

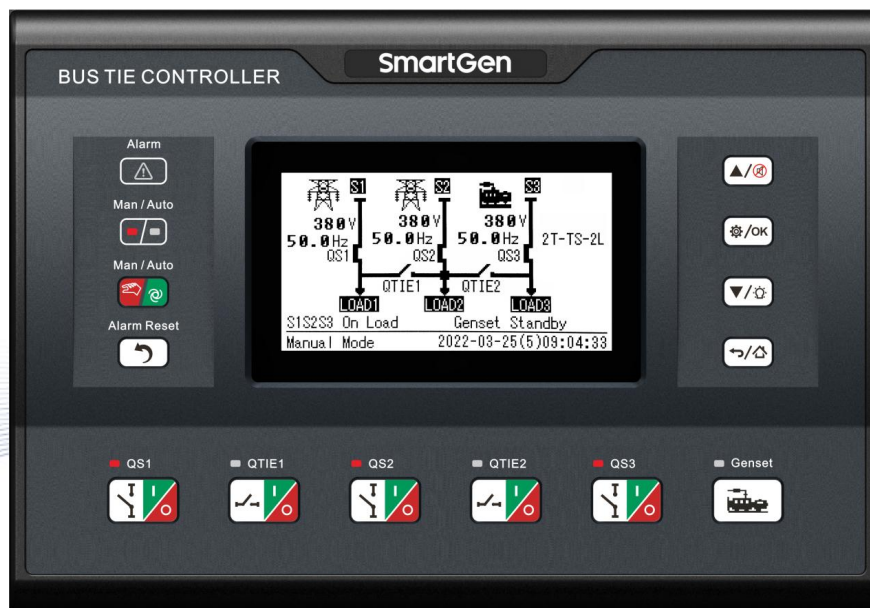
# SmartGen

MAKING CONTROL SMARTER

## HAT835

### THREE POWER BUS TIE CONTROLLER

### USER MANUAL



郑州众智科技股份有限公司  
SMARTGEN(ZHENGZHOU)TECHNOLOGY CO.,LTD.

**SmartGen** 众智 Chinese trademark

**SmartGen** English trademark

**SmartGen** — make your generator *smart*

**SmartGen Technology Co., Ltd.**

**No.28 Jinsuo Road, Zhengzhou, Henan Province, China**

**Tel:** +86-371-67988888/67981888/67992951

+86-371-67981000(overseas)

**Fax:** +86-371-67992952

**Web:** [www.smartgen.com.cn/](http://www.smartgen.com.cn/)

[www.smartgen.cn/](http://www.smartgen.cn/)

**Email:** [sales@smartgen.cn](mailto:sales@smartgen.cn)

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**Table 1 – Software Version**

Date	Version	Note
2022-05-16	1.0	Original release.
2022-08-19	1.1	1. Modify the description of switch transfer mode; 2. Add "Auto trans. auto restore" description; 3. Add "3P1B" typical application diagrams; 4. Add electrical interlock logic diagram.

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## 1 OVERVIEW

**HAT835 Three Power Bus Tie Controller** is intelligent tri-supply module with configurable function, automatic measurement, LCD display, and digital communication. It combines digitization, intelligence and networking. Automatic measurement and control can reduce human error, which is an ideal option for three power transfer.

The powerful microprocessor contained within the unit allows for precision voltage (3-way 3-phase) measuring and make accurate judgment and the corresponding volt free digital output port will active when there is over/under voltage, over/under frequency, loss of phase, reverse phase sequence and other abnormal condition occurs. It has compact structure, advanced circuits, simple wiring and high reliability, and can be widely used in electrical automatic control system of electric power, telecommunications, petroleum, coal, metallurgy, railways, municipal administration, intelligent building, etc.

## 2 PERFORMANCE AND CHARACTERISTICS

- System type can set as: 3 powers 2 bustie, 3 powers 1 bustie; specifically includes 2T-TS-2L、2T-TS-3L、2T-3I-3L、2T-TS-3G、2T-3I-2L、LT-TP-1NPL、LT-TS-1NPL、LT-TS-LP、LT-TS-LP-3G、LT-TP-LP、LT-TS-3I、LT-TS-3IG、RT-TP-3I、RT-TS-LP-1G、RT-TS-LP-1IG;
- 4.3 inchs single color 240x128 LCD display with white backlight, multilingual interface (including English, Simplified Chinese or Traditional Chinese), push-button operation;
- LCD can visually display current system topology, S1/S2/S3 voltage, frequency and other parameters;
- Collect and display 3-way 3-phase voltage, frequency and phase sequence;
- With over/under voltage, over/under frequency, loss of phase, reverse phase sequence detection function;
- Single breaker operation and system parameters adjusting can be conducted via front panel key;
- Display QS1/QS2/QS3/QTIE1/QTIE2 accumulated close times;
- Display S1/S2/S3 accumulated supply time, current continuous power time, last continuous power time and accumulated power time of LOAD1/LOAD2/LOAD3;
- For Stored-Energy type switch, its close relay will be active after the PF Input is active;
- Auto/Manual mode transfer. In manual mode, it can force the switch to close or open;
- All parameters can be set on site. Passwords authentication ensures authorized staff operation only;
- The unit can be manually tested on site to achieve start/stop operation;
- Closing output signal can be set as pulse or continuous output;
- Applicable for 3 isolated neutral line;
- With elevator delay output function;
- Real-time clock (RTC); event log function (event log can record 200 items circularly);
- Scheduled run & scheduled not run (can be set as start genset once a day/week/month whether with load or not);
- Can control multiple gensets to work as cycle run mode, master run mode, balanced time run mode;
- User can monitor data communication protocol address;
- PLC function is fitted;
- DIN16A-2 and DOUT16B-2 module can be connected via RS485 port;
- With Dual-RS485 isolated communication port. With “remote control, remote measurement, remote communication, remote adjustment” function by the ModBus-RTU communication protocol. It can remotely start/stop the genset and control breaker close or open;
- Widely DC power supply range allows the controller can bear instantaneous 80V DC input;
- Large terminal space allows the controller can bear maximum 625V AC voltage input;
- Suitable for various AC systems (3-phase 4-wire, 3-phase 3-wire, single-phase 2-wire, and 2-phase 3-wire);
- Modular design, anti-flaming ABS plastic shell, pluggable terminal, built-in mounting, compact structure with easy installation.

### 3 SPECIFICATION

**Table 2 – Performance Parameters**

Items	Contents	
Operating Voltage	1. DC8.0V~35.0V, continuous power supply; 2. AC(90~305)V power supply A1N1/A2N2/A3N3. These two can be used simultaneously or either way.	
Power Consumption	<7W (Standby mode: ≤2W)	
AC Voltage Input	AC system	
	3P4W (L-L)	(80~530)V
	3P3W (L-L)	(80~625)V Special order
	1P2W (L-N)	(50~305)V
	2P3W (A-B)	(80~530)V
Rated Frequency	50/60Hz	
Aux. Output 1~6 Capacity	16A AC250V Volts free output	
Aux. Output 7~12 Capacity	8A AC250V Volts free output	
Digital Input	GND (B-) connect is active.	
Communication	1. Dual-RS485 isolated interface, MODBUS Protocol; 2. D-type USB port.	
Case Dimensions	260mmx180mmx54mm	
Panel Cutout	242mmx161mm	
Working Temperature	(-25~+70)°C	
Working Humidity	(20~93)%RH	
Storage Temperature	(-30~+80)°C	
Protection Level	IP65: when water proof gasket ring inserted between panel and housing.	
Insulation Strength	Apply AC1.5kV voltage between high voltage terminal and low voltage terminal; The leakage current is not more than 3mA within 1min.	
Weight	1.2kg	

## 4 MEASURE AND DISPLAY DATA

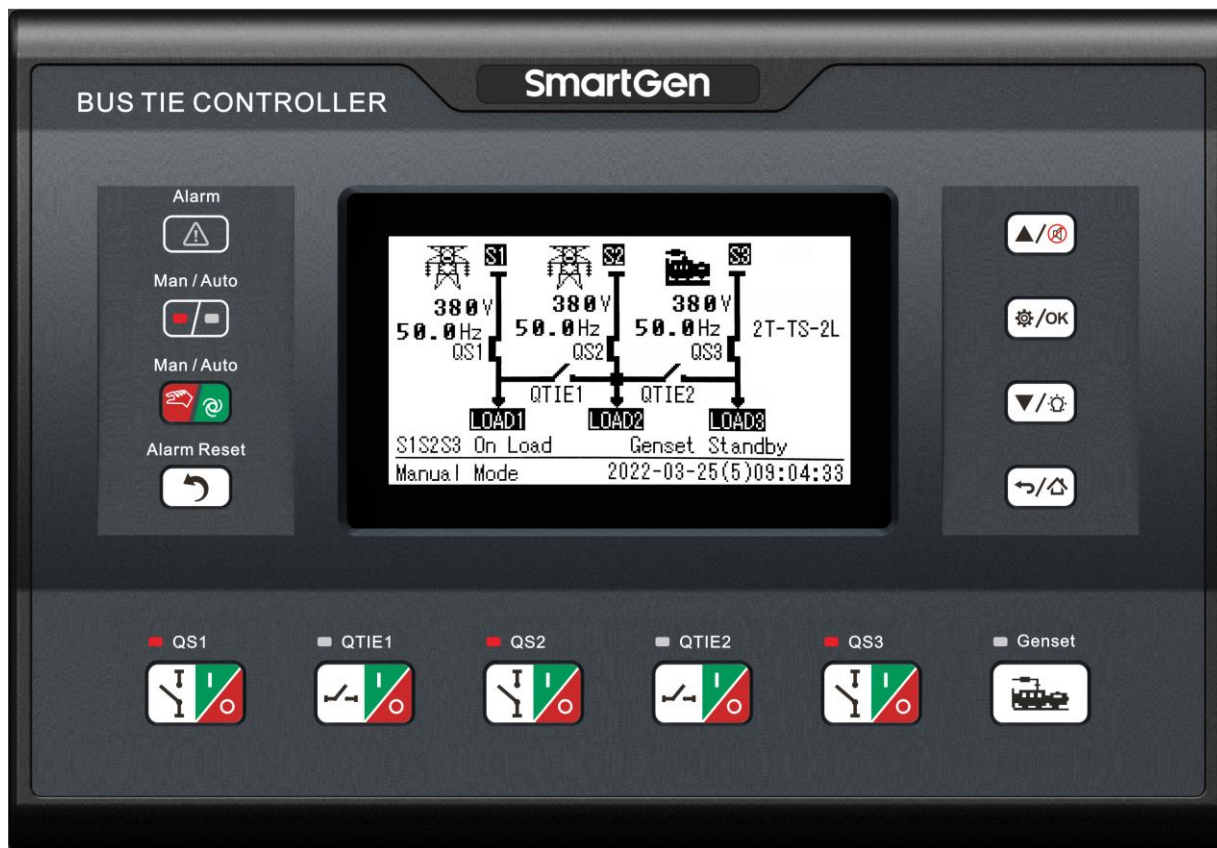
**Table 3 – Display Parameters**

No.	Measure & Display Data Items
1	S1/S2/S3 Phase Voltage
2	S1/S2/S3 Line Voltage
3	S1/S2/S3 Voltage Phase
4	S1/S2/S3 Frequency
5	S1 Accum. Supply Time
6	S2 Accum. Supply Time
7	S3 Accum. Supply Time
8	LOAD1 Current Continuous Power Time
9	LOAD2 Current Continuous Power Time
10	LOAD3 Current Continuous Power Time
11	LOAD1 Last Continuous Power Time
12	LOAD2 Last Continuous Power Time
13	LOAD3 Last Continuous Power Time
14	LOAD1 Accum. Power Time
15	LOAD2 Accum. Power Time
16	LOAD3 Accum. Power Time
17	Accum. Auto Transfer Time
18	QS1 Accum. Close Time
19	QS2 Accum. Close Time
20	QS3 Accum. Close Time
21	QTIE1 Accum. Close Time
22	QTIE2 Accum. Close Time
23	Switch Input/Output Port Status
24	Expand Switch Input/Output Port Status
25	Alarm Status
26	Power Status
27	Load Switch Status
28	Generator Running Status
29	Real Time Clock
30	Historical Records
31	Black Box Records
32	Communication Status



## 5 OPERATION

### 5.1 INDICATORS















**Fig.1 – Panel Indication Drawing**

**Table 4 – Indicators Description**

Indicator Type	Description
Alarm	Slow flashing (1 time per sec) when warn alarm occurs. Fast flashing (5 times per sec) when fault alarm occurs.
Man	Light on when the module is in Manual mode.
Auto	Light on when the module is in Auto mode.
QS1	Always illuminating: QS1 closed, S1 supplies power for load. Always extinguishing: QS1 opened.
QTIE1	Always illuminating: QTIE1 closed, S1/S2 supplies power for load. Always extinguishing: QTIE1 opened.
QS2	Always illuminating: QS2 closed, S2 supplies power for load. Always extinguishing: QS2 opened.
QTIE2	Always illuminating: QTIE2 closed, S2/S3 supplies power for load. Always extinguishing: QTIE2 opened.
QS3	Always illuminating: QS3 closed, S3 supplies power for load. Always extinguishing: QS3 opened.
Genset	Light on when the Start signal is initiated.

## 5.2 KEY FUNCTION DESCRIPTION






**Table 5 – Keys Function Description**

Icon	Key	Function Description
	QS1	Active in Manual mode. QS1 close and S1 supply after pressing this key. Press again, QS1 open.
	QTIE1	Active in Manual mode. QTIE1 close after pressing this key. Press again, QTIE1 open.
	QS2	Active in Manual mode. QS2 close and S2 supply after pressing this key. Press again, QS2 open.
	QTIE2	Active in Manual mode. QTIE2 close after pressing this key. Press again, QTIE2 open.
	QS3	Active in Manual mode. QS3 close and S3 supply after pressing this key. Press again, QS3 open.
	Test	Press it can directly enter genset manual start/stop screen.
	Man/Auto	Manual mode and Auto mode switching.
	Alarm Reset	Pressing this key can remove fault alarm.
	Return/Homepage	When setting parameters, press it to return previous menu In main screen, press it to return the first screen; in other screen, press the key to return to main screen.
	Set/Confirm	In main screen, press it to enter menu screen. In menu screen, press it can move cursor and confirm setting information.
	Up/Alarm Mute	In main screen, press it to scroll up screen. In menu screen, press it to up cursor or increase value in setting menu. Long press it can turn off the alarm sound.
	Down/Lamp Test	In main screen, press it to scroll down screen. In menu screen, press it to down cursor or decrease value in setting menu. In main screen, long press it to enter lamp test mode, LCD backlit and all LED lamps are illuminated and LCD screen display black.

## 6 LCD DISPLAY

### 6.1 MAIN SCREEN

**Table 6 – Screen Display**

Items	Display Contents
Homepage	S1 status, S2 status, S3 status, switch status; Supply system diagram, QS1 is S1 side switch, QS2 is S2 side switch, QS3 is S3 side switch; QTIE1 and QTIE2 are bust tie switches; S1/S2/S3 voltage and frequency; S1/S2/S3 priority; System configuration type; Generator start status; Auto trans. auto restore status.
S1/S2/S3	S1/S2/S3 line voltage, phase voltage, frequency, phase angle, S1/S2/S3 accumulated supply time.
Load 	LOAD1/LOAD2/LOAD3 current continuous power time; LOAD1/LOAD2/LOAD3 last continuous power time; LOAD1/LOAD2/LOAD3 accumulated power time; Accumulated auto transfer time.
QF 	QS1/QS2/QS3/QTIE1/QTIE2 accumulated close times.
I/O 	Programmable digital input status; Programmable digital output status; Expand digital input status; Expand digital output status.
Comm. 	Module address; RS485-1 comm. status, baud rate and stop bit; RS485-2 comm. status, baud rate and stop bit; USB comm. status.
Alarms 	Current alarm informations (warn alarm and fault alarm).
Status	Alarm status/working status; Real-time clock; Statusline is showed in the last line of main screen's each page.

## 6.2 STATUS DESCRIPTION

**Table 7 – S1 Voltage Status**

No.	Item	Description
1	S1 Available	S1 normal Delay.
2	S1 Unavailable	S1 abnormal Delay.
3	S1 Available	Voltage is within the setting range.
4	S1 Blackout	Voltage is 0.
5	S1 Over Volt	Voltage is higher than the set value.
6	S1 Under Volt	Voltage has fallen below the set value.
7	S1 Over Freq	Frequency is higher than the set value.
8	S1 Under Freq	Frequency has fallen below the set value.
9	S1 Loss of Phase	Loss of one or two phase of A, B and C.
10	S1 Phase Seq Wrong	A-B-C phase sequence is wrong.

**Table 8 – S2 Voltage Status**

No.	Item	Description
1	S2 Available	S2 normal Delay.
2	S2 Unavailable	S2 abnormal Delay.
3	S2 Available	Voltage is within the setting range.
4	S2 Blackout	Voltage is 0.
5	S2 Over Volt	Voltage is higher than the set value.
6	S2 Under Volt	Voltage has fallen below the set value.
7	S2 Over Freq	Frequency is higher than the set value.
8	S2 Under Freq	Frequency has fallen below the set value.
9	S2 Loss of Phase	Loss of one or two phase of A, B and C.
10	S2 Phase Seq Wrong	A-B-C phase sequence is wrong.

**Table 9 – S3 Voltage Status**

No.	Item	Description
1	S3 Available	S3 normal delay.
2	S3 Unavailable	S3 abnormal delay.
3	S3 Available	Voltage is within the setting range.
4	S3 Blackout	Voltage is 0.
5	S3 Over Volt	Voltage is higher than the set value.
6	S3 Under Volt	Voltage has fallen below the set value.
7	S3 Over Freq	Frequency is higher than the set value.
8	S3 Under Freq	Frequency has fallen below the set value.
9	S3 Loss of Phase	Loss of one or two phase of A, B and C.
10	S3 Phase Seq Wrong	A-B-C phase sequence is wrong.

