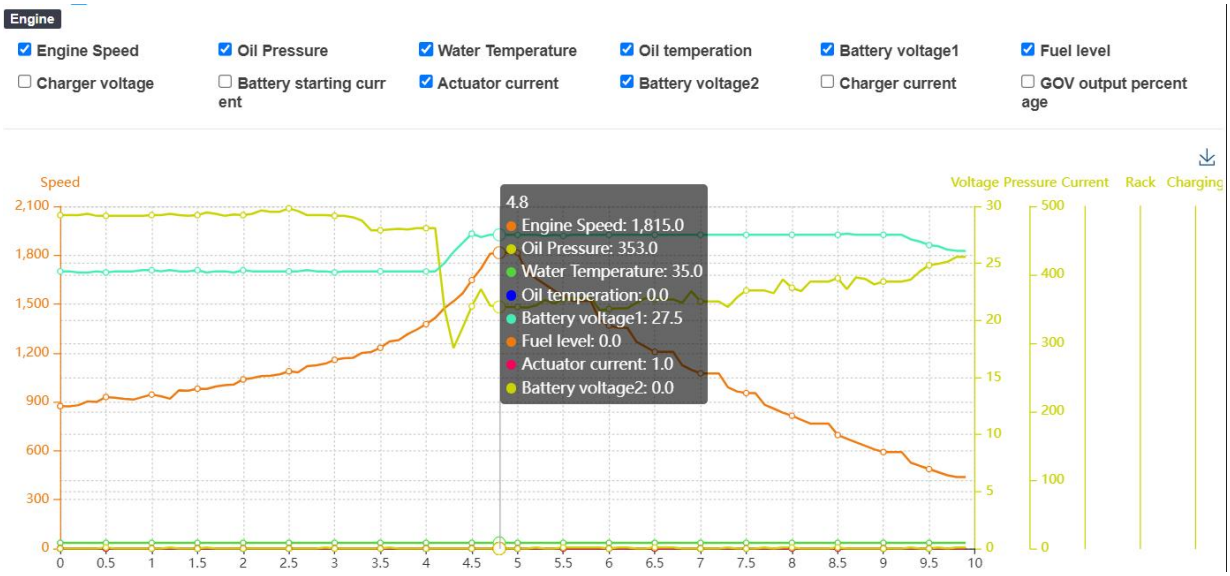


Fig. 14 Engine Curve

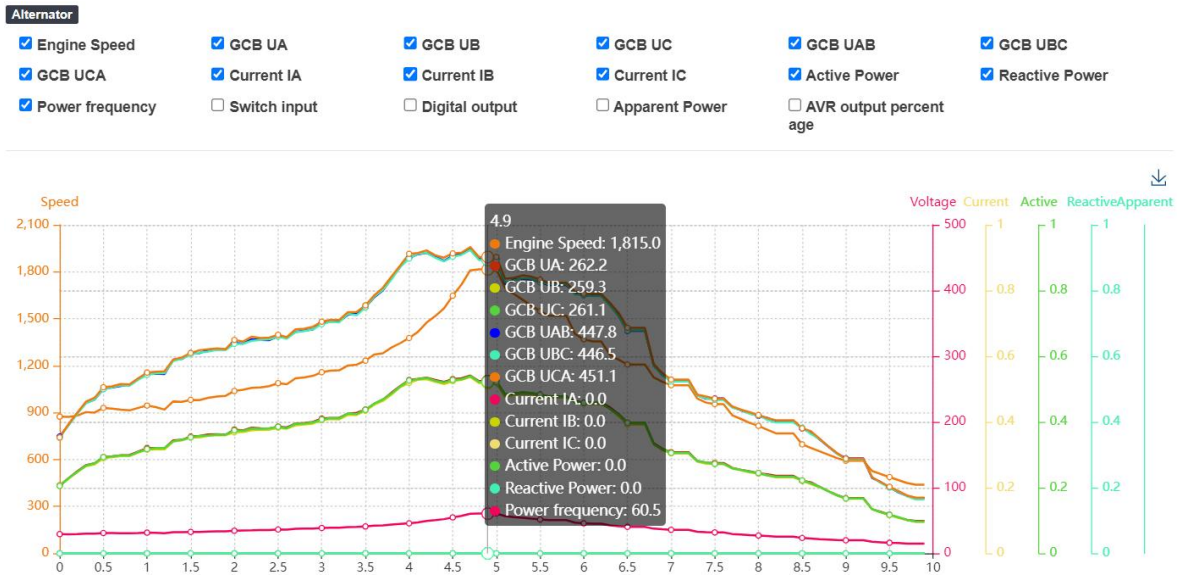


Fig. 15 Generator Curve

13 NEL TRIP

Non-essential load --- NEL for short.

