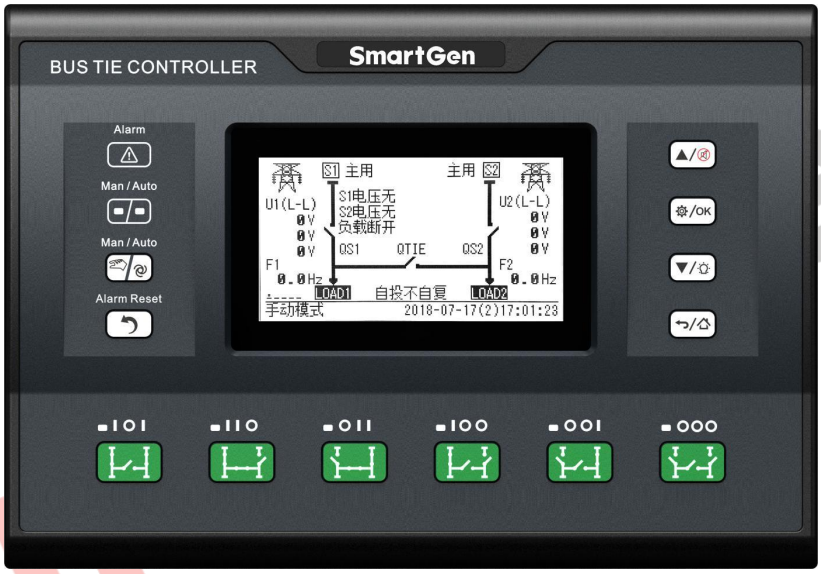
HAT821

DUAL POWER BUS TIE CONTROLLER

USER MANUAL



SMARTGEN (ZHENGZHOU) TECHNOLOGY CO., LTD.

3 SPECIFICATION

Table 2 – Performance Parameters

Items	Contents	
Operating Voltage	1. DC8.0V~35.0V, continuous power supply 2. AC(90~305)V power supply A1N1/A2N2	
Power Consumption	<7W(Standby mode:≤2W)	
AC Voltage Input	AC system	
	3P4W (L-L)	(80~530)V
	3P3W (L-L)	(80~625)V DC supply
	1P2W (L-N)	(50~305)V
	2P3W (A-B)	(80~530)V
Rated Frequency	50/60Hz	
Programmble Output 1~6 Relay Capacity	16A AC250V Volts free output	
Programmble Output 7~12 Relay 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 Conditions	Temperature: (-25~+70)°C; Relative Humidity: (20~93)%RH	
Storage Condition	Temperature: (-25~+70)°C	
Protection Level	IP65: when water proof gasket ring inserted between panel and housing.	
Insulation Strength	Apply AC1.5kV voltage between high voltage terminal and low voltage terminal; The leakage current is not more than 3mA within 1min.	
Weight	1.2kg	

4 MEASURE AND DISPLAY DATA

Table 3 – Display Parameters

No.	Measure & Display Data Items
1	S1/S2 Power Phase Voltage (L1-N,L2-N,L3-N)
2	S1/S2 Power Line Voltage (L1-L2,L2-L3,L3-L1)
3	S1/S2 Power Frequency
4	S1 Total Supply Time
5	S2 Total Supply Time
6	LOAD1/LOAD2 Continuous Power Supply Time (Present)
7	LOAD1/LOAD2 Continuous Power Supply Time (Last Time)
8	LOAD1/LOAD2 Total Power Supply Time
9	QS1 Total Close Times
10	QS2 Total Close Times
11	QTIE Total Close Times
12	Inp ut/Output Port Status
13	Real Time Clock
14	Historical Records & Black Box Records
15	Communication Status

Table 4 - Identification & Abbreviations Explanation

No.	Identification & Abbreviations	Explanation
1	S1	S1 power
2	S2	S2 power
3	QS1	S1 side switch
4	QS2	S2 side switch
5	QTIE	Bus-tie switch
6	PF	Ready for close signal
7	CB	Circuit breaker
8	LOAD1	Load 1
9	LOAD2	Load 2