**Table 10 – Genset Status**

No.	Item	Description
1	Genset Start Delay	Delay time before genset start.
2	Genset Stop Delay	Delay time before genset stop.
3	Scheduled Not Run	When scheduled not run is active, its duration time will be displayed.
4	Scheduled Run	When scheduled run is active, its duration time will be displayed.
5	S1 Cycle Run	S1 cycle run countdown will be terminated when cycle start is active.
6	S2 Cycle Run	S2 cycle run countdown will be terminated when cycle start is active.
7	S3 Cycle Run	S3 cycle run countdown will be terminated when cycle start is active.
8	S1 Genset Start	Active only when system has 2 gensets and S1 generating.
9	S2 Genset Start	Active only when system has 2 gensets and S2 generating.
10	S3 Genset Start	Active only when system has 2 gensets and S3 generating.
11	Genset Start	Genset start signal outputs.
12	Genset Standby	There is no start genset signal output.

**Table 11 – Switch Status**

No.	Item	Description
1	Ready to Transfer	Switch transfer begins.
2	QS1 Closing	QS1 closing delay is in progress.
3	QS1 Opening	QS1 opening delay is in progress.
4	QS2 Closing	QS2 closing delay is in progress.
5	QS2 Opening	QS2 opening delay is in progress.
6	QS3 Closing	QS3 closing delay is in progress.
7	QS3 Opening	QS3 opening delay is in progress.
8	QTIE1 Closing	QTIE1 closing delay is in progress.
9	QTIE1 Opening	QTIE1 opening delay is in progress.
10	QTIE2 Closing	QTIE2 closing delay is in progress.
11	QTIE2 Opening	QTIE2 opening delay is in progress.
12	Transfer Rest	Interval time of switch transfer.
13	Wait QS1 PF Input	QS1 PF input is active before QS1 closing.
14	Wait QS2 PF Input	QS2 PF input is active before QS2 closing.
15	Wait QS3 PF Input	QS3 PF input is active before QS3 closing.
16	Wait QTIE1 PF Input	QTIE1 PF input is active before QTIE1 closing.
17	Wait QTIE2 PF Input	QTIE2 PF input is active before QTIE2 closing.
18	Elevator Delay	Elevator control output before ATS transfer.
19	S1 On Load	QS1 was already closed and S1 is taking load.
20	S2 On Load	QS2 was already closed and S2 is taking load.
21	S3 On Load	QS3 was already closed and S3 is taking load.
22	S1S2S3 On Load	QS1, QS2, QS3 was already closed and S1S2S3 are taking load.
23	S1S2 On Load	QS1, QS2 was already closed and S1S2 are taking load.
24	S1S3 On Load	QS1, QS3 was already closed and S1S3 are taking load.
25	S2S3 On Load	QS2, QS3 was already closed and S2S3 are taking load.
26	Offload	Switch was already opened and load is disconnected.

Warning alarms are active when controller detects the alarm signals, and alarm indicator will flash slowly (1 time per sec). When alarm is reset, indicator is extinguished, which means warn alarms are not latched.

**Table 12 – Warning Alarms**

No.	Item	Description
1	Forced Open Warn	When the input is active and the action (cut off non-fire supply) select "Warn", it will initiate a warning alarm.
2	DC Power Under Volt	When DC power voltage has fallen below the pre-set value, it will initiate a warning alarm.
3	DC Power Over Volt	When DC power voltage has exceeded the pre-set value, it will initiate a warning alarm.
4	Input 1 Comm. Fail	Expand digital input 1 communication failure warning.
5	Input 2 Comm. Fail	Expand digital input 2 communication failure warning.
6	Input 3 Comm. Fail	Expand digital input 3 communication failure warning.
7	Output 1 Comm. Fail	Expand digital output 1 communication failure warning.
8	Output 2 Comm. Fail	Expand digital output 2 communication failure warning.
9	Output 3 Comm. Fail	Expand digital output 3 communication failure warning.

Fault alarms are active when controller detects the alarm signals. Alarm indicator will flash rapidly (5 times per sec) and the alarm will last until it was removed manually. Fault alarms are latched.

**Table 13 – Fault Alarms**

No.	Item	Description
1	QS1 Close Failure	QS1 fails to close.
2	QS1 Open Failure	QS1 fails to open.
3	QS2 Close Failure	QS2 fails to close.
4	QS2 Open Failure	QS2 fails to open.
5	QS3 Close Failure	QS3 fails to close.
6	QS3 Open Failure	QS3 fails to open.
7	QTIE1 Close Failure	QTIE1 fails to close.
8	QTIE1 Open Failure	QTIE1 fails to open.
9	QTIE2 Close Failure	QTIE2 fails to close.
10	QTIE2 Open Failure	QTIE2 fails to open.
11	Forced Open Fault	When the input is active and the action (cut off non-fire supply) select "Fault", it will initiate a fault alarm.
12	Switch Trip Alarm	It will issue alarm and enter manual mode when the input is active.
13	QS1 Trip Alarm	It will issue alarm and enter manual mode when the input is active.
14	QS2 Trip Alarm	It will issue alarm and enter manual mode when the input is active.
15	QS3 Trip Alarm	It will issue alarm and enter manual mode when the input is active.
16	QTIE1 Trip Alarm	It will issue alarm and enter manual mode when the input is active.
17	QTIE2 Trip Alarm	It will issue alarm and enter manual mode when the input is active.
18	S1 Genset Fault	Only when system has 2 gensets and S1 generating, S1 fails to start.
19	S2 Genset Fault	Only when system has 2 gensets and S2 generating, S2 fails to start.
20	S3 Genset Fault	Only when system has 2 gensets and S3 generating, S3 fails to start.



No.	Item	Description
21	Input 1 Comm. Fail Fault	Expand digital input 1 communication failure fault.
22	Input 2 Comm. Fail Fault	Expand digital input 2 communication failure fault.
23	Input 3 Comm. Fail Fault	Expand digital input 3 communication failure fault.
24	Output 1 Comm. Fail Fault	Expand digital output 1 communication failure fault.
25	Output 2 Comm. Fail Fault	Expand digital output 2 communication failure fault.
26	Output 3 Comm. Fail Fault	Expand digital output 3 communication failure fault.

The indication information will continuously display for 2s after it is active.


**Table 14 – Indication Information**

No.	Item	Description
1	Please Reset The Alarm	When there is fault alarm occurs, the indication will be displayed when change the genset mode to Auto Mode manually.
2	Please Open First	After two powers are already closed among S1, S2 and S3, if bus tie switch closes, the two powers will be paralleled. The indication will be displayed when bus tie close key or other power close key is pressed.
3	Panel Locked	The information displays when panel lock is active and keys are pressed (Manual/Auto, QS1, QTIE1, QS2, QTIE2, QS3 and Test keys).


**Table 15 – Other Status Information**


No.	Item	Description
1	Start Inhibit	Genset start Inhibit is active.
2	S1 Load Inhibit	S1 Load Inhibit input is active.
3	S2 Load Inhibit	S2 Load Inhibit input is active.
4	S3 Load Inhibit	S3 Load Inhibit input is active.
5	Remote Gen On Load	Remote start (on load) signal is active.
6	Remote Gen Off Load	Remote start (off load) signal is active.
7	Gen Start Mains NG	Start genset when mains is abnormal.
8	Gen Start Master	Start when the gens supply and switching to highest priority.
9	Auto Mode	Current mode is Auto mode.
10	Manual Mode	Current mode is Manual mode.
11	Local Mode	Current mode is Local mode.
12	Remote Inhibit	Remote control is inactive.

## 6.3 MAIN MENU

In main screen, press  key will enter into the menu interface.

<ul style="list-style-type: none"> <li>1. Configuration</li> <li>2. Data Calibration</li> <li>3. Historical Records</li> <li>4. Black Box Records</li> <li>5. Auto Trans. Auto Restore</li> <li>6. Language</li> <li>7. About</li> </ul>	<p>Press <b>Up/Down</b> key to choose parameters (the current line was highlighted with black) and then press <b>Confirm</b> key to enter into the corresponding display screen.</p>
--	--

 **NOTE 1:** Default password is 01234, user can change it in case of others change the parameters setting. Please clearly remember the password after changing. If you forget it, please contact SmartGen services.


 **NOTE 2:** Data Calibration is for factory use only and correct passwords must be input before entered.



## 7 START/STOP OPERATION

### 7.1 MANUAL START/STOP

#### 7.1.1 PANEL START/STOP

In the main screen, press  key to enter to "Manual Test Genset" interface when system type is "S1 Mains S2 Gens S3 Mains, S1 Gens S2 Mains S3 Mains, S1 Mains S2 Mains S3 Gens".

Manual Start/Stop	Press "Up/Down" key to choose parameters (the current line was highlighted with black) and then press "Confirm" key to confirm.
Return	
Genset Stop	
Genset Start	

**Genset Stop:** Disconnect the start signal, i.e. stop the running genset.

**Genset Start:** Output the start signal, i.e. start the genset.

When system is "S1 Gens S2 Gens S3 Mains", manual start/stop menu interface is as follows:

Manual Start/Stop	Press "Up/Down" key to choose parameters (the current line was highlighted with black) and then press "Confirm" key to confirm.
Return	
S1 Genset Stop	
S1 Genset Start	
S2 Genset Stop	
S2 Genset Start	

When system is "S1 Gens S2 Mains S3 Gens", manual start/stop menu interface is as follows:

Manual Start/Stop	Press "Up/Down" key to choose parameters (the current line was highlighted with black) and then press "Confirm" key to confirm.
Return	
S1 Genset Stop	
S1 Genset Start	
S3 Genset Stop	
S3 Genset Start	

When system is "S1 Mains S2 Gens S3 Gens", manual start/stop menu interface is as follows:

Manual Start/Stop	Press "Up/Down" key to choose parameters (the current line was highlighted with black) and then press "Confirm" key to confirm.
Return	
S2 Genset Stop	
S2 Genset Start	
S3 Genset Stop	
S3 Genset Start	

When system is "S1 Gens S2 Gens S3 Gens", manual start/stop menu interface is as follows:

Manual Start/Stop	Press "Up/Down" key to choose parameters (the current line was highlighted with black) and then press "Confirm" key to confirm.
Return	
S1 Genset Stop	
S1 Genset Start	
S2 Genset Stop	
S2 Genset Start	
S3 Genset Stop	
S3 Genset Start	

**S1 Genset Stop:** Disconnect the S1 start signal, i.e. stop the running S1 genset.

**S1 Genset Start:** Output the S1 start signal, i.e. start the S1 genset.

**S2 Genset Stop:** Disconnect the S2 start signal, i.e. stop the running S2 genset.

**S2 Genset Start:** Output the S2 start signal, i.e. start the S2 genset.

**S3 Genset Stop:** Disconnect the S3 start signal, i.e. stop the running S3 genset.

**S3 Genset Start:** Output the S3 start signal, i.e. start the S3 genset.

### 7.1.2 REMOTE START/STOP

Send remote start/stop signals using MODBUS protocol via RS485 port.

**Remote Stop:** Disconnect the start signal, i.e. stop the running genset.

**Remote Start:** Output the start signal, i.e. start the genset.

## 7.2 AUTO START/STOP

### 7.2.1 START CONDITIONS

#### 7.2.1.1 INPUT START

Set input port as "Remote Start On Load" or "Remote Start Off Load", both could not be set simultaneously.

**Remote Start On Load:** When the input is active, genset close relay will active after genset is normal; when the input inactive, genset will stop automatically.

**Remote Start Off Load:** When the input is active, mains close relay will active after mains is normal; when the input inactive, genset will stop automatically.

#### 7.2.1.2 GEN START MAINS NG

When mains is abnormal and the input is active, gens close relay will active after gens is normal.

#### 7.2.1.3 GEN START MASTER

This input is active when generator has master priority.

### 7.2.2 GEN-GEN START/STOP

When system is "S1 Gens S2 Gens S3 Mains, S1 Gens S2 Mains S3 Gens, S1 Mains S2 Gens S3 Gens, S1 Gens S2 Gens S3 Gens", input port start/stop function is as follows:

When system is "S1 Gens S2 Gens S3 Mains", S1, S2 start/stop; when system is "S1 Gens S2 Mains S3 Gens", S1, S3 start/stop; when system is "S1 Mains S2 Gens S3 Gens", S2, S3 start/stop; when system type is "S1 Gens S2 Gens S3 Gens", S1, S2, S3 start/stop.

**Gen Start Mains NG:** when mains is abnormal, S1 or S2 or S3 (determined by start priority) starts to supply. Genset close relay will active after genset is normal.

**Remote Start On Load:** Detect S1 or S2 or S3 start output according to start priority and start mode. Genset close relay will active after genset is normal.

**Remote Start Off Load:** Detect S1 or S2 or S3 start output according to start priority and start mode. Genset S1 close relay, S2 close relay and S3 close relay are deactivated after genset start.

**Gen-Gen Start Mode:** Cycle Run, Master-slave Run, Balanced Time Run, None.

### **Cycle Run**

If system is "S1 Gens S2 Gens S3 Mains", when S3 Mains is abnormal or remote start is active, S1 and S2 cycle run start according to the cycle run time. At the first time to start the genset, choose "S1 Start" or "S2 Start" depends on "Priority". e.g. S1 starts firstly if "S1" has higher priority. Then S1 cycle run countdown is started according to the preset delay. At the same time, genset fault delay will be initiated. If S1 genset is normal before the fault delay has expired, S1 will take load; S2 starts after the preset S1 cycle run delay has expired and the S2 loading process is same as S1. S1 will stop automatically after the S2 has taken load successfully. S1 and S2 will cycle run in this way alternately until the remote start signal deactivated.

During the start process, if there is genset fault alarm (genset fault delay overtime or genset fault input is active), fail to close or load inhibit alarm occurs, the starting genset will be stop immediately and the additional genset will start automatically.

During the cycle run process, if "Manual Mode" is selected, the current status will be held and the "cycle run countdown" will be suspended.

### **Master Run**

Master genset will start when mains abnormal or remote start signal is active. During the start process, if there is genset fault alarm (genset supply delay overtime or genset fault input is active), fail to close or load inhibit alarm occurs, the starting genset will stop immediately and the additional genset will start automatically. Otherwise, the master run genset will running continuously until the remote start signal deactivated or mains normal.

### **Balanced Time Run**

The gensets which has the shortest running hours will start when mains abnormal or remote start signal is active. During the start process, if there is genset fault alarm (genset supply delay overtime or genset fault input is active), fail to close or load inhibit alarm occurs, the starting genset will be stop immediately and the additional genset will start automatically. Otherwise, the current genset will running continuously until the remote start signal deactivated.

In system of multiple sets of gensets to start/stop, it should meet following several conditions:

- a) It is active in Auto mode;
- b) System set as "S1 Gens S2 Gens S3 Mains, S1 Gens S2 Mains S3 Gens, S1 Mains S2 Gens S3 Gens, S2 Gens S2 Gens S3 Gens";
  - 1) If system is "S1 Gens S2 Gens S3 Mains", the output should be set as "S1 Genset Start" and "S2 Genset Start"; if system is "S1 Gens S2 Mains S3 Gens", the output should be set as "S1 Genset Start" and "S3 Genset Start"; if system is "S1 Mains S2 Gens S3 Gens", the output should be set as "S2 Genset Start" and "S3 Genset Start";

- if system is "S1 Gens S2 Gens S3 Gens", the output should be set as "S1 Genset Start", "S2 Genset Start" and "S3 Genset Start";
- 2) If system is "S1 Gens S2 Gens S3 Mains", the input should be set as "S1 Genset Fault Input", "S2 Genset Fault Input" and "Remote Start On Load" or "Remote Start Off Load"; If system is "S1 Gens S2 Mains S3 Gens", the input should be set as "S1 Genset Fault Input", "S3 Genset Fault Input" and "Remote Start On Load" or "Remote Start Off Load"; If system is "S1 Mains S2 Gens S3 Gens", the input should be set as "S2 Genset Fault Input", "S3 Genset Fault Input" and "Remote Start On Load" or "Remote Start Off Load"; If system is "S1 Gens S2 Gens S3 Gens", the input should be set as "S1 Genset Fault Input", "S2 Genset Fault Input", "S3 Genset Fault Input" and "Remote Start On Load" or "Remote Start Off Load";
- c) Should set the system as "Gen-Gen Start Mode";
- d) Should configure setting "Genset Supply Delay", If start mode is cycle run, also should set "S1 Cycs Run Time", "S2 Cycs Run Time" or "S1 Cycs Run Time", "S3 Cycs Run Time" or "S2 Cycs Run Time", "S3 Cycs Run Time" or "S1 Cycs Run Time", "S2 Cycs Run Time", "S3 Cycs Run Time".

Among input ports, "S1 Genset Fault Input", "S2 Genset Fault Input" and "S3 Genset Fault Input" are selective setting, genset fault can be judged by "Genset Supply Delay" and it does not need to inquire the fault alarm via input port.

When Gen-Gen start type configured as "None", there is no start genset signals output.

For example:

**Table 16 – Genset Start**

System Type	Start Conditions	Result
S1 Gens S2 Gens S3 Mains	Input Active (Remote Start On Load/ Remote Start Off Load)	S1 Genset Start Output
	S3 Abnormal	
	Priority: S1>S2>S3 (It is defaulted and cannot be set.)	

### 7.2.3 SCHEDULED RUN

Once "Scheduled Run" enables, users can set the scheduled start time. Controller will send start signal at preset start time. Start signal will be deactivated after the start delay has expired. "Scheduled Run On Load" or "Scheduled Run Off Load" can be set.

