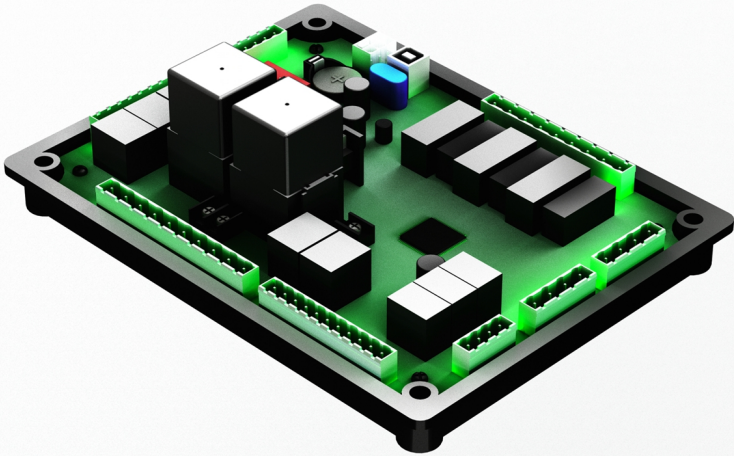
FM 7000
GENSET CONTROLLER
USER MANUAL



Software Version

No.	Version	Date	Note
1	V1.0	2020-05-10	Original release.
2	V1.1	2021-03-22	Fixed the wrong default value of output port.

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Symbol Description

Symbol	Description
 Note	Remind operators to operate correctly, otherwise it may cause the equipment not to work correctly.
 Be care	It is indicated that potential hazards can damage equipment without proper precautions.
 Warning	It is indicated if appropriate preventive measures are not taken, potentially dangerous situations may result in death, serious personal injury or significant property losses.


Warning

1. The installation of this equipment must be carried out by professionals.
2. When installing and operating the controller, please read the entire instruction manual first.
3. Any maintenance and commissioning of the equipment must be familiar with all the equipment.
4. t, safety standards and precautions in advance, otherwise it may cause personal injury or damage to related equipment.
5. The engine must have an overspeed protection device independent of the controller system to avoid casualties or other damage caused by engine out of control.
6. After the installation of the controller is completed, please verify that all protection functions are valid.


Be Care

1. Please keep the good connection of the power supply of the controller. Do not share the connection lines of the positive and negative electrodes of the battery with the floating charger.
2. During the operation of the engine, do not disconnect the battery, otherwise it may cause damage to the controller.

Catalogue

Summary

This series controller is specialized for Diesel / Gasoline / Gas Genset Start, Stop, Parameters monitoring, faults-checking as well as data setting.

The controller needs to be used with the HM series display panel, and the main control board parameters can be set through the host computer USB / RS485 / HM series panel. When the generator set cannot work normally, it can effectively protect and shut down the generator.

There are Chinese/English interface options, more language can be set according to user's request. All the parameters can be configured through the front face buttons or use programmable interface by RS485 or USB to adjust via PC. It can be widely applied for all kinds of auto control system of gensets.

Main Features

There are four Models under FM7000 series.

FM7000: Used for independent automation, through the remote start signal to control the automatic start and stop of the generator set;

FM7000R: Based on FM7000, it adds RS485 port.

FM7000C: Based on FM7000, it adds CAN port.

FM7000CR: Based on FM7000, it adds RS485 and CAN port.

- ◆ Dual core 32bit high performance single chip microcomputer.
- ◆ The system adopts a split installation structure, reducing the internal wiring of the control box by 80%, and greatly reducing the complete set cost.
- ◆ Equipped with emergency start electric lock switch interface, convenient for control box wiring;
- ◆ USB Port: parameters can be set even without power through USD port to monitor in real time.
- ◆ With RS485 communication port, can achieve "Three Remote" functions via MODBUS protocol.
- ◆ Standard CAN communication port, built-in J1939 protocol, has matched more than 30 kinds of engines;
- ◆ Collection of various parameters;
- ◆ Real time clock inside: preset time operate and auto maintenance is available. Genset working plan can be set as per week or month.
- ◆ Three class protection countdown function, which can set the maintenance time or date.
- ◆ The black box function can save the relevant parameters of the unit when the fault alarm occurs in real time, and it is convenient to find the cause of the fault.
- ◆ Totally 6 relay's output, among which 4 relay output can be self-configurable, each relay can be set as max 20 functions, besides, there are 3 groups as non-contact terminals.
- ◆ With 5 switches input, up to 20 functions optional;

