SmartGen

MAKING CONTROL SMARTER

HAT835

(HAT835/HAT835S)

THREE POWER BUS TIE CONTROLLER

USER MANUAL

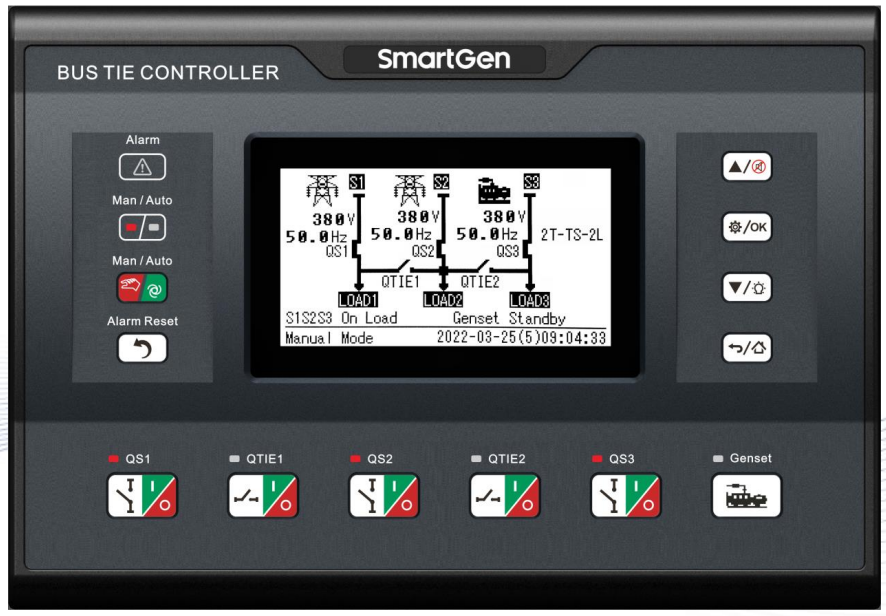

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Table 1 – Software Version

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.
2022-12-09	1.2	1. Add synchronous transfer mode; 2. Add “HAT835S”.
2025-04-10	1.3	Add the system topology diagrams for 2T-TS-2L-1I, 2T-TS-2G, 2T-TS-2G1, and 2T-TS-2G2.
2025-11-04	1.4	1. Add the Russian version of user manual. 2. Modify the minimum value of rated frequency.

CONTENTS

1 OVERVIEW 5
2 NAMING CONVENTION AND MODEL COMPARISON 6
2.1 NAMING CONVENSION 6
2.2 MODEL COMPARISON 6
3 PERFORMANCE AND CHARACTERISTICS 6
4 SPECIFICATION 8
5 MEASURE AND DISPLAY DATA 9
6 OPERATION 10
6.1 INDICATORS 10
6.2 KEY FUNCTION DESCRIPTION 11
7 LCD DISPLAY 13
7.1 MAIN SCREEN 13
7.2 STATUS DESCRIPTION 14
7.3 MAIN MENU 18
8 START/STOP OPERATION 19
8.1 MANUAL START/STOP 19
8.1.1 PANEL START/STOP 19
8.1.2 REMOTE START/STOP 20
8.2 AUTO START/STOP 20
8.2.1 START CONDITIONS 20
8.2.1.1 INPUT START 20
8.2.1.2 GEN START MAINS NG 20
8.2.1.3 GEN START MASTER 20
8.2.2 GEN-GEN START/STOP 20
8.2.3 SCHEDULED RUN 22
8.2.4 SCHEDULED NOT RUN 23
9 PARAMETERS CONFIGURATION 24
9.1 ILLUSTRATION 24
9.2 PARAMETERS TABLE 24
9.3 USER-DEFINED PROTOCOL 35
9.4 DIGITAL INPUT/OUTPUT FUNCTION DESCRIPTION 36
9.4.1 INPUT PORTS FUNCTION 36
9.4.2 OUTPUT PORTS FUNCTION 38
9.4.3 CUSTOM COMBINED OUTPUT 42
10 HISTORICAL RECORDS 43

11 BLACK BOX RECORDS 44
12 SWITCH OPERATION 45
12.1 MANUAL OPERATION 45
12.2 AUTOMATIC OPERATION 46
13 ATS POWER SUPPLY 55
13.1 CONTROLLER POWER SUPPLY 55
13.2 TPS31 POWER SUPPLY 56
14 COMMUNICATION CONFIGURATION AND CONNECTION 57
15 PLC FUNCTION INTRODUCTION 58
15.1 PLC EDITING SCREEN 58
15.2 PLC ELEMENT INTRODUCTION 58
15.3 LOGIC INTRODUCTION 58
15.4 APPLICATION EXAMPLE 59
16 TERMINALS 61
17 TYPICAL WIRING DIAGRAM 64
18 EIECTRICAL INTERLOCK LOGIC 72
19 INSTALLATION 74
20 TROUBLE SHOOTING 75

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 NAMING CONVENTION AND MODEL COMPARISON

2.1 NAMING CONVENSION

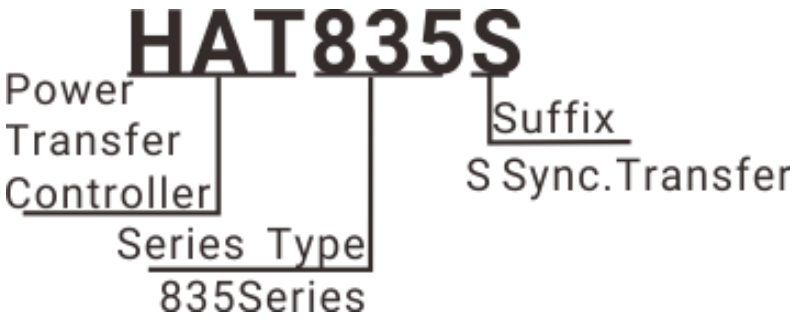


Fig.1 – Naming Convention

2.2 MODEL COMPARISON

Table 2 – Model Comparison

Functions						
Model	**DC Supply**	**AC Supply**	**Sync. Closing**	**Input Port No.**	**Output Port No.**	**RS485**
HAT835	●	●		12	12	●
HAT835S	●	●	●	12	12	●

3 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、2T-TS-2L-1I、2T-TS-2G、2T-TS-2G1、2T-TS-2G2;

——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;

——Four parallel modes, which can be set as manual parallel or automatic parallel (HAT835S);

——The electric interlock release function is used during switch is parallel transferring (only for HAT835S);
——Parallel connection fault detection, if any two-way switch parallel time is over than 300ms, the alarm will output and open the last closing switch;
——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.

4 SPECIFICATIONS

Table 3 – 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	

5 MEASURE AND DISPLAY DATA

Table 4– 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 Total Supply Time
6	S2 Total Supply Time
7	S3 Total Supply Time
8	LOAD1 Current Continuous Electrical Time
9	LOAD2 Current Continuous Electrical Time
10	LOAD3 Current Continuous Electrical Time
11	LOAD1 Last Continuous Electrical Time
12	LOAD2 Last Continuous Electrical Time
13	LOAD3 Last Continuous Electrical Time
14	LOAD1 Total Receive Time
15	LOAD2 Total Receive Time
16	LOAD3 Total Receive Time
17	Total Auto Run Time
18	QS1 Total Electrical Time
19	QS2 Total Electrical Time
20	QS3 Total Electrical Time
21	QTIE1 Total Electrical Time
22	QTIE2 Total Electrical 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	Genset Running Status
29	Real Time Clock
30	Historical Records
31	Black Box Records
32	Communication Status
33	Sync Information (HAT835S)

6 OPERATION

6.1 INDICATORS

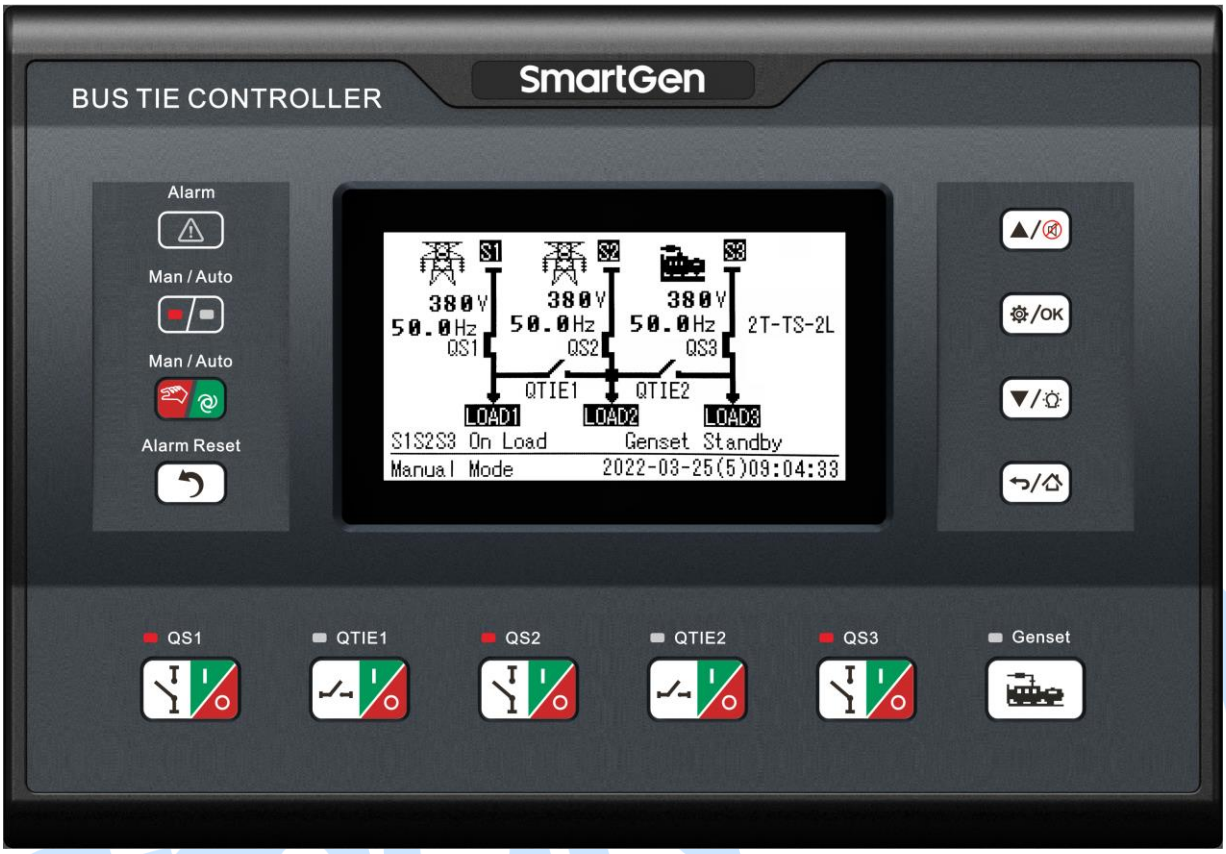


Fig.2 – Panel Indication Drawing

Table 5 – 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.

6.2 KEY FUNCTION DESCRIPTION

Table 6 – Keys Function Description

Icon	Key	Function Description
	QS1	Active in Manual mode. QS1 close and S1 supply after pressing this key. (Screen turns to selection interface when sync closing, only for HAT835S) Press again, QS1 open.
	QTIE1	Active in Manual mode. QTIE1 close after pressing this key. (Screen turns to selection interface when sync closing, only for HAT835S) Press again, QTIE1 open.
	QS2	Active in Manual mode. QS2 close and S2 supply after pressing this key. (Screen turns to selection interface when sync closing, only for HAT835S) Press again, QS2 open.
	QTIE2	Active in Manual mode. QTIE2 close after pressing this key. (Screen turns to selection interface when sync closing, only for HAT835S) Press again, QTIE2 open.
	QS3	Active in Manual mode. QS3 close and S3 supply after pressing this key. (Screen turns to selection interface when sync closing, only for HAT835S) 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.

Icon	Key	Function Description
	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.

7 LCD DISPLAY

7.1 MAIN SCREEN

Table 7– 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 bus tie switches; S1/S2/S3 voltage and frequency; System layout type; Genset working status; Auto transfer/restore status. Parallel mode status.
S1/S2/S3	S1/S2/S3 line voltage, phase voltage, frequency, phase angle, S1/S2/S3 total supply time.
Load 	LOAD1/LOAD2/LOAD3 current continuous electrical time; LOAD1/LOAD2/LOAD3 last continuous electrical time; LOAD1/LOAD2/LOAD3 total receive time; Total auto run (transfer) time.
QF 	QS1/QS2/QS3/QTIE1/QTIE2 total electrical 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 information (including warning alarm and fault alarm).
S1S2/S1S3/S2S3 Synchronization 	Voltage difference; Frequency difference; Phase difference; Only HAT835S displays.
Status	Alarm status/working status; Real-time clock; Status line is showed in the last line of main screen's each page.

