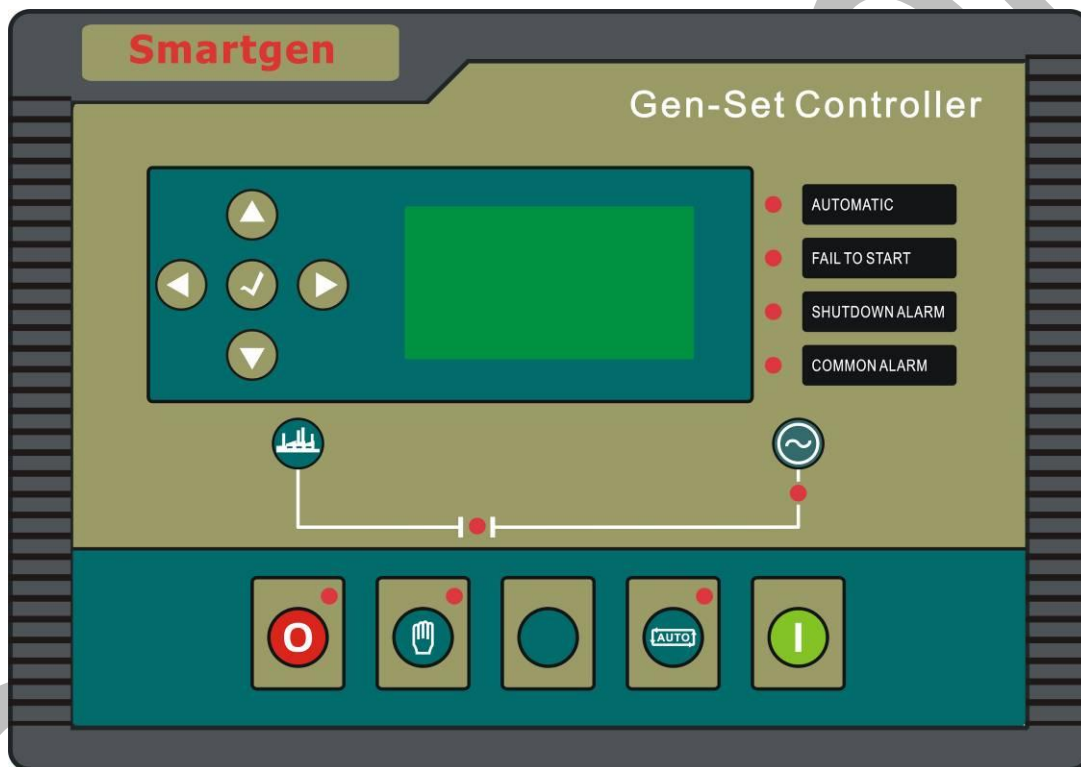


# Smartgen<sup>®</sup>

## HGM6510 Genset Parallel Unit

### USER MANUAL



Smartgen Technology



众智电子 Chinese trademark

**Smartgen**<sup>®</sup> English trademark

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#### Version history

Date	Version	Contents
2010-01-01	1.1	Original release
2010-05-10	1.2	Panel dimensions changed; Terminal numbers in wiring diagram changed.
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2012-01-09	1.5	1.Input and output functions description and debugging procedures added; 2.Back panel diagram updated; <b>3.HGM6500 Synchronization Plan List</b> and display contents added.
2012-08-15	1.6	1.Monitoring mode input and power management mode description added; 2.Generator close input number of wiring diagram corrected.

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## 1 OVERVIEW

**HGM6510** controller is designed for manual/auto parallel systems of more than 20 generators with similar or different capacity or single gen-set constant power output and mains parallel. The controller allows automatic start/stop, data measurement, alarm protection as well as remote control, remote measurement and remote communication. It has LCD display, selectable Chinese/English interface, and it is reliable and easy to use.

The controller integrates GOV (Engine Speed Governor) and AVR (Automatic Voltage Regulator) control functions, automatic synchronization and load sharing; it can be used to parallel with other HGM6510 controller.

**HGM6510** controller can accurately monitor multiple running states of the gen-set. When genset abnormal condition occurs, it splits bus and shuts down the gen-set, simultaneously the fault condition appears on LCD.

**HGM6510** controller is based on 32-bit MPU, has SAE J1939 interface that can communicate with a number of EFI engines' ECU. Multiple parameters such as rotation speed, water temperature, oil temperature, oil pressure can be transmitted via this communication interface and displayed on LCD, so there is no need to install additional sensors and complicated wiring is avoided while electric parameters accuracy is ensured.

## 2 PERFORMANCE AND CHARACTERISTICS

- 2 application modes:
  - 1) parallel operation of multiple gen-sets;
  - 2) gen-set and mains parallel operation, gen-set as constant power output.
- One-core 32-bit microprocessor, LCD with backlight, optional languages interface, touch-button operation;
- Complete monitoring: practically all generator electric and non-electric parameters are monitored, as follows:

### **Generator electric parameters:**

3-phase phase voltage $U_a, U_b, U_c$	Unit: V
3-phase line voltage $U_{ab}, U_{bc}, U_{ca}$	Unit: V

3-phase current Ia, Ib, Ic	Unit: A
Frequency F1	Unit: Hz
Split phase active power PA, PB, PC	Unit: kW
Total phase active power P	Unit: Kw
Split phase reactive power RA, RB, RC	Unit: kvar
Total phase reactive power P	Unit: kvar
Split phase apparent power SA, SB, SC	Unit: kVA
Total phase apparent power S	Unit: KVA
Split phase power factor PF1, PF2, PF3	
Average power factor P	
Total active energy	Unit: kWh
Total reactive energy	Unit: kVarh
Total apparent energy	Unit: kVAh
3-phase voltage phase sequence and phase angle detection	
<b>Bus/mains electric parameters:</b>	
3-phase phase Voltage Ua, Ub, Uc	Unit: V
3-phase line Voltage Uab, Ubc, Uca	Unit: V
Frequency F1	Unit: Hz
3 phase voltage phase sequence and phase angle detection	
<b>Synchronization parameters:</b>	
Generator and bus/mains voltage difference detection	
Generator and bus/mains phase angle difference detection	
Generator and bus/mains frequency difference detection	
<b>Generator abnormal conditions:</b>	
Over Voltage	
Under Voltage	
Over Frequency	
Under Frequency	
Phase Loss	
Reverse phase sequence	
No power	

**Fault display and alarm:**

High temperature warning  
High temperature shutdown alarm  
Low oil pressure warning  
Low oil pressure shutdown alarm  
Over speed shutdown alarm  
Low fuel level warning  
Start battery over voltage warning  
Start battery under voltage warning  
Load over current shutdown  
Fail to start alarm  
Fail to stop alarm  
Emergency shutdown  
Close fault  
Open fault  
Oil pressure sensor open circuit alarm  
Reverse power  
Reverse phase sequence  
ECU communication failure

.....

- Multiple operation modes in auto state: on-load running, off load running, demand parallel running;
- Ramp on and ramp off function;
- Weekly and monthly start/stop; on-load (parallel operation) or off load commissioning;
- SAE J1939 interface for direct EFI engine monitoring;
- True RMS measurement for multiple abnormal electric quantity situations;
- Accurate measurement and display of engine electric parameters as well as water temperature, oil pressure, fuel level and others;
- Control and protection: automatic start/stop/parallel operation, synchronization detection, load sharing and alarm protection;

- Maintenance function, maintenance due warning or shutdown alarm;
- For the engines that do not support J1939: temperature, pressure and fuel level sensors also can be connected externally; multiple ready to use and user-defined sensor curves;
- Free adjustment of input port information that is displayed on LCD via PC software: Chinese/English support, 20 English letters or 10 Chinese characters maximum;
- Close to activate/open to activate configurable input port types; normally open/normally closed configurable output port types;
- All output ports are logic output;
- Real-time calendar, clock and total run counter;
- Possibility of repeated saving of 99 event logs, which can be inquired on the spot.
- Multi-level password protection to avoid misuse by non-qualified personnel;
- Gen-set operational parameters can be adjusted from front panel or via PC;
- Wide power supply range (8-35) VDC enables compatibility with different battery voltage environment;
- RS485/232C communication interface with MODBUS protocol for remote control, remote measurement, remote communication and remote adjustment of the gen-set;
- to realize “four remote” (remote controlling, remote measuring, remote communication and remote adjustment) of the controller;
- Modular design, anti-flaming ABS shell, plug-in terminals, compact structure, convenient panel mounting installation.

### 3 SPECIFICATION





Parameter	Details
Working Voltage	DC8. 0V to 35. 0V, uninterruptible power supply
Overall Consumption	<3W (Standby mode: ≤2W)
Alternator Voltage Input:	
3 Phase 4 Wire	15V AC - 360 V AC (ph-N)
3 Phase 3 Wire	30V AC - 600 V AC (ph-ph)
Single Phase 2 Wire	15V AC - 360 V AC (ph-N)
2 Phase 3 Wire	15V AC - 360 V AC (ph-N)
True RMS Accuracy	1%
Alternator Frequency	50Hz/60Hz
Speed Sensor Voltage	1. 0 V to 24 V (RMS)











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Parameter	Details
Speed Sensor Frequency	Maximum 10,000 Hz
Start Relay Output	16 Amp DC28V power supply output
Fuel Relay Output	16 Amp DC28V power supply output
Configurable Relay Output 1	16 Amp DC28V power supply output
Configurable Relay Output 2	16 Amp DC28V power supply output
Configurable Relay Output 3	16 Amp DC28V power supply output
Configurable Relay Output 4	16 Amp 250VAC passive output
Configurable Relay Output 5	16 Amp 250VAC passive output
Case Dimensions	260mm x 182mm x 57mm
Panel Cutout	214mm x 160mm
CT Secondary Current	Rated 5A
Working Conditions	Temperature: (-25~+70)°C Humidity: (20~93)% without condensation
Storage Conditions	Temperature:(-30~+80)°C
Protection Level	IP55: when waterproof rubber gasket installed between the controller and panel fascia. IP42: when waterproof rubber gasket is not installed between the controller and panel fascia.
Insulation Intensity	Object: input/output/power supply Quote standard: IEC688-1992 Test method: AC1.5kV/1min Leakage current 3mA
Weight	0.90kg

#### 4 PUSHBUTTONS

	Stop/Reset	When the genset is running, pressing this button will ramp off and stop running the generator; In case of alarm condition, pressing the buttons will reset alarm; In stop mode, pressing and holding for 3 seconds will test panel light indicators (light test); During shutdown process, pressing this button again will lead to quick shutdown.
	Start	In manual mode pressing this button will start the gen-set (The button has effect in manual mode only)
	Manual	Places the gen-set into its manual mode.
		Reserved

	Auto	Places the gen-set into its <b>auto</b> mode.
	Close Generator	In manual state, when bus bar has voltage, pressing the button will synchronize generator with bus and, after that, close generator onto bus; when bus bar has no voltage, pressing the key will close generator breaker immediately.
	Open generator	In manual state, when start mode is enabled, pressing the button will transfer load to other generators and then open breaker; when start mode is not in force, pressing the button will open the switch immediately.
	Up	Scrolls the screen up; in settings menu moves cursor up and increases the set value.
	Down	Scrolls the screen down; in settings menu moves cursor down and decreases the set value.
	Left	Scrolls the screen left; in settings menu moves cursor left.
	Right	Scrolls the screen right; in settings menu moves cursor right.
	Confirm	In settings menu confirms the set value.