- 3 sensor simulation input connectors, 6 input types is configurable and various kinds of units can be set.
- Battery charging control function, which can protect the battery according to battery voltage status.
- Sensor can be self-defined by front face button or PC software.
- Adapt to 3P4W,1P2W,2P3W(120V/240V,50/60HZ)
- Various of crank conditions (RPM, Frequency, Oil Pressure) can be chosen.
- Control Protection: Auto Start/Stop of genset, load transfer (ATS control) and perfect failure display and protection.
- The main board is equipped with a 40A oil valve motor relay, which can be directly driven to start;
- Electric lock control, can start and stop directly;
- Module design: All the connections are adapted with European connectors so that installation, connection, repair and replacement can be more easily.

Parameters acquisition

- Engine RPM
- Engine oil pressure
- Engine water temperature
- Engine fuel temperature
- Engine fuel level
- Engine battery voltage
- Charging voltage
- Mains Frequency
- Mains phase voltage L-N
- Mains phase voltage L-L
- Generator 3 Phase voltage L-N
- Generator 3 Phase voltage L-L
- Generator 3 phase current A
- Generator Frequency Hz
- Generator Power Factor COS φ
- Generator active power KW
- Generator apparent power KVA
- Generator reactive power KVar
- Current load rate %
- Average loading rate %
- Current consumption KWH
- Total consumption KWH
- Total Crank times
- Current running time
- Total running time
- Unit maintenance countdown
- Current date/time

Alarm Protection

- Over speed
- Under speed
- Low oil pressure
- High water temperature
- High Oil temperature
- Low fuel level
- Low oil level
- External instant unloading shutdown
- External emergency alarm
- RPM Lost
- Sensor Open
- Over Frequency
- Under Frequency
- Over voltage
- Under voltage
- Over current
- Non-balance of current
- Over power
- Gen load failure
- Gen unload failure
- Mains Load failure
- Mains unload failure
- Primary maintenance expire
- Secondary maintenance expire
- Third maintenance expire
- ECU alarm failure
- ECU communication Failure
- Low water level alarm
- Louver opening exception
- Emergency Stop
- Crank failure
- Battery overpressure
- Battery undervoltage
- Stop Failure