The controller can control the NEL1, NEL2 and NEL3 to trip separately. The order of the essentiality is: NEL3 > NEL2 > NEL1.

- **Auto Trip:**

When NEL auto trip is enabled:

If the genset power has exceeded the NEL trip value, after the trip delay, NEL1 will trip the earliest, and then is NEL2, NEL3;

When NEL auto reconnection is enabled:

If the genset power has fallen below the auto reconnection set value, after the auto reconnection delay, NEL3 will reconnection the earliest, and then is NEL2, NEL1.

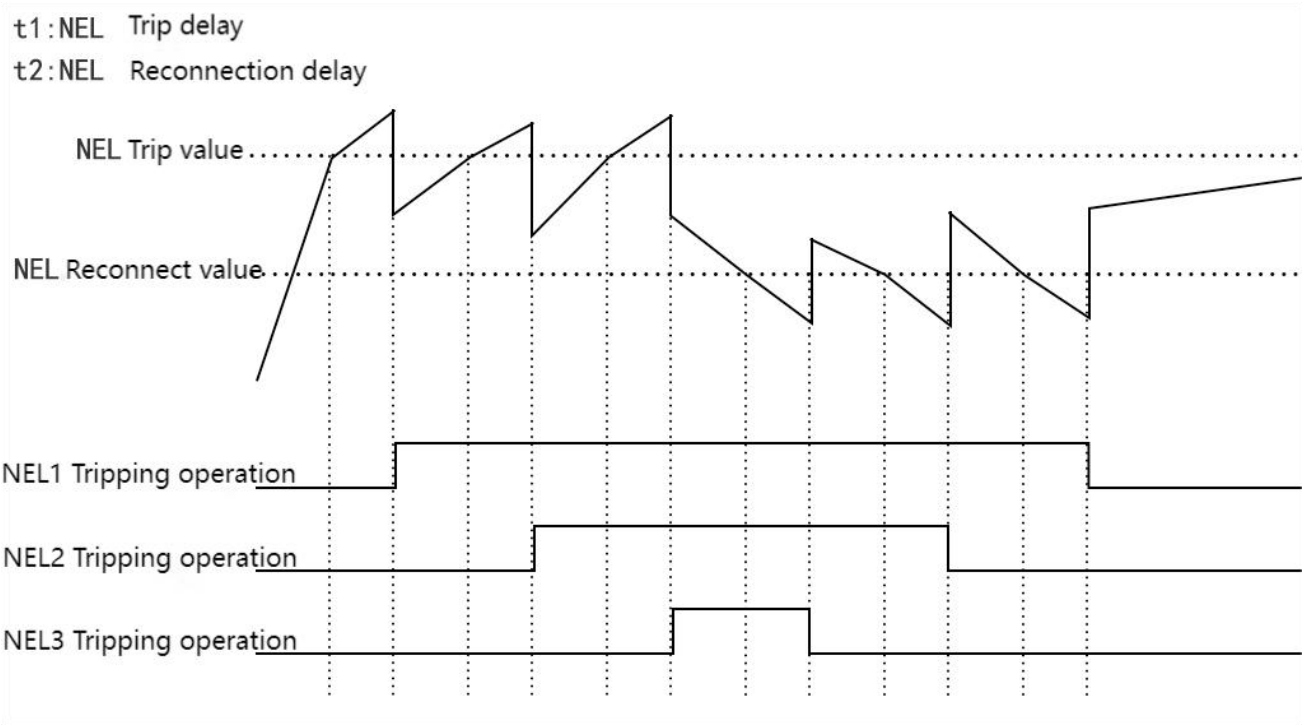


Fig.16 NEL Sequence

- **Manual Trip:**

If NEL manual trip input is active (earthed falling edge is active), NEL1 will trip without delay; If NEL manual trip input is active again, NEL2 will trip; If NEL manual trip input is active the third time, NEL3 will trip. During this process, the controller does not detect if the genset power has exceed the NEL trip value or not.