7.2 STATUS DESCRIPTION

Table 8– 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 9– 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 10– 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 11 – Genset Status

No.	Item	Description
1	Genset Start Delay	Delay time before genset start.
2	Genset Return Delay	Delay time before genset stop.
3	Schedule Not Work	When scheduled not run is active, its duration time will be displayed.
4	Schedule Work	When scheduled run is active, its duration time will be displayed.
5	Gen1 Cycle Run	S1 cycle run countdown will be terminated when cycle start is active.
6	Gen2 Cycle Run	S2 cycle run countdown will be terminated when cycle start is active.
7	Gen3 Cycle Run	S3 cycle run countdown will be terminated when cycle start is active.
8	S1 Genset Working	Active only when system has 2 gensets and S1 generating.
9	S2 Genset Working	Active only when system has 2 gensets and S2 generating.
10	S3 Genset Working	Active only when system has 2 gensets and S3 generating.
11	Genset Working	Genset start signal outputs.
12	Genset Standby	There is no start genset signal output.

Table 12 – Switch Status

No.	Item	Description
1	Ready to Transfer	Switch transfer begins.
2	Closing QS1	QS1 closing delay is in progress.
3	Opening QS1	QS1 opening delay is in progress.
4	Closing QS2	QS2 closing delay is in progress.
5	Opening QS2	QS2 opening delay is in progress.
6	Closing QS3	QS3 closing delay is in progress.
7	Opening QS3	QS3 opening delay is in progress.
8	Closing QTIE1	QTIE1 closing delay is in progress.
9	Opening QTIE1	QTIE1 opening delay is in progress.
10	Closing QTIE2	QTIE2 closing delay is in progress.
11	Opening QTIE2	QTIE2 opening delay is in progress.
12	Transfer Rest	Interval time of switch transfer.
13	Waiting QS1 PF	QS1 PF input is active before QS1 closing.
14	Waiting QS2 PF	QS2 PF input is active before QS2 closing.
15	Waiting QS3 PF	QS3 PF input is active before QS3 closing.
16	Wait QTIE1 PF	QTIE1 PF input is active before QTIE1 closing.
17	Wait QTIE2 PF	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.
27	Waiting For Sync	Wait for the synchronous conditions (voltage difference, frequency

No.	Item	Description
		difference and phase difference) of S1&S2 or S2&S3 or S1&S3 to meet the set value delay.
28	Sync Closing QS1	QS1 sync closing outputs when the synchronous conditions are met.
29	Sync Closing QS2	QS2 sync closing outputs when the synchronous conditions are met.
30	Sync Closing QS3	QS3 sync closing outputs when the synchronous conditions are met.
31	Sync Closing QTIE1	QTIE1 sync closing outputs when the synchronous conditions are met.
32	Sync Closing QTIE2	QTIE2 sync closing outputs when the synchronous conditions are met.

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 13 – 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 UV Warn	When DC power voltage has fallen below the pre-set value, it will initiate a warning alarm.
3	DC OV Warn	When DC power voltage has exceeded the pre-set value, it will initiate a warning alarm.
4	In1 Com. Fail Warn	Expand digital input 1 communication failure warning.
5	In2 Com. Fail Warn	Expand digital input 2 communication failure warning.
6	In3 Com. Fail Warn	Expand digital input 3 communication failure warning.
7	Out1 Com. Fail Warn	Expand digital output 1 communication failure warning.
8	Out2 Com. Fail Warn	Expand digital output 2 communication failure warning.
9	Out3 Com. Fail Warn	Expand digital output 3 communication failure warning.
10	Sync Fail Warn	When sync failure is active and the action selects “Warn” it will initiate a warning alarm after the sync wait is overtime,

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 14 – Fault Alarms

No.	Item	Description
1	QS1 Failed to Close	QS1 fails to close.
2	QS1 Failed to Open	QS1 fails to open.
3	QS2 Failed to Close	QS2 fails to close.
4	QS2 Failed to Open	QS2 fails to open.
5	QS3 Failed to Close	QS3 fails to close.
6	QS3 Failed to Open	QS3 fails to open.
7	QTIE1 Failed to Close	QTIE1 fails to close.
8	QTIE1 Failed to Open	QTIE1 fails to open.
9	QTIE2 Failed to Close	QTIE2 fails to close.

No.	Item	Description
10	QTIE2 Failed to Open	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 Switch Trip Alarm	It will issue alarm and enter manual mode when the input is active.
14	QS2 Switch Trip Alarm	It will issue alarm and enter manual mode when the input is active.
15	QS3 Switch Trip Alarm	It will issue alarm and enter manual mode when the input is active.
16	QTIE1 Switch Trip Alarm	It will issue alarm and enter manual mode when the input is active.
17	QTIE2 Switch 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.
21	In 1 Com. Fault	Expand digital input 1 communication failure fault.
22	In 2 Com. Fault	Expand digital input 2 communication failure fault.
23	In 3 Com. Fault	Expand digital input 3 communication failure fault.
24	Out 1 Com. Fault	Expand digital output 1 communication failure fault.
25	Out 2 Com. Fault	Expand digital output 2 communication failure fault.
26	Out 3 Com. Fault	Expand digital output 3 communication failure fault.
27	Sync Fail Fault	When the sync failure is active and the action selects fault, it will initiate a fault alarm after the sync. wait is overtime.
28	Switch Parallel Time	It will initiate a fault alarm when any two-way switch parallel time is over 300ms.

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

Table 15 – Indication Information

No.	Item	Description
1	Please Reset 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 during non-parallel mode transfers.
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 16 – Other Status Information

No.	Item	Description
1	Start Inhibit	Genset start Inhibit is active.
2	S1 Loading Inhibit	S1 Load Inhibit input is active.
3	S2 Loading Inhibit	S2 Load Inhibit input is active.
4	S3 Loading Inhibit	S3 Load Inhibit input is active.

No.	Item	Description
5	Remote Start On Load	Remote start (on load) signal is active.
6	Remote Start Offload	Remote start (off load) signal is active.
7	Mains Abnormal Start	Start genset when mains is abnormal.
8	Master-Slave Start	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 Ctrl Inhibit	Remote control is inactive.

7.3 MAIN MENU

In main screen, press ⚙/OK key will enter the menu interface.

1. Configuration **2. Data Calibration** **3. Historical Records** **4. Black Box Records** **5. Auto Trans./Restore** **6. Parallel Mode (Only for HAT835S)** **7. Language** **8. About**	Press **Up/Down** key to choose parameters (the current line was highlighted with black) and then press **Confirm** key to enter the corresponding display screen.

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.

8 GENSET START/STOP OPERATION

8.1 MANUAL START/STOP

8.1.1 PANEL START/STOP

In the main screen, press  key to enter to “Manual Genset Start” interface when system layout type is “S1 Mains S2 Genset S3 Mains, S1 Genset S2 Mains S3 Mains, S1 Mains S2 Mains S3 Genset”.

Manual Gen Start	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 Genset S2 Genset S3 Mains”, Manual Genset Start menu interface is as follows:

Manual Genset Start	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 Genset S2 Genset S3 Gens”, Manual Genset Start menu interface is as follows:

Manual Genset Start	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 Genset S3 Genset”, Manual Genset Start menu interface is as follows:

Manual Genset Start	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 Genset S2 Genset S3 Genset”, Manual Genset Start menu interface is as follows:

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

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.

8.1.2 COMMUNICATION 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.

8.2 AUTO START/STOP

8.2.1 START CONDITIONS

8.2.1.1 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.

8.2.1.2 MAINS ABNORMAL START

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

8.2.1.3 MASTER-SLAVE START

This input is active when generator has master priority.

8.2.2 GEN-GEN START/STOP

When system is “S1 Genset S2 Genset S3 Mains, S1 Genset S2 Mains S3 Genset, S1 Mains S2 Genset S3 Genset, S1 Genset S2 Genset S3 Genset”, input port start/stop function is as follows:

When system is “S1 Genset S2 Genset S3 Mains”, S1, S2 start/stop; when system is “S1 Genset S2 Mains S3 Genset”, S1, S3 start/stop; when system is “S1 Mains S2 Genset S3 Ge Genset ns”, S2, S3 start/stop; when system type is “S1 Genset S2 Genset S3 Genset”, S1, S2, S3 start/stop.

Mains Abnormal Start: 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 Gen Start (Cycle Run) Mode

If system is “S1 Genset S2 Genset 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-Slave Start

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 Gens Hours

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 Genset S2 Genset S3 Mains, S1 Genset S2 Mains S3 Genset, S1 Mains S2 Genset S3 Genset, S2 Genset S2 Genset S3 Genset”;

   1) If system is “S1 Genset S2 Genset S3 Mains”, the output should be set as “S1 Genset Start” and “S2 Genset Start”; if system is “S1 Genset S2 Mains S3 Genset”, the output should be set as “S1 Genset Start” and “S3 Genset Start”; if system is “S1 Mains S2 Genset S3 Genset”, the output should be set as “S2 Genset Start” and “S3

Genset Start"; if system is "S1 Genset S2 Genset S3 Genset", the output should be set as "S1 Genset Start", "S2 Genset Start" and "S3 Genset Start";

2) If system is "S1 Genset S2 Genset 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 Genset S2 Mains S3 Genset", 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 Genset S3 Genset", 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 Genset S2 Genset S3 Genset", 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 Available Delay", If start mode is cycle run, also should set "S1 Cycle Work Time", "S2 Cycle Work Time" or "S1 Cycle Work Time", "S3 Cycle Work Time" or "S2 Cycle Work Time", "S3 Cycle Work Time" or "S1 Cycle Work Time", "S2 Cycle Work Time", "S3 Cycle Work 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 Available Delay" and it does not need to inquire the fault alarm via input port.

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

For example:

Table 17 – Genset Start

System Type	Start Conditions	Result
S1 Genset S2 Genset 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.)	

8.2.3 SCHEDULED WORK

Once "Schedule Gen Enable" is enabled, 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 be active after genset is normal.

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

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

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

Schedule 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.

Schedule Daily: Can start the genset at same time everyday.

8.2.4 SCHEDULED NOT WORK

Once “Gen Inhibit Work Set” is enabled, users can set the “Scheduled Not Work” time. Start signal will be deactivated at preset time and it will be inhibited before the delay has expired.

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

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

Inhibit 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.

Inhibit Daily: Can not start the genset at same time every day.

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

9 PARAMETERS CONFIGURATION

9.1 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 the 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.

9.2 PARAMETERS TABLE

Table 18 – Parameter Configuration Form

No.	Item	Range	Default	Description
AC Config				
1	S1 Available Delay	(0~3600)s	10	The delay from S1 voltage abnormal to normal.
2	S1 Unavailable Delay	(0~3600)s	5	The delay from S1 voltage normal to abnormal.
3	S2 Available Delay	(0~3600)s	10	The delay from S2 voltage abnormal to normal.
4	S2 Unavailable Delay	(0~3600)s	5	The delay from S2 voltage normal to abnormal.
5	S3 Available Delay	(0~3600)s	10	The delay from S3 voltage abnormal to normal.
6	S3 Unavailable Delay	(0~3600)s	5	The delay from S3 voltage normal to abnormal.
7	S1 Type Set	(0~1)	0	0: Mains 1: Genset.
8	S2 Type Set	(0~1)	0	0: Mains 1: Genset.
9	S3 Type Set	(0~1)	1	0: Mains 1: Genset.
10	System Layout	(0~18)	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
				15：2T-TS-2L-1I 16：2T-TS-2G 17：2T-TS-2G1 18：2T-TS-2G2
11	AC System	(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	Primary	(30~30000)V	100	Primary voltage of potential transformer
14	Secondary	(30~1000)V	100	Secondary voltage of potential 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	(15.0~75.0)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	Phase Seq. Wrong	(0~1)	1	0: Disable 1: Enable
30	S1 Supply Busbar	(0~3)	0	0: Bus tie is allowed to close;