## 5 OPERATION

### 5.1 AUTOMATIC OPERATION (MULTIPLE SETS)

Auto mode is activated by pressing  button; a LED indicator next to the button will illuminate to confirm that the gen-set is placed into auto start mode.

#### Automatic Starting Sequence

Using PC testing software, set one of the 9 configurable inputs as “Remote Start On-load (on demand)”. When the input activates, every gen-set will be started according to the pre-set priority procedure, synchronize, enter parallel operation and automatically start sharing load with other units on the bus.

1. When “Remote Start” is active, “Start Delay” starts;

2. "Start Delay" countdown is displayed on LCD;
3. When start delay is over, preheat relay energizes (if configured), "preheat start delay XX s" message is shown on LCD;
4. When preheat delay is over, fuel relay is energized for 1s (for EFI engines the start signal is sent via ECU); start relay activates; if engine fails to fire during pre-set crank time, fuel relay and start relay deactivate and "crank rest time" begins before the next crank attempt.

**NOTE:** If CANBUS is set as active in the controller settings, then engine ECU will receive the start signal from CANBUS.

5. If engine fails to fire after a pre-set number of attempts, the first line of LCD display will be highlighted with black and "Fail to Start" alarm message will be displayed;
6. In case of successful crank attempt, "safety on timer" starts. During this period, low oil pressure, high temperature, under speed, charge failure alarms are disabled. As soon as this delay is over, "start idle delay" is initiated (if configured).

**NOTE:** If CANBUS is set as active in the controller settings, then engine speed can be received directly from ECU.



7. During "start idle delay", under speed, under frequency, under voltage alarms are inhibited. When this delay is over, "warming up delay" starts (if configured).
8. When "warming up delay" is over, if generator state is normal, its indicator will be illuminated. If voltage and frequency has reached on-load requirements, the closing relay will be energized, generator will accept load, generator power indicator will turn on, and generator will enter Normal Running state; if voltage and frequency are not normal, the controller will initiate alarm shutdown (alarm type will be displayed on LCD alarm page).
9. In case of running in parallel, after warming up delay is over:
  - a) If bus has no voltage, then the controller will send a closing signal to other parallel gen-sets, closing relay output will activate to prevent other generators from closing at the same time.
  - b) If bus bar has voltage or other gen-sets are already closed, the controller will adjust

speed and voltage through GOV and AVR to synchronize gen-sets with bus; when synchronism has been achieved, breaker close signal will be initiated and the gen-set will be connected to the bus. Once they are connected, the controller will gradually accelerate and share load with other parallel gen-sets.

### Stopping Sequence,

- 1) As soon as “Remote Start” deactivates, Stop Delay begins.
- 2) When “Stop delay” is over, the controller will gradually transfer load to other generators, open breaker, and “Cooling Delay” will begin. During cooling delay, if “Remote Start” signal becomes active again, the controller will enter parallel state again. When “Cooling Delay” is over, “Stop Idle Delay” starts;
- 3) During “Stop Idle Delay” (if it is configured), idle relay is energized. If CANBUS is enabled in the controller settings, stop function can be carried out directly through CANBUS;
- 4) “ETS delay” begins, ETS relay is energized while fuel relay is de-energized.
- 5) "Waiting for Complete Stop" begins, complete stop is detected automatically.
- 6) After complete stop generator is placed into its standby mode. Otherwise, fail to stop alarm is initiated and the corresponding fail to stop alarm message is shown on LCD.




## 5.2 MANUAL OPERATION (MULTIPLE SETS)

1. To activate manual mode press  button and an LED indicator next to it will illuminate; then press  button to start the gen-set;
2. When start delay is over, preheat relay is energized (if configured), “preheat start delay XX s” message is shown on LCD;
3. When preheat delay is over, fuel relay is energised for 1s (for EFI engines the start signal is sent via ECU); start relay activates; if the engine fails to fire during pre-set crank time, fuel relay and start relay deactivate and “crank rest time” begins before the next crank attempt.

**NOTE:** If CANBUS is set as active in the controller settings, then engine ECU will receive the start signal from CANBUS.

4. If engine fails to fire after a pre-set number of attempts, the first line of LCD display will be highlighted with black and “Fail to Start” alarm message will be displayed;
5. In case of successful crank attempt, “safety on timer” starts. During this period, low oil pressure, high temperature, under speed, charge failure alarms are disabled. As soon as this delay is over, “start idle delay” is initiated (if configured).

**NOTE:** If CANBUS is set as active in the controller settings, then engine speed can be received from ECU directly.

6. During “start idle delay”, under speed, under frequency, under voltage alarms are inhibited. When this delay is over, “warming up delay” starts (if configured).
7. After “Warming up Delay” is over, the gen-set waits for taking load;
8. Press  button, during single unit operation when “Warming up Delay” is over, if generator state is normal, the generator state indicator will be illuminated; if voltage and frequency reach on-load demands, generator power supply indicator illuminates and normal running state begins; if voltage or frequency values are not normal, the controller initiates alarm shutdown (corresponding alarm message will be displayed on LCD).
9. Press  button, during parallel operation, when “Warming up Delay” is over
  - a. If bus has no voltage, then the controller will send a closing signal to other gen-sets which are prepare for parallel, and closing relay output will activate to prevent other generators from closing at the same time.
  - b. If bus bar has voltage or other gen-sets are already closed, the controller will adjust speed and voltage through GOV and AVR to synchronize gen-sets with bus; When synchronism has been achieved, breaker close signal will be initiated and the gen-set will be connected to the bus. Once they are connected, the controller will gradually accelerate and share load with other parallel gen-sets.
10. If during parallel operation open  button is pressed, the controller will first transfer load to other generators, and only then send an opening signal.

## 6 PROTECTIONS

When an alarm occurs, common alarm indicator (if configured) will flash and alarm message will be displayed on LCD.

### 6.1 WARNING ALARMS

Warnings are not shutdown alarms and do not affect the operation of the gen-set. Warning does not lead to shutdown, and after warning condition is no longer present, warning alarm will be cleared automatically. Warning alarms types are as follows:

No	Type	Active range	Description
1	Genset Current Over	Always active	When the controller detects that gen-set current has exceeded the pre-set value, it sends a warning alarm signal and a warning message is displayed on LCD.
2	Fail To Stop	When after stop delay is over	When after stop delay is over, if gen-set output power or oil pressure are not equal to 0, the generator will initiate warning alarm and warning alarm message will be displayed on LCD.
3	Low Fuel Level	Always active	When the controller detects that fuel level has fallen below the pre-set value, it sends a warning alarm signal and a warning message is displayed on LCD.
4	Charge Fail	From start idle to stop idle	When the controller detects that charger voltage has fallen below the pre-set value, it sends a warning alarm signal and a warning message is displayed on LCD.
5	Loss Of Speed	From crank disconnect to stop idle	When the controller detects that the engine speed is zero, it sends a warning alarm signal and a warning message is displayed on LCD.
6	Battery Under Volt	Always active	When the controller detects that start battery voltage has fallen below the pre-set value, it sends a warning alarm signal and a warning message is displayed on LCD.
7	Battery Over Volt	Always active	When the controller detects that start battery voltage has exceeded the pre-set value, it sends a warning alarm signal and a warning message is displayed on LCD.

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No	Type	Active range	Description
8	Gen open fail	Always active	When breaker open delay is over, but the controller has not detected breaker open signal, it will initiate a warning alarm signal and a warning message will be displayed on LCD.
9	Auxiliary Input 1-9	User defined	When controller detected auxiliary input 1-9 warning signal, it will initiate a warning alarm signal and a warning message will be displayed on LCD.
10	Maintenance Due	Always active	When engine total run time exceeds the pre-set maintenance value or after a pre-set date comes, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD. *1
11	Fail to sync time	When synchronization is enabled	When within the pre-set synchronization time, the controller does not detect synchronization signal within setting time, it will initiate a warning alarm signal and a warning message will be displayed on LCD.
12	Genset Reverse Phase	When generator is normal	When the controller detects that generator phase is not correct (correct phase is L1 L2 L3), it will initiate a warning alarm signal and a warning message will be displayed on LCD.
13	Bus Reverse Phase	When mains are normal	When the controller detects that mains phase is not correct (correct phase is L1 L2 L3), it will initiate a warning alarm signal and a warning message will be displayed on LCD.
14	MSC Data Error	Always active	When the controller detects MSC data error, it will initiate a warning alarm signal and a warning message will be displayed on LCD.
15	MSC Too Few Sets	Always active	If the number of parallel generators is less than the pre-set minimum, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.*2

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No	Type	Active range	Description
16	ECU Warn	Always active	If an error message from ECU is received via CANBUS, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.
17	Negative Phase Sequen.	After generator is closed	When the controller detects that load current unbalance has exceeded the pre-set value, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.
18	High Temperature	From start idle to stop idle	When the controller detects that engine temperature has exceeded the pre-set value, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.
19	Low Temperature	Always active	When the controller detects that engine temperature has fallen below the pre-set value, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.
20	Low Oil Pressure	From start idle to stop idle	When the controller detects that engine oil pressure has fallen below the pre-set value, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.
21	Over Speed	Always active	When the controller detects that engine speed has exceeded the pre-set value, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.
22	Under Speed	Waiting for load → cooling down	When the controller detects that engine speed has fallen below the pre-set value, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.
23	Genset High Frequency	Always active	When the controller detects that generator frequency has exceeded the pre-set value, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.