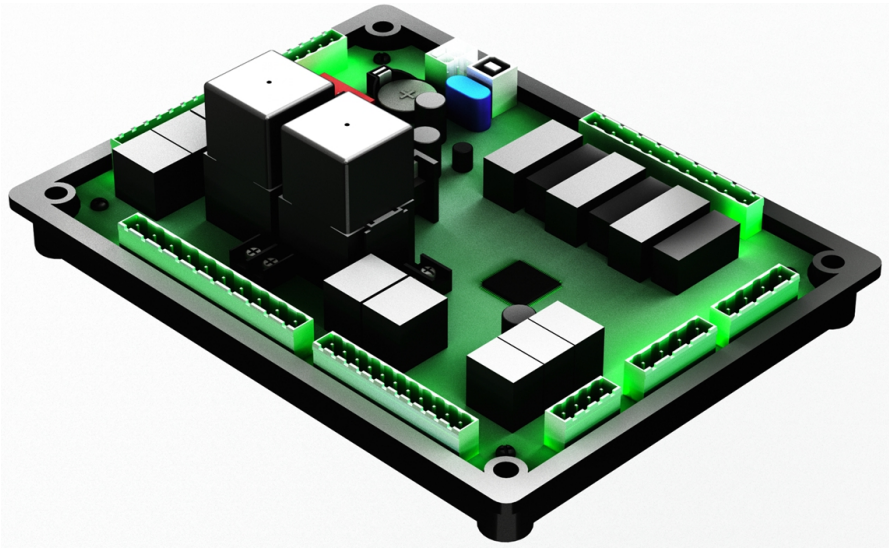
Parameters

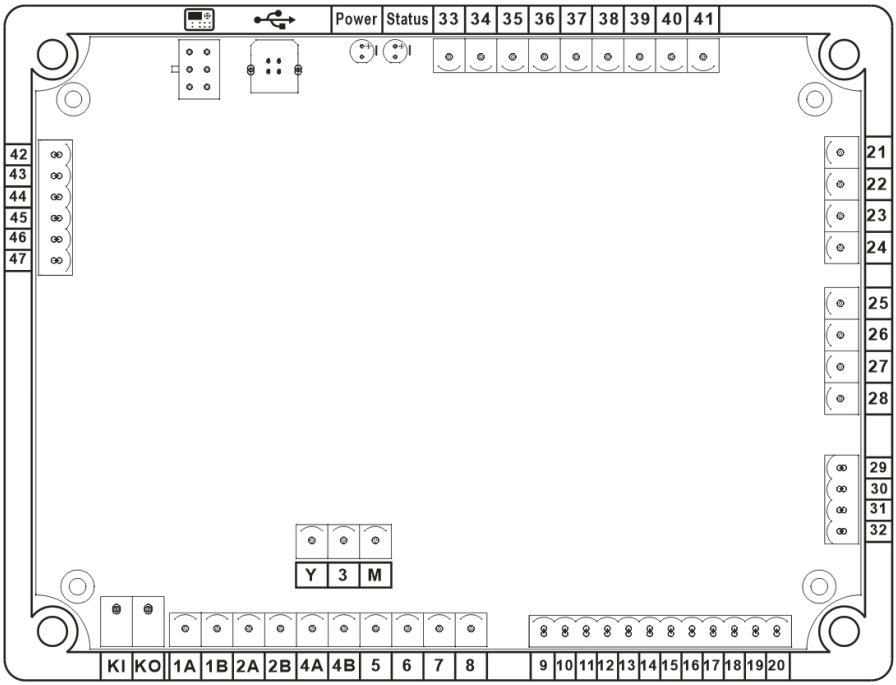
Working voltage	DC8V----36V Continuous
Power consumption	Standby：24V：MAX 2W
	Working：24V：MAX 10W
AC Voltage Input	1P2W 30VAC-276VAC (ph-N)
	2P3W 30VAC-276VAC (ph-N)

	3P4W 30VAC-276VAC (ph-N)
Rotate speed sensor Frequency	50-10000Hz
MAX Accumulating Time	99999.9Hours（Min Store time:6min）
Fuel Relay Output	Max 15Amp DC+VE Supply voltage
Start Relay Output	Max 15Amp DC+VE Supply voltage
Programmable Relay output 1	Max 5Amp DC+VE Supply voltage
Programmable Relay output 2	250V/10 AMP Non-contact normally Open output
Programmable Relay output 3	250V/10 AMP Non-contact normally Open output
Programmable Relay output 4	250V/10 AMP Non-contact normally Open output
Excitation output	Max 0.9AMP DC+VE supply voltage
Switch value input	Available if connecting with Battery -
Working condition	-25-70℃
Storage condition	-40-80℃
Protection Level	IP54：when waterproof rubber gasket is added between controller and its panel
Insulation strength	Apply AC1.5kV voltage between high voltage terminal and low voltage terminal; The leakage current is not more than 3mA within 1min.
Overall dimension	213mm*162mm*55mm
Weight	1.0Kg

Overall Dimension and Wiring Diagram

◆ **Overall Dimension:**





Panel and display

LED indicator	Status	Function
Green light Power	Normally closed	Abnormal controller power supply
	Normally open	The controller power supply is normal
Red light Status	Normally closed	Unit standby
	Normally open	Unit running
	FLASH	Unit alarm