5 OPERATION

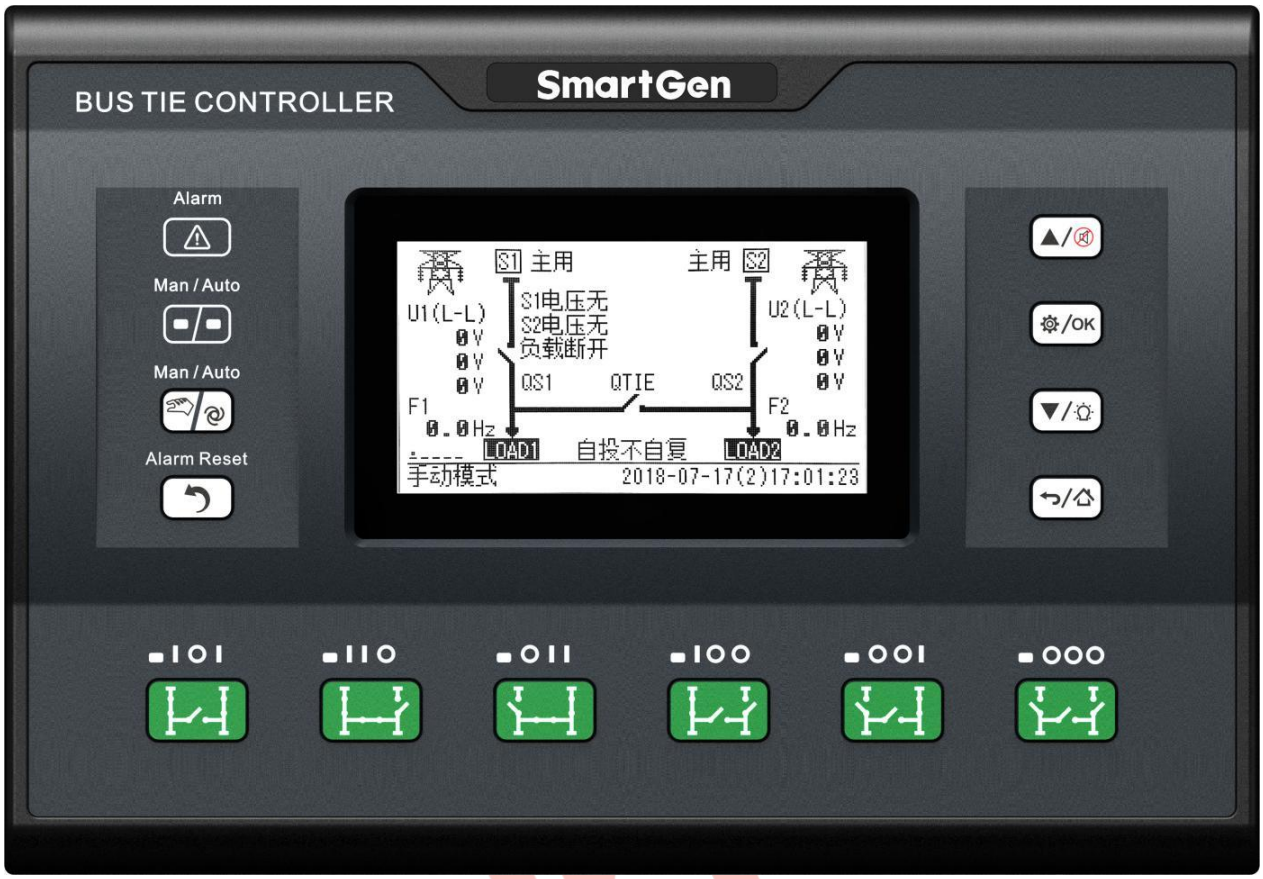


Fig.1 – Penal Indication Drawing

5.1 INDICATORS

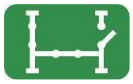
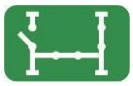
Table 5 – Indicators Description

Indicator Type	Description
Alarm	Slow flashing (1time 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.
IOI	Illuminated: QS1 closed, QS2 closed, LOAD1 powered by S1, LOAD2 powered by S2. Flashing: status switching
IIO	Illuminated: QS1 closed, QTIE closed, LOAD1 and LOAD2 powered by S1. Flashing: status switching
OII	Illuminated: QS1 closed, QS2 closed, LOAD1 and LOAD2 powered by S2. Flashing: status switching
IOO	Illuminated: QS1 closed, LOAD1 powered by S1, LOAD2 disconnect. Flashing: status switching
OOI	Illuminated: QS2 closed, LOAD2 powered by S2, LOAD1 disconnect.