No	Type	Active range	Description
24	Genset Frequency Low	Waiting for load → cooling down	When the controller detects that generator frequency has fallen below the pre-set value, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.
25	Genset Voltage Over	Always active	When the controller detects generator voltage has exceeded the pre-set value, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.
26	Genset Voltage Under	Waiting for load → cooling down	When the controller detects that generator voltage has fallen below the pre-set value, the controller will initiate a warning alarm signal and a warning message will be displayed on LCD.
27	Loss of Excitation	During parallel operation	When the controller detects that gen-set reactive power has exceeded the pre-set value, it initiates a warning alarm signal and a warning message is displayed on LCD.

### Notes

\*1: When maintenance time is due, set one of the input ports as “Reset Maintenance Alarm”, then the alarm will be cleared by sending an active grounding impulse.

\*2: There are 2 possible reasons:

- Communication line between the controllers disconnects, which interrupts communication.
- Other parallel gen-sets controllers have not been powered on.

## 6.2 SHUTDOWN ALARMS

Shutdown alarm will not disappear until they are reset manually. As soon as shutdown alarm is initiated, the gen-set will be shut down.

No	Type	Range	Description
1	Emergency Stop	Always active	When the controller detects an emergency shutdown alarm signal, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.

HGM6510 GENSET PARALLEL UNIT

No	Type	Range	Description
2	High Temperature	From start idle to stop idle	When the controller detects that water/cylinder temperature has exceeded the pre-set high temperature shutdown value, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
3	Low Oil Pressure	From start idle to stop idle	When the controller detects that oil pressure has fallen below the pre-set low OP shutdown value, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
4	Over Speed	Always active	When the controller detects that the generator speed has exceeded the pre-set overspeed shutdown value, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
5	Under Speed	Waiting for load → cooling down	When the controller detects generator speed has fallen below the pre-set underspeed shutdown value, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
6	Loss of Speed	From crank disconnect to stop idle	When the controller detects that gen-set speed is equal to zero, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
7	Genset Frequency High	Always active	When the controller detects that generator frequency has exceeded the pre-set generator frequency shutdown value, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
8	Genset Frequency Low	Waiting for load → cooling down	When the controller detects that generator frequency has fallen below the pre-set frequency shutdown value, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
9	Genset Voltage Over	Always active	When the controller detects that generator voltage has exceeded the pre-set voltage shutdown value, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.

## HGM6510 GENSET PARALLEL UNIT

No	Type	Range	Description
10	Genset Voltage Under	Waiting for load → cooling down	When the controller detects that generator voltage has fallen below the pre-set voltage shutdown value, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
11	Genset Current Over	Always active	When the controller detects that generator current has exceeded the pre-set current shutdown value, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
12	Fail To Start	If the engine failed to fire after the pre-set number of attempts	When the engine has failed to fire after the pre-set number of attempts, the controller will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
13	Pressure Sensor Open	Always active	When the controller detects oil pressure sensor open circuit, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
14	Auxiliary Input 1-9	User-defined	When the controller detects aux. input ports shutdown alarm signal, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
15	CANBUS Error	When CANBUS is set as active in controller settings and after engine is started.	When the controller detects no signal from engine ECU, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
16	Negative Phase Sequen.	After generator is closed	When the controller detects that load current unbalance value has exceeded the threshold, it will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.
17	ECU Warn	When CANBUS is set as active in controller settings and after engine is started.	If alarm shutdown signal is received from ECU through CANBUS, the controller will initiate alarm shutdown, and alarm shutdown message will be displayed on LCD.

### 6.3 TRIP SHUTDOWN ALARMS

When the controller detects electrical trip signal, it immediately disconnects generator breaker closing relay, which leads to unloading and then generator is cooling down and stopped.

No	Type	Range	Description
1	Genset Current Over	Always active	When the controller detects that generator current has exceeded the pre-set value, it initiates trip alarm signal and trip shutdown alarm message appears on LCD.*1
2	Genset Reverse Power	During parallel operation	When the controller detects has exceeded the pre-set value, it initiates trip alarm signal and trip shutdown alarm message appears on LCD.
3	Loss Of Excitation	During synchronization	When the controller detects that negative reactive power has exceeded the pre-set value, it initiates trip alarm signal and trip shutdown alarm message appears on LCD.
4	Negative Phase Sequence	After generator breaker is closed	When the controller detects that load current unbalance value has exceeded the pre-set value, it initiates trip alarm signal and trip shutdown alarm message appears on LCD.
5	Auxiliary Input 1-9	User-defined	When the controller detects aux. input ports 1-9 trip shutdown alarm, it initiates trip alarm signal and trip shutdown alarm message appears on LCD.
6	MSC Error	When parallel operation is enabled	When the controller cannot detect MSC (multiset communication link), it initiates trip alarm signal and trip shutdown alarm message appears on LCD.
7	MSC Too Few Sets	Always active	If the number of parallel generators is less than the pre-set number, the controller initiates trip alarm signal and trip shutdown alarm message appears on LCD.

**Note \*1:** E.g. if over current value is set as 110% with 1 hour delay and action is trip shutdown, then when load current exceeds 110% if within one hour current value does not fall below 110%, then load will be disconnected and the gen-set will be cooled down and stopped. Even higher current can lead to switch opening after a short time, for instance, when full-load current is RMS\*2, then switch will be opened after 36 seconds,

and cooling down and shutdown will follow.

## 7 PANEL CONFIGURATION

### 7.1 LCD DISPLAY

#### 7.1.1 STATUS DISPLAY

<b>STATUS</b> 1-1	First Status Screen
<b>STOP MODE</b>	Controller Modes: STOP/MANUAL/AUTO Mode
<b>GENSET AT REST</b>	Genset Working Status
<b>GENSET OPEN</b>	Generator Switch State Indicator
<b>STATUS</b> 1-2	Second Status Screen
UL-N 0 V 0.0 A	Generator Average Phase Voltage/Current
UL-L 0V 0.00Hz	Generator Average Line Voltage/Frequency
Pf = 0.00L 0.0 kW	Generator Average Power Factor, Total Active Power
<b>STATUS</b> 1-3	Third State Screen
F S E123456789	F: fuel output, S: start input, E: emergency shutdown, 1~9 auxiliary input port, 1~5 output ports
<b>INPUT</b>	Input state: close/open
<b>OUTPUT</b>	Output state: close/open
<b>STATUS</b> 1-4	Forth State Screen
MSC Total 3	Total number of modules
MSC ID 012	Module ID
Priority 012	Module priority

#### 7.1.2 ENGINE DISPLAY

<b>ENGINE</b> 2-1	First Engine Screen
<b>SPEED</b> 0 RPM	Engine Speed
<b>BATTERY</b> 0.0 V	Generator Start Battery Voltage
<b>CHARGE D+</b> 0.0 V	AC Charger D+ Voltage
<b>ENGINE</b> 2-2	Second Engine Screen
<b>OIL PRESSURE</b>	Engine Oil Pressure
0 kPa	
0.0 Bar	
0 Psi	
<b>ENGINE</b> 2-3	Third Engine Display

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FUEL LEVEL 0 % TEMPERATURE 0 °C 0 °F	Fuel Level Engine Temperature
ENGINE 2-4	Fourth Engine Screen
STARTS 00000 num	Total Number of Starts
HOURS RUN 00000:00:00	Total Run Time: Hours:Minutes:Seconds
MAINTENANCE 00000h	Time till the next engine maintenance.

**7.1.3 GENERATOR DISPLAY**

GENERATOR 3-1	First Generator Screen
UL-L 0 0 0 V	Generator 3-phase Phase Voltage L1-N L2-N L3-N
UL-N 0 0 0 V	Generator 3-phase Line Voltage L1-L2 L2-L3 L3-L1
F = 0.00Hz 0 RPM	Generator Frequency, Engine Speed
GENERATOR 3-2	Second Generator Screen
IL 0.0 0.0 0.0 A	3-phase Current L1 L2 L3
Pf 0.00 0.00 0.00	3-phase Power Factor L1 L2 L3
APF 0.00L I0 0.0 A	Generator Frequency Power Factor, Generator Phase Loss Current
GENERATOR 3-3	Third Generator Screen
kW 0.0 0.0 0.0	3-phase separate phase Active Power L1 L2 L3
TkW 0.0 Ramp 0.0	Generator Total Active Power, Pre-set Active Power Percentage
kW% 0.0 Tgt% 0.0	Active Power Output Percentage, Target Active Power Percentage
GENERATOR 3-4	Fourth Generator Screen
kVar 0.0 0.0 0.0	3-phase Reactive Power L1 L2 L3
TkVar 0.0 Ramp 0.0	Total Reactive Power, Pre-Set Reactive Power Percentage
kVar% 0.0 Tgt% 0.0	Reactive Power Output Percentage, Target Reactive Power Percentage
GENERATOR 3-5	Fifth Generator Screen
kVA 0.0 0.0 0.0	3-phase apparent power L1 L2 L3
TkVA 0.0	Total apparent power
GOV% 0.0 AVR% 0.0	Speed Governing Voltage Output Percentage, Voltage

HGM6510 GENSET PARALLEL UNIT

	regulation Output Percentage
<b>GENERATOR 3-6</b>	Sixth Generator Screen
kWh 0000000.0	Total Active Electric Power
kVAh 0000000.0	Total Apparent Electric Power
kVarh 0000000.0	Total Reactive Electric Power
<b>GENERATOR 3-7</b>	Seventh Generator Screen
<b>PHASE-SEQUENCE: LN1-LN2-LN3 000-120-240°</b>	Generator Phase-Sequence

**7.1.4 BUS DISPLAY**

<b>BUS 4-1</b>	First Bus Screen
UL-L 0 0 0 V	Bus 3-phase Phase Voltage L1-N L2-N L3-N
UL-N 0 0 0 V	Bus 3-phase Line Voltage L1-L2 L2-L3 L3-L1
F = 0.00Hz	Bus Frequency
<b>BUS 4-2</b>	Second Bus Display
<b>PHASE SEQUENCE: LN1-LN2-LN3 000-120-240°</b>	Bus Phase-Sequence

**7.1.5 SYNCHRONIZATION DISPLAY**

Remarks: “√” means the error value meet standard. “X” means failing standard.