No.	Item	Range	Default	Description
	Set			1: QTIE1 is prohibited to close; 2: QTIE2 is prohibited to close; 3: Bus tie is prohibited to close.
31	S2 Supply Busbar 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.
32	S3 Supply Busbar 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.
Switch Config				
1	ATS Power Type	(0~1)	1	0: DC Power Supply 1: AC Power Supply
2	AC Power Low Point	(0~100)%	70	The lowest AC power supply voltage, the switch will not transfer if it is lower than this value.
3	AC Power High Point	(0~200)%	200	The highest AC power supply voltage, the switch will not transfer if it is higher than this value.
4	Definite C/O 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.
5	Close Time	(0.1~20.0)s	5.0	Pulse time of close relay.
6	Open Time	(0.1~20.0)s	5.0	Pulse time of open relay.
7	Transfer Time	(0~9999)s	1	Interval time from S1 switch open to S2 switch close; or from S2 switch open to S1 switch close.
8	Forced Open Action	(0~1)	0	0: Warn Alarm 1: Fault Alarm
9	Continually Close	(0~1)	0	0: Disable 1: Enable If “Enable” is selected, “Close Time” and “Open Time” are deactivated.
10	Auto Trans./Restore	(0~1)	1	0: Auto transfer non-restore 1: Auto transfer auto restore
11	Restore Time Set	(0~30000)min	0	The delay time of auto restore.
12	Restore Start Time (h)	(0~23)h	0	Allow to set the auto restore time period. When starting time is equal to the stopping time, then all day could auto restore; when starting time is less than the stopping time, then this period coud auto restore; when starting time is more than the stopping time, outside this period could auto restore.
13	Restore Start Time (min)	(0~59)min	0	
14	Restore Stop Time (h)	(0~23)h	0	
15	Restore Stop Time (min)	(0~59)min	0	

No.	Item	Range	Default	Description
16	Parallel Mode	(0~3)	0	0: Non-parallel 1 Manual automatic parallel 2: Automatic parallel 3: Manual parallel.
17	Volt Diff. Enabled	(0~1)	0	0: Disable 1: Enable
18	Volt Diff.	(0~50)V	5	The max. voltage difference when synchronization succeeds.
19	Freq Diff.	(0~0.50)Hz	0.20	The max. frequency difference when synchronization succeeds.
20	Phase Diff.	(0~20)°	5	The max. phase difference when synchronization succeeds.
21	Fail to Sync Action	(0~1)	0	0: Warn Alarm 1: Fault Alarm
22	Transfer in Sync Fail	(0~1)	0	0: Disable 1: Enable After synchronization fails, it will keep waiting for synchronization until closing after the synchronization. When warning alarms, the alarm will be cleared when synchronization is finished or exited.
23	Fail to Sync Delay	(0~9999)s	120	The time of waiting for synchronization success, while fails when over the delay time.
24	Breaker Feedback Time	(0.1~1.0)s	0.6	When synchronous transfers, sync closing or opening output starts to delay, if the correct closing status is detected during delay, the closing/opening pulse output will be stopped. If the delay is over and still can't detect the correct closing status, it will send an alarm of closing/opening failure.
Generator				
1	Genset Start Delay	(0~9999)s	1	When the genset is ready to start, start delay begins, after the start delay has expired, start signal will be initiated.
2	Genset 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: Cycle Gens 1: Master-Slave Gens 2: Balance Gens Hours 3: Not Used
4	S1 Cycle Work Time	(0~9999)min	720	Genset cycle start S1 running time.
5	S2 Cycle Work Time	(0~9999)min	720	Genset cycle start S2 running time.
6	S3 Cycle Work Time	(0~9999)min	720	Genset cycle start S3 running time.
7	Genset Available	(0~9999)s	120	When the start signal is active, the start

No.	Item	Range	Default	Description
	Time			delay will be initiated. If the gen voltage lasts abnormal after the delay has expired, "Genset Fault" alarm will be initiated.
8	DC Volt Enable	(0~1)	0	0: Disable 1: Enable
9	DC Under Volt (LV) Warn	(0~1)	0	0: Disable 1: Enable
10	Set Value	(0~100.0)V	10.0	"DC UV Warn" 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 UV Warn" alarm will be removed if the DC supply voltage has exceeded the set value.
12	DC Over Volt (OV) Warn	(0~1)	0	0: Disable 1: Enable
13	Set Value	(0~100.0)V	30.0	"DC OV Warn" alarm will be initiated if the DC supply voltage has exceeded the set value.
14	Return Value	(0~100.0)V	29.5	"DC OV Warn" alarm will be removed if the DC supply voltage has fallen below the set value.
Scheduled (Start/Stop) Set				
1	Schedule Gen Enable	(0~1)	0	0: Disable 1: Enable
2	Schedule Load	(0~1)	0	0: Off Load 1: On Load
3	Schedule Period	(0~2)	0	0: Monthly 1: Weekly 2: Daily
4	Schedule Monthly	(Jan~Dec)	Monthly	☑ Jan. ☑ Feb. ☑ Mar. ☑ Apr. ☑ May ☑ June ☑ July ☑ Aug. ☑ Sep. ☑ Oct. ☑ Nov. ☑ Dec.
5	Schedule Monthly (Date)	(1~31)	1	The date of start the genset
6	Schedule Weekly	(Sun~Sat)	Sun	☑ Sun ☐ Mon ☐ Tue ☐ Wed

No.	Item	Range	Default	Description
				☐ Thu ☐ Fri ☐ Sat
7	Schedule Hours	(0~23)h	0	The time of start the genset
8	Schedule Minutes	(0~59)min	0	
9	Schedule Work Time	(0~30000)min	30	The duration time of genset running
10	>Gen Inhibit Work Set	(0~1)	0	0: Disable 1: Enable
11	Inhibit Period	(0~2)	0	0: Monthly 1: Weekly 2: Daily
12	Inhibit Monthly	(Jan~Dec)	Monthly	☑ Jan. ☑ Feb. ☑ Mar. ☑ Apr. ☑ May ☑ June ☑ July ☑ Aug. ☑ Sep. ☑ Oct. ☑ Nov. ☑ Dec.
13	Inhibit Monthly (Date)	(1~31)	1	The date of *NOT* run the genset
14	Inhibit Weekly	(Sun~Sat)	Sun	☑ Sun ☐ Mon ☐ Tue ☐ Wed ☐ Thu ☐ Fri ☐ Sat
15	Inhibit Hours	(0~23)h	0	The time of *NOT* start the genset
16	Inhibit Minutes	(0~59)min	0	
17	Inhibit Rest Time	(0~30000)min	30	The duration time of genset not running
Load				
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.
Digit Inputs Config				
1	Digital Input 1	(0~61)	1	QS1 (Closed) Input
2	Active Type	(0~1)	0	0: Close to activate 1: Open to activate

No.	Item	Range	Default	Description
3	Digital Input 2	(0~61)	2	QS2 (Closed) Input
4	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
5	Digital Input 3	(0~61)	3	QS3 (Closed) Input
6	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
7	Digital Input 4	(0~61)	4	QTIE1 (Closed) Input
8	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
9	Digital Input 5	(0~61)	5	QTIE2 (Closed) Input
10	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
11	Digital Input 6	(0~61)	0	Not Used
12	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
13	Digital Input 7	(0~61)	0	Not Used
14	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
15	Digital Input 8	(0~61)	0	Not Used
16	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
17	Digital Input 9	(0~61)	0	Not Used
18	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
19	Digital Input 10	(0~61)	0	Not Used
20	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
21	Digital Input 11	(0~61)	0	Not Used
22	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
23	Digital Input 12	(0~61)	0	Not Used
24	Active Type	(0~1)	0	0: Close to activate 1: Open to activate
Relay Outputs Config				
1	Relay Output 1	(0~1)	0	0: Output (N/O) 1: Output (N/C)
2	Contents Setting	(0~146)	31	QS1 Close Control
3	Relay Output 2	(0~1)	0	0: Output (N/O) 1: Output (N/C)
4	Contents Setting	(0~146)	32	QS1 Open Control
5	Relay Output 3	(0~1)	0	0: Output (N/O) 1: Output (N/C)
6	Contents Setting	(0~146)	33	QS2 Close Control
7	Relay Output 4	(0~1)	0	0: Output (N/O) 1: Output (N/C)
8	Contents Setting	(0~146)	34	QS2 Open Control
9	Relay Output 5	(0~1)	0	0: Output (N/O) 1: Output (N/C)
10	Contents Setting	(0~146)	35	QS3 Close Control

No.	Item	Range	Default	Description
11	Relay Output 6	(0~1)	0	0: Output (N/O) 1: Output (N/C)
12	Contents Setting	(0~146)	36	QS3 Open Control
13	Relay Output 7	(0~1)	0	0: Output (N/O) 1: Output (N/C)
14	Contents Setting	(0~146)	37	QTIE1 Close Control
15	Relay Output 8	(0~1)	0	0: Output (N/O) 1: Output (N/C)
16	Contents Setting	(0~107)	38	QTIE1 Open Control
17	Relay Output 9	(0~1)	0	0: Output (N/O) 1: Output (N/C)
18	Contents Setting	(0~146)	39	QTIE2 Close Control
19	Relay Output 10	(0~1)	0	0: Output (N/O) 1: Output (N/C)
20	Contents Setting	(0~146)	40	QTIE2 Open Control
21	Relay Output 11	(0~1)	1	0: Output (N/O) 1: Output (N/C)
22	Contents Setting	(0~146)	29	Genset Start Output
23	Relay Output 12	(0~1)	0	0: Output (N/O) 1: Output (N/C)
24	Contents Setting	(0~146)	0	Not Used
25	Combined 1 Or Out 1 Active Type	(0~1)	0	0: Output (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
34	Combined 2 Or Out 2 Contents Setting	(0~146)	0	Not Used
35	Combined 2 And Out Active Type	(0~1)	0	0: Output (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)

No.	Item	Range	Default	Description
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 (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
56	Combined 6 Or Out 1 Contents Setting	(0~146)	0	Not Used
57	Combined 6 Or Out 2 Active Type	(0~1)	0	0: Output (N/O) 1: Output (N/C)
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 (N/O) 1: Output (N/C)
60	Combined 6 And Out Contents Setting	(0~146)	0	Not Used
Module Config				
1	Power On Mode	(0~2)	0	0: Last Mode (Keep the previous mode)

No.	Item	Range	Default	Description
				1: Manual Mode 2: Auto Mode
2	Language	(0~3)	0	0: Simplified Chinese 1: English 2: Traditional Chinese (TChinese) 3: Russian
3	Password	(00000~65534)	01234	For entering parameters setting.
4	Module Address	(1~254)	1	RS485 communication address
5	Com 1 Baud Rate	(0~3)	2	0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps
6	Com 1 Stop Bit	(1~2)	2	2 stop bits or 1 stop bit can be set.
7	RS485-1 COM Set	(0~3)	0	0: Enable COM Adj/Ctrl (enable remote adjust/control) 1: Disable COM Control (disable remote control) 2: Disable COM Adjust (disable remote adjust) 3: Disable COM Adj/Ctrl (disable remote adjust/control)
8	Com 2 Baud Rate	(0~3)	2	0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps
9	Com 2 Stop Bit	(1~2)	2	2 stop bits or 1 stop bit can be set.
10	RS485-2 COM Set	(0~3)	0	0: Enable COM Adj/Ctrl (enable remote adjust/control) 1: Disable COM Control (disable remote control) 2: Disable COM Adjust (disable remote adjust) 3: Disable COM Adj/Ctrl (disable remote adjust/control)
11	Date/Time Setting			
12	Controller Description 1	(0~20) characters		"About" information is displayed. Any characters can be inputted via PC software (English letters occupy 1 character, Chinese characters occupy 2 characters.).
13	Controller Description 2	(0~20) characters		
EXP Input Module 1~3				
1	Enable Set	(0~1)	0	0: Disable 1: Enable When enables, it can communicate with DIN16A-2 module.
2	Com. Fail Act	(0~1)	0	0: Warn Alarm 1: Fault Alarm

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

9.3 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 19 – 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
3821	User-defined		2Bytes
3822-3929	User-defined		2*N