**Scheduled Run On Load:** When the input is active, genset close relay will active after genset is normal.

**Scheduled Run Off Load:** When the input is active, mains close relay will active after mains is normal.

Cycle time of Scheduled Run can be set as start monthly, weekly and daily.

**Run Monthly:** Which month to start, start date and time can be set.

**Run Weekly:** Can start the genset at the same time in couple days of a week. Eg. Start the genset at 8:00 a.m. from Monday to Friday and keep 10 hours.

**Run Daily:** Can start the genset at same time everyday.

#### 7.2.4 SCHEDULED NOT RUN


Once “Scheduled Not Run” enables, users can set the “Scheduled Not Start” time. Start signal will be deactivated at preset time and it will be inhibited before the delay has expired.

Cycle time of “Scheduled Not Run” can be set as monthly, weekly and daily.

**Not Run Monthly:** Which month *not* start, *not* start date and time can be set.

**Not Run Weekly:** Can not start the genset at the same time in couple days of a week. Eg. Not Start the genset at 19:00 p.m. from Monday to Friday and keep 12 hours.




**Not Run Daily:** Can not start the genset at same time everyday.

 **NOTE 3:** “Scheduled Not Run” operation is prior to “Scheduled Run” operation.

SmartGen

## 8 PARAMETERS CONFIGURATION

### 8.1 ILLUSTRATION

In the main interface, press /OK key, choose **Configuration** and press /OK again to enter into password confirmation interface. If password is correct, enter into parameter setting interface, otherwise, exit to main interface directly. Factory default password is **01234**. In parameters configuration interface, pressing  key to return the previous menu.

### 8.2 PARAMETERS TABLE

**Table 17 – Parameter Configuration Form**

No.	Item	Range	Default	Description
<b>AC Config</b>				
1	S1 Volt Normal	(0~3600)s	10	The delay from S1 voltage abnormal to normal.
2	S1 Volt Abnormal	(0~3600)s	5	The delay from S1 voltage normal to abnormal.
3	S2 Volt Normal	(0~3600)s	10	The delay from S2 voltage abnormal to normal.
4	S2 Volt Abnormal	(0~3600)s	5	The delay from S2 voltage normal to abnormal.
5	S3 Volt Normal	(0~3600)s	10	The delay from S3 voltage abnormal to normal.
6	S3 Volt Abnormal	(0~3600)s	5	The delay from S3 voltage normal to abnormal.
7	S1 Type Set	(0~1)	0	0: Mains 1: Gens.
8	S2 Type Set	(0~1)	0	0: Mains 1: Gens.
9	S3 Type Set	(0~1)	1	0: Mains 1: Gens.
10	System Type	(0~9)	0	0: 2T-TS-2L 1: 2T-TS-3L 2: 2T-TS-3G 3: 2T-3I-3L 4: 2T-3I-2L 5: LT-TP-1NPL 6: LT-TS-1NPL 7: LT-TS-LP 8: LT-TS-LP-3G 9: LT-TP-LP 10: LT-TS-3I 11: LT-TS-3IG 12: RT-TP-3I 13: RT-TS-LP-1G 14: RT-TS-LP-1IG

No.	Item	Range	Default	Description
11	AC Supply Mode	(0~3)	0	0: 3 Phase, 4 Wire (3P4W) 1: 3 Phase, 3 Wire (3P3W) 2: 2 Phase, 3 Wire (2P3W) 3: Single Phase, 2 Wire (1P2W)
12	PT Fitted	(0~1)	0	0: Disable 1: Enable
13	PT Primary	(30~30000)V	100	Primary voltage of voltage transformer
14	PT Secondary	(30~1000)V	100	Secondary voltage of voltage transformer
15	Rated Voltage	(0~30000)V	220	Rated voltage of AC system
16	Over Voltage	(0~1)	1	0: Disable 1: Enable
17	Set Value	(0~200)%	120	Upper limit value of voltage; it is abnormal if the value has exceeded the set value.
18	Return Value	(0~200)%	115	Upper limit return value of voltage; it is normal only when the value has fallen below the set value.
19	Under voltage	(0~1)	1	0: Disable 1: Enable
20	Set Value	(0~200)%	80	Lower limit value of voltage; it is abnormal if the value has fallen below the set value.
21	Return Value	(0~200)%	85	Lower limit return value of voltage; it is normal only when the value has exceeded the set value.
22	Rated Frequency	(10.0~75.0)Hz	50.0	Rated frequency of AC system
23	Over Frequency	(0~1)	1	0: Disable 1: Enable
24	Set Value	(0~200)%	110	Upper limit value of frequency; it is abnormal if the value has exceeded the set value.
25	Return Value	(0~200)%	104	Upper limit return value of frequency; it is normal only when the value has fallen below the set value.
26	Under Frequency	(0~1)	1	0: Disable 1: Enable
27	Set Value	(0~200)%	90	Lower limit value of frequency; it is abnormal if the value has fallen below the set value.
28	Return Value	(0~200)%	96	Lower limit return value of frequency; it is normal only when the value has exceeded the set value.
29	Reverse Phase Seq.	(0~1)	1	0: Disable 1: Enable
30	S1 Bus Tie Set	(0~3)	0	0: Bus tie is allowed to close; 1: QTIE1 is prohibited to close; 2: QTIE2 is prohibited to close; 3: Bus tie is prohibited to close.
31	S2 Bus Tie Set	(0~3)	0	0: Bus tie is allowed to close; 1: QTIE1 is prohibited to close; 2: QTIE2 is prohibited to close;

No.	Item	Range	Default	Description
				3: Bus tie is prohibited to close.
32	S3 Bus Tie Set	(0~3)	0	0: Bus tie is allowed to close; 1: QTIE1 is prohibited to close; 2: QTIE2 is prohibited to close; 3: Bus tie is prohibited to close.
<b>Switch</b>				
1	Power Supply Type	(0~1)	1	0: DC Supply      1: AC Supply
2	AC Power Supply Voltage Lower Limit	(0~100)%	70	The lowest AC power supply voltage, the switch will not transfer if it is lower than this value.
3	AC Power Supply Voltage Upper Limit	(0~200)%	200	The highest AC power supply voltage, the switch will not transfer if it is higher than this value.
4	Auto Trans. Auto Restore	(0~1)	1	0: Auto trans. non-restore 1: Auto trans. auto restore
5	Auto Restore Waiting Time Set	(0~30000)min	0	The delay time of auto restore.
6	Auto Restore Starting Time Allowed (h)	(0~23)h	0	
7	Auto Restore Starting Time Allowed (min)	(0~59)min	0	
8	Auto Restore Stopping Time Allowed (h)	(0~23)h	0	
9	Auto Restore Stopping Time Allowed (min)	(0~59)min	0	
10	Fixed Close/Open Time	(0~1)	0	0: Disable    1: Enable Disable: The output time was judged depends on the close relay; the longest output time up to the set delay. Enable: The output time last for the preset time.
11	Close Delay	(0.1~20.0)s	5.0	Pulse time of close relay.
12	Open Delay	(0.1~20.0)s	5.0	Pulse time of open relay.
13	Transfer Interval	(0~9999)s	1	Interval time from S1 switch open to S2 switch close; or from S2 switch open to S1 switch close.
14	Forced Open Action	(0~1)	0	0: Warn Alarm    1: Fault Alarm
15	Continually Close	(0~1)	0	0: Disable    1: Enable If "Enable" is selected, "Close Time" and "Open Time" are deactivated.
<b>Generator</b>				
1	Start Delay	(0~9999)s	1	When the genset is ready to start, start



No.	Item	Range	Default	Description
				delay begins, after the start delay has expired, start signal will be initiated.
2	Stop Delay	(0~9999)s	5	When the genset is ready to stop, stop delay begins, after the stop delay has expired, stop signal will be initiated.
3	Gen-Gen Start Mode	(0~3)	0	0: Cycs Run 1: Master Run 2: Balanced Time Run 3: None
4	S1 Cycle Run Time	(0~9999)min	720	Gens cycle start S1 running time.
5	S2 Cycle RunTime	(0~9999)min	720	Gens cycle start S2 running time.
6	S3 Cycle RunTime	(0~9999)min	720	Gens cycle start S3 running time.
7	Supply Delay	(0~9999)s	120	When the start signal is active, the start delay will be initiated. If the gen voltage lasts abnormal after the delay has expired, "Genset Fault" alarm will be initiated.
8	DC Volt Detect	(0~1)	0	0: Disable 1: Enable
9	DC Under Volt Warn	(0~1)	0	0: Disable 1: Enable
10	Set Value	(0~100.0)V	10.0	"DC Under Volts" alarm will be initiated if the DC supply voltage has fallen below the set value.
11	Return Value	(0~100.0)V	10.5	"DC Under Volts" alarm will be removed if the DC supply voltage has exceeded the set value.
12	DC Over Volt Warn	(0~1)	0	0: Disable 1: Enable
13	Set Value	(0~100.0)V	30.0	"DC Over Volts" alarm will be initiated if the DC supply voltage has exceeded the set value.
14	Return Value	(0~100.0)V	29.5	"DC Over Volts" alarm will be removed if the DC supply voltage has fallen below the set value.
<b>Scheduled Start/Stop</b>				
1	Scheduled Run	(0~1)	0	0: Disable 1: Enable
2	Run Mode	(0~1)	0	0: Off Load 1: On Load
3	Cycle Selection	(0~2)	0	0: Monthly 1: Weekly 2: Daily
4	Time (Month)	(Jan~Dec)	Monthly	<input checked="" type="checkbox"/> Jan. <input checked="" type="checkbox"/> Feb. <input checked="" type="checkbox"/> Mar. <input checked="" type="checkbox"/> Apr. <input checked="" type="checkbox"/> May <input checked="" type="checkbox"/> June

No.	Item	Range	Default	Description
				<input checked="" type="checkbox"/> July <input checked="" type="checkbox"/> Aug. <input checked="" type="checkbox"/> Sep. <input checked="" type="checkbox"/> Oct. <input checked="" type="checkbox"/> Nov. <input checked="" type="checkbox"/> Dec.
5	Time (Day)	(1~31)	1	The date of start the genset
6	Time (Week)	(Sun~Sat)	Sun	<input checked="" type="checkbox"/> Sun <input type="checkbox"/> Mon <input type="checkbox"/> Tue <input type="checkbox"/> Wed <input type="checkbox"/> Thu <input type="checkbox"/> Fri <input type="checkbox"/> Sat
7	Time (Hour)	(0~23)h	0	The time of start the genset
8	Time (Minute)	(0~59)min	0	
9	Duration	(0~30000)min	30	The duration time of genset running
10	Scheduled Not Run	(0~1)	0	0: Disable    1: Enable
11	Run Mode	(0~2)	0	0: Monthly 1: Weekly 2: Daily
12	Time (Month)	(Jan~Dec)	Monthly	<input checked="" type="checkbox"/> Jan. <input checked="" type="checkbox"/> Feb. <input checked="" type="checkbox"/> Mar. <input checked="" type="checkbox"/> Apr. <input checked="" type="checkbox"/> May <input checked="" type="checkbox"/> June <input checked="" type="checkbox"/> July <input checked="" type="checkbox"/> Aug. <input checked="" type="checkbox"/> Sep. <input checked="" type="checkbox"/> Oct. <input checked="" type="checkbox"/> Nov. <input checked="" type="checkbox"/> Dec.
13	Time (Day)	(1~31)	1	The date of <i>NOT</i> start the genset
14	Time (Week)	(Sun~Sat)	Sun	<input checked="" type="checkbox"/> Sun <input type="checkbox"/> Mon <input type="checkbox"/> Tue <input type="checkbox"/> Wed <input type="checkbox"/> Thu <input type="checkbox"/> Fri <input type="checkbox"/> Sat
15	Time (Hour)	(0~23)h	0	The time of <i>NOT</i> start the genset
16	Time (Minute)	(0~59)min	0	
17	Duration	(0~30000)min	30	The duration time of genset not running
<b>Load</b>				

No.	Item	Range	Default	Description
1	Elevator Control	(0~1)	1	0: Disable 1: Enable
2	Elevator Delay	(0~300)s	300	Delay time before load disconnect or switch transfer. It is used for controlling running elevator to stop at nearest floor until the transfer is over.
<b>Aux. Inputs</b>				
1	Aux. Input 1	(0~61)	1	QS1 Closed
2	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
3	Aux. Input 2	(0~61)	2	QS2 Closed
4	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
5	Aux. Input 3	(0~61)	3	QS3 Closed
6	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
7	Aux. Input 4	(0~61)	4	QTIE1 Closed
8	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
9	Aux. Input 5	(0~61)	5	QTIE2 Closed
10	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
11	Aux. Input 6	(0~61)	0	Not Used
12	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
13	Aux. Input 7	(0~61)	0	Not Used
14	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
15	Aux. Input 8	(0~61)	0	Not Used
16	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
17	Aux. Input 9	(0~61)	0	Not Used
18	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
19	Aux. Input 10	(0~61)	0	Not Used
20	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
21	Aux. Input 11	(0~61)	0	Not Used
22	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
23	Aux. Input 12	(0~61)	0	Not Used
24	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
<b>Aux. Outputs</b>				
1	Aux. Output 1	(0~1)	0	0: Output (NO) 1: Output (NC)

No.	Item	Range	Default	Description
2	Contents Setting	(0~146)	31	QS1 Close Control
3	Aux. Output 2	(0~1)	0	0: Output (NO) 1: Output (NC)
4	Contents Setting	(0~146)	32	QS1 Open Control
5	Aux. Output 3	(0~1)	0	0: Output (NO) 1: Output (NC)
6	Contents Setting	(0~146)	33	QS2 Close Control
7	Aux. Output 4	(0~1)	0	0: Output (NO) 1: Output (NC)
8	Contents Setting	(0~146)	34	QS2 Open Control
9	Aux. Output 5	(0~1)	0	0: Output (NO) 1: Output (NC)
10	Contents Setting	(0~146)	35	QS3 Close Control
11	Aux. Output 6	(0~1)	0	0: Output (NO) 1: Output (NC)
12	Contents Setting	(0~146)	36	QS3 Open Control
13	Aux. Output 7	(0~1)	0	0: Output (NO) 1: Output (NC)
14	Contents Setting	(0~146)	37	QTIE1 Close Control
15	Aux. Output 8	(0~1)	0	0: Output (NO) 1: Output (NC)
16	Contents Setting	(0~107)	38	QTIE1 Open Control
17	Aux. Output 9	(0~1)	0	0: Output (NO) 1: Output (NC)
18	Contents Setting	(0~146)	39	QTIE2 Close Control
19	Aux. Output 10	(0~1)	0	0: Output (NO) 1: Output (NC)
20	Contents Setting	(0~146)	40	QTIE2 Open Control
21	Aux. Output 11	(0~1)	1	0: Output (NO) 1: Output (NC)
22	Contents Setting	(0~146)	29	Genset Start Output
23	Aux. Output 12	(0~1)	0	0: Output (NO) 1: Output (NC)
24	Contents Setting	(0~146)	0	Not Used
25	Combined 1 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
26	Combined 1 Or Out 1 Contents Setting	(0~146)	21	S1 Available
27	Combined 1 Or Out 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
28	Combined 1 Or Out 2 Contents Setting	(0~146)	23	S2 Available
29	Combined 1 And Out Active Type	(0~1)	1	0: Output (NO) 1: Output (NC)
30	Combined 1 And Out Contents Setting	(0~146)	0	Not Used
31	Combined 2 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
32	Combined 2 Or Out 1 Contents Setting	(0~146)	0	Not Used
33	Combined 2 Or Out 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
34	Combined 2 Or Out 2 Contents Setting	(0~146)	0	Not Used
35	Combined 2 And Out	(0~1)	0	0: Output (NO) 1: Output (NC)

No.	Item	Range	Default	Description
	Active Type			
36	Combined 2 And Out Contents Setting	(0~146)	0	Not Used
37	Combined 3 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
38	Combined 3 Or Out 1 Contents Setting	(0~146)	0	Not Used
39	Combined 3 Or Out 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
40	Combined 3 Or Out 2 Contents Setting	(0~146)	0	Not Used
41	Combined 3 And Out Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
42	Combined 3 And Out Contents Setting	(0~146)	0	Not Used
43	Combined 4 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
44	Combined 4 Or Out 1 Contents Setting	(0~146)	0	Not Used
45	Combined 4 Or Out 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
46	Combined 4 Or Out 2 Contents Setting	(0~146)	0	Not Used
47	Combined 4 And Out Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
48	Combined 4 And Out Contents Setting	(0~146)	0	Not Used
49	Combined 5 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
50	Combined 5 Or Out 1 Contents Setting	(0~146)	0	Not Used
51	Combined 5 Or Out 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
52	Combined 5 Or Out 2 Contents Setting	(0~146)	0	Not Used
53	Combined 5 And Out Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
54	Combined 5 And Out Contents Setting	(0~146)	0	Not Used
55	Combined 6 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
56	Combined 6 Or Out 1 Contents Setting	(0~146)	0	Not Used
57	Combined 6 Or Out 2	(0~1)	0	0: Output (NO) 1: Output (NC)

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No.	Item	Range	Default	Description
	Active Type			
58	Combined 6 Or Out 2 Contents Setting	(0~146)	0	Not Used
59	Combined 6 And Out Active Type	(0~1)	0	0: Output (NO)    1: Output (NC)
60	Combined 6 And Out Contents Setting	(0~146)	0	Not Used
Module Settings				
1	Power On Mode	(0~2)	0	0: Last Mode (Keep the previous mode) 1: Manual Mode 2: Auto Mode
2	Language	(0~2)	0	0: Simplified Chinese 1: English 2: Traditional Chinese
3	Password	(00000~65534)	01234	For entering parameters setting.
4	Module Address	(1~254)	1	RS485 communication address
5	RS485-1 Baud Rate	(0~3)	2	0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps
6	RS485-1 Stop Bit	(1~2)	2	2 stop bits or 1 stop bit can be set.
7	RS485-1 Comm. Set	(0~3)	0	0: Remote Adj./Control Enable 1: Remote Control Disable 2: Remote Adj. Disable 3: Remote Adj./Control Disable
8	RS485-2 Baud Rate	(0~3)	2	0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps
9	RS485-2 Stop Bit	(1~2)	2	2 stop bits or 1 stop bit can be set.
10	RS485-2 Comm. Set	(0~3)	0	0: Remote Adj./Control Enable 1: Remote Control Disable 2: Remote Adj. Disable 3: Remote Adj./Control Disable
11	Date and Time			
12	Controller Description 1	(0~20) characters		“About” information is displayed. Any characters can be inputted via PC software (letter occupies 1 character, Chinese character occupies 2.).
13	Controller Description 2	(0~20) characters		
Expand Input Module 1~3				
1	Enable	(0~1)	0	0: Disable    1: Enable When enables, it can communicate with DIN16A-2 module.
2	Comm. Fail Action	(0~1)	0	0: Warn Alarm    1: Fault Alarm

No.	Item	Range	Default	Description
3	Module Address	(1~254)	100	Communication address for RS485 network communication.
4	Expand Inputs Set	(1~16)	1	It can set 16 inputs function and active type of DIN16A-2 module.
<b>Expand Output Module 1~3</b>				
1	Enable	(0~1)	0	0: Disable 1: Enable When enables, it can communicate with DOUT16B-2 module.
2	Comm. Fail Action	(0~1)	0	0: Warn Alarm 1: Fault Alarm
3	Module Address	(1~254)	103	Communication address for RS485 network communication.
4	Expand Outputs Set	(1~16)	1	It can set 16 inputs function and active type of DOUT16B-2 module.