<b>SYN SCOP 5-1</b>	First Screen Display
VOLT DIFF +0.1 V √	Voltage Difference Between generator and mains
FREQ DIFF +0.01 Hz √	Frequency Difference Between generator and mains
PHASE DIFF +0.1° √	Phase Difference Between generator and mains

**7.1.6 ALARM DISPLAY**

<b>ALARMS 6-1</b>	First Alarm Screen
ALARMS:(01/02)	Total Number of Alarms
SHUTDOWN ALARM	Alarm Type: Warning/Shutdown/Trip
OP SENSOR OPEN	Alarm Description
<b>ALARMS 6-2</b>	Second Alarm Screen
ALARMS:(02/02)	Total Number of Alarms
SHUTDOWN ALARM	Alarm Type: Warning/Shutdown/Trip
GENERATOR FAIL TO CLOSE	Alarm Description








**7.1.7 EVENT LOG**









EVENTS 7-1	First Event Log Screen
RECORDS: (01/02)	Total Number of Records
OVER CURRENT TRIP	Error Type
2010-12-18 21:31:55	Record Time
EVENTS 7-2	Second Event Log Screen
RECORDS: (02/02)	Total Number of Records
GENERATOR	Error Type
FAIL TO CLOSE	Record Time
2010-12-18 08:11:07	

**7.1.8 "ABOUT" DISPLAY**


ABOUT 8-1	First About Screen
MODEL: HGM6510	Model NO.
SOFTWARE:V4.0.2	Module Software Version
11-03-08 (2) 03:11:32	Real-time Clock
ABOUT 8-2	Second About Screen
HARDWARE: V1.3	Module Hardware Version
CPU TEMP:37°C/98°F	
ISSUE DATE: 2011-06-24	

**7.2 PARAMETER CONFIGURATION**

Press and hold  and then press  to enter parameter settings password screen. Use  and  to increase/decrease digit value 1~9 and  or  to move cursor left or right; after you have input the fourth digit press  to verify the password. If the password is correct, you will be able to enter parameter settings menu; otherwise you will exit to the previous screen. (Factory default password is 1234 and it can be changed by users)

Press  or  to scroll parameters up or down. When the needed parameter is displayed, press  to enter settings. When the first digit is highlighted with black, press  or  to increase or decrease the value, and press  or  to move the cursor right or left. Finally, press  to confirm this setting after the user setting the last digit.



During parameter configuration, pressing  will exit this menu directly and return to the main screen.

**Parameters list:**

No.	Parameter	Range	Default	Notes
01	Oil Pressure Warn	(1-999)kPa	124kPa/18.0PSI	Return value: 138kPa/20.0PSI
02	Oil Pressure Stop	(0-997)kPa	103kPa/14.9PSI	Setting standard: shutdown value<warning value<return value
03	Engine Temp Warn	(81-139)°C	90°C/194°F	Return value: 88°C/190°F
04	Engine Temp Stop	(82-140)°C	95°C/203°F	Setting standard: shutdown value>warning value>return value
05	Fuel Level Warn	(0-100)%	10%	Analogue value
06	Start Delay	(0-9999)s	5s	Timer
07	Preheat Delay	(0-300)s	0s	Timer
08	Cranking Time	(3-60)s	8s	Timer
09	Crank Rest Time	(3-60)s	10s	Timer
10	Safety On Time	(1-60)s	10s	Timer
11	Over Speed Delay	(0-10)s	2s	Timer
12	Start idle Time	(0-3600)s	10s	Timer
13	Warming Up Time	(0-3600)s	30s	Timer
14	Stop Delay	(0-9999)s	30s	Timer
15	Cooling Time	(0-3600)s	60s	Timer
16	Stop Idle Time	(0-3600)s	10s	Timer
17	ETS Solenoid Hold	(0-120)s	2s	Timer
18	Fail to Stop Delay	(10-120)s	30s	Timer
19	Gen. Transient	(0-30)s	5s	Timer
20	Batt Low Delay	(0-9999)s	60s	Timer
21	Batt Over Delay	(0-9999)s	60s	Timer
22	Reverse Power Time	(0-300)s	10s	Timer

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No.	Parameter	Range	Default	Notes
23	Generator Under (Warn)	(50-1300)V	196V	On-load value: 207V Setting standard: Shutdown value<warning value<on-load value.
24	Generator Under (Stop)	(50-1300 )V	184V	Generator under Voltage shutdown
25	Generator Over (Warn)	(50-1300)V	265V	Return value: 253V
26	Generator Over (Stop)	(50-1300)V	273V	Setting standard: shutdown value>warning value>return value
27	Generator Under Frequency (Warn)	(0.1-74.9)Hz	42.0Hz	On-load value: 45.0Hz Setting standard: Shutdown value<warning value<on-load value.
28	Generator Under Frequency (Stop)	(0-74.8)Hz	40.0Hz	Generator Under Frequency shutdown
29	Generator Over Frequency (Warn)	(0.1-74.9)Hz	55.0Hz	Return value: 52.0Hz
30	Generator Over Frequency (Stop)	(0.2-75)Hz	57.0Hz	Setting standard: Shutdown value>warning value>return value
31	Over Current	(50-120)%	100%	Analogue Value
32	Flywheel Teeth	(10-500)	118	Used for judging crank disconnect condition and detecting engine speed.
33	Under Speed (Warn)	(1-5999)RPM	1350RPM	On-load value: 1380RPM Setting standard: Shutdown value<warning value<on-load value.
34	Under Speed (Stop)	(0-5998)RPM	1270RPM	Under speed shutdown
35	Over Speed (Warn)	(1-5999)RPM	1650RPM	Return value: 1620RPM
36	Over Speed (Stop)	(2-6000)RPM	1710RPM	Setting standard: Shutdown value>warning value>return value
37	Over Speed Shoot	(0-10)%	10	Analogue Value
38	Battery Under Volt (Warn)	(0-39.9)V	8.0V	Return Value: 9.0V
39	Battery Over Volt	(0.1-40)V	33.0V	Return Value: 32 V

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No.	Parameter	Range	Default	Notes
	(Warn)			
40	Charge Fail Volt (Warn)	(0-39)V	6.0V	Analogue Value
41	Language Select	(0-2)	0	0:Chinese; 1:English 2: Espanol
42	Change Password	(0-9999)	1234	Numerical Value
43	Module Priority	(0-19)	0	The smaller the number, the higher the priority.
44	Module Addr. (RS485)	(1-254)	1	RS485 communication address
45	Generator CT	5-6000:5A	500A	Load Current: 500A
46	Full kw Load	(0-6000)	345	Unit: kW
47	Full kVar Load	(0-6000)	258	Unit: kVar
48	Load Ramp	(0-100)%	3%	Load/unload speed (%/s)
49	Load Per for Start	(0-100)%	80%	Regulates other gen-sets start load percentage.
50	Load Per for Stop	(0-99)%	50%	Regulates other gen-sets stop load percentage.
51	Sync Upper Freq.	(0-2)Hz	0.2Hz	Frequency difference between the generator and the bus. If is lower than positive and higher than negative, then it is considered synchronous.
52	Sync Lower Freq	(0-2)Hz	0.1Hz	
53	Sync Voltage	(0-30)V	3V	Voltage difference between generator and bus.
54	Synch Phase Angle	(0-20)°	10°	Phase difference between generator and bus.
55	Fail to Sync Time	(5-300)s	60s	If after synchronization is initiated, the gen-set fails to synchronize after the delay, Fail to Synchronize alarm will be initiated.
56	MSC Baud Rate	(0-2)	0	Baud rate of MSC 0:330K 1:250K 2:125K

**Other parameters configuration (can only be configured via PC software)**

Parameter	Default Value
Module Addr.	1
Alternator Selection	Yes
Generator Poles Number	4
Magnetic Pickup	Yes
Quick On-load Mode	No
Start Times	3
Voltage Transformer	No
Fuel Pump Control	No
Input 1	Remote start on-load (on demand), close to activate
Input 2	Low oil pressure alarm, close to activate, active period: after safety on delay.
Input 3	High temperature alarm, close to activate, active period: after safety on delay.
Input 4	Close generator auxiliary input, close to activate
Input 5	Indication, close to activate
Input 6	Working mode selection, close to activate
Input 7	Indication, close to activate
Input 8	Indication, close to activate
Input 9	Indication, close to activate
Output 1	Generator Voltage normal
Output 2	Common alarm
Output 3	Idle/high-speed control
Output 4	Generator close impulse output
Output 5	Generator open impulse output
Generator Rated Freq.	50.0Hz
Generator Rated Volt.	230V
LED1	System in <b>AUTO</b> mode
LED2	Fail to start alarm
LED3	Common shutdown alarm
LED4	Common alarm
Delay Overload Current	100%(500A)
Time multiplier	36
Over Current Action	Trip shutdown
Starter disengagement Generator Frequency	15Hz
Starter disengagement Engine speed	450RPM
Starter disengagement Oil Pressure	Not used

Detect Oil Pressure During Cranking	No
Scheduled Start/Stop	No
MSC ID	0
GOV Settings	0V
AVR Settings	0V
Synch Frequency PID Settings	Configured via HGM6500 PC software.
Synch Voltage PID Settings	
Active Power PID Settings	
Reactive Power PID Settings	

### 7.3 DATE/TIME SETTING

Press  and  simultaneously to enter date and time setting. The first digit of the fourth row will be highlighted with black. Press  or  to increase/decrease the value of selected digit and press  or  to move cursor left or right; after altering the last digit, press  to confirm, press  save changes and exit. Press  without press  to exit directly without saving.