If NEL manual reconnection input is active (earthed falling edge is active), NEL3 will reconnect without delay; If NEL manual reconnection input is active again, NEL2 will reconnect; If NEL manual reconnection input is active the third time, NEL1 will reconnect. During this process, the controller detects the genset power: if the genset power has fallen below the NEL reconnection value, then the input is active; if it doesn't, the input is deactivated.

NOTE: When auto trip and auto reconnection are enabled, manual trip is still active.

14 POWER CORRECTION FACTOR

The rated power of the diesel genset refers to the power that allows continuous operation for 12h within 24h in the condition of the external atmospheric pressure of 0.1Mpa, the ambient air temperature of 20℃, the relative humidity of 50% and the rated speed (including the excess power of 110% continuous operation for 1h under overload). If the external air pressure, temperature, humidity and other conditions are different from the above standard conditions, then correct the coefficient C value corresponding to the chart set by the FPSS8607-G50 parallel controller. That is, the actual power should be equal to the rated power multiplied by the correction factor C.

Actual Power=Rated Power * C

Table 16 Power Correction Factor

Atmospheric Pressure (Mpa)	Air Temperature ℃				
	0	10	20	30	45
0.101	1.00	1.00	1.00	0.96	0.89
0.094	1.00	0.95	0.92	0.88	0.82
0.09	0.94	0.90	0.87	0.83	0.77
0.079	0.81	0.77	0.74	0.71	0.65
0.07	0.69	0.66	0.63	0.61	0.55
0.062	0.59	0.56	0.53	0.50	0.46

Note: The data shown in the power correction coefficient chart is illustrative data, and the actual value is subject to the engine type used.

15 USB

Users can set the controller's parameters and monitor the controller's status via the test software which provided by Fortrust company. The connection way between PC and controller as following:

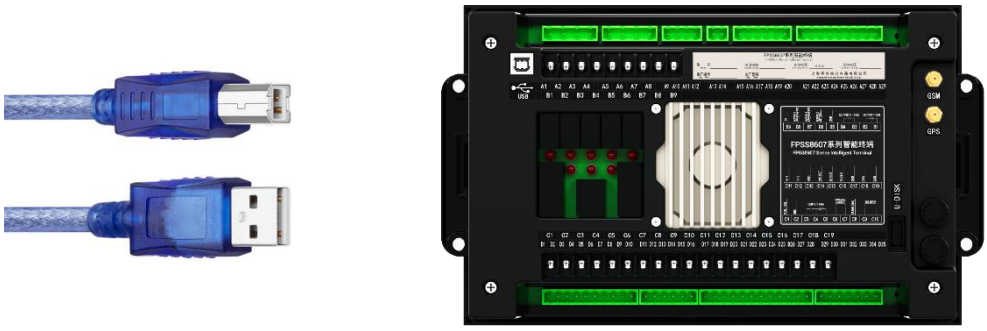


Fig.17 USB Connection Method

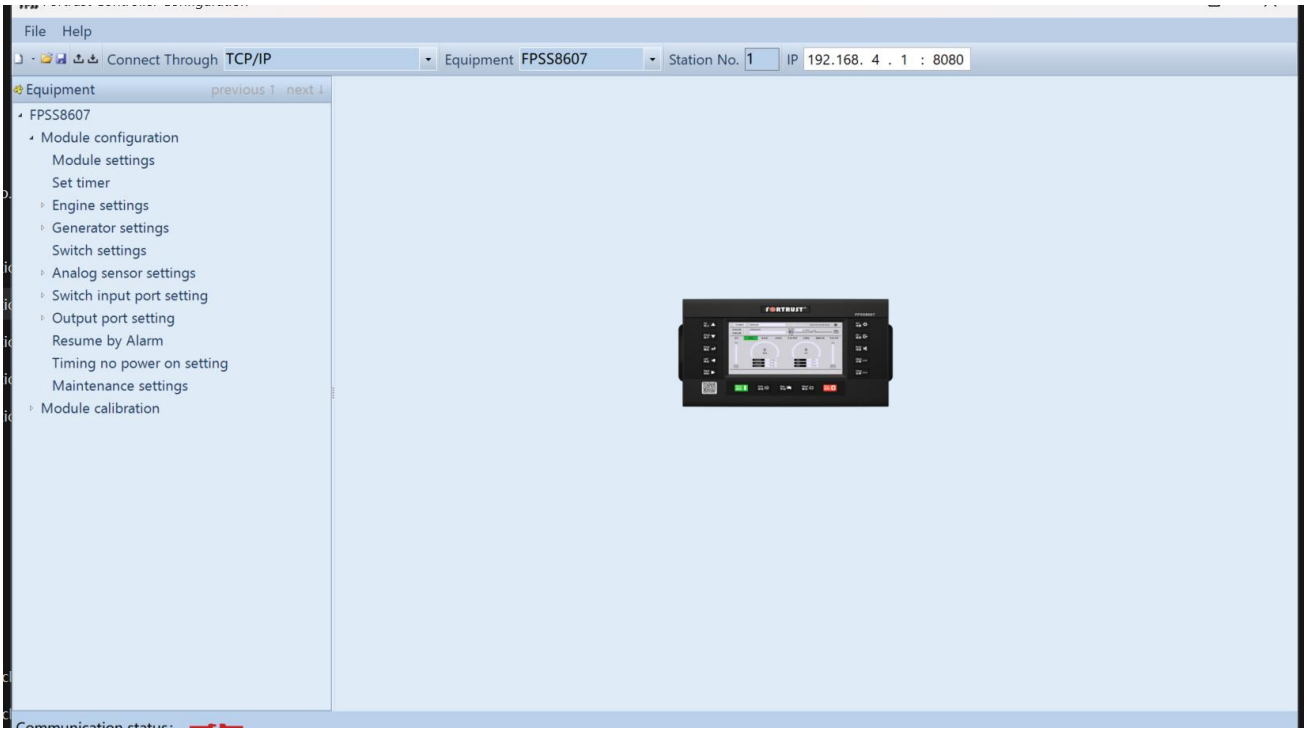


Fig. 18 PC Interface

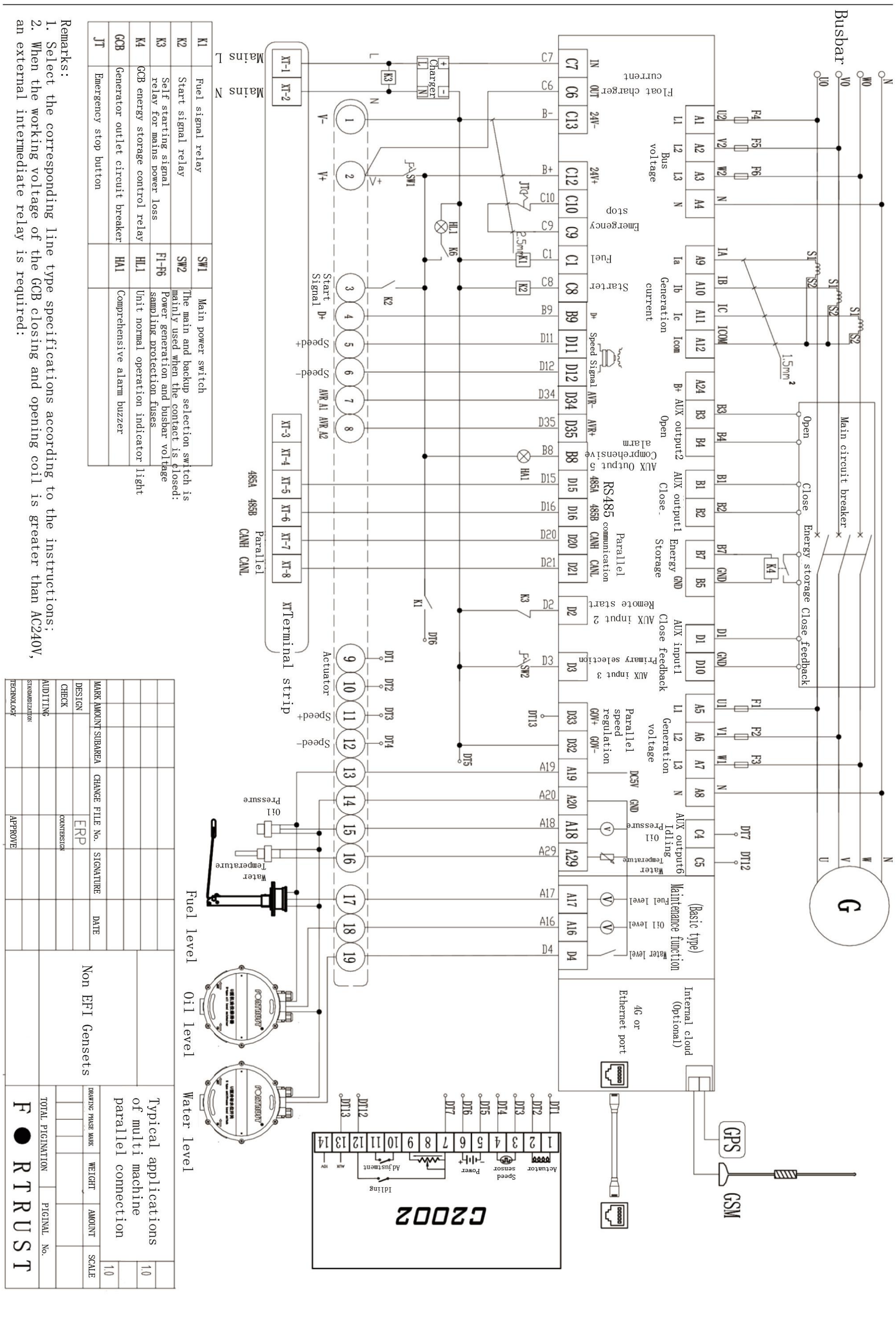
16 FAULT FINDING

Table 17 Fault Finding

Symptoms	Possible Solutions
Controller no response with power.	Check starting batteries; Check controller connection wirings; Check DC fuse.
Genset shutdown	Check the water/cylinder temperature is too high or not; Check the AC genset voltage; Check DC fuse.
Controller emergency stop	Check emergence stop button is correct or not; Check whether the starting battery positive be connected with the emergency stop input; Check whether the circuit is open.
Low oil pressure alarm after crank Disconnect	Check the oil pressure sensor and its connections.
High water temperature alarm after crank disconnect	Check the water temperature sensor and its connections.
Shutdown alarm in running	Check related switch and its connections according to the information on LCD; Check programmable inputs.
Crank not disconnect	Check fuel oil circuit and its connections;