### 8.3 USER-DEFINED PROTOCOL

The configuration item of user-defined protocol only can be set via upper computer. To facilitate user remote monitoring and reduce system communication bus pressure, 3800-3929 are created to be user-defined data field. User can read data in custom sequence via address 3800-3929 through upper computer to configure user-defined data address.

**Table 18 – User-defined Protocol**

Address	Item	Description	Bytes
3800	User-defined	User-defined Data Field	2Bytes
3801	User-defined		2Bytes
3802	User-defined		2Bytes
3803	User-defined		2Bytes
3804	User-defined		2Bytes
3805	User-defined		2Bytes
3806	User-defined		2Bytes
3807	User-defined		2Bytes
3808	User-defined		2Bytes
3809	User-defined		2Bytes
3810	User-defined		2Bytes
3811	User-defined		2Bytes
3812	User-defined		2Bytes
3813	User-defined		2Bytes
3814	User-defined		2Bytes
3815	User-defined		2Bytes
3816	User-defined		2Bytes
3817	User-defined		2Bytes
3818	User-defined		2Bytes
3819	User-defined		2Bytes
3820	User-defined		2Bytes

Address	Item	Description	Bytes
3821	User-defined		2Bytes
3822-3929	User-defined		2*N

SmartGen



## 8.4 DIGITAL INPUT/OUTPUT FUNCTION DESCRIPTION

### 8.4.1 INPUT PORTS FUNCTION

**Table 19 – Input Ports Function Description**

No.	Item	Description
0	Not Used	Invalid
1	QS1 Closed	QS1 closed signal inputs.
2	QS2 Closed	QS2 closed signal inputs.
3	QS3 Closed	QS3 closed signal inputs.
4	QTIE1 Closed	QTIE1 closed signal inputs.
5	QTIE2 Closed	QTIE2 closed signal inputs.
6	Forced Open	Forced open (cut off non-fire supply) only suits for ATS with open control. No matter the genset is in manual mode or auto mode, when the input is active, this will force the breaker to transfer the ATS to 0 position.
7	Remote Start On Load	When active, controller will send genset start signal. When mains is normal, genset will close the breaker.
8	Remote Start Off Load	When active, controller will send a genset start signal. When mains is normal, mains will close the breaker.
9	Lamp Test	When active, all LED lights on the front panel are illuminated and the backlight of the LCD is illuminated while the LCD screen is black in color.
10	Gen1 Fault Input	In Cycle start, if the input is active, S1 Gens start will be inhibited.
11	Gen2 Fault Input	In Cycle start, if the input is active, S2 Gens start will be inhibited.
12	Gen3 Fault Input	In Cycle start, if the input is active, S3 Gens start will be inhibited.
13	Start Inhibit Input	In Auto mode, start signal will be deactivated after the stop delay has expired. In Manual mode, if the genset is running, users should stop it manually; then the manual start signal will be deactivated.
14	Breaker Trip Input	Trip failure alarm will be initiated when the input is active.
15	QS1 Trip Input	QS1 trip fault alarm will be initiated when the input is active.
16	QS2 Trip Input	QS2 trip fault alarm will be initiated when the input is active.
17	QS3 Trip Input	QS3 trip fault alarm will be initiated when the input is active.
18	QTIE1 Trip Input	QTIE1 trip fault alarm will be initiated when the input is active.
19	QTIE2 Trip Input	QTIE2 trip fault alarm will be initiated when the input is active.
20	Auto Trans. Auto Restore Input	If the Aux. input is configured with this, the auto trans. auto restore status is subject to the input port status. When the input is active and the auto trans. auto restore will be active, when the input is inactive while it is auto trans. non restore.
21	S1 Load Inhibit	In Manual mode, S1 manual close is inhibited; if breaker already closed, users should open it manually. In Auto mode, if breaker already closed, then load will disconnect or S2/S3 takes load.
22	S2 Load Inhibit	In Manual mode, S2 manual close is inhibited; if breaker already closed, users should open it manually. In Auto mode, if breaker already closed, then load will disconnect or S1/S3 takes load.

No.	Item	Description
23	S3 Load Inhibit	In Manual mode, S3 manual close is inhibited; if breaker already closed, users should open it manually. In Auto mode, if breaker already closed, then load will disconnect or S1/S2 takes load.
24	QS1 PF Input	When the S1 PF input is active, S1 close relay will be activated.
25	QS2 PF Input	When the S2 PF input is active, S2 close relay will be activated.
26	QS3 PF Input	When the S3 PF input is active, S3 close relay will be activated.
27	QTIE1 PF Input	When the QTIE1 PF input is active, QTIE1 close relay will be activated.
28	QTIE2 PF Input	When the QTIE2 PF input is active, QTIE2 close relay will be activated.
29	Reserved	
30	Alarm Reset	Reset the current alarm.
31	Alarm Mute	Silence the audible alarm.
32	Reserved	
33	Reserved	
34	Reserved	
35	Forced Manual Mode	Set the controller in Manual mode compulsively.
36	Forced Auto Mode	Set the controller in Auto mode compulsively.
37	Remote Control Inhibit	Remote control operation is inactive.
38	Panel Lock	Panel button operation are inhibited (Except Up, Down, Confirm, Return, Reset and Mute keys)
39	Schedule Inhibit	Schedule Start and Schedule Not Start function are deactivated.
40	Simulate S1 OK	Simulate S1 voltage is normal; the S1 voltage abnormal delay is deactivated.
41	Simulate S2 OK	Simulate S2 voltage is normal; the S2 voltage abnormal delay is deactivated.
42	Simulate S3 OK	Simulate S3 voltage is normal; the S3 voltage abnormal delay is deactivated.
43	Local Mode	Set controller to local mode.
44	Reserved	
45	Reserved	
46	Manual/Auto	Manual mode when it is active, auto mode when it is inactive.
47	Reserved	
48	Simulate QS1 C/O Key	Simulate QS1 c/o key function.
49	Simulate QS2 C/O Key	Simulate QS2 c/o key function.
50	Simulate QS3 C/O Key	Simulate QS3 c/o key function.
51	QTIE1 C/O Key	Simulate QTIE1 c/o key function.
52	QTIE2 C/O Key	Simulate QTIE2 c/o key function.
53	Simulate Manual/Auto Key	Simulate manual/auto key function.
54	Reserved	
55	Reserved	
56	Reserved	
57	Reserved	
58	Reserved	
59	Reserved	

No.	Item	Description
60	Reserved	
61	Reserved	

#### 8.4.2 OUTPUT PORTS FUNCTION

**Table 20 – Output Ports Function Description**

No.	Items	Description
0	Not Used	Invalid
1	Custom Combined 1	
2	Custom Combined 2	
3	Custom Combined 3	
4	Custom Combined 4	
5	Custom Combined 5	
6	Custom Combined 6	
7	Reserved	
8	Reserved	
9	Reserved	
10	Reserved	
11	Common Alarm	It includes fault alarm and warn alarm.
12	Common Fault Alarm	It includes transfer fault alarm (close failure, open failure).
13	Common Warn Alarm	It includes forced open, expand input/output module communication failure, DC power under/over voltage alarm.
14	Transfer Fault	It includes “QS1 Close Failure” alarm, “QS1 Open Failure” alarm, “QS2 Close Failure” alarm, “QS2 Open Failure” alarm, “QS3 Close Failure” alarm, “QS3 Open Failure”, “QTIE1 Close Failure” alarm, “QTIE1 Open Failure”, “QTIE2 Close Failure” alarm, “QTIE2 Open Failure” alarm.
15	Audible Alarm	It can be connected annunciator externally when input is active. When “alarm mute” input is active or 60s delay has expired, it can remove the alarm.
16	Local Mode	Output when controller is in local mode.
17	Genset Start Delay	Output when start signal is initiated.
18	Genset Stop Delay	Output when stop signal is initiated.
19	Elevator Control	Output before the load disconnect or switch transfer. Used for control the running elevator stop at the nearest floor until the switch transfer is terminated.
20	Reserved	
21	S1 Available	Output when S1 power is normal.
22	S1 Unavailable	Output when S1 power is abnormal.
23	S2 Available	Output when S2 power is normal.
24	S2 Unavailable	Output when S2 power is abnormal.
25	S3 Available	Output when S3 power is normal.
26	S3 Unavailable	Output when S3 power is abnormal.
27	Auto Mode	Output when the genset is in Auto mode.

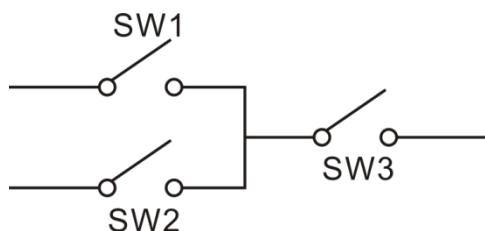
No.	Items	Description
28	Manual Mode	Output when the genset is in Manual mode.
29	Genset Start Output	Control the genset to start.
30	Reserved	
31	QS1 Close Control	Control the QS1 switch to close.
32	QS1 Open Control	Control the QS1 switch to open.
33	QS2 Close Control	Control the QS2 switch to close.
34	QS2 Open Control	Control the QS2 switch to open.
35	QS3 Close Control	Control the QS3 switch to close.
36	QS3 Open Control	Control the QS3 switch to open.
37	QTIE1 Close Control	Control the QTIE1 switch to close.
38	QTIE1 Open Control	Control the QTIE1 switch to open.
39	QTIE2 Close Control	Control the QTIE2 switch to close.
40	QTIE2 Open Control	Control the QTIE2 switch to open.
41	Reserved	
42	QS1 Closed Input	The close status of S1 switch.
43	QS2 Closed Input	The close status of S2 switch.
44	QS3 Closed Input	The close status of S3 switch.
45	QTIE1 Closed Input	The close status of QTIE1 switch.
46	QTIE2 Closed Input	The close status of QTIE2 switch.
47	Reserved	
48	S1 Genset Start	It controls S1 genset start and is used for gen-gen system and S1 is generating.
49	S2 Genset Start	It controls S2 genset start and is used for gen-gen system and S2 is generating.
50	S3 Genset Start	It controls S3 genset start and is used for gen-gen system and S3 is generating.
51	Reserved	
52	S1S2S3 ATS Power L1	ATS power supply
53	S1S2S3 ATS Power N	
54	Remote Control	Control the output via RS485 command.
55	Input 1 Status	Aux. Input status.
56	Input 2 Status	
57	Input 3 Status	
58	Input 4 Status	
59	Input 5 Status	
60	Input 6 Status	
61	Input 7 Status	
62	Input 8 Status	
63	Input 9 Status	
64	Input 10 Status	
65	Input 11 Status	
66	Input 12 Status	
67	Reserved	
68	Reserved	

No.	Items	Description
69	S1 Blackout	S1 power supply status
70	S1 Over Volt	
71	S1 Under Volt	
72	S1 Over Freq	
73	S1 Under Freq	
74	S1 Loss of Phase	
75	S1 Reverse Phase Seq	
76	Reserved	
77	Reserved	
78	S2 Blackout	S2 power supply status
79	S2 Over Volt	
80	S2 Under Volt	
81	S2 Over Freq	
82	S2 Under Freq	
83	S2 Loss of Phase	
84	S2 Reverse Phase Seq	
85	Reserved	
86	Reserved	
87	S3 Blackout	S3 power supply status
88	S3 Over Volt	
89	S3 Under Volt	
90	S3 Over Freq	
91	S3 Under Freq	
92	S3 Loss of Phase	
93	S3 Reverse Phase Seq	
94	Reserved	
95	Reserved	
96	Switching	Output during the switch transfer process.
97	DC Power Under Volt	Output when DC power under voltage alarm occurs.
98	DC Power Over Volt	Output when DC power over voltage alarm occurs.
99	Scheduled Not Run	Output during the scheduled not run process.
100	Scheduled Run	Output during the scheduled run process.
101	Reserved	
102	Reserved	
103	PLC Flag 1	PLC flag output.
104	PLC Flag 2	
105	PLC Flag 3	
106	PLC Flag 4	
107	PLC Flag 5	
108	PLC Flag 6	
109	PLC Flag 7	
110	PLC Flag 8	
111	PLC Flag 9	
112	PLC Flag 10	

No.	Items	Description
113	PLC Flag 11	
114	PLC Flag 12	
115	PLC Flag 13	
116	PLC Flag 14	
117	PLC Flag 15	
118	PLC Flag 16	
119	PLC Flag 17	
120	PLC Flag 18	
121	PLC Flag 19	
122	PLC Flag 20	
123	PLC Flag 21	
124	PLC Flag 22	
125	PLC Flag 23	
126	PLC Flag 24	
127	PLC Flag 25	
128	PLC Flag 26	
129	PLC Flag 27	
130	PLC Flag 28	
131	PLC Flag 29	
132	PLC Flag 30	
133	PLC Flag 31	
134	PLC Flag 32	
135	PLC Flag 33	
136	PLC Flag 34	
137	PLC Flag 35	
138	PLC Flag 36	
139	PLC Flag 37	
140	PLC Flag 38	
141	PLC Flag 39	
142	PLC Flag 40	
143	Reserved	
144	Reserved	
145	Reserved	
146	Reserved	

### 8.4.3 CUSTOM COMBINED OUTPUT

Custom combined output is composed by 3 parts, OR condition output SW1, OR condition output SW2, AND condition output SW3.



SW1 or SW2 is **TRUE**, while SW3 is **TRUE**, Defined combination output is active;

SW1 and SW2 are **FALSE**, or SW3 is **FALSE**, Defined combination output is deactivated.

**NOTE 4:** SW1, SW2, SW3 can be set as any contents except for “defined combination output” in the output setting.

**NOTE 5:** 3 parts of defined combination output (SW1, SW2, SW3) couldn’t include or recursively include themselves.

Example,

Contents of OR condition output SW1: input port 1 is active;

Close when OR condition output SW1 is active/inactive: normally open when active (disconnect when inactive);

Contents of OR condition output SW2, input port 2 is active;

Close when OR condition output SW2 is active/inactive: normally open when active (disconnect when inactive);



Contents of AND condition output SW3: input port 3 is active;

Close when AND condition output SW3 is active/inactive: normally open when active (disconnect when inactive);

When input port 1 active or input port 2 active, if input port 3 is active, Defined combination output is outputting; If input port 3 inactive, Defined combination output is not outputting;

When input port 1 inactive and input port 2 inactive, whatever input port 3 is active or not, Defined combination output is not outputting.

## 9 HISTORICAL RECORDS

On the main screen press /OK key and select **Historical Records**, and then press /OK key again, the screen will show the historical records interface.

Each record includes:

- Record date and time
- Record type
- Event log
- S1 power supply status
- S2 power supply status
- S3 power supply status
- S1 3-phase voltage
- S2 3-phase voltage
- S3 3-phase voltage
- S1 frequency
- S2 frequency
- S3 frequency

Maximum pieces of historical record are 200. The first record is latest, and users could check every records by dredge up/down. The latest record will cover the oldest one when records amount exceeds 200.

Event log type includes: Action Event, Warn Event and Fault Event. All fault event actions are fault alarm while all warn event actions are warning alarm.



**Table 21 – Action Events List**

No.	Action Events	Description
1	Closing QS1	Record when the QS1 close relay activated.
2	Closing QS2	Record when the QS2 close relay activated.
3	Closing QS3	Record when the QS3 close relay activated.
4	Closing QTIE1	Record when the QTIE1 close relay activated.
5	Closing QTIE2	Record when the QTIE2 close relay activated.
6	Opening QS1	Record when the QS1 open relay activated.
7	Opening QS2	Record when the QS2 open relay activated.
8	Opening QS3	Record when the QS3 open relay activated.
9	Opening QTIE1	Record when the QTIE1 open relay activated.
10	Opening QTIE2	Record when the QTIE2 open relay activated.
11	Genset Start	Record when the Genset Start signal output.
12	S1 Genset Start	Record when the S1 Genset Start signal output.
13	S2 Genset Start	Record when the S2 Genset Start signal output.
14	S3 Genset Start	Record when the S3 Genset Start signal output.
15	Genset Stop	Record when the Genset Start signal deactivated.
16	S1 Genset Stop	Record when the S1 Genset Start signal deactivated.
17	S2 Genset Stop	Record when the S2 Genset Start signal deactivated.
18	S3 Genset Stop	Record when the S3 Genset Start signal deactivated.