9.4 DIGITAL INPUT/OUTPUT FUNCTION DESCRIPTION

9.4.1 INPUT PORTS FUNCTION

Table 20 – Input Ports Function Description

No.	Item	Description
0	Not Used	Invalid
1	QS1 Input	QS1 closed signal inputs.
2	QS2 Input	QS2 closed signal inputs.
3	QS3 Input	QS3 closed signal inputs.
4	QTIE1 Input	QTIE1 closed signal inputs.
5	QTIE2 Input	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 Breaker Trip Input	QS1 trip fault alarm will be initiated when the input is active.
16	QS2 Breaker Trip Input	QS2 trip fault alarm will be initiated when the input is active.
17	QS3 Breaker Trip Input	QS3 trip fault alarm will be initiated when the input is active.
18	QTIE1 Breaker Trip Input	QTIE1 trip fault alarm will be initiated when the input is active.
19	QTIE2 Breaker Trip Input	QTIE2 trip fault alarm will be initiated when the input is active.
20	Auto Trans./Restore	If the Aux. input is configured with this, the auto transfer auto restore status is subject to the input port status. When the input is active and the auto transfer auto restore will be active, when the input is inactive while it is auto transfer non restore.
21	S1 Close 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 Close 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 Close 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 Breaker PF Input	When the S1 PF input is active, S1 close relay will be activated.
25	QS2 Breaker PF Input	When the S2 PF input is active, S2 close relay will be activated.
26	QS3 Breaker PF Input	When the S3 PF input is active, S3 close relay will be activated.
27	QTIE1 Breaker PF Input	When the QTIE1 PF input is active, QTIE1 close relay will be activated.
28	QTIE2 Breaker PF Input	When the QTIE2 PF input is active, QTIE2 close relay will be activated.
29	Sync Inhibit	The sync transfer function is inactive. (HAT835S)
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	Scheduler 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 Input	Manual mode when it is active, auto mode when it is inactive.
47	Reserved	
48	Simulate KEY QS1	Simulate QS1 close/open key function.
49	Simulate KEY QS2	Simulate QS2 close/open key function.
50	Simulate KEY QS3	Simulate QS3 close/open key function.
51	Simulate KEY QTIE1	Simulate QTIE1 close/open key function.
52	Simulate KEY QTIE2	Simulate QTIE2 close/open key function.
53	KEY MANU/AUTO	Simulate manual/auto key function.
54	Non-parallel	Set the parallel mode as non-parallel and the parallel transfer is inhibited in this mode. (HAT835S).
55	Manu/Auto Parallel	Set the parallel mode as manual auto parallel, both manual mode and automatic mode (auto restore) can be parallelly transferred. (HAT835)
56	Auto Parallel	Set parallel mode as automatic parallel, when the controller is in auto mode, the parallel transfer can be automatically operated when main

No.	Item	Description
		power supply automatically restores. (HAT835S)
57	Manu Parallel	Set the parallel mode as manual parallel, when the controller is in manual mode, the parallel transfer can be manually operated. (HAT835S)
58	Reserved	
59	Reserved	
60	Reserved	
61	Reserved	

9.4.2 OUTPUT PORTS FUNCTION

Table 21 – 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 (Failed to Close, Failed to Open).
13	Common Warn Alarm	It includes forced open, expand input/output module communication failure, DC power under/over voltage alarm.
14	Transition (Transfer) Fault	It includes “QS1 Failed to Close” alarm, “QS1 Failed to Open” alarm, “QS2 Failed to Close” alarm, “QS2 Failed to Open” alarm, “QS3 Failed to Close” alarm, “QS3 Failed to Open”, “QTIE1 Failed to Close” alarm, “QTIE1 Failed to Open”, “QTIE2 Failed to Close” alarm, “QTIE2 Failed to Open” 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	Interlock Bypass	Output the electrical interlock release signal when ATS sync

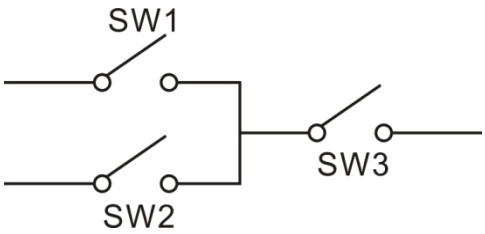
No.	Items	Description
		parallel transfers.
21	S1 Available	Output when S1 power is normal.
22	S1 Unavailable	Output when S1 power is abnormal.
23	S2 Available	Output when S2 power is normal.
24	S2 Unavailable	Output when S2 power is abnormal.
25	S3 Available	Output when S3 power is normal.
26	S3 Unavailable	Output when S3 power is abnormal.
27	Auto Mode	Output when the genset is in Auto mode.
28	Manual Mode	Output when the genset is in Manual mode.
29	Genset Start Output	Control the genset to start.
30	Reserved	
31	QS1 Closed Input	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	Switch Parallel	Output when switch parallel alarms.
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	Digital Input status.
56	Input 2 Status	
57	Input 3 Status	
58	Input 4 Status	
59	Input 5 Status	
60	Input 6 Status	

No.	Items	Description
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	
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 Phase Seq Wrong	
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 Phase Seq Wrong	
85	Sync Fail	Output when two power supplies fail to be synchronized after the synchronization delay. (HAT835)
86	Sync Waiting	Wait for S1&S2 or S1&S3 or S2&S3 to sync output. (HAT835S)
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 Phase Seq Wrong	
94	Reserved	
95	Reserved	
96	Switching	Output during the switch transfer process.
97	DC Under Volt	Output when DC power under voltage alarm occurs.
98	DC Over Volt	Output when DC power over voltage alarm occurs.
99	Gen Inhibit Work	Output during the scheduled not work process.
100	Scheduler Gen Start	Output during the scheduled work process.
101	Reserved	
102	Reserved	

No.	Items	Description
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	
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	

9.4.3 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.

10 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
Record Event
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 records are 200. The first record is latest, and users could check every record by scrolling up/down. The latest record will cover the oldest one when records amount exceeds 200.

Record 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 22 – 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.
22	Sync Closing QS1	Record when QS1 is sync closing.
23	Sync Closing QS2	Record when QS2 is sync closing.
24	Sync Closing QS3	Record when QS3 is sync closing.
25	Sync Closing QTIE1	Record when QTIE1 is sync closing.
26	Sync Closing QTIE2	Record when QTIE2 is sync closing.

11 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
Record event
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. Each event will record for 60s in total (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.

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

Table 23 – Action Events List

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

12 SWITCH OPERATION

12.1 MANUAL OPERATION

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

In non-parallel mode, 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).

After pressing the switch transfer key in parallel mode, if the parallel closing is needed that judged by the software, the interface will turn to target state selection. The switch will start to transfer after selecting the assured transfer state and the indicator light will illuminate after transferring. The controller will alarm and stop transferring if the closing failure occurs during the transferring.

Table 24 – 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.

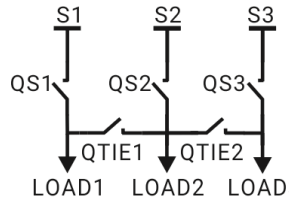
NOTE: Pressing the switch closing key, the main interface will turn to target selection interface in parallel mode and the sync transfer is needed judged by the software. Meanwhile, the target switch state is displayed, press the up/down key to select the transfer target, then press the confirm key to confirm the selection and press the return key to cancel the closing transfer.

12.2 AUTOMATIC OPERATION

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

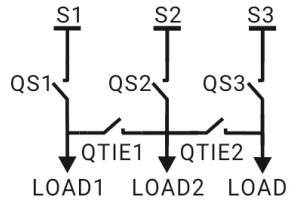
Under auto mode, the controller will switch automatically to ensure power supply according to S1, S2, S3 status, system type. Examples are showed below:

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

System Topology	Power Status			Switch Logic				
System: 2T-TS-2L When three powers are normal, it supplies for them separately; each power at most can supply two loads simultaneously.  	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

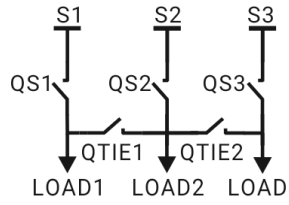
Note: 2T-TS-2L（2T：two tie，TS：tie standby，2L：two loads），2 Bus Tie-Bus Tie Standby-each power supplies two loads.

Table 26 – 2T-TS-3L Auto Transfer Logic

System Topology	Power Status			Switch Logic				
System: 2T-TS-SL When three power are normal, it supplies for them separately; each power can supply three loads simultaneously.  	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

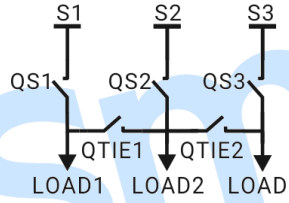
Note: 2T-TS-3L（2T：two tie，TS：tie standby，3L：three loads），2 Bus Tie-Bus Tie standby- each power supplies three loads.

Table 27 – 2T-TS-3G Auto Transfer Logic

System Topology	Power Status			Switch Logic				
System: 2T-TS-3G 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

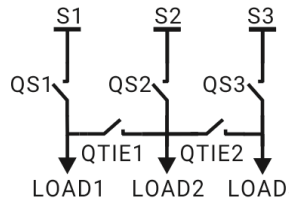
Note: 2T-TS-3G（2T：two tie，TS：tie standby，3G：S3 Genset）, 2 Bus Tie-Bus Tie Standby-S3 is Gen.

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

System Topology	Power Status			Switch Logic				
System: 2T-3I-3L 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

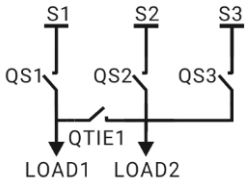
Note: 2T-3I-3L（2T：two tie，3I：S3 independent，3L：three loads）, 2 Bus Tie-S3 independently supply-S1/S2 can supply for 3 loads simultaneously.

Table 29 – 2T-3I-2L Auto Transfer Logic

System Topology	Power Status			Switch Logic				
System: 2T-3I-2L 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

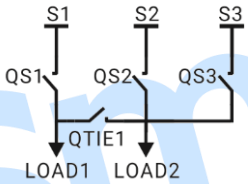
Note: 2T-3I-2L(2T：two tie，3I：S3 independent，2L：two loads), 2 Bus Tie-S3 independently supply-S1/S2 power can supply 2 load simultaneously.

Table 30 – LT-TP-1NPL Auto Transfer Logic

System Topology	Power Status			Switch Logic			
System: LT-TP-1NPL 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

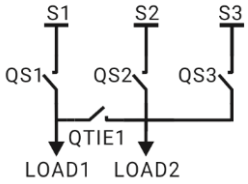
Note: LT-TP-1NPL (LT：left tie，TP：tie priority，1NPL：1 Non-priority load), Left Bus Tie-Bus Tie Main Use-LOAD1 is NEL.

Table 31 – LT-TS-1NPL Auto Transfer Logic

System Topology	Power Status			Switch Logic			
System: LT-TS-1NPL 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

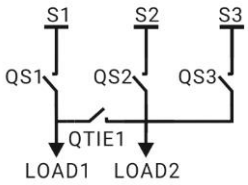
Note: LT-TS-1NPL (LT：left tie，TS：tie standby ，1NPL：1 Non-priority load), Left Bus Tie-Bus Tie Standby-LOAD 1 is NEL.

Table 32 – LT-TS-LP Auto Transfer Logic

System Topology	Power Status			Switch Logic			
System: LT-TS-LP 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

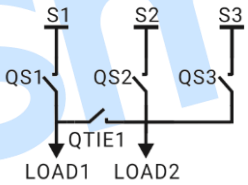
Note: LT-TS-LP(LT：left tie，TS：tie standby，LP：load priority), Left-Bus Tie-Bus Tie Standby-Load is prior to supply.

Table 33 – LT-TS-LP-3G Auto Transfer Logic

System Topology	Power Status			Switch Logic			
System: LT-TS-LP-3G 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

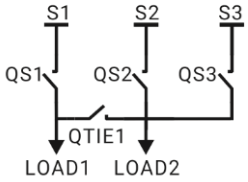
Note: LT-TS-LP-3G (LT：left tie，TS：tie standby，LP：load priority，3G：S3 Genset), Left Bus Tie-Bus Tie Standby-Load is prior to supply-S3 is Gens.

Table 34 – LT-TP-LP Auto Transfer Logic

System Topology	Power Status			Switch Logic			
System: LT-TP-LP 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

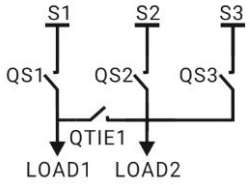
Note: LT-TP-LP（LT：left tie，TP：tie priority, LP：load priority）, Left Bus Tie-Bus Tie Main Use-Load is prior to supply.

Table 35 – LT-TS-3I Auto Transfer Logic

System Topology	Power Status			Switch Logic			
System: LT-TS-3I 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

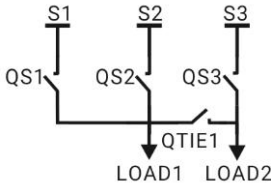
Note: LT-TS-3I (LT：left tie，TS：tie standby，3I：S3 independent), Left Bus Tie-Bus Tie Standby-S3 independently supply.

Table 36 – LT-TS-3IG Auto Transfer Logic

System Topology	Power Status			Switch Logic			
System: LT-TS-3IG 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

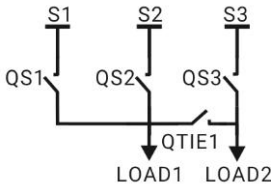
Note: LT-TS-3IG (LT：left tie，TS：tie standby，3I：S3 independent，3IG：S3 independent，S3 Genset), Left Bus Tie-Bus Tie Standby- S3 independently supply, S3 is Gens. S1 and S2 are Mains, mains is normal and takes load.