Date and time order: Year-Month-Date (Week) Hour-Minute-Second

**NOTE:** Parameters and the date/time must be configured in **STOP** mode only.

### 7.4 DATA DISPLAY

#### 7.4.1 BASIC DISPLAY

Speed  
Oil Pressure  
Coolant Temperature  
Fuel Level  
Battery/Charger Voltage  
Total Run Time/Start Times  
Remaining Maintenance Time  
Generator Phase Voltage (L1-N, L2-N, L3-N)  
Generator Line Voltage (L1-L2, L2-L3, L3-L1)

Generator Frequency  
 Load/Generator Current (L1, L2, L3)  
 Generator Split Phase Active Power (L1, L2, L3)  
 Generator Total Active Power  
 Each Phase Power Factor (L1, L2, L3)  
 Average Power Factor  
 Generator Each Phase Reactive Power (L1, L2, L3)  
 Generator 3-phase Total Reactive Power  
 Generator Total Active/Reactive/Apparent electric energy  
 Generator Phase Sequence  
 Bus Phase Voltage (L1-N, L2-N, L3-N)  
 Bus Line Voltage (L1-L2, L2-L3, L3-L1)  
 Bus Frequency  
 Bus Phase Sequence

#### 7.4.2 ECU DISPLAY

Oil Temperature  
 Coolant Pressure  
 Inlet Temperature  
 Exhaust Temperature  
 Turbocharger Temperature  
 Fuel Pressure  
 Fuel Consumption  
 Total Fuel Consumption

## 8 INPUT AND OUTPUT PORTS CONFIGURATION

### 8.1 CONFIGURABLE INPUT PORTS 1-9

No	Type	Description
0	User configured	<p>The input is configured to perform one of the following functions:</p> <p><b>Indication:</b> display only, no warning or shutdown</p> <p><b>Warning:</b> warning only, no shutdown</p> <p><b>Shutdown:</b> alarm and immediate shutdown</p> <p><b>Electrical Trip:</b> alarm, unloading generator, cooling down and shutdown</p> <p><b>Never active:</b> Input is not active</p> <p><b>Always active:</b> always detecting</p> <p><b>Active from cranking:</b> detecting from the start of cranking.</p>

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		<b>Active after safety on:</b> input activates after safety on delay.
1	Alarm Mute	When active, this will disable an output configured as “audible alarm”.
2	Alarm Reset	When an alarm is active, resets shutdown and trip alarm.
3	Alternative Frequency	For EFI engines fitted with ECU CANBUS. When active, 60Hz is selected.
4	Alternative Voltage	For EFI engines fitted with ECU CANBUS
5	Auto Restore Inhibit	In AUTO mode, after the normal operation of generator, when this input is active, automatic stop will not be allowed.
6	Auto Start Inhibit	In AUTO mode, when this input is active, automatic start is not allowed.
7	Reserved	
8	Generator Auxiliary Input Close	Connect to auxiliary contact of generator switch.
9	Generator Load Inhibit	When the input is active, generator breaker will be inhibited to close.
10	Drop Enable	For EFI engines fitted with ECU CANBUS. When active, droop is allowed.
11	Lamp Test	When input is active, all LED indicators will be illuminated.
12	Reserved	
13	Reserved	
14	Panel Lock	When the input is active, all panel buttons, except for LEFT, RIGHT, UP, DOWN and CONFIRM will be locked.
15	Remote Start (Off load)	In AUTO mode, when this input is active, the gen-set will be automatically started and after normal operation it will accept load. Only when this input is not active, auto stop will be enabled.
16	Remote Start (On-load)	In auto mode, when the input is active, the gen-set will be automatically started and after normal operation it will close onto the bus; when input deactivates, the gen-set will automatically open and stop.
17	Remote Start On Load (On demand)	In AUTO mode, when this input is active, all the parallel units are started in the order of priority; then according to the load, the number of units is automatically increased or decreased.
18	Scheduled Run Inhibit	In AUTO mode, when the input is active, regular start is inhibited

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19	Reserved	
20	Simulated AUTO Button	External pushbuttons (not self-locking switch) can be connected to simulate panel pushbuttons.
21	Simulated MANUAL Button	
22	Simulated STOP Button	
23	Reserved	
24	Simulated START Button	
25	Transfer to Bus	
26	Transfer to generator	
27	MSC Alarm inhibit	When MSC is disconnected or data error occurs, alarm signal will be prohibited.
28	Duty Select	When the input is active, priority is the highest; used to select main/standby generator.
29	Reset Maintenance Alarm	When the input is active, the controller will reset maintenance time to its pre-set value and clear the alarm.
30	Remote Start in Island Mode	Reserved
31	Mains Parallel Mode	When the input is active, the generator power output is constant (output power value is defined via PC software) and will not share load with other generators.
32	Speed Raise	Used in mains parallel mode, inching input; when active, increases generator active power output by 1%.
33	Speed Lower	Used in mains parallel mode, inching input; when active, decreases generator active power output by 1%.
34	Voltage Raise	Used in mains parallel mode, inching input; when active, increases generator reactive power output by 1%.
35	Voltage Lower	Used in mains parallel mode, inching input; when active, decreases generator reactive power output by 1%.
36	Black Start Input	When the input is active: a) Generator transfer failure alarms will not be detected; b) When the gen-set is started generator close output is simultaneously activated; controls breaker switch. Used in case of transformer load to avoid over current shutdown when the generator is closed.



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37	Auto Mode Input	When the input is active, the controller is in auto mode and other modes are disabled.
38	Disable Shutdown	When the input is active, all the shutdown alarms are disabled.
39	Monitor Mode Input	When the input is active, LCD shows “monitoring mode”; in this mode gen-set start and stop are not controlled, only gen-set parameters are monitored.
40	Power manager mode	When the input is active, LCD shows “power management mode”; in this mode, the controller does not start/stop the gen-set, it is only responsible for synchronization, power sharing, start/stop schedule and switch opening/closing.
41	Reserved	

**NOTE:** Do not prescribe the same function to configurable inputs 1-9 (except for “Not Used” and “User-defined”), otherwise incorrect operation can occur.

## 8.2 CONFIGURABLE OUTPUT PORTS 1-5

All output ports have the same options, similar functions can be prescribed to several output ports.

No	Type	Description
00	Output Not Used	
01	Air Flap Relay	Closes air-flaps during emergency or overspeed shutdown.
02	Audible Alarm	In case of warning, shutdown, trip; external annunciator can be connected. When mute alarm input is active, this output is disabled.
03	Battery High Volts	Active in case of battery over voltage warning alarm.
04	Battery Low Volts	Active in case of battery under voltage warning alarm.
05	Digital Input 7 Active	Activates when input port 7 is active
06	Digital Input 8 Active	Activates when input port 8 is active
07	Digital Input 9 Active	Activates when input port 9 is active
08	Start Relay Output	Active during cranking, deactivates after crank disconnect.
09	Fuel Relay Output	Active from the start of the gen-set, deactivated after complete stop.
010	Calling for Scheduled On	When scheduled start is activated and gen-set is running (Automatic mode)
011	Charging Alternator Failure	Active in case of generator charging failure warning alarm.
012	Close Generator	Controls generator switch.( Continuous active)
013	Close Generator	Generator impulse close output; output time depends on

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No	Type	Description
	Pulse	impulse time.
014	Close Mains	Controls mains switch.
015	Close Mains Pulse	Mains close impulse output; output time depends on impulse time.
016	Common Under/Over Freq. Shutdown	Active in case of under frequency or over frequency shutdown alarm
017	Common Under/Over Freq. Warn	Active in case of under frequency or over frequency warning alarm
018	Common Under/Over Voltage Shutdown	Active in case of under/over voltage shutdown alarm.
019	Common Under/Over Voltage Warn	Active in case of under/over voltage warning alarm.
020	Common Alarm	Active in case of generator common warning, common shutdown, common electrical trip alarms.
021	Common Electrical Alarm Trip	Active in case of common trip alarm.
022	Common Shutdown Alarm	Active in case of common shutdown alarm.
023	Common Warn Alarm	Active in case of common warning alarm.
024	Coolant Temp. High Pre-alarm for 1#	Active in case of high water/cylinder temperature warning alarm.
025	Coolant Temp. High Shutdown for 1#	Active in case of high water/cylinder temperature shutdown alarm.
026	Cooling Timer in Progress	Active during cooling delay
027	Check Sync Output	Active during synchronization
028	Digital Input 1 Active	Activates when input port 1 is active.
029	Digital Input 2 Active	Activates when input port 2 is active.
030	Digital Input 3 Active	Activates when input port 3 is active.
031	Digital Input 4 Active	Activates when input port 4 is active.
032	Digital Input 5 Active	Activates when input port 5 is active.
033	Digital Input 6 Active	Activates when input port 6 is active.
034	Emergency Stop	Active in case of emergency shutdown alarm.
035	Energise to Stop	Active during ETS delay
036	Fail To Start	Active in case of fail to start alarm.
037	Fuel Pump Control	Controlled by fuel level
038	Generator Available	Active when the generator is on-load and during cooling down.

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No	Type	Description
039	Generator High Freq. Pre-alarm	Active in case of generator over frequency warning alarm.
040	Generator High Freq. Shutdown	Active in case of generator over frequency shutdown alarm.
041	Generator High Voltage Pre-alarm	Active in case of generator over voltage warning alarm.
042	Generator High Voltage Shutdown	Active in case of generator over voltage shutdown alarm.
043	Generator Low Freq. Pre-alarm	Active in case of generator under frequency warning alarm.
044	Generator Low Freq. Shutdown	Active in case of generator under frequency shutdown alarm.
045	Generator Low Voltage Pre-alarm	Active in case of generator under voltage warning alarm.
046	Generator Low Voltage Shutdown	Active in case of generator under voltage shutdown alarm.
047	Louver Control	Activates when the gen-set is started, deactivates after complete stop.
048	Low Fuel Level	Active in case of low fuel level.
049	Loss Of Speed	Active if after safety on delay the controller detects that engine speed is equal to zero.
050	Mains Failure	Active in case of mains over frequency, under frequency, over voltage, under voltage or when auxiliary mains abnormal input is active.
051	Mains High Frequency	Active in case of mains over frequency.
052	Mains High Voltage	Active in case of mains over voltage.
053	Mains Low Frequency	Active in case of mains under frequency.
054	Mains Low Voltage	Active in case of mains under voltage.
055	Oil Pressure Low Pre-alarm for 1#	Active in case of low oil pressure warning alarm.
056	Oil Pressure Low Shutdown for 1#	Active in case of low oil pressure shutdown alarm.
057	Oil Pressure Sensor Open Circuit	Active in case of oil pressure sensor open circuit.
058	Open Generator	Controls generator load switch
059	Open Generator Pulse	Generator open impulse output, output time is controlled by impulse time.