No.	Action Events	Description
19	Auto Mode	Record when the genset mode transferred to Auto Mode.
20	Manual Mode	Record when the genset mode transferred to Manual Mode.
21	Local Mode	Record when the genset is forced to Local Mode.

## 10 BLACK BOX RECORDS

On the main screen press /OK key and select **Black Box Records**, and then press /OK key again, the screen will show the black box records interface.

Each record includes:

- Record date and time
- Record type
- Event log
- S1 power supply status
- S2 power supply status
- S3 power supply status
- S1 3-phase voltage
- S2 3-phase voltage
- S3 3-phase voltage
- S1 frequency
- S2 frequency
- S3 frequency

Maximum pieces of black box record are 5. Every event records total 60s (before 10s and after 50s) data information of this event, and record once per second. The latest record will cover the oldest one when records amount exceeds 5. The first record is latest. Users could check details by pressing Confirm Key, and could check the 60 datas by dredge up/down.

Event log type: the action event of close/open switching in auto mode.

**Table 22 – Action Events List**

No.	Action Events	Description
1	Auto QS1 Close	QS1 Close in auto mode
2	Auto QS2 Close	QS2 Close in auto mode
3	Auto QS3 Close	QS3 Close in auto mode
4	Auto QTIE1 Close	QTIE1 Close in auto mode
5	Auto QTIE2 Close	QTIE2 Close in auto mode






## 11 SWITCH OPERATION

### 11.1 MANUAL OPERATION

Manual mode is selected by pressing the  button; a LED beside the button will illuminate to confirm the operation.

Switch will start to transfer immediately after pressing the key. During the transferring, corresponding lamps will flash, and then the lamp will be normally illuminated when transfer is done. If fail to close or fail to open occurs in the transfer process, the controller will alarm (Transfer Key is still active and the operation can be redone).

**Table 23 – Manual Transfer Keys**

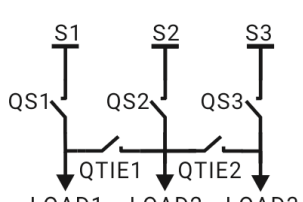
Icon	Key Name	Description
	QS1	After pressing this key, if load is disconnected, QS1 will close, S1 supplies for the load. Press it again, QS1 will open.
	QTIE1	After pressing this key, if QTIE1 switch is disconnected, QTIE1 will close. Press it again, QTIE1 will open.
	QS2	After pressing this key, if load is disconnected, QS2 will close, S2 supplies for the load. Press it again, QS2 will open.
	QTIE2	After pressing this key, if QTIE2 switch is disconnected, QTIE2 will close. Press it again, QTIE2 will open.
	QS3	After pressing this key, if load is disconnected, QS3 will close, S3 supplies for the load. Press it again, QS3 will open.

## 11.2 AUTOMATIC OPERATION

Auto mode is selected by pressing the  button; a LED beside the button will illuminate to confirm the operation.

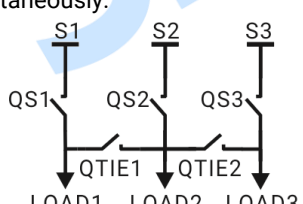
Under auto mode, the controller will switch automatically to ensure power supply according to S1, S2, S3 status, system type. Examples are showed below:

**Table 24 – 2T-TS-2L Auto Transfer Logic**

System Topology	Power Status			Switch Logic				
<b>System: 2T-TS-2L</b> When three powers are normal, it supplies for them separately; each power at most can supply two loads simultaneously. <div style="text-align: center;">  </div>	S1	S2	S3	QS1	QTIE1	QS2	QTIE2	QS3
	1	1	1	On	Off	On	Off	On
	1	1	0	On	Off	On	On	Off
	1	0	1	On	On	Off	Off	On
	1	0	0	On	On	Off	Off	Off
	0	1	1	Off	On	On	Off	On
	0	1	0	Off	On	On	Off	Off
	0	0	1	Off	Off	Off	On	On
	0	0	0	Off	Off	Off	Off	Off

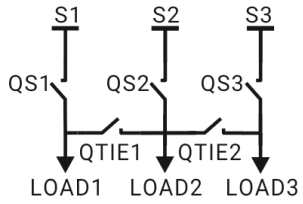
Note: 2T-TS-2L (2T: two tie, TS: tie standby, 2L: two loads), 2 Bus Tie-Bus Tie Standby-each power supplies two loads.

**Table 25 – 2T-TS-3L Auto Transfer Logic**

System Topology	Power Status			Switch Logic				
<b>System: 2T-TS-3L</b> When three power are normal, it supplies for them separately; each power can supply three loads simultaneously. <div style="text-align: center;">  </div>	S1	S2	S3	QS1	QTIE1	QS2	QTIE2	QS3
	1	1	1	On	Off	On	Off	On
	1	1	0	On	Off	On	On	Off
	1	0	1	On	On	Off	Off	On
	1	0	0	On	On	Off	On	Off
	0	1	1	Off	On	On	Off	On
	0	1	0	Off	On	On	On	Off
	0	0	1	Off	On	Off	On	On
	0	0	0	Off	Off	Off	Off	Off

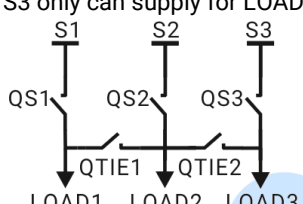
Note: 2T-TS-3L (2T: two tie, TS: tie standby, 3L: three loads), 2 Bus Tie-Bus Tie standby- each power supplies three loads.

**Table 26 – 2T-TS-3G Auto Transfer Logic**

System Topology	Power Status			Switch Logic				
<b>System: 2T-TS-3G</b> S3 is emergency power, S1 or S2 or S3 can supply for three loads simultaneously. 	S1	S2	S3	QS1	QTIE1	QS2	QTIE2	QS3
	1	1	1	On	Off	On	On	Off
	1	1	0	On	Off	On	On	Off
	1	0	1	On	On	Off	On	Off
	1	0	0	On	On	Off	On	Off
	0	1	1	Off	On	On	On	Off
	0	1	0	Off	On	On	On	Off
	0	0	1	Off	On	Off	On	On
	0	0	0	Off	Off	Off	Off	Off

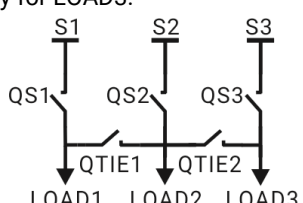
Note: 2T-TS-3G (2T: two tie, TS: tie standby, 3G: S3 Genset) , 2 Bus Tie-Bus Tie Standby-S3 is Gen.

**Table 27 – 2T-3I-3L Auto Transfer Logic**

System Topology	Power Status			Switch Logic				
<b>System: 2T-3I-3L</b> S3 is emergency power, S1 or S2 can supply for three loads simultaneously, while S3 only can supply for LOAD3. 	S1	S2	S3	QS1	QTIE1	QS2	QTIE2	QS3
	1	1	1	On	Off	On	On	Off
	1	1	0	On	Off	On	On	Off
	1	0	1	On	On	Off	On	Off
	1	0	0	On	On	Off	On	Off
	0	1	1	Off	On	On	On	Off
	0	1	0	Off	On	On	On	Off
	0	0	1	Off	Off	Off	Off	On
	0	0	0	Off	Off	Off	Off	Off

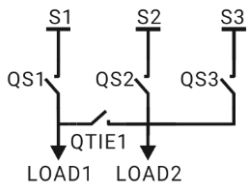
Note: 2T-3I-3L (2T: two tie, 3I: S3 independent, 3L: three loads) , 2 Bus Tie-S3 independently supply-S1/S2 can supply for 3 loads simultaneously.

**Table 28 – 2T-3I-2L Auto Transfer Logic**

System Topology	Power Status			Switch Logic				
<b>System: 2T-3I-2L</b> S1 or S2 at most can supply for two loads simultaneously, S3 only can supply for LOAD3. 	S1	S2	S3	QS1	QTIE1	QS2	QTIE2	QS3
	1	1	1	On	Off	On	On	Off
	1	1	0	On	Off	On	On	Off
	1	0	1	On	On	Off	Off	On
	1	0	0	On	On	Off	Off	Off
	0	1	1	Off	On	On	Off	On
	0	1	0	Off	On	On	Off	Off
	0	0	1	Off	Off	Off	Off	On
	0	0	0	Off	Off	Off	Off	Off

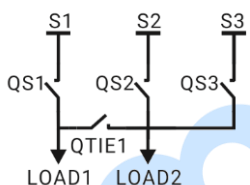
Note: 2T-3I-2L(2T: two tie, 3I: S3 independent, 2L: two loads), 2 Bus Tie-S3 independently supply-S1/S2 power can supply 2 load simultaneously.

**Table 29 – LT-TP-1NPL Auto Transfer Logic**

System Topology	Power Status			Switch Logic			
<b>System: LT-TP-1NPL</b> If S2 and S3 only supply for essential load (LOAD2), and S2 is prior to S3; S1 has priority to supplies for LOAD1 and LOAD2 	S1	S2	S3	QS1	QTIE1	QS2	QS3
	1	1	1	On	On	Off	Off
	1	1	0	On	On	Off	Off
	1	0	1	On	On	Off	Off
	1	0	0	On	On	Off	Off
	0	1	1	Off	Off	On	Off
	0	1	0	Off	Off	On	Off
	0	0	1	Off	Off	Off	On
	0	0	0	Off	Off	Off	Off

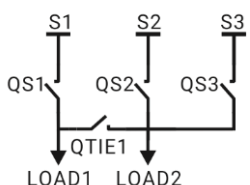
Note: LT-TP-1NPL (LT: left tie, TP: tie priority, 1NPL: 1 Non-priority load), Left Bus Tie-Bus Tie Main Use-LOAD1 is NEL.

**Table 30 – LT-TS-1NPL Auto Transfer Logic**

System Topology	Power Status			Switch Logic			
<b>System: LT-TS-1NPL</b> S2 and S3 only supply for essential load (LOAD 2, and S2 is prior to S3; S1 has the priority to supply for LOAD 1, only supply the two loads when S2 and S3 are abnormal.) 	S1	S2	S3	QS1	QTIE1	QS2	QS3
	1	1	1	On	Off	On	Off
	1	1	0	On	Off	On	Off
	1	0	1	On	Off	Off	On
	1	0	0	On	On	Off	Off
	0	1	1	Off	Off	On	Off
	0	1	0	Off	Off	On	Off
	0	0	1	Off	Off	Off	On
	0	0	0	Off	Off	Off	Off

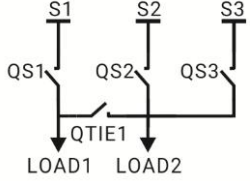
Note: LT-TS-1NPL (LT: left tie, TS: tie standby , 1NPL: 1 Non-priority load), Left Bus Tie-Bus Tie Standby-LOAD 1 is NEL.

**Table 31 – LT-TS-LP Auto Transfer Logic**

System Topology	Power Status			Switch Logic			
<b>System: LT-TS-LP</b> Each power can supply for two loads simultaneously. S1 is prior to supply for LOAD1, only supply the two loads when S2 and S3 are abnormal. S2 takes priority over S3 to supply for LOAD2, only supply the two loads when S1 is abnormal. 	S1	S2	S3	QS1	QTIE1	QS2	QS3
	1	1	1	On	Off	On	Off
	1	1	0	On	Off	On	Off
	1	0	1	On	Off	Off	On
	1	0	0	On	On	Off	Off
	0	1	1	Off	On	On	Off
	0	1	0	Off	On	On	Off
	0	0	1	Off	On	Off	On
	0	0	0	Off	Off	Off	Off

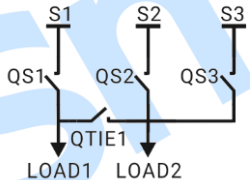
Note: LT-TS-LP(LT: left tie, TS: tie standby, LP: load priority), Left-Bus Tie-Bus Tie Standby-Load is prior to supply.

**Table 32 – LT-TS-LP-3G Auto Transfer Logic**

System Topology	Power Status			Switch Logic			
<b>System: LT-TS-LP-3G</b> Each power can supply for two loads simultaneously; Two loads are supplied by S1 and S2 separately, S3 only supplies for two loads when S1 and S2 are abnormal. 	S1	S2	S3	QS1	QTIE1	QS2	QS3
	1	1	1	On	Off	On	Off
	1	1	0	On	Off	On	Off
	1	0	1	On	Off	Off	On
	1	0	0	On	On	Off	Off
	0	1	1	Off	On	On	Off
	0	1	0	Off	On	On	Off
	0	0	1	Off	Off	Off	On
	0	0	0	Off	Off	Off	Off

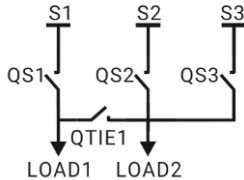
Note: LT-TS-LP-3G (LT: left tie, TS: tie standby, LP: load priority, 3G: S3 Genset), Left Bus Tie-Bus Tie Standby-Load is prior to supply-S3 is Gens.

**Table 33 – LT-TP-LP Auto Transfer Logic**

System Topology	Power Status			Switch Logic			
<b>System: LT-TP-LP</b> Each power can supply for two loads simultaneously. Supply for two loads according to the power priority S1>S2>S3. 	S1	S2	S3	QS1	QTIE1	QS2	QS3
	1	1	1	On	Off	On	Off
	1	1	0	On	On	On	Off
	1	0	1	On	Off	Off	On
	1	0	0	On	On	Off	Off
	0	1	1	Off	On	On	Off
	0	1	0	Off	On	On	Off
	0	0	1	Off	Off	Off	On
	0	0	0	Off	Off	Off	Off

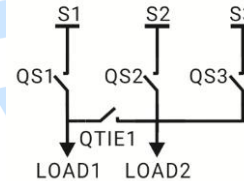
Note: LT-TP-LP (LT: left tie, TP: tie priority, LP: load priority) , Left Bus Tie-Bus Tie Main Use-Load is prior to supply.

**Table 34 – LT-TS-3I Auto Transfer Logic**

System Topology	Power Status			Switch Logic			
<b>System: LT-TS-3I</b> S1 or S2 can supply for two loads simultaneously; S1 is prior to supply for LOAD1, only supply for the two loads when S2 and S3 are abnormal. S2 takes priority over S3 to supply for LOAD2, only supply the two loads when S1 is abnormal. S3 only ensures to supply for LOAD2. 	S1	S2	S3	QS1	QTIE1	QS2	QS3
	1	1	1	On	Off	On	Off
	1	1	0	On	Off	On	Off
	1	0	1	On	Off	Off	On
	1	0	0	On	On	Off	Off
	0	1	1	Off	On	On	Off
	0	1	0	Off	On	On	Off
	0	0	1	Off	Off	Off	On
	0	0	0	Off	Off	Off	Off

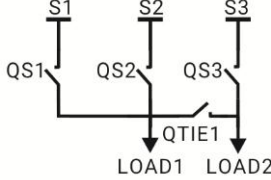
Note: LT-TS-3I (LT: left tie, TS: tie standby, 3I: S3 independent), Left Bus Tie-Bus Tie Standby-S3 independently supply.

**Table 35 – LT-TS-3IG Auto Transfer Logic**

System Topology	Power Status			Switch Logic			
<b>System: LT-TS-3IG</b> S1 or S2 can supply for two loads simultaneously; Two loads are supplied by S1 and S2 separately, S3 only supply for LOAD2. 	S1	S2	S3	QS1	QTIE1	QS2	QS3
	1	1	1	On	Off	On	Off
	1	1	0	On	Off	On	Off
	1	0	1	On	On	Off	Off
	1	0	0	On	On	Off	Off
	0	1	1	Off	On	On	Off
	0	1	0	Off	On	On	Off
	0	0	1	Off	Off	Off	On
	0	0	0	Off	Off	Off	Off

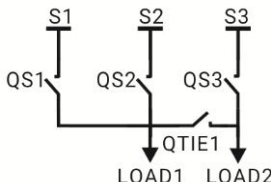
Note: LT-TS-3IG (LT: left tie, TS: tie standby, 3I: S3 independent, 3IG: S3 independent, S3 Genset), Left Bus Tie-Bus Tie Standby- S3 independently supply, S3 is Gens. S1 and S2 are Mains, mains is normal and takes load.

**Table 36 – RT-TP-3I Auto Transfer Logic**

System Topology	Power Status			Switch Logic			
<b>System: RT-TP-3I</b> S1 and S2 can supply for two loads simultaneously; Supply for two loads according to the power priority S1>S2, S3 only supply for LOAD2. 	S1	S2	S3	QS1	QTIE1	QS2	QS3
	1	1	1	On	On	Off	Off
	1	1	0	On	On	Off	Off
	1	0	1	On	On	Off	Off
	1	0	0	On	On	Off	Off
	0	1	1	Off	On	On	Off
	0	1	0	Off	On	On	Off
	0	0	1	Off	Off	Off	On
	0	0	0	Off	Off	Off	Off

Note: RT-TP-3I (RT: right tie, TP: tie priority, 3I: S3 independent), Right Bus Tie-Bus Tie Main Use-S3 independently supply.