Table 37 – RT-TP-3I Auto Transfer Logic

System Topology	Power Status			Switch Logic			
System: RT-TP-3I 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

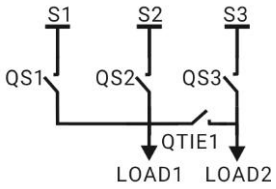
Note: RT-TP-3I (RT：right tie，TP：tie priority，3I：S3 independent), Right Bus Tie-Bus Tie Main Use-S3 independently supply.

Table 38 – RT-TS-LP-1G Auto Transfer Logic

System Topology	Power Status			Switch Logic			
System: RT-TS-LP-1G 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

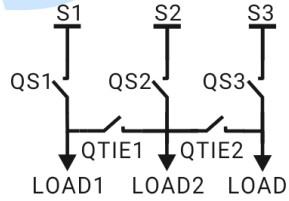
Note: RT-TS-LP-1G (RT：right tie，TS：tie standby，LP：load priority，1G：S1 Genset), Right Bus Tie-Bus Tie Standby- Load is prior to supply-S1 is Gens.

Table 39 – RT-TS-LP-1IG Auto Transfer Logic

System Topology	Power Status			Switch Logic			
System: RT-TS-LP-1IG S2 and S3 can supply for two loads simultaneously; Two loads are preferentially supplied by S2 and S3; S1 only supply for LOAD1.  	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	On
	0	0	0	Off	Off	Off	Off

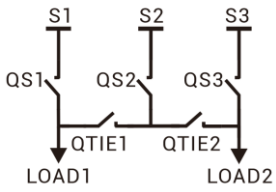
Note: RT-TS-LP-1IG (RT：right tie，TS：tie standby，LP：load priority，1I G：S1 independent，S1 Genset), Right Bus Tie-Bus Tie Standby-Load is prior to supply-S1 independently supply, S1 is Gens.

Table 40 – 2T-TS-2L-1I Auto Transfer Logic

System Topology	Power Status			Switch Logic				
System: 2T-TS-2L-1I When all three power supplies are normal, they supply power to the three loads respectively; S2 and S3 serve as mutual backups, while S2 acts as the backup for S1.  	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	Off	Off	On	On
	1	0	0	On	Off	Off	Off	Off
	0	1	1	Off	On	On	Off	On
	0	1	0	Off	Off	On	On	Off
	0	0	1	Off	Off	Off	On	On
	0	0	0	Off	Off	Off	Off	Off

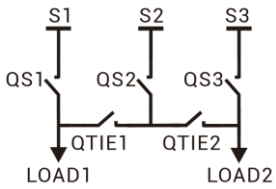
Note: 2T-TS-2L-1I (2T: two tie; TS: tie standby; 2L: two loads; 1I: S1 independent) – Dual Bus Ties- Bus Tie Standby, each power supplies two loads-S1 independently supply.

Table 41 – 2T-TS-2G Auto Transfer Logic

System Topology	Power Status			Switch Logic				
System: 2T-TS-2G When S1 and S3 are normal, they supply power to LOAD1 and LOAD2 respectively, while S2 functions as a generating unit serving as backup for both LOAD1 and LOAD2.  	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	Off	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 / On	Off	Off / On	Off

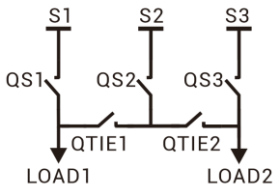
Note: 2T-TS-2G (2T: two tie; TS: tie standby; 2G: S2 Genset) – Dual Bus Ties - Bus Tie Standby, S2 serves as a generator backup for both systems, while bus ties retaining their previous open/close state.

Table 42 – 2T-TS-2G1 Auto Transfer Logic

System Topology	Power Status			Switch Logic				
System: 2T-TS-2G1 When S1 and S3 are normal, they supply power to LOAD1 and LOAD2 respectively, while S2 functions as a generating unit serving as backup for both LOAD1.  	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	Off	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	Off	Off
	0	0	1	Off	On	Off	On	On
	0	0	0	Off	Off / On	Off	Off / On	Off

Note: 2T-TS-2G1 (2T: two tie; TS: tie standby; 2G: S2 Genset) – Dual Bus Ties-Bus Tie Standby, S2 serves as a generator backup for LOAD1, while bus ties retaining their previous open/close state.

Table 43 – 2T-TS-2G2 Auto Transfer Logic

System Topology	Power Status			Switch Logic				
System:2T-TS-2G2 When S1 and S3 are normal, they supply power to LOAD1 and LOAD2 respectively, while S2 functions as a generating unit serving as backup for both LOAD2.  	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	Off	Off	Off	On
	1	0	0	On	On	Off	On	Off
	0	1	1	Off	On	On	Off	On
	0	1	0	Off	Off	On	On	Off
	0	0	1	Off	On	Off	On	On
	0	0	0	Off	Off / On	Off	Off / On	Off

Note: 2T-TS-2G2 (2T: two tie; TS: tie standby; 2G2: S2 Genset-load2) – Dual Bus Ties-Bus Tie Standby, S2 serves as a generator backup for LOAD2, while bus ties retaining their previous open/close state.

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.

13 ATS POWER SUPPLY

13.1 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.

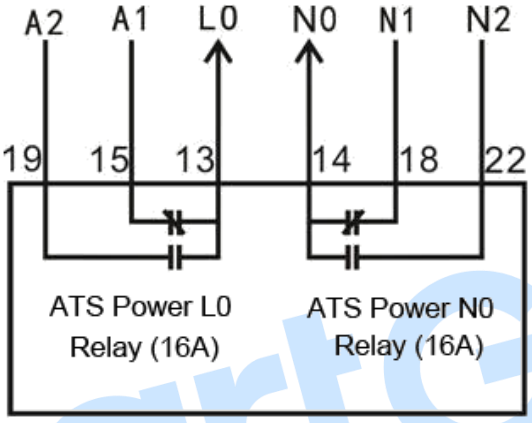


Fig.3 – Internal Wiring of ATS Power LO-NO Output

The controller will intelligently 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. Ouput12; 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:

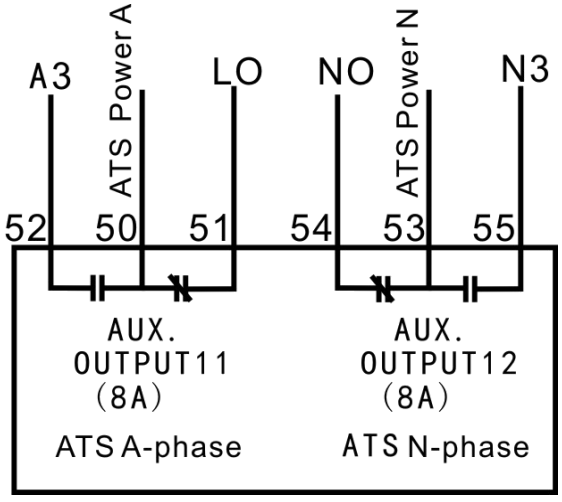


Fig.4 – Wring of ATS Supplied by Any of S1, S2, S3

13.2 TPS31 POWER SUPPLY

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

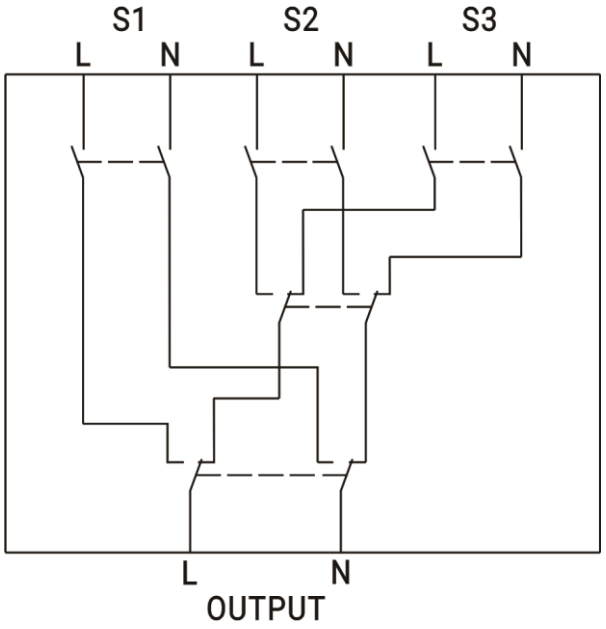


Fig.5 – Internal Transfer Diagram

14 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.

15 PLC FUNCTION INTRODUCTION

15.1 PLC EDITING SCREEN

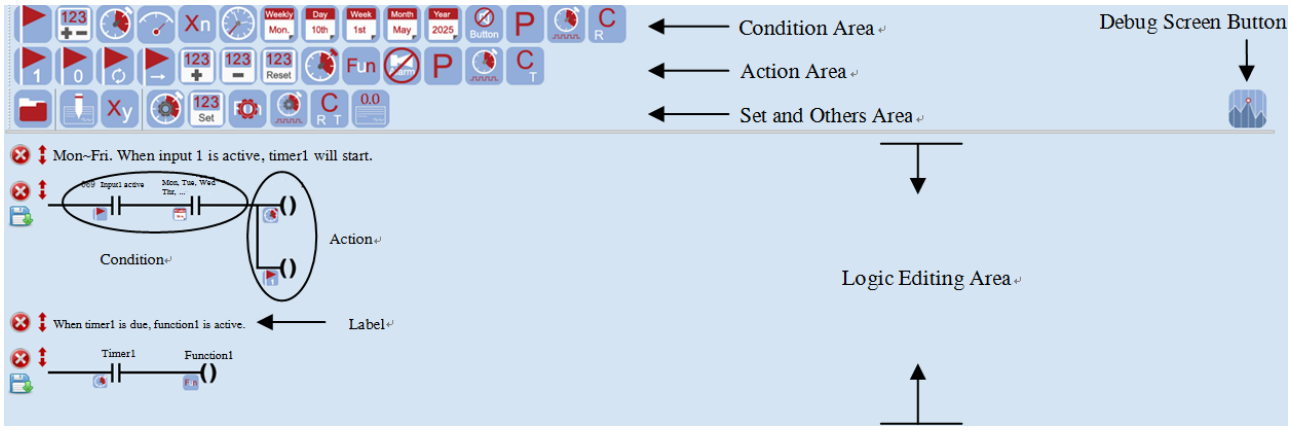


Fig.6 – PLC Editing Screen

15.2 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 44 – Counter Description

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

15.3 LOGIC INTRODUCTION

Take “OR” logic as the example:

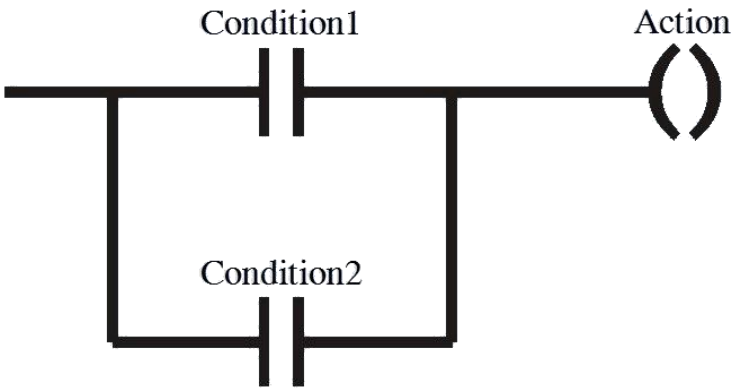


Fig.7 – OR Logic Diagram

When condition1 or condition2 is active, action is triggered.

For example:

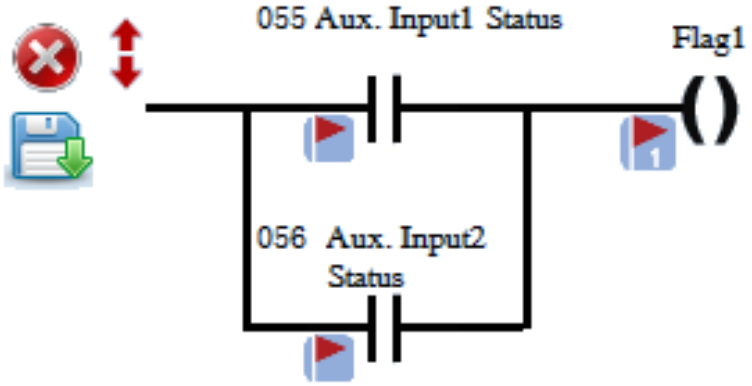


Fig.8 – OR Logic Example Diagram

15.4 APPLICATION EXAMPLE

Example1 (S1 voltage normal output).