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No	Type	Description
060	Open Mains	Controls mains load switch.
061	Open Mains Pulse	Mains open impulse output, output time is controlled by impulse time.
062	Over Current Pre-alarm	Active in case of generator over current warning alarm.
063	Over Current Trip	Active in case of generator over current trip shutdown.
064	Over Speed Pre-alarm	Active in case of engine over speed warning alarm.
065	Over Speed Shutdown	Active in case of engine over speed shutdown alarm.
066	Preheat (during pre-heat timer)	Active from preheat delay till the start of cranking.
067	Preheat (until end of crank)	Active from preheat delay till the end of cranking.
068	Preheat (until end of warm timer)	Active from preheat delay till the end of warming up.
069	Preheat (until safety on)	Active from preheat delay till the end of safety on time.
070	Open Output	Controls switch, unloads generator or mains.
071	System in Test Mode	Active when the system is in the test mode.
072	System in Auto Mode	Active when the system is in the Auto mode.
073	System in Manual Mode	Active when the system is in the manual mode.
074	System in Stop Mode	Active when the system is in the stop mode.
075	Under Speed Warning	Active in case of under speed warning.
076	Under Speed Pre-alarm	Active in case of under speed shutdown.
077	Reserved	
078	Idle/High-Speed Control	Active: cranking → start idle; stop idle → waiting for complete stop.
079	Pre-oil Supply Output	Active: cranking → safety on time.
080	Raise Speed Energized	Reserved

No	Type	Description
081	Excite Generator	Output when started. During safety on running, output 2 seconds without generator Frequency.
082	Drop Speed Energized	Reserved
083	Preset to Lubricate	Active: preheat → safety on time.
084	Raise Volt. Output	Reserved
085	Drop Volt. Output	Reserved
086	Reverse Power Output	If generator inverse power has exceeded the pre-set limit, the output activates after a delay
087	Over Power Output	If generator power has exceeded the pre-set limit, the output activates after a delay
088	Low Water Temperature Warn	Active in case of low temperature warning.
089	Generator Volt. Normal	Active when generator voltage is normal.
090	ECU Power	For engines with EFI ECU support; controls ECU power supply.
091	ECU Stop	For engines with EFI ECU support; controls ECU stop

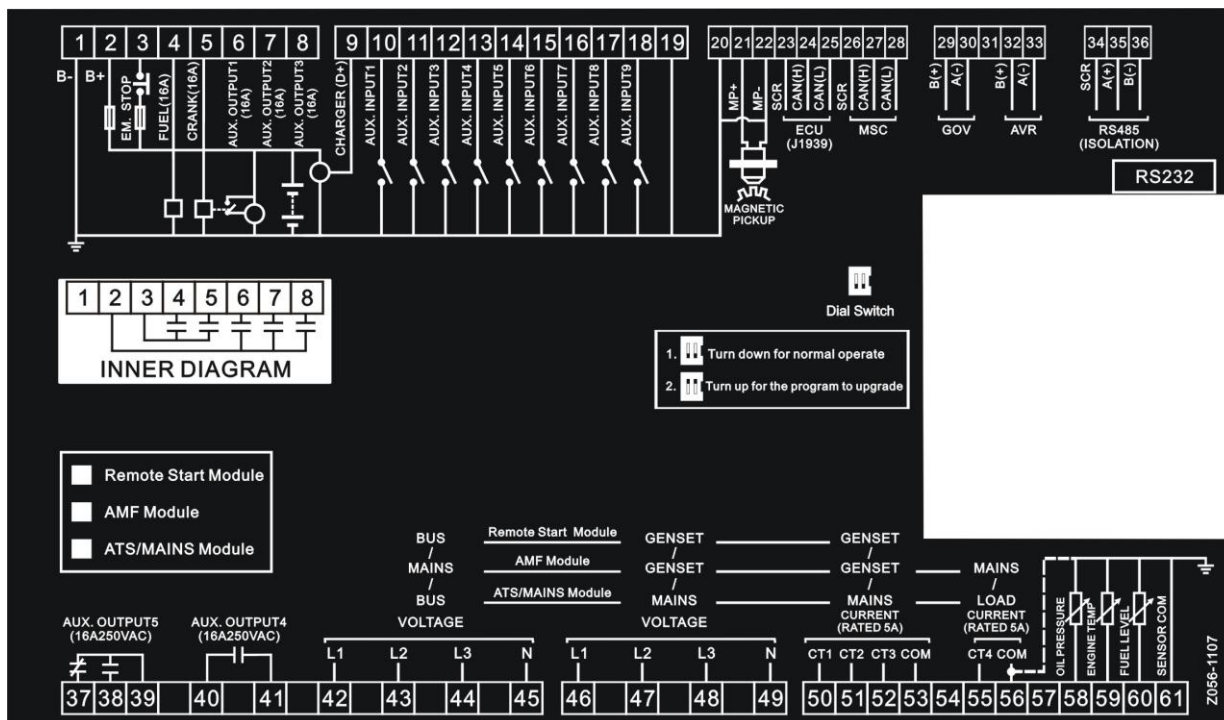
**NOTE: Functions of 1~5 output ports only can be configured via PC software.**

## 9 EVENT LOG

HGM6510 controller can save a maximum of 99 shutdown logs, including shutdown type, date and time (warning alarms are not recorded). Once the log is full (99 records), any subsequent shutdown entry will overwrite the oldest entry in the log, so the log will always contain the 99 most recent abnormal events.

## 10 BACK PANEL

HGM6510 controller back panel is shown below:



Terminal connections description

Pin	Function	Cable Size	Description
1	DC Power Supply Input (B-)	2.5mm <sup>2</sup>	DC power supply negative input. Connect externally to start battery negative.
2	DC Power Supply Input (B+)	2.5mm <sup>2</sup>	DC power supply negative input. Connect externally to start battery negative; 20A fuse recommended.
3	Emergency Stop	2.5mm <sup>2</sup>	Connected to DC voltage via emergency stop button; provides DC voltage for fuel and start relay; max. 30A fuse recommended.
4	Fuel Relay Output	2.5mm <sup>2</sup>	DC voltage provided by terminal 3; rated current 16 Amp
5	Crank	2.5mm <sup>2</sup>	DC voltage provided by terminal 3; rated current 16 Amp
6	Aux. Output 1	2.5mm <sup>2</sup>	B+ output, rated current 16 Amp.
7	Aux. Output 2	2.5mm <sup>2</sup>	B+ output, rated current 16 Amp.
8	Aux. Output 3	2.5mm <sup>2</sup>	B+ output, rated current 16 Amp.
9	Charger Failure/Excitation	1.0mm <sup>2</sup>	Generator charger D+ input port; must not be grounded.
10	Aux. Input 1	1.0mm <sup>2</sup>	Digital input
11	Aux. Input 2	1.0mm <sup>2</sup>	Digital input
12	Aux. Input 3	1.0mm <sup>2</sup>	Digital input

HGM6510 GENSET PARALLEL UNIT

Pin	Function	Cable Size	Description
13	Aux. Input 4	1.0mm <sup>2</sup>	Digital input
14	Aux. Input 5	1.0mm <sup>2</sup>	Digital input
15	Aux. Input 6	1.0mm <sup>2</sup>	Digital input
16	Aux. Input 7	1.0mm <sup>2</sup>	Digital input
17	Aux. Input 8	1.0mm <sup>2</sup>	Digital input
18	Aux. Input 9	1.0mm <sup>2</sup>	Digital input
19	Common GND(B-)	1.0mm <sup>2</sup>	Connect to gen-set enclosure or starting battery negative.
20	Magnetic Pickup Sensor SCR	1.0mm <sup>2</sup>	Connect to speed sensor
21	Magnetic Pickup Sensor +	1.0mm <sup>2</sup>	
22	Magnetic Pickup Sensor -	1.0mm <sup>2</sup>	
23	EFI CAN J1939 SCR	0.5mm <sup>2</sup>	Use 120Ω screened communication line.
24	EFI CAN J1939 Data Line (H)	0.5mm <sup>2</sup>	
25	J1939 Data Line (L)	0.5mm <sup>2</sup>	
26	MSC SCR	0.5mm <sup>2</sup>	Use 120Ω screened communication line to connect all parallel HGM6510 controllers together.
27	MSC (H)	0.5mm <sup>2</sup>	
28	MSC (L)	0.5mm <sup>2</sup>	
29	GOV Wire B (+)	1.0mm <sup>2</sup>	2-core shielded wire recommended with shielding layer connected to the ground at GOV end.
30	GOV Wire A (-)	1.0mm <sup>2</sup>	
31	Not Used		
32	AVR Wire B (+)	1.0mm <sup>2</sup>	2-core shielded wire recommended with shielding layer connected to the ground at AVR end.
33	AVR Wire A (-)	1.0mm <sup>2</sup>	
34	RS485 SCR	0.5mm <sup>2</sup>	PC programming or monitoring port (isolation), shielding layer grounded at one end.
35	RS485 A (-)	0.5mm <sup>2</sup>	
36	RS485 B (+)	0.5mm <sup>2</sup>	
37 38 39	Aux. Output 5	2.5mm <sup>2</sup>	Relay normally open and normally closed volt-free contacts, rated current 16A
40 41	Aux. Output 4	2.5mm <sup>2</sup>	Relay normally open volt-free contact, rated current 16A.
42	Bus A Phase Sensing Input	1.0mm <sup>2</sup>	Connected to bus A Phase (2A fuse recommended).
43	Bus B Phase Sensing Input	1.0mm <sup>2</sup>	Connected to bus B Phase (2A fuse recommended).
44	Bus C Phase Sensing Input	1.0mm <sup>2</sup>	Connected to bus C Phase (2A fuse recommended).