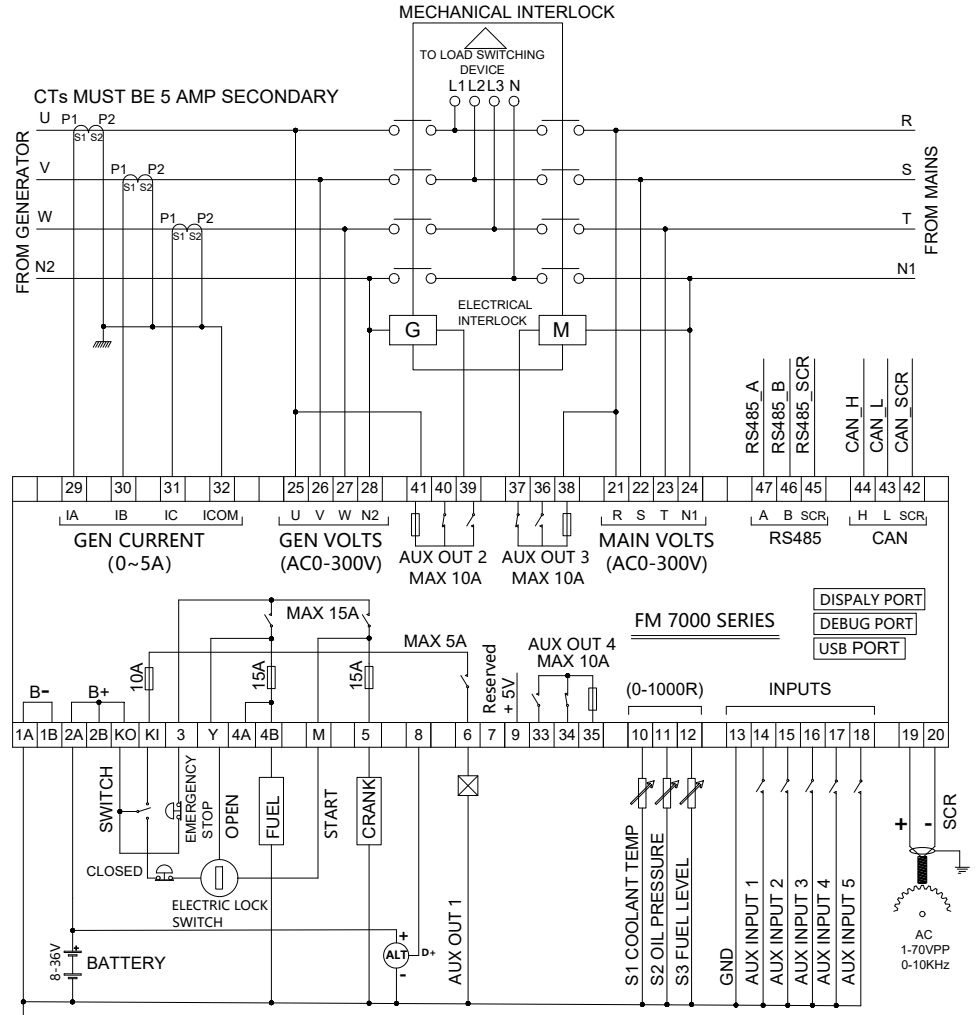
◆ **Descriptions of terminal connection**

KI	Power switch input	Controller power supply input B+.	2.5mm^2
KO	Power switch Output	Controller power supply input B+.	
Y	External electric lock Open	External electric lock start control	2.5mm^2
M	External electric lock start		

1A 1B	Battery Negative Input B-	Controller power supply input B-.	2.5mm^2
2A 2B	Battery Negative Input B+	Controller power supply input B+.	2.5mm^2
3	Emergency stop	B+ voltage input is active, and connected to emergency stop normal closed button.	2.5mm^2
4A 4B	Fuel Output	Active output, Max 15Amp	2.5mm^2
5	Crank Output	Active output, Max 15Amp.	2.5mm^2
6	Aux. Output 1	Active output, Max 5Amp.	1.5mm^2
7	Reserved		
8	Charging excitation output	Active output, Max 0.9Amp.	1.0mm^2
9	+5V	5V power output, max 50mA	1.0mm^2
10	Aux. Sensor _WT	Sensor input types can be configured as: disabled, oil pressure sensor, water temperature sensor, oil temperature sensor, cylinder temperature sensor, oil level sensor. Oil pressure sensor compatible with voltage and resistance.	1.0mm^2
11	Aux. Sensor _OP		1.0mm^2
12	Aux. Sensor _FL		1.0mm^2
13	Sensor common GND	Connect the battery negative or outer.	1.0mm^2
14	Aux. Input 1	The grounding is valid according to the function selection switch input.	1.0mm^2
15	Aux. Input 5		1.0mm^2
16	Aux. Input 3		1.0mm^2
17	Aux. Input 4		1.0mm^2
18	Aux. Input 5		1.0mm^2
19	Speed sensor +	Use a shielded wire to connect the speed sensor.	1.0mm^2
20	Speed sensor -		1.0mm^2
21	Mains Voltage R	Connected to the mains R phase.	1.0mm^2
22	Mains Voltage S	Connected to the mains S phase.	1.0mm^2