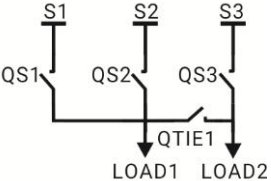
**Table 37 – RT-TS-LP-1G Auto Transfer Logic**

System Topology	Power Status			Switch Logic			
<b>System: RT-TS-LP-1G</b> Each power can supply for two loads; Two loads are preferentially supplied by S2 and S3; S1 supplies for two loads only when S2 and S3 are abnormal simultaneously; 	S1	S2	S3	QS1	QTIE1	QS2	QS3
	1	1	1	Off	Off	On	On
	1	1	0	Off	On	On	Off
	1	0	1	Off	On	Off	On
	1	0	0	On	On	Off	Off
	0	1	1	Off	Off	On	On
	0	1	0	Off	On	On	Off
	0	0	1	Off	On	Off	On
	0	0	0	Off	Off	Off	Off

Note: RT-TS-LP-1G (RT: right tie, TS: tie standby, LP: load priority, 1G: S1 Genset), Right Bus Tie-Bus Tie Standby- Load is prior to supply-S1 is Gens.



**Table 38 – RT-TS-LP-1IG Auto Transfer Logic**

System Topology	Power Status			Switch Logic			
<p>System: RT-TS-LP-1IG</p> <p>S2 and S3 can supply for two loads simultaneously;</p> <p>Two loads are preferentially supplied by S2 and S3; S1 only supply for LOAD1.</p> 	S1	S2	S3	QS1	QTIE1	QS2	QS3
	1	1	1	Off	Off	On	On
	1	1	0	Off	On	On	Off
	1	0	1	Off	On	Off	On
	1	0	0	On	Off	Off	Off
	0	1	1	Off	Off	On	On
	0	1	0	Off	On	On	Off
	0	0	1	Off	On	Off	合
	0	0	0	Off	Off	Off	Off

Note: RT-TS-LP-1IG (RT: right tie, TS: tie standby, LP: load priority, 1IG: S1 independent, S1 Genset), Right Bus Tie-Bus Tie Standby-Load is prior to supply-S1 independently supply, S1 is Gens.

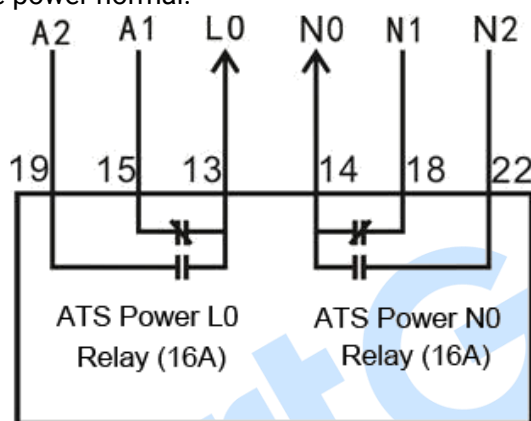
During the transferring process, if fail to close or close inhibit occurs, the corresponding switch will not close, and other switches that can control close will supply power. If fail to open occurs, open failure fault alarm will be initiated, the switch won't execute any order, controller enters manual mode.

## 12 ATS POWER SUPPLY

### 12.1 CONTROLLER POWER SUPPLY

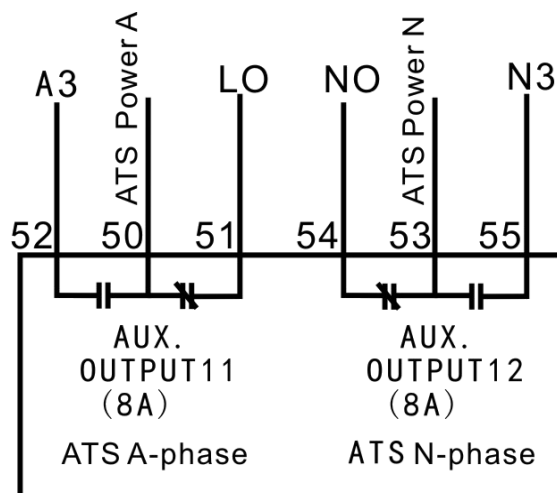
ATS power type can be set as DC Power or AC Power. If DC Power is selected, then the switch can be transferred at any time (even when both S1, S2 and S3 are outage). If AC Power is selected, whether the power is normal or not should be judged according to the AN voltage status of S1, S2 and S3 and AC power voltage.

The controller will intelligently control supply when the power of ATS is from S1 and S2. As long as 1 voltage of S1 and S2 is normal, the controller can ensure ATS voltage power normal and can be transferred properly. When ATS voltage power is from LO and NO, it will send close/open signal only if the controller detects voltage power normal.



**Fig.2 – Internal Wiring of ATS Power LO-NO Output**

The controller will intelligent control to supply when the power of ATS switch is from S1 S2 and S3. As long as 1 voltage of S1 S2 and S3 is normal, the controller can ensure ATS voltage power normal and can be transferred properly. Users need to respectively connect LO, A3 (A phase of S3) to Terminal51 (normally close) and Terminal52 (normally open) of Aux. Output11; and respectively connect NO, N3 (N phase of S3) to Terminal54 (normally close) and Terminal55 (normally open) of Aux. Output12; then connect the COM of Aux. Output11 and 12 to ATS power supply. Then set Aux. Output11 as corresponding phase voltage "S1S2S3ATS Power L1", set Aux. Output12 as "S1S2S3ATS Power N" in parameter setting interface. Please refer connection method as below:



**Fig.3 – Wring of ATS Supplied by Any of S1, S2, S3**

## 12.2 TPS31 POWER SUPPLY

ATS power supply also can be controlled by external module TPS31. The internal transfer diagram of TPS31 is as following:

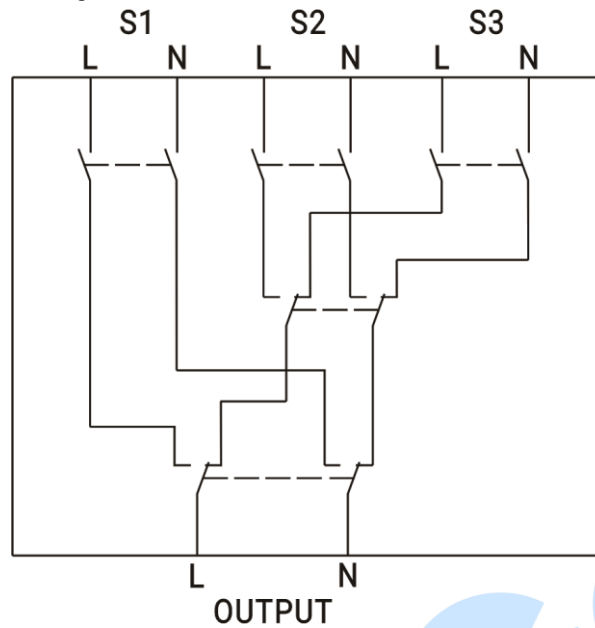


Fig.4 – Internal Transfer Diagram

## 13 COMMUNICATION CONFIGURATION AND CONNECTION

HAT835 controller equips with 2 RS485 serial ports which enable the connection of LAN. It uses Modbus protocol via PC or system software, it can also be applicable to three power switching management to factories, telecom, industrial and civil buildings, which achieves “remote control, remote measuring, remote communication” functions.

More information of Communication Protocol, please refer to “HAT835 Communication Protocol”.

### **Communication parameters:**

Module address	1 (range: 1-254)
Baud rate	9600 bps (2400/4800/9600/19200bps)
Data bit	8-bit
Parity bit	None
Stop bit	2 bits (1 bit or 2 bits)

There is a D-type USB port which can be used to connect PC for software upgrading and parameter setting.

## 14 PLC FUNCTION INTRODUCTION

### 14.1 PLC EDITING SCREEN

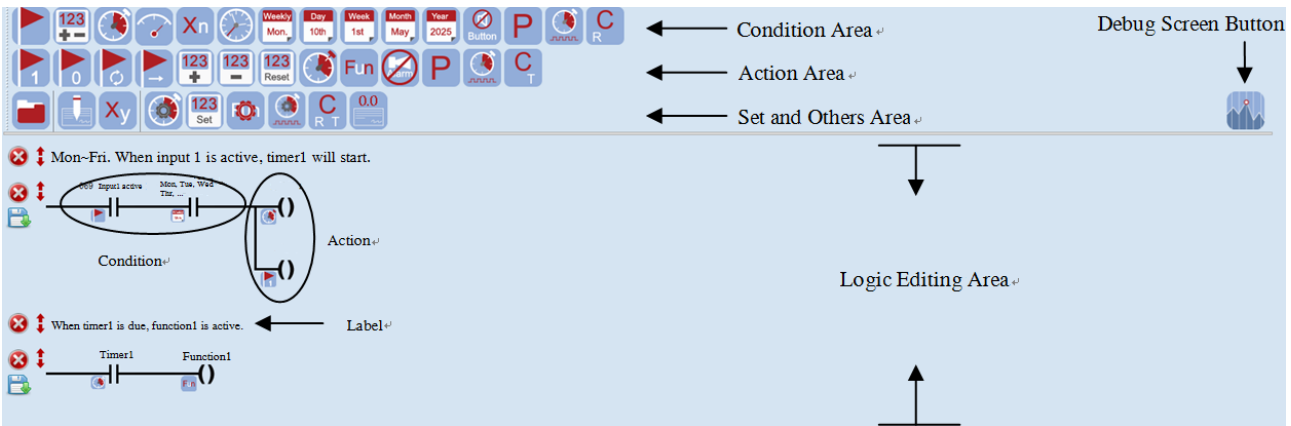


Fig.5 – PLC Editing Screen

### 14.2 PLC ELEMENT INTRODUCTION

PLC element includes condition area element, action area element, set and others area element. Drag the corresponding element icon to logic editing area for logical editing.

For example, counter in condition element:

Table 39 – Counter Description

Icon	Condition	Description	Example
	Counter	Test whether counter value has reached set value.	<p>When counter1 value reaches set value, the condition is active; otherwise, it is inactive.</p>

### 14.3 LOGIC INTRODUCTION

Take “OR” logic as the example:

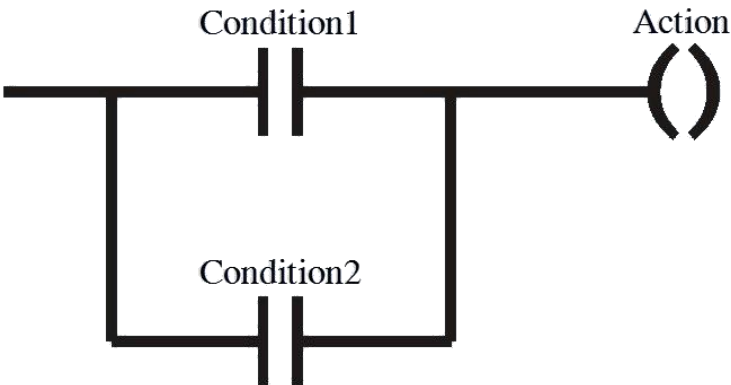


Fig.6 – OR Logic Diagram

When condition1 or condition2 is active, action is triggered.

For example:

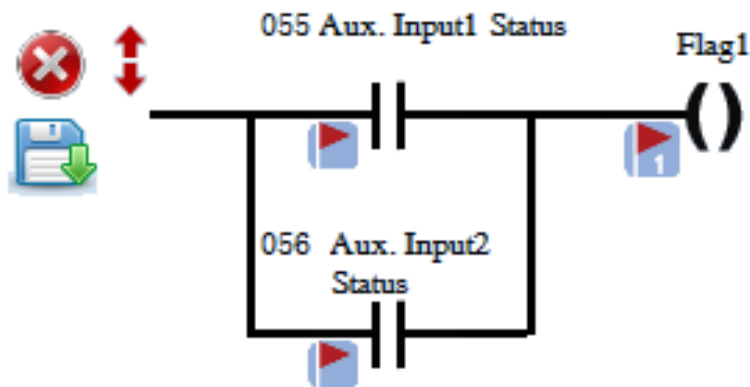


Fig.7 – OR Logic Example Diagram

## 14.4 APPLICATION EXAMPLE

Example1 (S1 voltage normal output).

Function: Flag1 outputs when S1 voltage is normal.



Fig.8 – PLC Example1 Logic

12	NO Output	103 PLC Flag 1
----	-----------	----------------

Fig.9 – PLC Example1 Outputs Set

Example2 (Manual mode delay output).

Function: After entering manual mode, it outputs after delay for 180s.

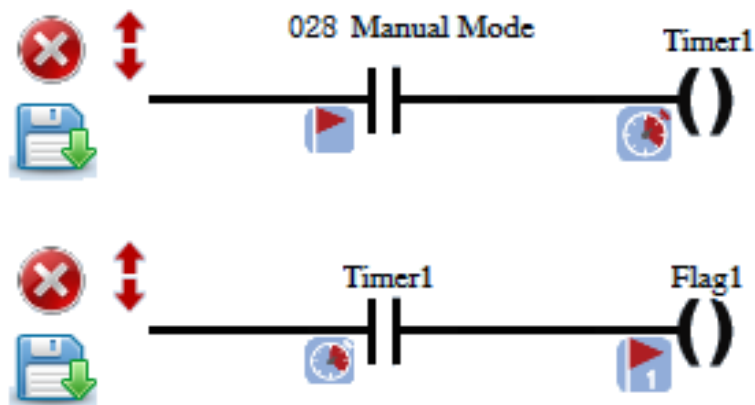


Fig.10 – PLC Example2 Logic

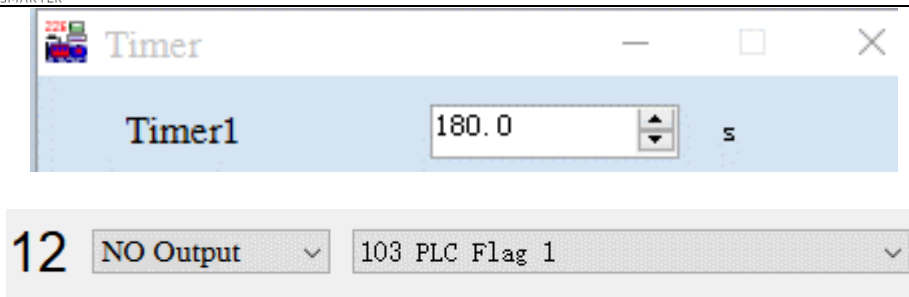


Fig.11 – PLC Example2 Outputs Set

▲NOTE 6: PLC function refers to “Controller PLC Function Module User Manual”.