HGM6510 GENSET PARALLEL UNIT

Pin	Function	Cable Size	Description
45	Bus Neutral Line Input	1.0mm <sup>2</sup>	Connected to Neutral.
46	Genset A Phase Sensing	1.0mm <sup>2</sup>	Connected to genset A Phase output (Recommend 2A fuse).
47	Genset B Phase Sensing	1.0mm <sup>2</sup>	Connected to genset B Phase output (Recommend 2A fuse).
48	Genset C Phase Sensing	1.0mm <sup>2</sup>	Connected to genset C phase output (Recommend 2A fuse).
49	Genset Neutral Input	1.0mm <sup>2</sup>	Connected to generator neutral line.
50	C.T. A Phase Sensing Input	2.5mm <sup>2</sup>	External C.T. secondary coil (Maximum 5A).
51	C.T. B Phase Sensing Input	2.5mm <sup>2</sup>	External C.T. secondary coil (Maximum 5A).
52	C.T. C Phase Sensing Input	2.5mm <sup>2</sup>	External C.T. secondary coil (Maximum 5A).
53	C.T. Common Port	2.5mm <sup>2</sup>	External C.T. common port; this port must at the same time be connected to battery negative or ground.
54	Not Used		
55	Load C.T. Sensing Input	2.5mm <sup>2</sup>	External CT secondary coil (Maximum 5A). HGM6520 ONLY.
56			
57	Not Used		
58	Pressure Sensor Input	1.0mm <sup>2</sup>	Externally connect to a resistance type sensor.
59	Temp Sensor Input	1.0mm <sup>2</sup>	Externally connect to a resistance type sensor.
60	Fuel Level Sensor Input	1.0mm <sup>2</sup>	Externally connect to a resistance type sensor.
61	Sensor Common Port	1.0mm <sup>2</sup>	Sensor common ground, connect to gen-set enclosure or starter battery negative.
	RS232 Port		PC programming or monitoring port; do not use this RS485 port at the same time.
	DIP Switch	2-bit	For upgrading program 1.Up for normal use; 2.Down for upgrading program



## 11 ECU INTERFACE

**HGM6510** controller is fitted with EFI engine ECU interface. Because different manufactories use different ports and communication protocols, please check if the controller is suitable for your engine.

This controller can monitor and control some electrical parameters of the engine, such as speed, oil pressure, temperature. These parameters can be monitored by standard communication port and there is no need to install corresponding sensors, which can reduce wiring and enhance reliability.

Please refer to **HGM6500 Synchronization Plan List** for more information on engine ports.

## 12 DEBUGGING PROCEDURE

### 12.1 STEP 1. SINGLE UNIT DEBUGGING

- 1) Check the parameter configuration of the controller;
- 2) Check the gen-set connections and MSC CAN connection lines between the units. (E.g. if 3 generators are correctly connected, HGM6510 LCD status screen 1-4 will display Module Number: 3. See the picture on the right).

Status	
1-4	
Module Number	3
Module ID	012
Priority	012

- 3) In manual mode, check if engine and generator data is normal;
- 4) In manual mode check if switch opens and closes normally;
- 5) In manual mode, after closing the breaker check if generator frequency can be adjusted to the rated frequency (e.g. set the rated frequency as 52Hz/48Hz);
- 6) In manual mode, after closing the breaker check if generator voltage can be adjusted to the rated voltage (e.g. set the rated voltage as 240V/220V);
- 7) Activate manual start on-load, check if power factor, active power and reactive power are normal; if their values are negative, check generator voltage and current phase sequence, current transformer incoming line direction, current transformer secondary current dotted terminal;
- 8) In manual mode do performance tests according to the national standards.

**Note: Please refer to HGM6500 Synchronization Plan List for more information on GOV and AVR settings.**

## 12.2 STEP 2: MANUAL PARALLEL OPERATION OFF-LOAD

- 1) Manually close parallel sets, check that the units synchronization is balanced and breaker close impulse current is not too high;
- 2) During parallel operation off load, check that there is no high circumfluence on HGM6510 current screen;
- 3) 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 HGM6510 controller, or adjust engine GOV or generator AVR gain and stability potentiometer to avoid active and reactive power oscillation; output close to 0.

## 12.3 STEP 3: MANUAL PARALLEL OPERATION ON-LOAD

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

## 12.4 STEP 4: FULLY AUTOMATIC PARALLEL OPERATION

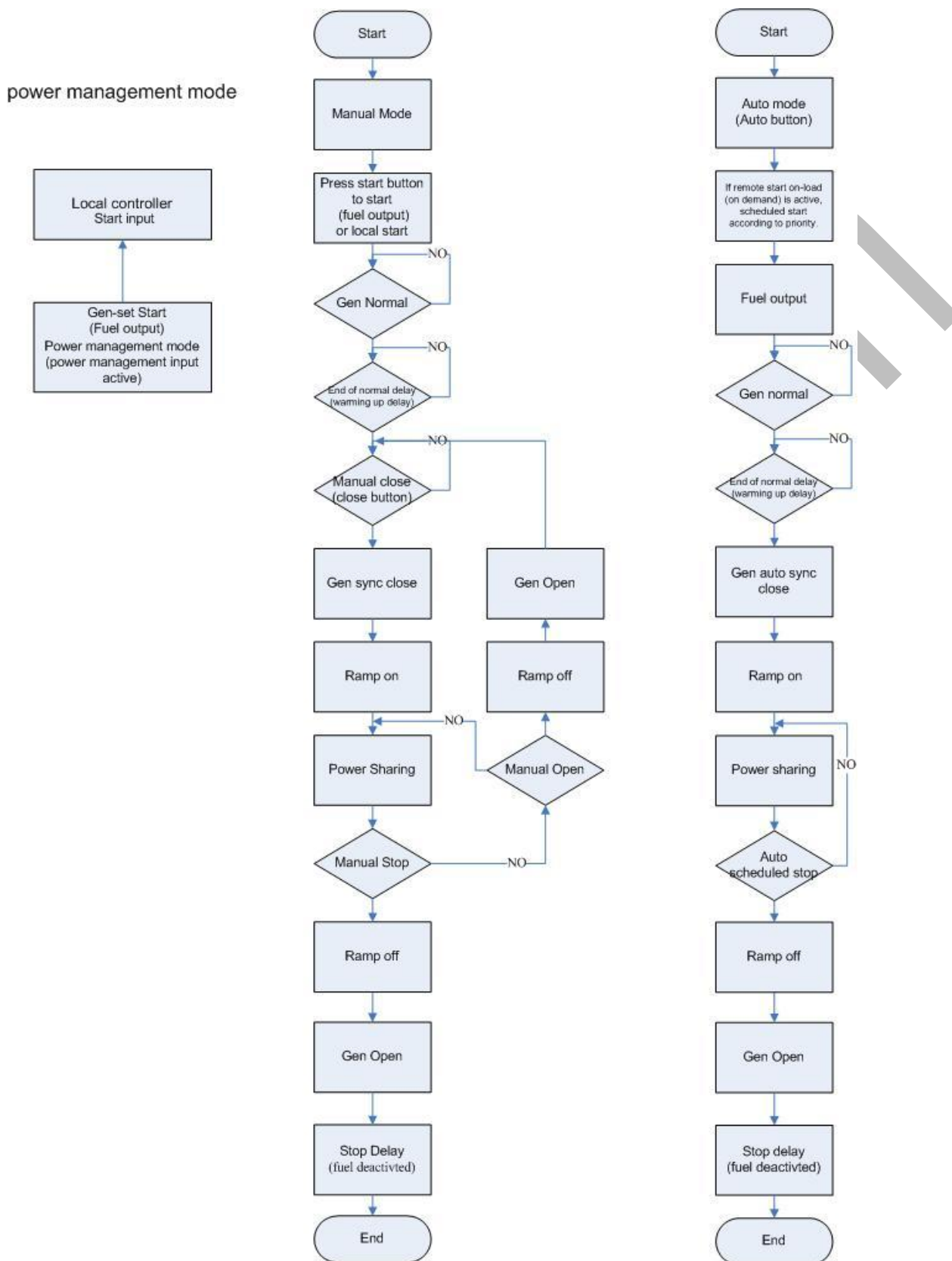
When the controller is in auto status, if digital input “remote start on-load (on demand)” is active, it will carry out fully automatic parallel operation, start and stop. There are 3 ways of automatic parallel operation:

- 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 falls 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: Engine with the lowest total 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.