Function: Flag1 outputs when S1 voltage is normal.

Fig.9 – PLC Example1 Logic

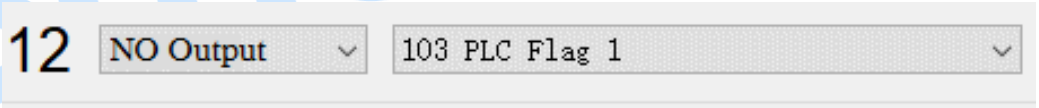


Fig.10 – PLC Example1 Outputs Set

Example2 (Manual mode delay output).

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

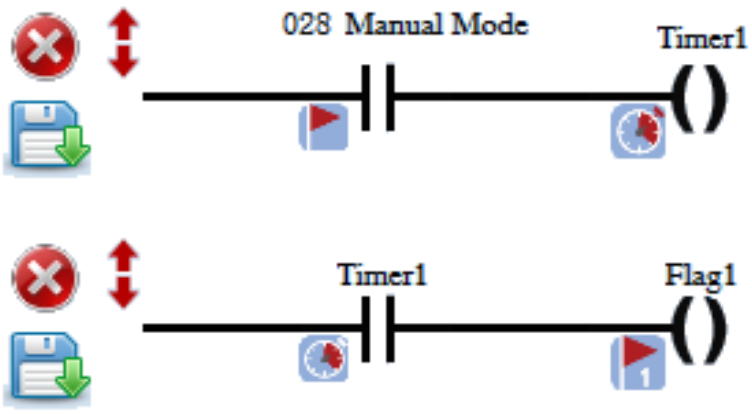


Fig.11 – PLC Example2 Logic

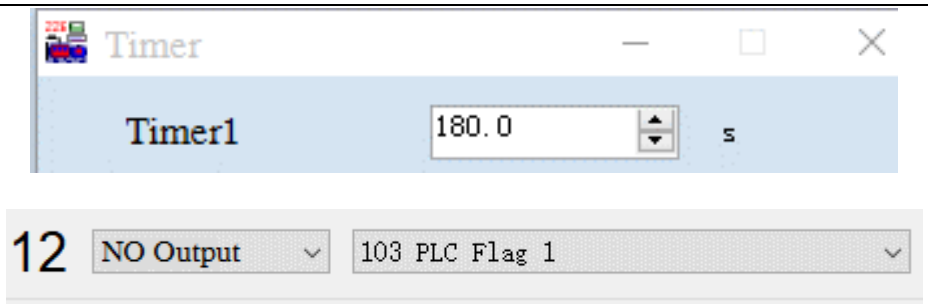


Fig.12 – PLC Example2 Outputs Set

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

16 TERMINALS

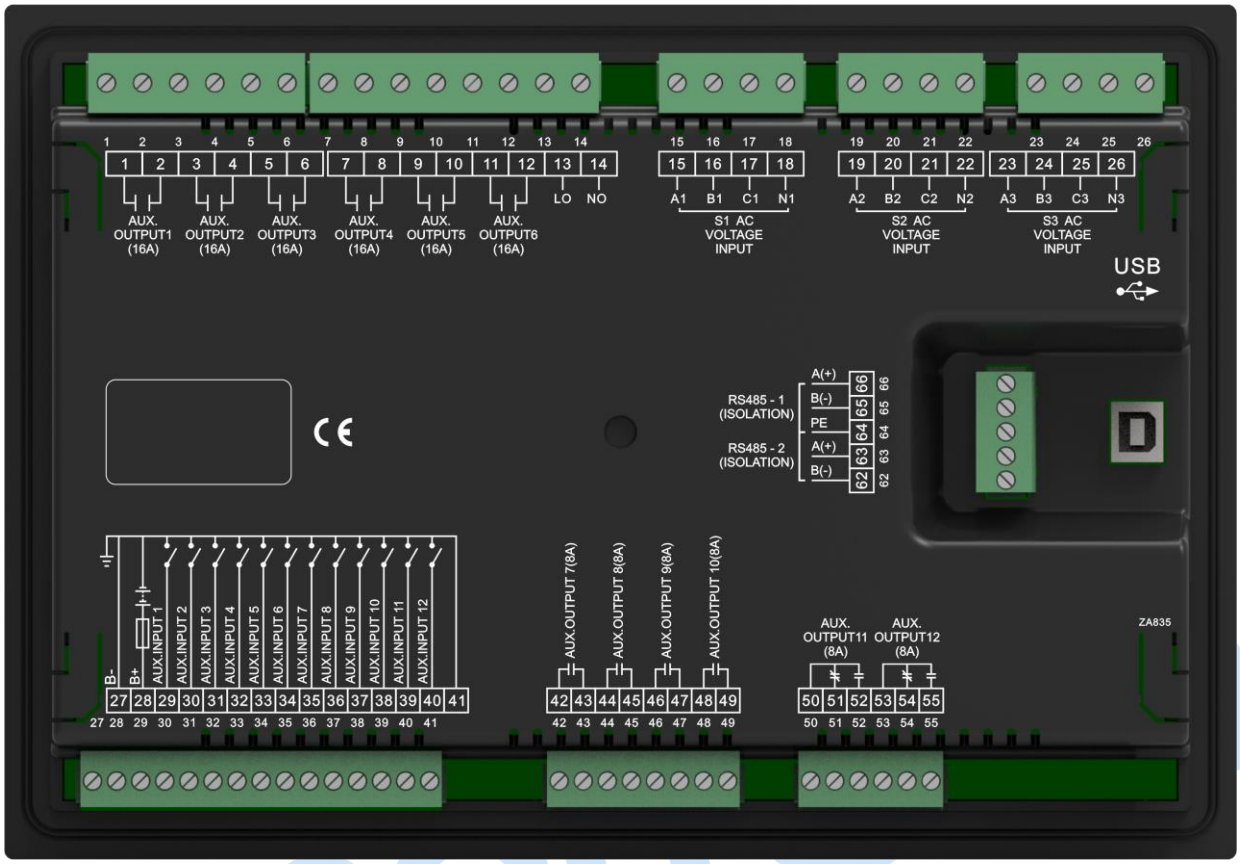


Fig.13 – Controller Rear Panel Drawing

Table 45 – Inputs/Outputs Function Description

No.	Items	Description	Remark
1 2	AUX.OUTPUT1	Relay Output1	Default: QS1 Close Control Volts free; Relay contact; Normally Open output. Capacity: 250V16A
3 4	AUX.OUTPUT2	Relay Output2	Default: QS1 Open Control Volts free; Relay contact; Normally Open output. Capacity: 250V16A
5 6	AUX.OUTPUT3	Relay Output3	Default: QS2 Close Control Volts free; Relay contact; Normally Open output. Capacity: 250V16A
7 8	AUX.OUTPUT4	Relay Output4	Default: QS2 Open Control Volts free; Relay contact; Normally Open output. Capacity: 250V16A
9 10	AUX.OUTPUT5	Relay Output5	Default: QS3 Close Control Volts free; Relay contact; Normally Open output. Capacity: 250V16A
11 12	AUX.OUTPUT6	Relay Output6	Default: QS3 Open Control Volts free; Relay contact; Normally Open output. Capacity: 250V16A

No.	Items	Description	Remark
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	Digital Input 1	Default: QS1 (closed) input. Ground connected is active.
30	AUX.INPUT2	Digital Input 2	Default: QS2 (closed) input. Ground connected is active.
31	AUX.INPUT3	Digital Input 3	Default: QS3 (closed) input. Ground connected is active.
32	AUX.INPUT4	Digital Input 4	Default: QTIE1 (closed) input. Ground connected is active.
33	AUX.INPUT5	Digital Input 5	Default: QTIE2 (closed) input. Ground connected is active.
34	AUX.INPUT6	Digital Input 6	Default: Not used. Ground connected is active.
35	AUX.INPUT7	Digital Input 7	Default: Not Used Ground connected is active.
36	AUX.INPUT8	Digital Input 8	Default: Not Used Ground connected is active.
37	AUX.INPUT9	Digital Input 9	Default: Not Used Ground connected is active.
38	AUX.INPUT10	Digital Input 10	Default: Not Used Ground connected is active.
39	AUX.INPUT11	Digital Input 11	Default: Not Used Ground connected is active.
40	AUX.INPUT12	Digital Input 12	Default: Not Used Ground connected is active.
41	B-(GND)	Input ground terminal	Connect to B- internally.
42	AUX. OUTPUT 7	Relay Output7	Default: Not Used. Volts free; Relay contact; Normally
43			

No.	Items	Description		Remark
				open output. Capacity: 250V8A
44 45	AUX. OUTPUT 8	Relay Output8		Default: Not Used. Volts free; Relay contact; Normally open output. Capacity: 250V8A
46 47	AUX. OUTPUT 9	Relay Output9		Default: Not Used. Volts free; Relay contact; Normally open output. Capacity: 250V8A
48 49	AUX. OUTPUT 10	Relay Output10		Default: Not Used. 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.