## 15 TERMINALS

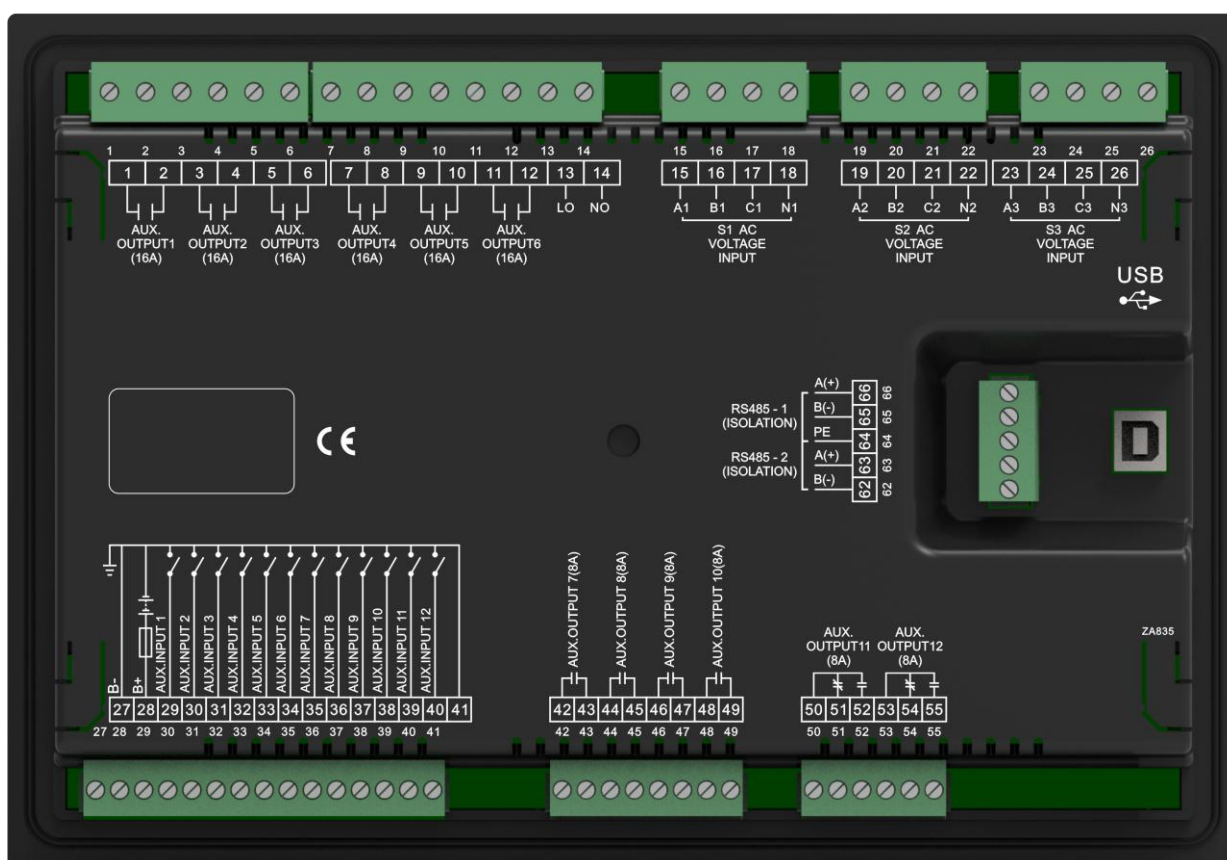


Fig.12 – Controller Rear Panel Drawing

Table 40 – Inputs/Outputs Function Description

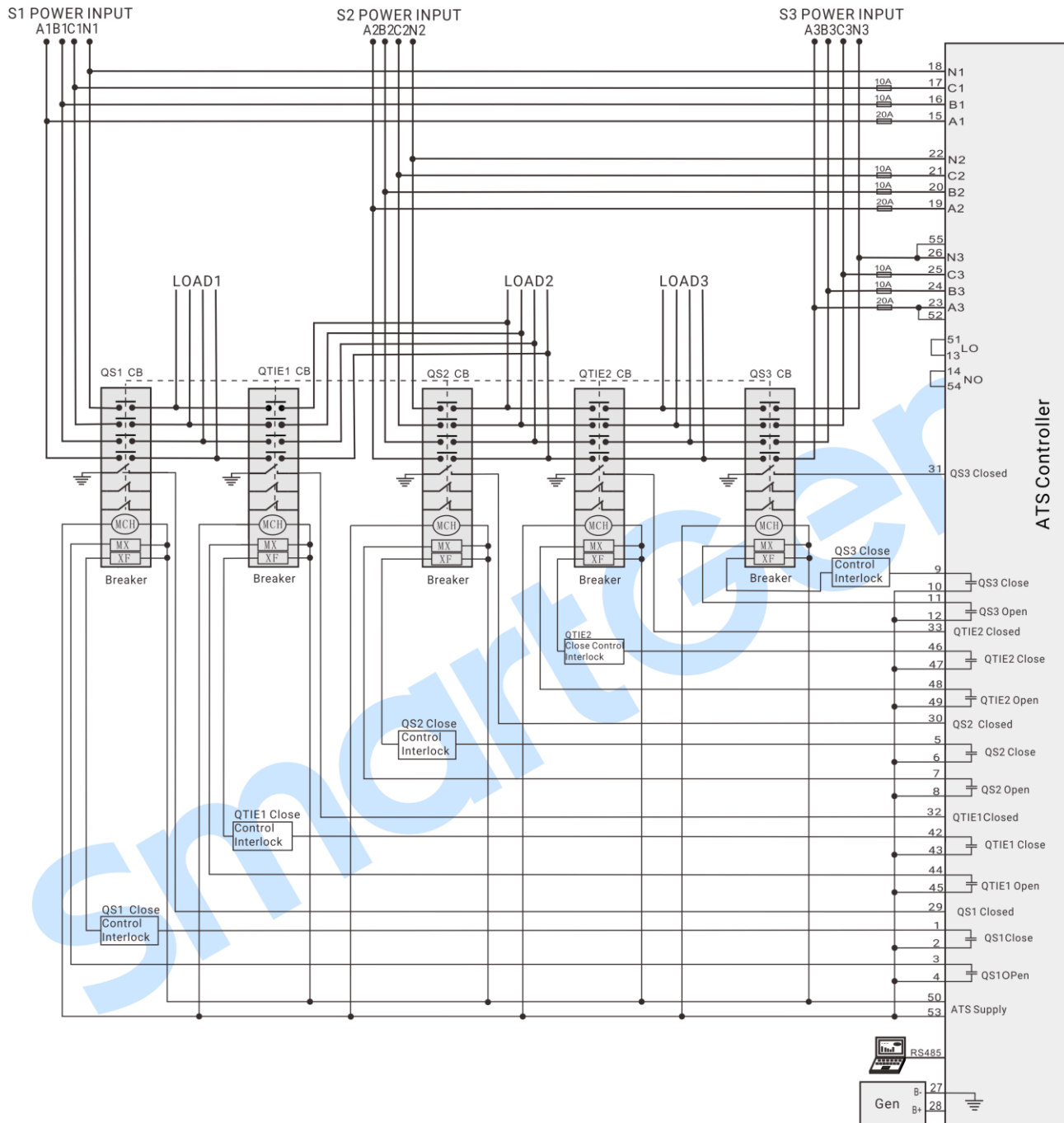
No.	Items	Description	Remark
1	AUX.OUTPUT1	Aux. Output1	Default: QS1 Close Control
2			Volts free; Relay contact; Normally Open output. Capacity: 250V16A
3	AUX.OUTPUT2	Aux. Output2	Default: QS1 Open Control
4			Volts free; Relay contact; Normally Open output. Capacity: 250V16A
5	AUX.OUTPUT3	Aux. Output3	Default: QS2 Close Control

No.	Items	Description	Remark
6			Volts free; Relay contact; Normally Open output. Capacity: 250V16A
7	AUX.OUTPUT4	Aux. Output4	Default: QS2 Open Control
8			Volts free; Relay contact; Normally Open output. Capacity: 250V16A
9	AUX.OUTPUT5	Aux. Output5	Default: QS3 Close Control
10			Volts free; Relay contact; Normally Open output. Capacity: 250V16A
11	AUX.OUTPUT6	Aux. Output6	Default: QS3 Open Control
12			Volts free; Relay contact; Normally Open output. Capacity: 250V16A
13	LO	ATS Power L	Power supply for ATS switching (S1 and S2)
14	NO	ATS Power N	
15	A1	S1 AC System 3P4W voltage input	For single phase, only connect A1, N1
16	B1		
17	C1		
18	N1		
19	A2	S2 AC System 3P4W voltage input	For single phase, only connect A2, N2
20	B2		
21	C2		
22	N2		
23	A3	S3 AC System 3P4W voltage input	For single phase, only connect A3, N3
24	B3		
25	C3		
26	N3		
27	B-	Connect to DC negative pole	Ground terminal
28	B+	Connect to DC positive pole	DC(8-35)V; Power supplied by controller.
29	AUX.INPUT1	Aux. Input1	Default: QS1 closed. Ground connected is active.
30	AUX.INPUT2	Aux. Input2	Default: QS2 closed. Ground connected is active.
31	AUX.INPUT3	Aux. Input3	Default: QS3 closed. Ground connected is active.
32	AUX.INPUT4	Aux. Input4	Default: QTIE1 closed. Ground connected is active.
33	AUX.INPUT5	Aux. Input5	Default: QTIE2 closed. Ground connected is active.
34	AUX.INPUT6	Aux. Input6	Default: Not used. Ground connected is active.
35	AUX.INPUT7	Aux. Input7	Default: Not Used Ground connected is active.
36	AUX.INPUT8	Aux. Input8	Default: Not Used Ground connected is active.



No.	Items	Description		Remark
37	AUX.INPUT9	Aux. Input9		Default: Not Used Ground connected is active.
38	AUX.INPUT10	Aux. Input10		Default: Not Used Ground connected is active.
39	AUX.INPUT11	Aux. Input11		Default: Not Used Ground connected is active.
40	AUX.INPUT12	Aux. Input12		Default: Not Used Ground connected is active.
41	B-(GND)	Input ground terminal		Connect to B- internally.
42	AUX. OUTPUT 7	Aux. Output7		Default: Not Used.
43				Volts free; Relay contact; Normally open output. Capacity: 250V8A
44	AUX. OUTPUT 8	Aux. Output8		Default: Not Used.
45				Volts free; Relay contact; Normally open output. Capacity: 250V8A
46	AUX. OUTPUT 9	Aux. Output9		Default: Not Used.
47				Volts free; Relay contact; Normally open output. Capacity: 250V8A
48	AUX. OUTPUT 10	Aux. Output10		Default: Not Used.
49				Volts free; Relay contact; Normally open output. Capacity: 250V8A
50	AUX. OUTPUT 11	COM	Aux. Output11	Default: Genset Start, Normally Closed. Volts free; Relay contact; Normally open/close output. Capacity: 250V8A
51		Normally Close		
52		Normally Open		
53	AUX. OUTPUT 12	COM	Aux. Output12	Default: Not Used. Volts free; Relay contact; Normally Open/Close output. Capacity: 250V8A
54		Normally Close		
55		Normally Open		
62	RS485-2 B(-)	RS485-2 communication port		120Ω impedance matched resistance should be connected according to the different situation.
63	RS485-2 A(+)			
64	PE	Comm. port ground terminal		
65	RS485-1 B(-)	RS485-1 communication port		120Ω impedance matched resistance should be connected according to the different situation.
66	RS485-1 A(+)			
USB	USB	D-type USB communication port		Parameters setting and software upgrading via PC.

## 16 TYPICAL WIRING DIAGRAM

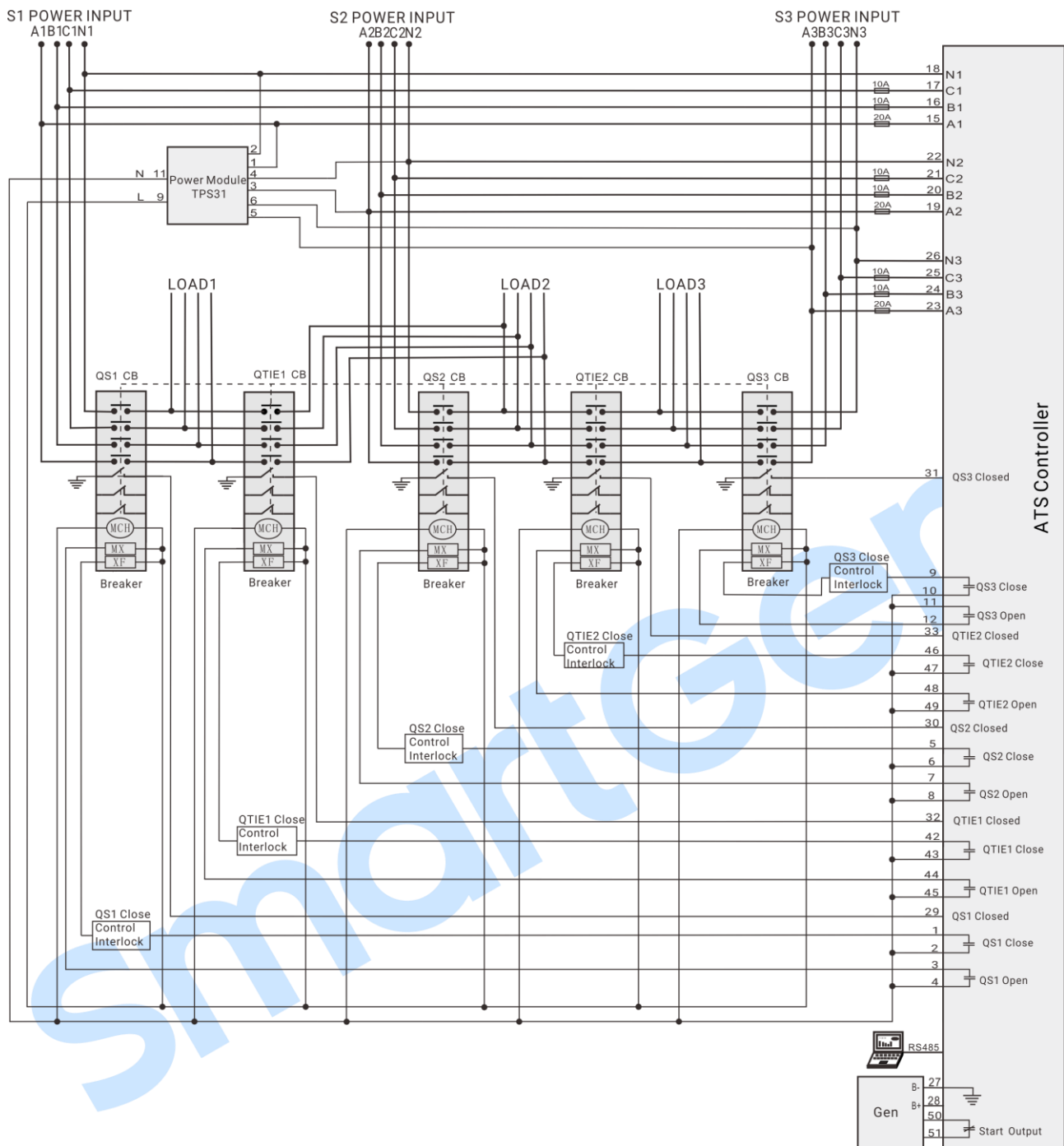


**Fig.13 – 3P2B Controller Power Supply Breaker Application Diagram**

MCH: Stored Energy Motor; MX: Open Relay; XF: Close Relay; For LO, NO please refer to previous chapter “ATS Power Supply”.

**Table 41 – Corresponding Settings**

Partial Parameters Setting	
Aux. Output 1	QS1 Close
Aux. Output 2	QS1 Open
Aux. Output 3	QS2 Close
Aux. Output 4	QS2 Open
Aux. Output 5	QS3 Close
Aux. Output 6	QS3 Open
Aux. Output 7	QTIE1 Close
Aux. Output 8	QTIE1 Open
Aux. Output 9	QTIE2 Close
Aux. Output 10	QTIE2 Open
Aux. Output 11	S1S2S3 ATS Power L1
Aux. Output 12	S1S2S3 ATS Power N
Aux. Input 1	QS1 Closed
Aux. Input 2	QS2 Closed
Aux. Input 3	QS3 Closed
Aux. Input 4	QTIE1 Closed
Aux. Input 5	QTIE2 Closed

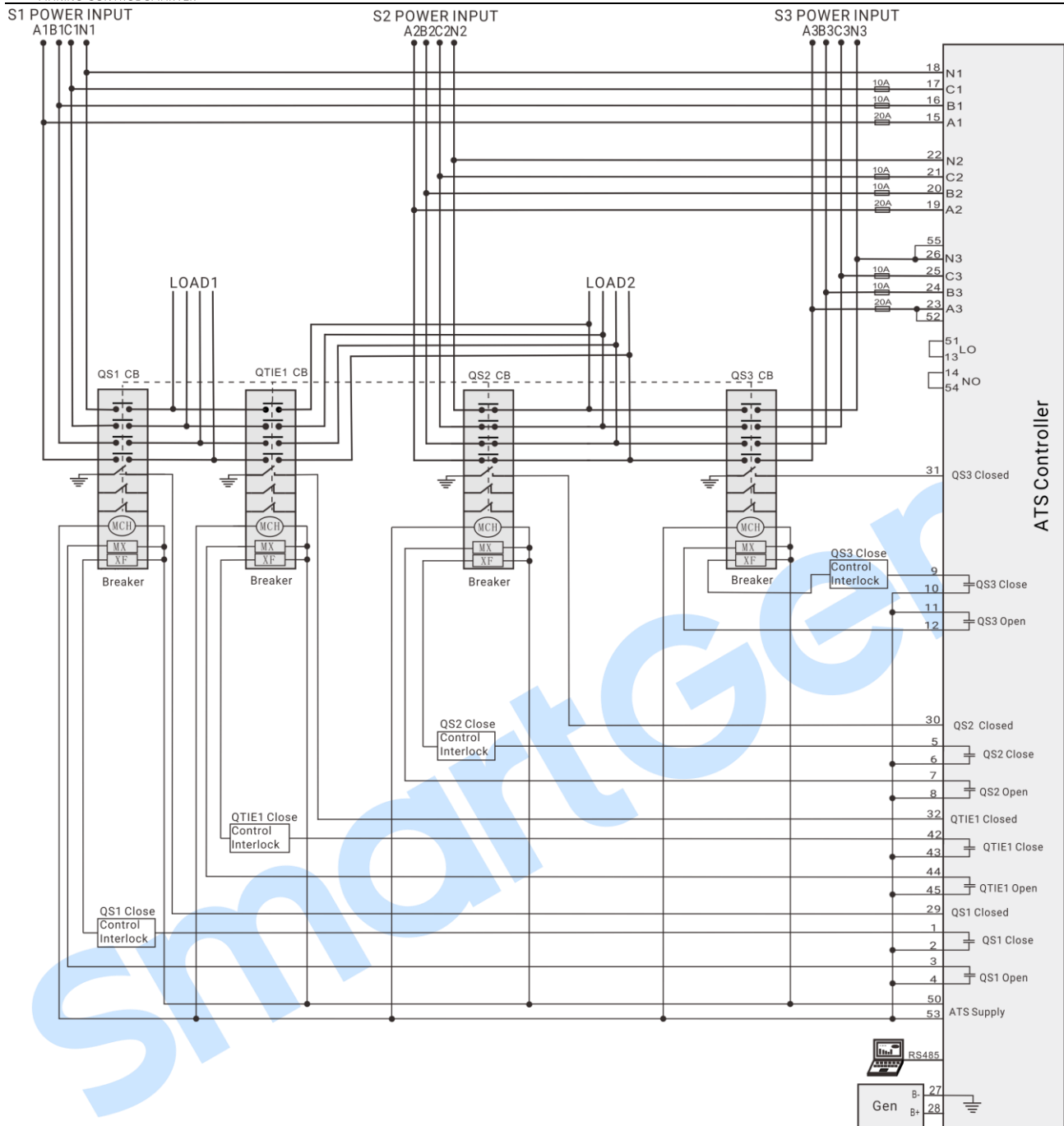


**Fig.14 – 3P2B TPS31 Power Supply Breaker Application Diagram**

MCH: Stored Energy Motor; MX: Open Relay; XF: Close Relay; For “TPS31 Supply Instruction” please refer to previous chapter “TPS31Supply”.