23	Mains Voltage T		Connected to the mains T phase.	1.0mm²
24	Mains Voltage N1		Connected to the mains N1 phase.	1.0mm²
25	Generator Voltage U		Connected to the power generation output U phase.	1.0mm²
26	Generator Voltage V		Connected to the power generation output V phase.	1.0mm²
27	Generator Voltage W		Connected to the power generation output W phase.	1.0mm²
28	Generator Voltage N2		Connected to the power generation output N2 phase.	1.0mm²
29	Load CT Secondary IA		Current Transformer Secondary Rated 5A.	1.5mm²
30	Load CT Secondary IB			1.5mm²
31	Load CT Secondary IC			1.5mm²
32	Load CT Secondary ICOM		Connect to the common GND instead of the neutral line N.	1.5mm²
33	Aux. Output 2	Normally open	Passive output, Max 10Amp.	1.5mm²
34		Normally closed		1.5mm²
35		Public port		1.5mm²
36	Aux. Output 2	Normally open		1.5mm²
37		Normally closed		1.5mm²
38		Public port		1.5mm²
39	Aux. Output 4	Normally open		1.5mm²
40		Normally closed		1.5mm²
41		Public port		1.5mm²
42	CAN-SCR		Impedance-120Ω shielding wire is recommended, its single-end connect with ground.	1.0mm²
43	CAN-L			1.0mm²
44	CAN-H			1.0mm²
45	RS485 SCR		A 120 Ω shielded wire and good grounding are recommended.	1.0mm²
46	RS485 B			1.0mm²
47	RS485 A			1.0mm²

◆ FM7000 3-phase 4-wire Typical Wiring Diagram



⏚ BATTERY NEGATIVE MUST BE GROUNDED

REMARK:

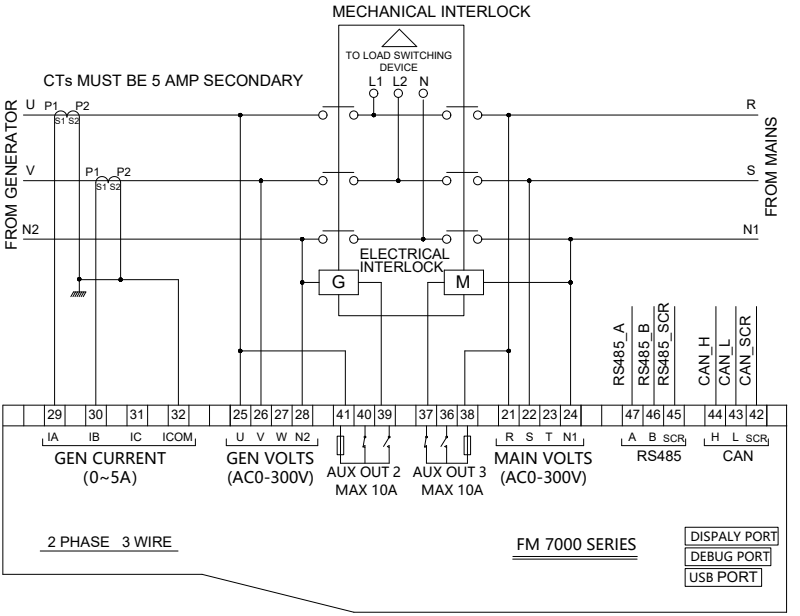
1.No. 13 common sensor lines must be securely attached to the vicinity of the sensor body.

2.To ensure reliable operation of the module and the measuring accuracy, power lines as much as possible and do not share power cable crude and other devices.

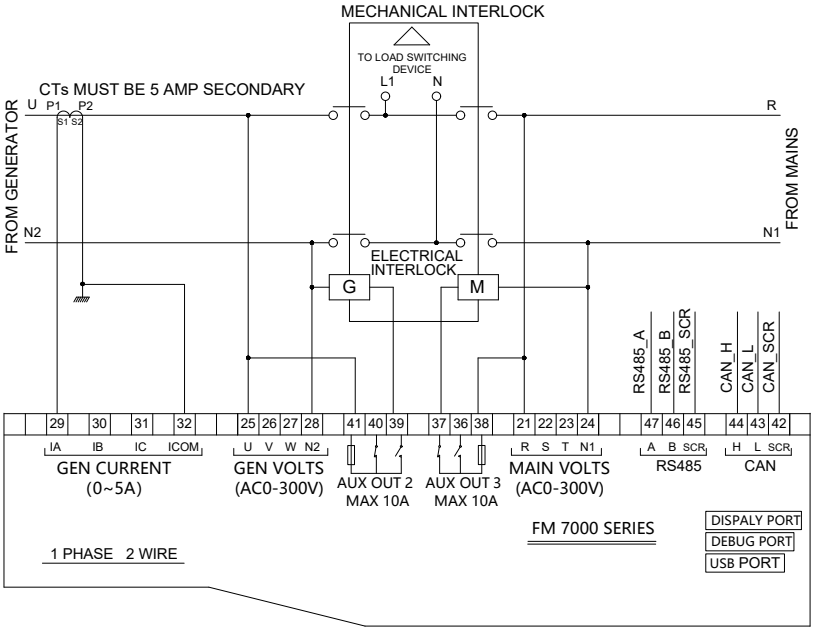
Note: Please don't move battery during running status or it may cause the controller broken!