17 TYPICAL WIRING DIAGRAM

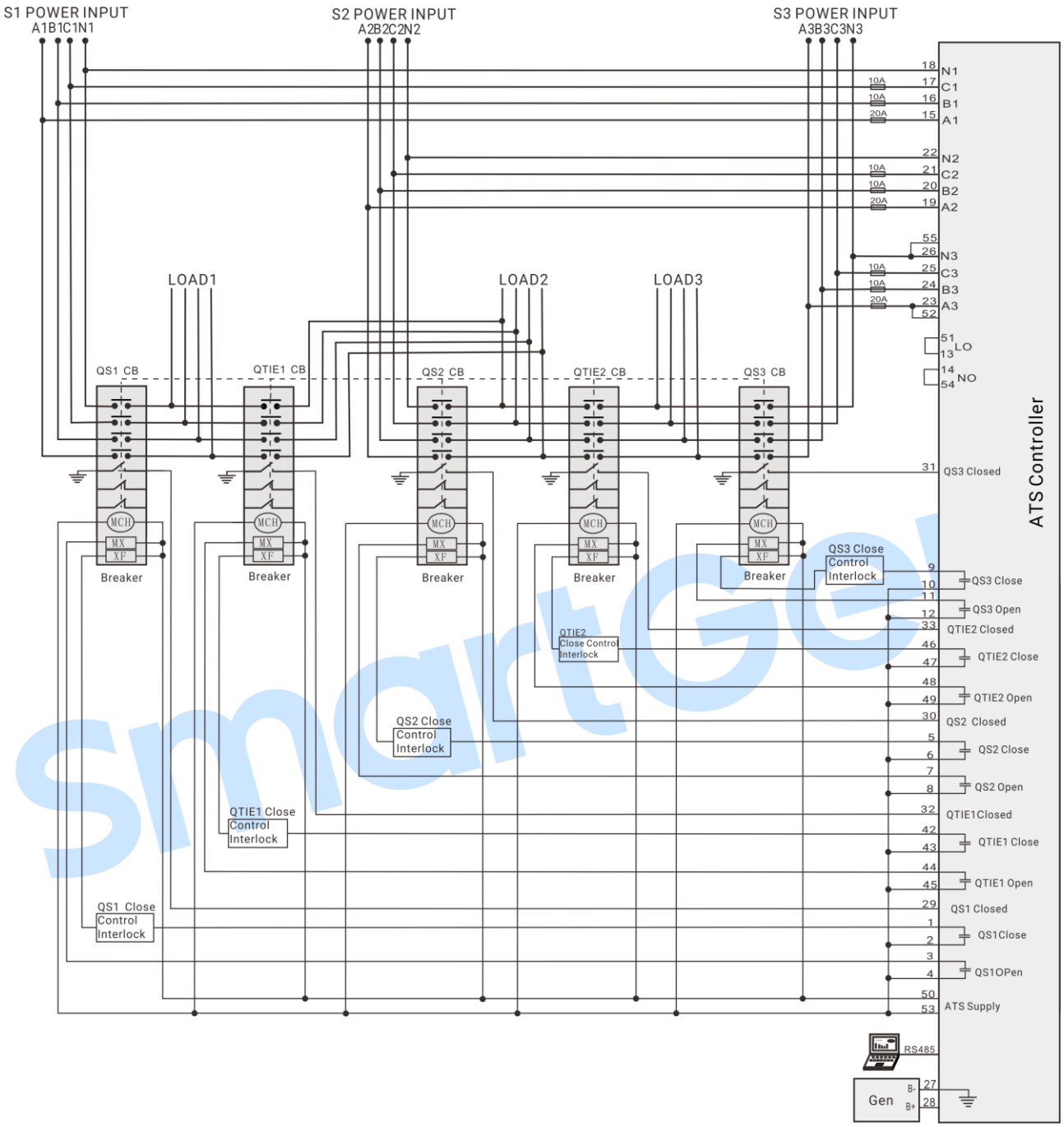


Fig.14 – 3P2B Controller Power Supply Breaker Application Diagram

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

Table 46 – Corresponding Settings

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

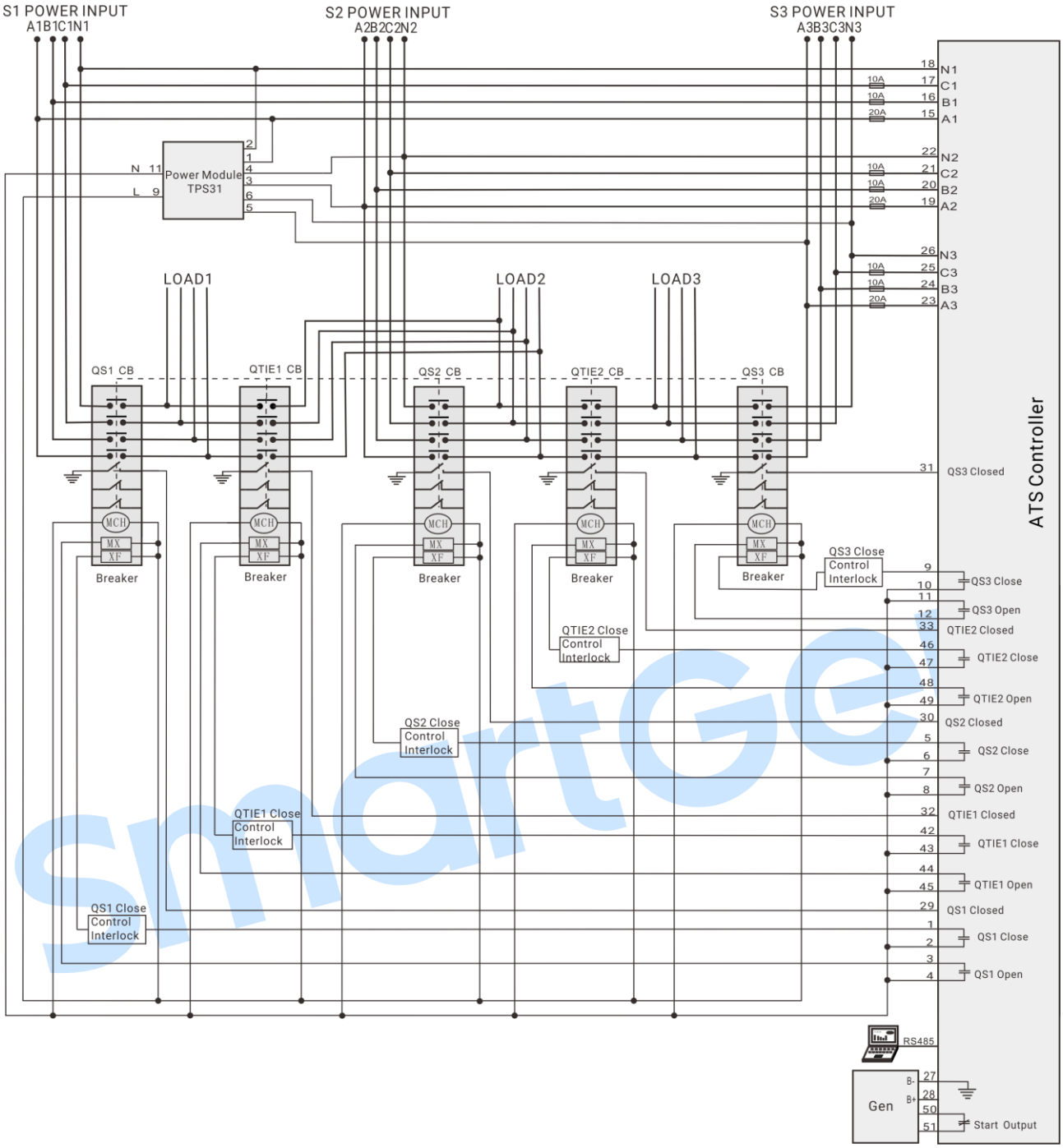


Fig.15 – 3P2B TPS31 Power Supply Breaker Application Diagram

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

Table 47 – Corresponding Settings

Partial Parameters Setting	
Aux. Output 1	Closing QS1
Aux. Output 2	Opening QS1
Aux. Output 3	Closing QS2
Aux. Output 4	Opening QS2
Aux. Output 5	Closing QS3
Aux. Output 6	Opening QS3
Aux. Output 7	Closing QTIE1
Aux. Output 8	Opening QTIE1
Aux. Output 9	Closing QTIE2
Aux. Output 10	Opening QTIE2
Aux. Input 1	QS1 (Closed) Input
Aux. Input 2	QS2 (Closed) Input
Aux. Input 3	QS3 (Closed) Input
Aux. Input 4	QTIE1 (Closed) Input
Aux. Input 5	QTIE2 (Closed) Input

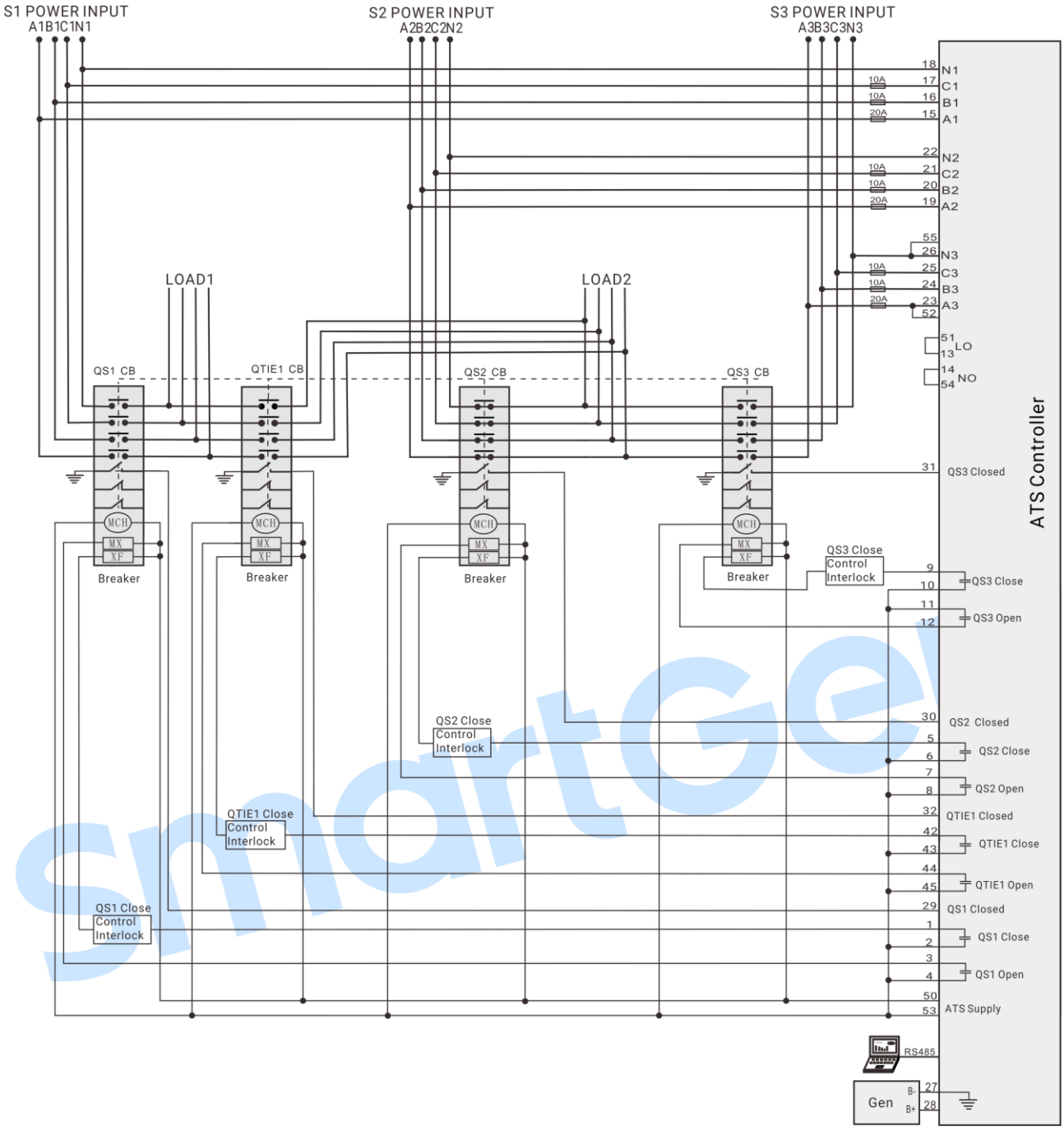


Fig.16 – 3P1B (Left Bus Tie) Controller Power Supply Breaker Application Diagram

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

Table 48 – Corresponding Settings

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

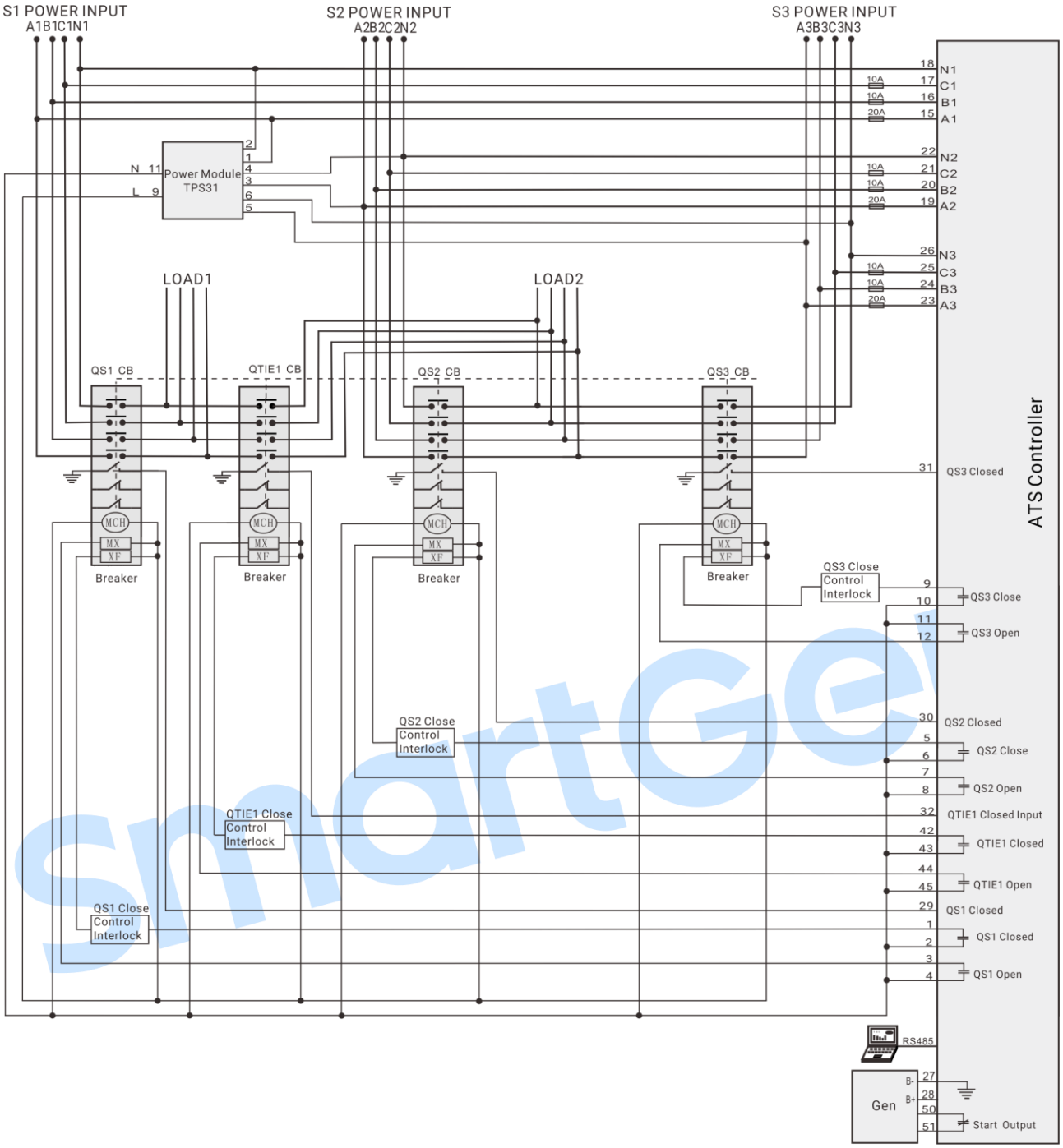


Fig.17 – 3P1B (Left Bus Tie) TPS31 Power Supply Breaker Application Diagram

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

Table 49 – Corresponding Settings

Partial Parameters Setting	
Aux. Output 1	Closing QS1
Aux. Output 2	Opening QS1
Aux. Output 3	Closing QS2
Aux. Output 4	Opening QS2
Aux. Output 5	Closing QS3
Aux. Output 6	Opening QS3
Aux. Output 7	Closing QTIE1
Aux. Output 8	Opening QTIE1
Aux. Input 1	QS1 (Closed) Input
Aux. Input 2	QS2 (Closed) Input
Aux. Input 3	QS3 (Closed) Input
Aux. Input 4	QTIE1 (Closed) Input

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”.