**Table 42 – Corresponding Settings**

Partial Parameters Setting	
Aux. Output 1	QS1 Close
Aux. Output 2	QS1 Open
Aux. Output 3	QS2 Close
Aux. Output 4	QS2 Open
Aux. Output 5	QS3 Close
Aux. Output 6	QS3 Open
Aux. Output 7	QTIE1 Close
Aux. Output 8	QTIE1 Open
Aux. Output 9	QTIE2 Close
Aux. Output 10	QTIE2 Open
Aux. Input 1	QS1 Closed
Aux. Input 2	QS2 Closed
Aux. Input 3	QS3 Closed
Aux. Input 4	QTIE1 Closed
Aux. Input 5	QTIE2 Closed

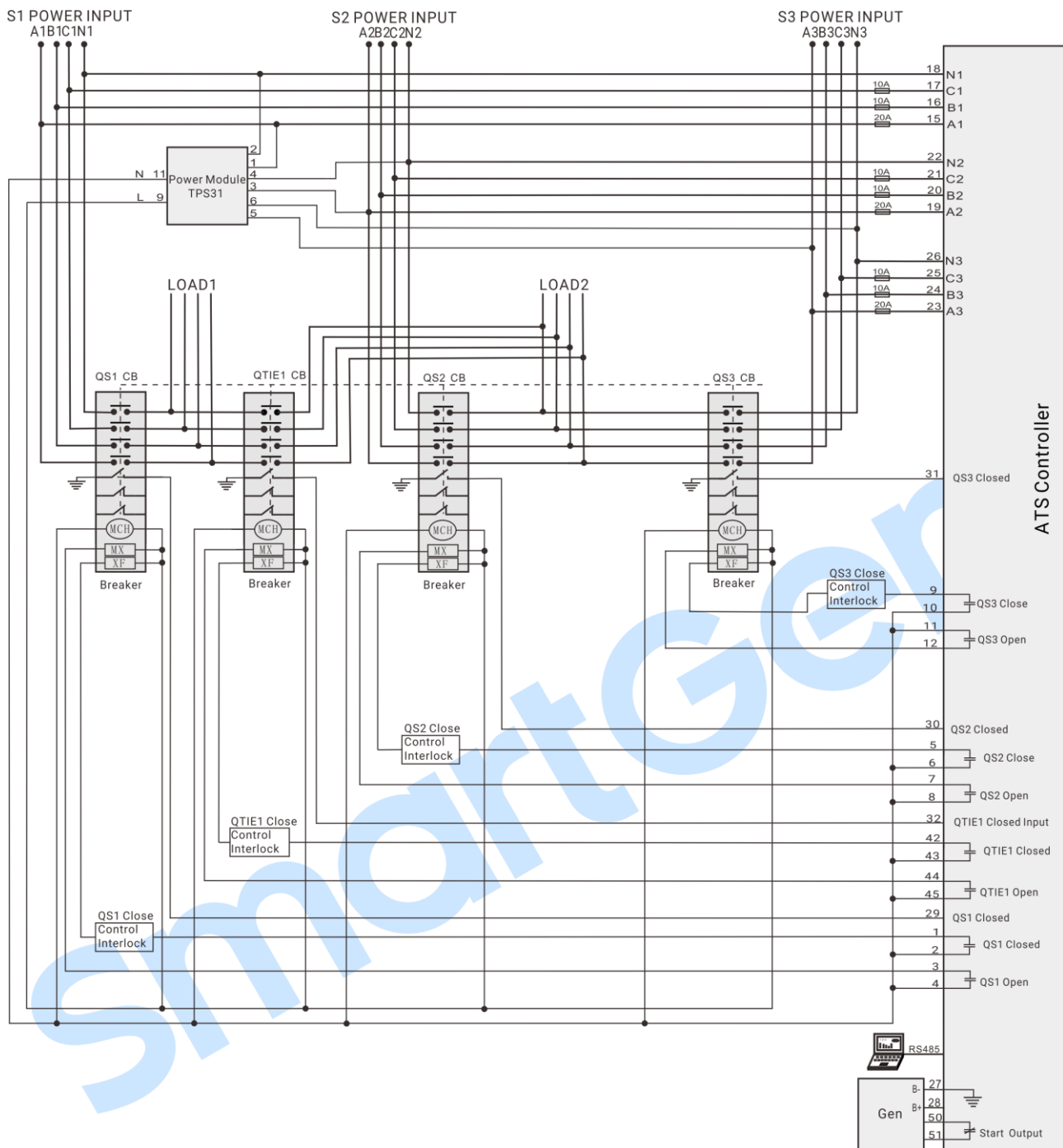


**Fig.15 – 3P1B (Left Bus Tie) Controller Power Supply Breaker Application Diagram**

MCH: Stored Energy Motor; MX: Open Relay; XF: Close Relay; For LO, NO please refer to previous chapter "ATS Power Supply".

**Table 43 – Corresponding Settings**

Partial Parameters Setting	
Aux. Output 1	QS1 Close
Aux. Output 2	QS1 Open
Aux. Output 3	QS2 Close
Aux. Output 4	QS2 Open
Aux. Output 5	QS3 Close
Aux. Output 6	QS3 Open
Aux. Output 7	QTIE1 Close
Aux. Output 8	QTIE1 Open
Aux. Output 11	S1S2S3 ATS Power L1
Aux. Output 12	S1S2S3 ATS Power N
Aux. Input 1	QS1 Closed
Aux. Input 2	QS2 Closed
Aux. Input 3	QS3 Closed
Aux. Input 4	QTIE1 Closed



**Fig.16 – 3P1B (Left Bus Tie) TPS31 Power Supply Breaker Application Diagram**

MCH: Stored Energy Motor; MX: Open Relay; XF: Close Relay; For “TPS31 Supply Instruction” please refer to previous chapter “TPS31Supply”.



**Table 44 – Corresponding Settings**

Partial Parameters Setting	
Aux. Output 1	QS1 Close
Aux. Output 2	QS1 Open
Aux. Output 3	QS2 Close
Aux. Output 4	QS2 Open
Aux. Output 5	QS3 Close
Aux. Output 6	QS3 Open
Aux. Output 7	QTIE1 Close
Aux. Output 8	QTIE1 Open
Aux. Input 1	QS1 Closed
Aux. Input 2	QS2 Closed
Aux. Input 3	QS3 Closed
Aux. Input 4	QTIE1 Closed

**NOTE 7:** The diagrams above are only for example, please do wiring according to actual conditions. The details of electrical interlock logic please refer to Chapter “17 Electrical Interlock Logic”.

## 17 ELECTRICAL INTERLOCK LOGIC

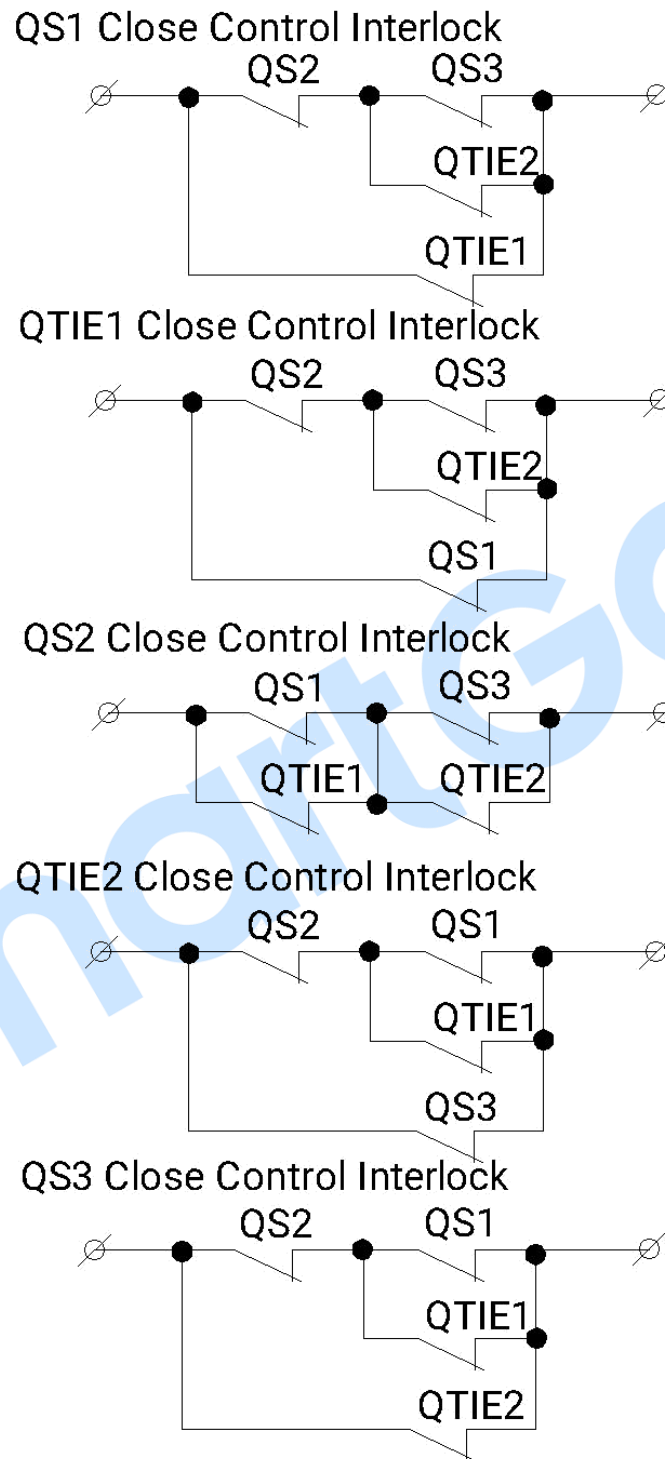
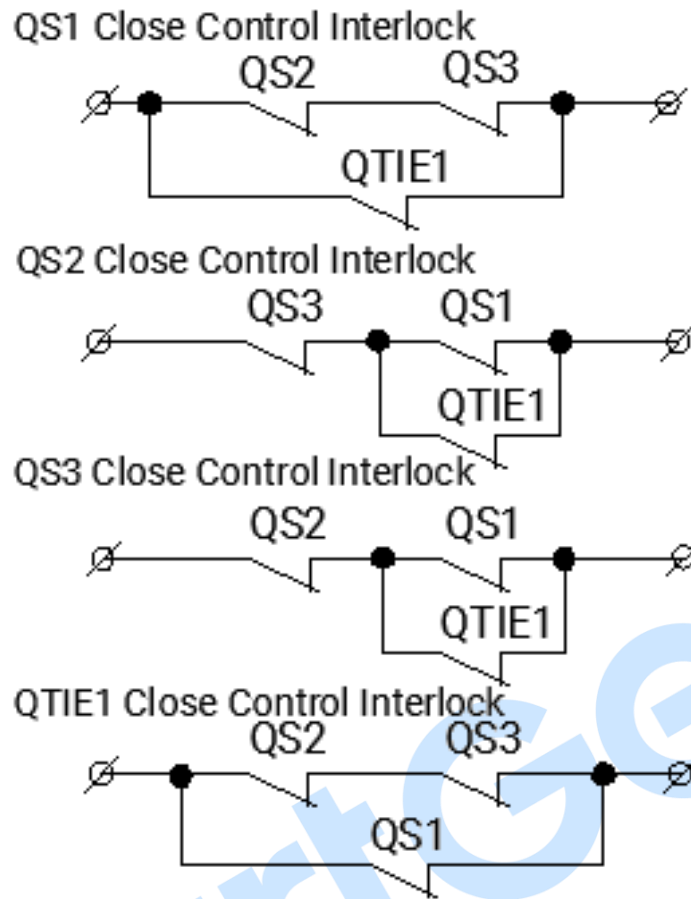


Fig.17 – 3P2B Electrical Interlock Logic Diagram



**Fig.18 – 3P1B Electrical Interlock Logic Diagram**

## 18 INSTALLATION

Controller is panel built-in design; it is fixed by clips when installed.

Unit: mm

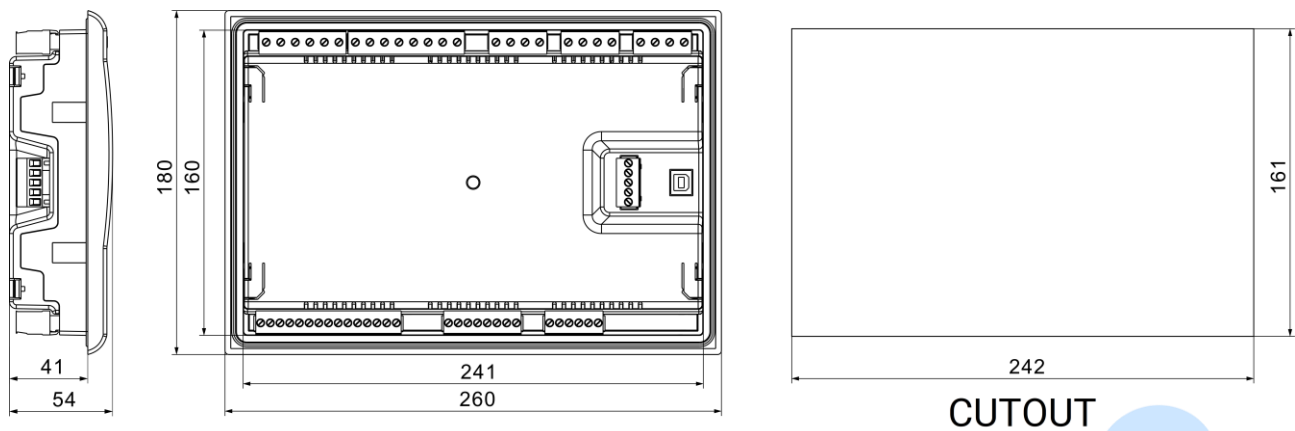


Fig.15 – Overall & Cutout Dimensions

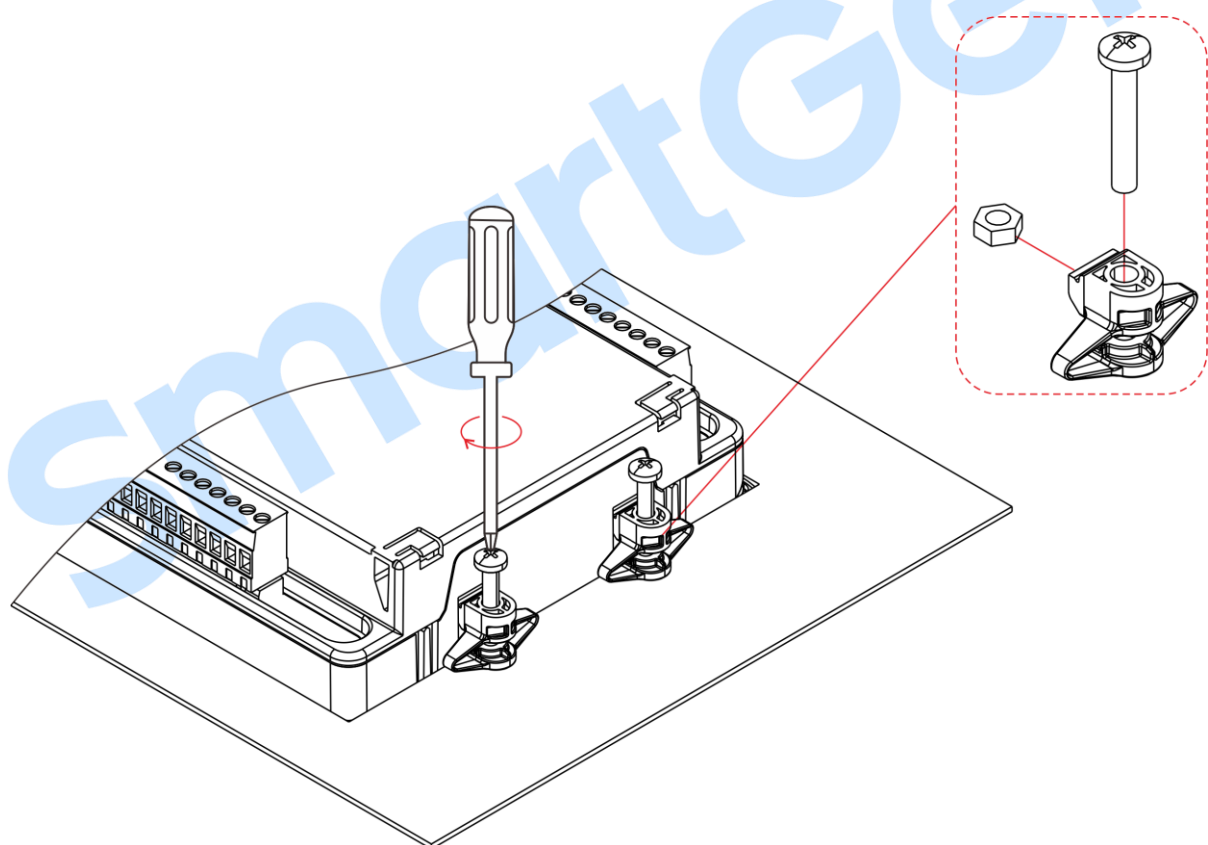


Fig.16 – Clips Installation Drawing

Table 45 – Troubleshooting

Symptoms	Possible Solutions
Controller no response	Check DC voltage. Check DC fuse. Check AC Power supply.
RS485 communication abnormal	Check RS485's positive and negative are connected correctly or not. Check RS485 converter whether damage or not. Check the module address. If above methods can't solve the problem, parallel connection 120Ω resistor between RS485 A terminal and B terminal is recommended.
Auxiliary output error	Check auxiliary output connections, pay attention to normally open contact and normally close contact. Check the output settings in parameters settings.
Auxiliary input abnormal	Ensure that the auxiliary input is soundly connected to GND when it's active, while hung up when it is inactive. ( <b>⚠NOTE:</b> The input port will be possibly destroyed when connected with high voltage) Check the input settings in parameters settings.
ATS transfer abnormal	Check ATS. Check the connection wirings between controller and ATS. Check ATS related parameter setting.
Genset start abnormal	Check system type setting. Check the output settings in parameters settings. Check all start/stop settings.