WARNING: When generator is on-load, C. T. secondary must not be open circuit, Otherwise, the high voltage generated will pose a danger to personal safety.

◆ FM7000 2-phase 3-wire Typical Wiring Diagram



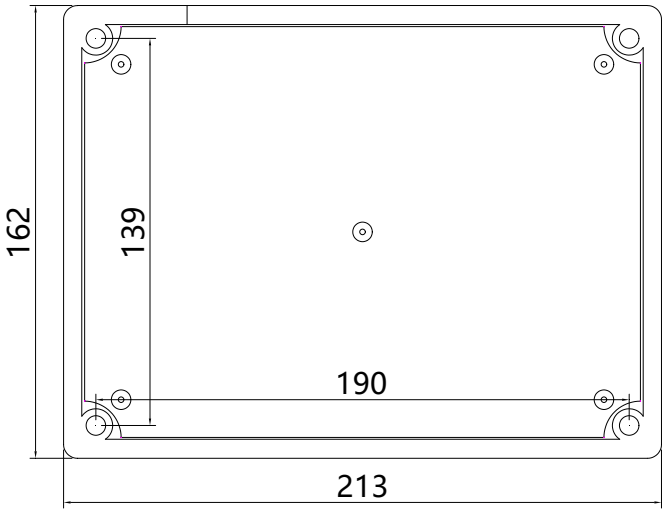
◆ FM7000 1-phase 2-wire Typical Wiring Diagram



Installation instruction

◆FM7000 The controller is fixed by four screws;

◆ Please do not over tighten the screws, the size is fixed by four screws.



Note: If the controller is installed directly in the genset shell or other fluctuated equipment, the rubber pad must be installed.

◆Battery Voltage Input

FM7000 controller is suitable for 8-36V DC battery voltage. Battery negative must be reliably connected to the enclosure of the engine. The controller power supply B+ and B- must be connected to battery positive and negative, and the wire size must not be less than 2.5mm^2.

NOTE:

In case of floating charger connect charger output to battery positive and negative directly, then, connect battery positive and negative poles to controller positive and negative power supply.

◆Output and relay expansion

Note: All outputs of the controller are relay contacts. The maximum current capacity is described in the "Parameters" in this manual. Please use it in the relay current capacity. If an extended relay is needed, add a continuous current diode (when the extended relay coil is DC) or a resistance-capacitance loop (when the extended relay coil is AC) to both ends of the coil to prevent interference with the controller or other equipment.

◆ AC current input

Current transformer with rated secondary current 5A must be externally connected to the controller current input.


WARNING: When generator is on-load, C. T. secondary must not be open circuit, Otherwise, the high voltage generated will pose a danger to personal safety.

◆Withstanding voltage test


If withstanding voltage test is conducted after the controller has already been installed onto the control panel, please unplug all controller terminal connections in order to prevent high voltage from damaging it.

Fault finding

Controller no response with power	Check DC voltage. Check DC fuse. Check if the terminal 1 and 2 is with battery voltage.
Genset shutdown	Check the water/cylinder temperature is too high or not. Check the genset AC voltage. Check DC fuse.
Genset Emergency Stop	Check the emergency stop button. Check that the voltage of the controller's 3 feet to the ground should be the battery voltage. Check the controller connection.
Low oil pressure alarm	Check oil pressure sensor and its wiring. Check the oil pressure sensor type and controller settings must be consistent. Check whether the low oil pressure sensor is normal.
High temperature alarm	Check temperature sensor and its wiring. Check the temperature sensor type and controller settings must be consistent. Check whether the temperature sensor is normal.
Shutdown Alarm in running	Check related switch and its connections according to the information on LCD. Check programmable inputs.
Fail to start	Check fuel return circuit and wiring. Check start battery. Consult engine manual.
Starter motor does not respond	Check the wiring to the starter. Check start battery.
Unit operation but ATS does not switch	Check the ATS. Check the cable between the controller and the ATS.
USB communication is abnormal	Check the USB connection. Check whether the USB port of the computer is normal. Check whether the USB driver is installed.
RS485 cannot communicate normally	Check the connection. Check if the communication ID number setting is correct. Check if the A and B lines of RS485 are reversed. Check if the RS485 communication line driver is installed or not. Check if the communication port of the PC is damaged. Add a 120 Ω resistor between the AB of the controller RS485.