18 ELECTRICAL INTERLOCK LOGIC

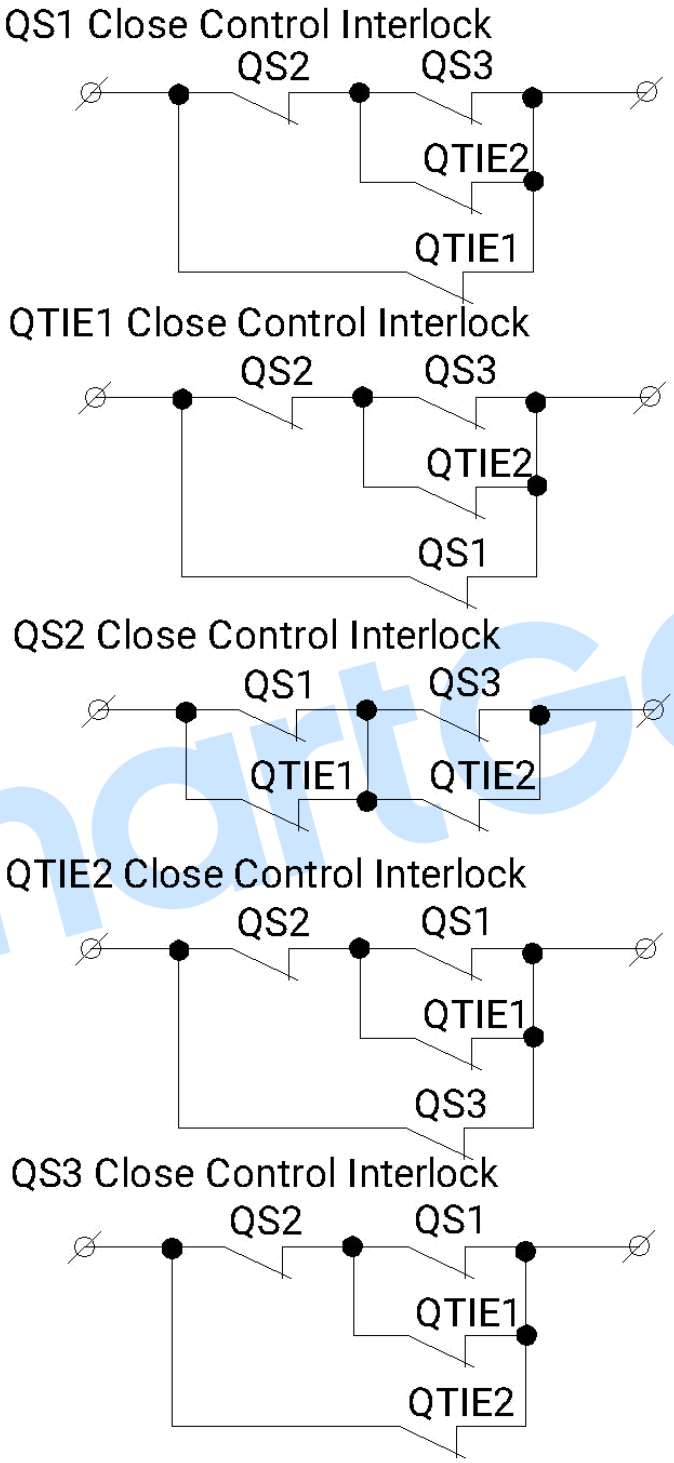


Fig.18 – 3P2B Electrical Interlock Logic Diagram

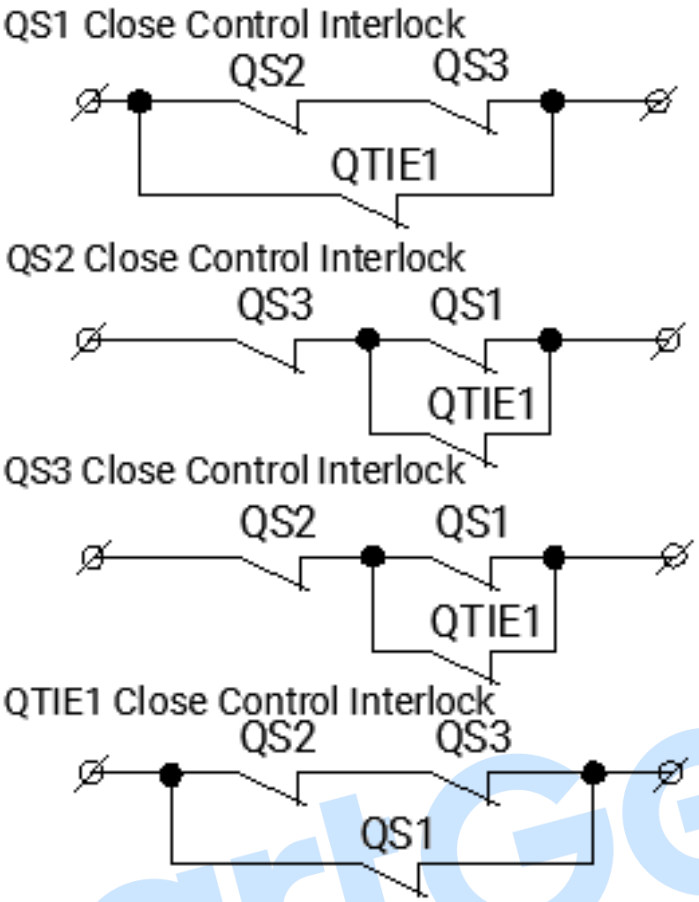


Fig.19 – 3P1B Electrical Interlock Logic Diagram

19 INSTALLATION

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

Unit: mm

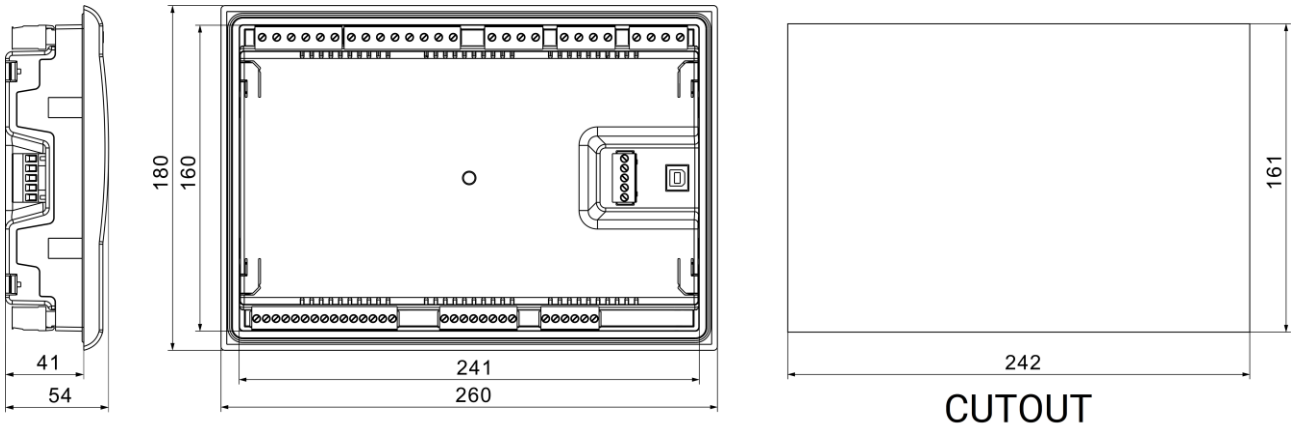


Fig.20 – Overall & Cutout Dimensions

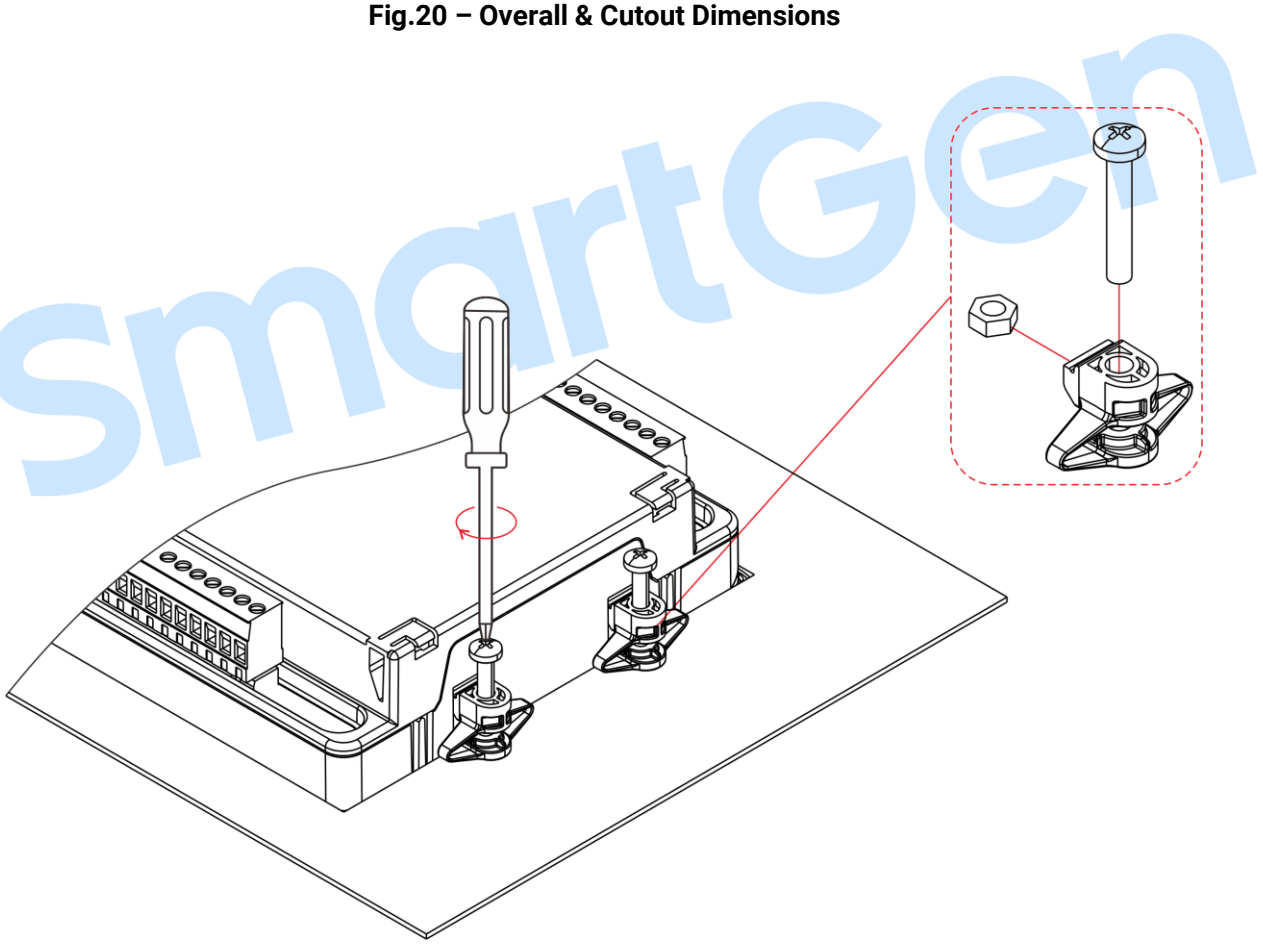


Fig.21 – Clips Installation Drawing

20 TROUBLE SHOOTING

Table 50 – 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.
Relay output error	Check auxiliary output connections, pay attention to normally open contact and normally close contact. Check the output settings in parameters settings.
Digital input abnormal	Ensure that the auxiliary input is soundly connected to GND when it's active, while hung up when it is inactive. (**NOTE:** 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.