### 13 POWER MANAGEMENT MODE



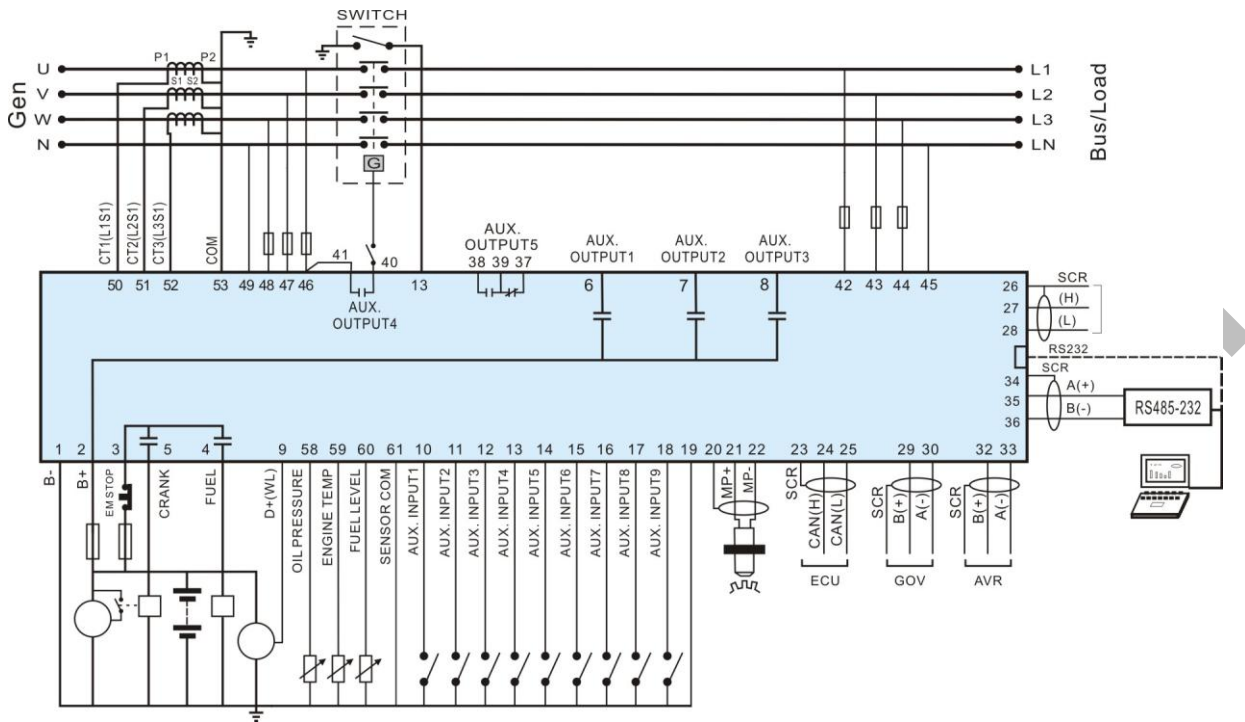
HGM6510 power management mode can be selected via configurable input port.

## 14 TROUBLESHOOTING

Problem	Possible solution
Controller does not respond to power on	Check starting batteries; Check the wiring to the controller; Check the DC fuse. Check that HGM6510 controller back panel DIP switch is in the wrong position.
Gen-set shutdown	Check that water/cylinder temperature is not too high; Check alternator voltage; Check the DC fuse.
Emergency shutdown	Check emergency shutdown button functions; Check if the starting battery positive is correctly connected to the emergency stop input; Check that there is no open circuit
Low oil pressure alarm after crank disconnect	Check the oil pressure sensor and its connections.
High water temperature alarm after crank disconnect	Check the temperature sensor and its connections.
Alarm shutdown during running	Check corresponding switch and its wiring according to the information on LCD; Check auxiliary input port.
Generator fails to close	Check ATS auxiliary input port; Check generator close relay.
Generator Reverse Phase	Check generator voltage phase sequence.
Bus Reverse Phase	Check bus voltage phase sequence.
MSC ID Error	MSC ID of the controller is similar to another ID. Try to set MSC ID using PC software again.
MSC Data Error	Check MSC connection CAN polarity; Check if 120Ω matching resistor is correctly connected.
Fail to start	Check fuel return circuit and its connections; Check starting batteries; Check speed sensor and its connections; Refer to engine manual.
Starter motor does not respond,	Check starter connections; Check starting batteries.
Gen-set is running, but ATS does not transfer load	Check ATS; Check ATS and controller connections.

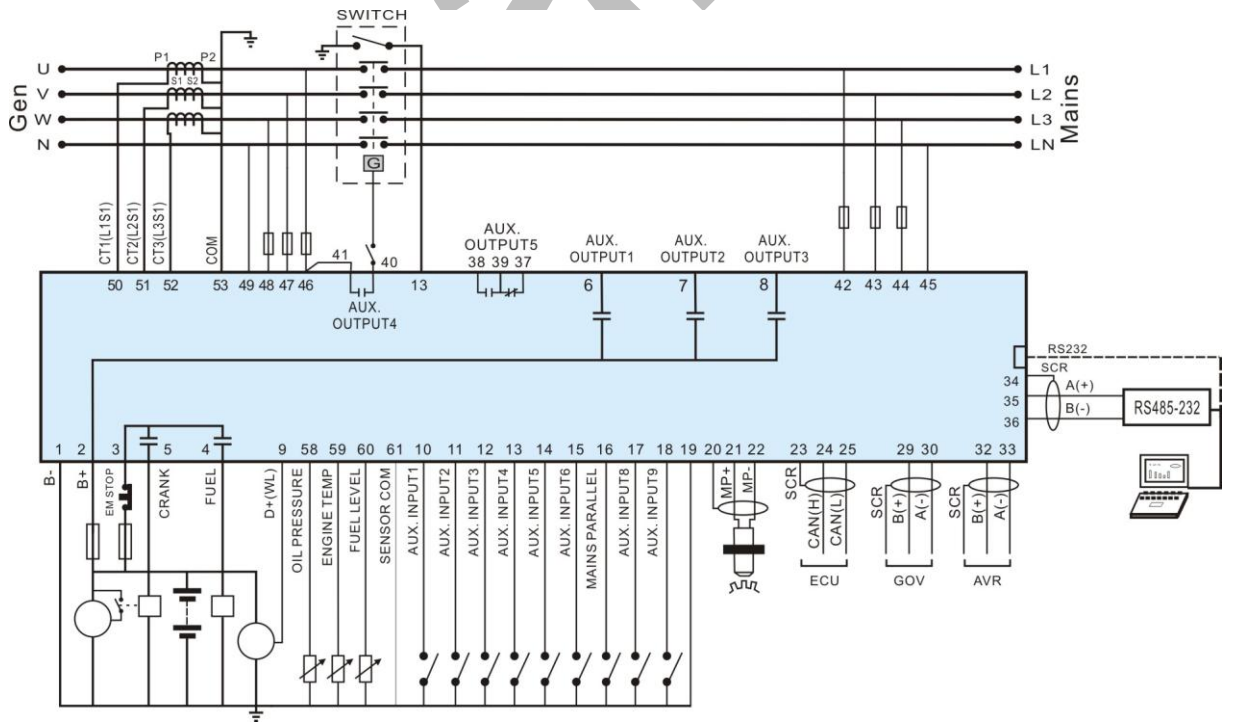
# 14 TYPICAL WIRING DIAGRAMS

## HGM6510 Typical Wiring Diagram



Expansion high-capacity relays for start and fuel output ports are recommended.

## HGM6510 Mains Parallel Application



Mains parallel function for HGM6510 controller can be selected via configurable input

port. In mains parallel mode, generator will run in parallel with mains and it will only be able to output a fixed amount of power. Mains parallel operation parameters are shown:

7

031 Mains parallel mode    Close to activate

**Load control**

Load parallel ramp minimum

Setting value: 0.0%(0.0 KW)    Current reading: 0.0%(0.0 KW)

Set

Load model

Mode select: Bus    Current reading: Bus

Set

Active power: 18.0%(62.1KW)    Current reading: 0.0%(0.0 KW)

Set

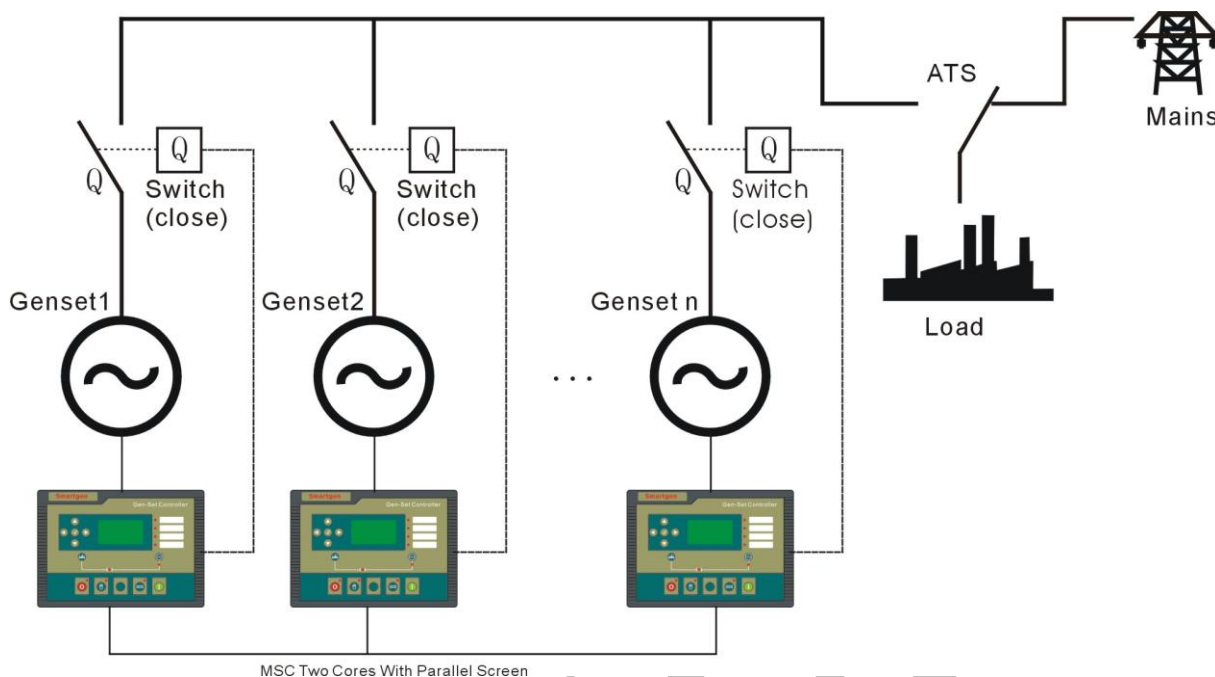
Reactive power

kVAr 0.0%(0.0kVar 1.00 lag)    Current reading: 0.0%(0.0kVar 0.00 lag)

pf

Set

### HGM6510 Multi-genset Parallel Application



## 15 COMMUNICATION INTERFACE

The controller is fitted with both standard RS232 and RS485 communication interfaces, so computer can directly (or through a modem) communicate with controller and perform remote start/stop, data monitoring and other functions.

RS232/485 interface uses MODBUS communication protocol. MODBUS is a master-slave protocol, and the controller acts as a slave. When the controller receives a request from the host (PC or monitoring host), it sends defined format data to the host. The controller never actively sends data to the host.

## 16 CASE DIMENSIONS AND PANEL CUTOUT