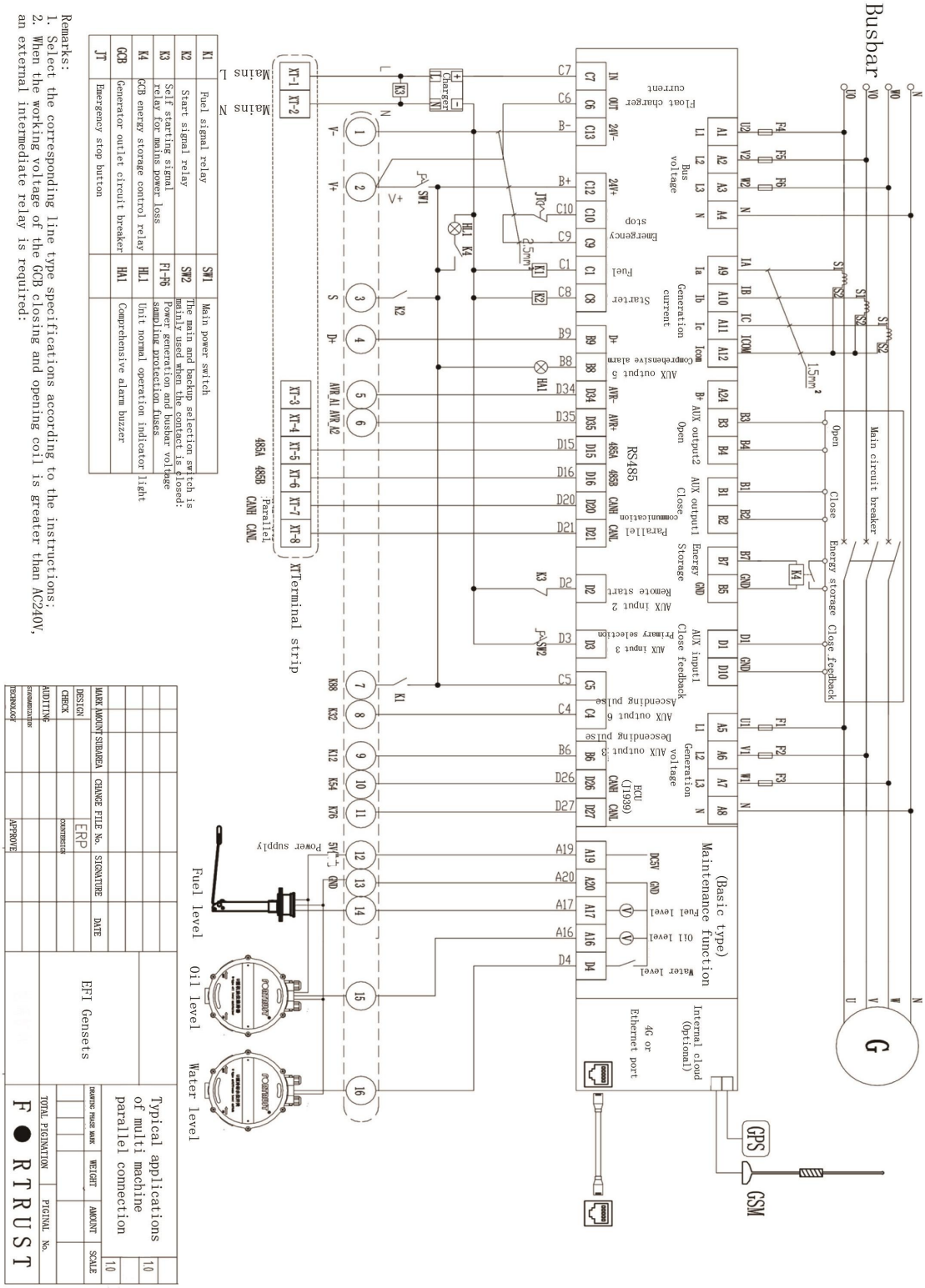
	Check starting batteries; Check speed sensor and its connections; Refer to engine manual.
Starter no response	Check starter connections; Check starting batteries.
RS485 communication abnormal	Check connections; Check setting of COM port is correct or not; Check RS485's connections of A and B is reverse connect or not; Check RS485 transfer module whether damage or not; Check communication port of PC whether damage.
ECU communication failure	Check connections of CAN high and low polarity; Check if type of engine correct; Check if connections from controller to engine and setting of outputs correct.
ECU warning	Get information from LCD of alarm page; Refer to engine manual according to SPN alarm code

Appendix II Typical Parallel Non-EFI Typical Application Diagram



Appendix II. Typical Parallel Application Diagram for Non EFI Gensets

Appendix III Typical Parallel EFI Typical Application Diagram



K1	Fuel signal relay	SW1	Main power switch
K2	Start signal relay	SW2	The main and backup selection switch is mainly used when the contact is closed: Power generation and busbar voltage sampling protection fuses
K3	Self starting signal relay for mains power loss	F1-F6	
K4	GCB energy storage control relay	HL1	Unit normal operation indicator light
GCB	Generator outlet circuit breaker	HA1	Comprehensive alarm buzzer
JT	Emergency stop button		

Remarks:
1. Select the corresponding line type specifications according to the instructions;
2. When the working voltage of the GCB closing and opening coil is greater than AC240V, an external intermediate relay is required:

FORTRUST®

Address: Room 803, Building A, Senlan Meilun Building, 555 Lansong Road, Pudong New District, Shanghai

Sales Hotline：19851351321

Postcode：200137

Factory Address: No.49 Mingzhu Road, High-Tech Industrial Development Zone,Qidong, Nantong, Jiangsu Province

Sales Hotline：19851351386

Postcode：226236

Cloud Factory Address: 4th Floor, Building 9, Zone B, Electronic Science and Technology Park, No. 1 Shuangxing Avenue, Shuangliu District, Chengdu City, Sichuan Province

Sales Hotline：13918022476

Postcode：610299

Web：www.fortrustpowerele.com

Email: info @fortrust.cn