Indicator Type	Description
	Flashing: status switching
OOO	Illuminated: QS1, QS2, QTIE are all open, LOAD1 and LOAD2 are disconnect. Flashing: status switching

5.2 KEY FUNCTION DESCRIPTION

Table 6 – Buttons Function Description

Icon	Buttons	Function Description
	IOI	Active in Manual mode. After pressing this key, QS1 will close, QTIE will open and QS2 will close, which means LOAD1 powered by S1 and LOAD2 powered by S2.
	IIO	Active in Manual mode. After pressing this key, QS1 will close, QTIE will close and QS2 will open, which means LOAD1 and LOAD2 powered by S1.
	OII	Active in Manual mode. After pressing this key, QS1 will open, QTIE will close and QS2 will close, which means LOAD1 and LOAD2 powered by S2.
	IOO	Active in Manual mode. After pressing this key, QS1 will close, QTIE will open and QS2 will open, which means LOAD1 powered by S1 and LOAD2 disconnect.
	OOI	Active in Manual mode. After pressing this key, QS1 will open, QTIE will open and QS2 will close, which means LOAD2 powered by S2 and LOAD1 disconnect.
	OOO	Active in Manual mode. After pressing this key, QS1 will open, QTIE will open and QS2 will open, which means LOAD1 and LOAD2 disconnect.
	Man/Auto	Manual mode and Auto mode switching.
	Alarm Reset	Pressing this key can reset fault alarm.
	Return/Homepage	When setting parameters, press the key to return back. In main screen, press the key to return the first screen; in other screen, hold and press the key to return to main screen.
	Set/Confirm	In main screen, press the key to enter to menu. In menu screen, press this key can move cursor and confirm setting information.

Icon	Buttons	Function Description
	Up/Alarm Mute	In main screen, press the key to scroll up screen. In menu interface, press this key to up cursor or increase value in setting menu. Mute the alarm.
	Down/Lamp Test	In main screen, press the key to scroll down screen. In menu interface, press this key to down cursor or decrease value in setting menu. In main screen, press the key for seconds to enter lamp test mode, LCD backlit and all LED lamps are lit and LCD screen display black.

6 LCD DISPLAY

6.1 MAIN SCREEN

Table 6 – Screen Display

Items	Display Contents
Homepage	S1 status, S2 status, Switch status; Supply system diagram, QS1 is side switch for S1, QS2 is side switch for S2, QTIE is bus-tie switch; S1/S2 voltage and frequency; S1/S2 priority switch; AutoTrans/Restore status
S1 	S1 line voltage, phase voltage and frequency; S1 total supply time.
S2 	S2 line voltage, phase voltage and frequency; S2 total supply time.
LOAD1 	LOAD1 continuous power supply time (present); LOAD1 continuous power supply time (last time); LOAD1 total power supply time.
LOAD2 	LOAD2 continuous power supply time (present); LOAD2 continuous power supply time (last time); LOAD2 total power supply time.
QF 	QS1 Total Close Times; QS2 Total Close Times; QTIE Total Close Times.
I/O 	Programmable digital input status and auxiliary status; Programmable digital output status.
Comm. 	RS485-1 Comm. status and baud rate; RS485-2 Comm. status and baud rate; USB Comm. status
Alarms 	Present alarm informations (Warn alarm and fault alarm)
Status	Alarm status/working status; Real-time clock; Statusline is showed below in every main screen pages.

7.3 DIGITAL INPUT/OUTPUT FUNCTION DESCRIPTION

7.3.1 INPUT PORTS FUNCTION

Table 18 – Input Ports Function Description

No.	Item	Description
0	Not Uesd	Invalid
1	Forced Open	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 OFF position. LOAD1 and LOAD2 disconnected.
2	Reserved	
3	Reserved	
4	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.
5	Reserved	
6	Reserved	
7	Reserved	
8	Breaker Trip Input	Trip failure input, if input is active, controller will initiate “Breaker Trip Fault” alarm, and forced enter into manual mode at the same time; if input is inactive, alarm can be reset manually.
9	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 QS1 disconnect.
10	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 QS2 disconnect.
11	QS1 Breaker PF Input	When the S1 PF input is active, S1 close relay will activated.
12	QS2 Breaker PF Input	When the S2 PF input is active, S2 close relay will activated.
13	Reserved	
14	Reserved	
15	Alarm Reset	Reset the current alarm.
16	Alarm Mute	Silence the audible alarm.
17	Reserved	
18	Reserved	
19	S1 Master Input	Set S1 master use compulsively.
20	S2 Master Input	Set S2 master use compulsively.
21	Forced Manual Mode	Set the controller in Manual mode compulsively.

No.	Item	Description
22	Forced Auto Mode	Set the controller in Auto mode compulsively.
23	Panel Lock	Panel button operation are inhibited (Except Up, Down, Confirm, and Return keys)
24	Reserved	
25	Reserved	
26	Simulate S1 OK	Simulate S1 voltage is normal; the S1 voltage abnormal delay is deactivated.
27	Simulate S2 OK	Simulate S2 voltage is normal; the S2 voltage abnormal delay is deactivated.
28	Reserved	
29	Reserved	
30	Reserved	
31	Reserved	
32	Reserved	
33	Auto Charge/Rec.	Auto charge/recover when the input active, auto transfer/nonrestore when invalid.
34	Reserved	
35	QTIE Close Inhibit	In Manual mode, QTIE manual close is inhibited; if breaker already closed, users should open it manually. In Auto mode, if breaker already closed, then QTIE disconnect.
36	QTIE PF Input	When the QTIE PF input is active, QTIE close relay will activated.
37	Simulate KEY OOO	Same function with Panel OOO Key. Please use reset key to control ATS to transfer to OOO.
38	Simulate KEY OOI	Same function with Panel OOI Key. Please use reset key to control ATS to transfer to OOI.
39	Simulate KEY IOO	Same function with Panel IOO Key. Please use reset key to control ATS to transfer to IOO.
40	Simulate KEY OII	Same function with Panel OII Key. Please use reset key to control ATS to transfer to OII.
41	Simulate KEY IIO	Same function with Panel IIO Key. Please use reset key to control ATS to transfer to IIO.
42	Simulate KEY IOI	Same function with Panel IOI Key. Please use reset key to control ATS to transfer to IOI.
43	Reserved	
44	Simulate Manual/Auto Key	

No.	Item	Description
45	Remote Control Inhibit	
46	QS1 Trip Fault	
47	QS2 Trip Fault	
48	QTIE Trip Fault	
49	S1 Supply QTIE Open	
50	S2 Supply QTIE Open	

7.3.2 OUTPUT PORTS FUNCTION

Table 17 – Output Ports Function Description

No.	Items	Description
0	Not Uesd	Invalid
1	Custom Combined 1	Output status please to see corresponding custom combination.
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 “Transition Fault” alarm, “Force Open Fault” alarm and “Over Current” alarm.
13	Common Warn Alarm	It includes “Force Open Fault” alarm.
14	Transition Fault	It includes “QS1 Fail to Close” alarm, “QS1 Fail to Open” alarm, “QS2 Fail to Close” alarm, “QS2 Fail to Open” alarm, “QTIE Fail to Close” alarm, “QTIE Fail to Open” alarm.
15	Audible Alarm	Action when common alarm occurs. Can be connected annunciator externally. When “alarm mute” input is active or 60s delay has expired, it can remove the alarm.
16	Reserved	
17	Reserved	
18	Reserved	
19	Elevator Control	Output before the load disconnect or switch transfer. Used for control the running elevator stop at the nearest floor until the switch transfer is terminated.
20	Reserved	
21	Reserved	
22	Reserved	

No.	Items	Description
23	S1 Available	Output when S1 power is normal.
24	S1 Unavailable	Output when S1 power is abnormal.
25	S2 Available	Output when S2 power is normal.
26	S2 Unavailable	Output when S2 power is abnormal.
27	Reserved	
28	Reserved	
29	Reserved	
30	Auto Mode	Output when the genset is in Auto mode.
31	Manual Mode	Output when the genset is in Manual mode.
32	Reserved	
33	Reserved	
34	QS1 Close Control	Control the QS1 switch to close.
35	QS1 Open Control	Control the QS1 switch to open.
36	QS2 Close Control	Control the QS2 switch to close.
37	QS2 Open Control	Control the QS2 switch to open.
38	Reserved	
39	Reserved	
40	Reserved	
41	Reserved	
42	Reserved	
43	QTIE Closed Input	The close status of QTIE switch
44	Reserved	
45	QS1 Closed Input	The close status of S1 switch
46	QS2 Closed Input	The close status of S2 switch
47	Reserved	
48	Reserved	
49	Reserved	
50	Reserved	
51	Reserved	
52	Reserved	
53	Remote Control	Remote control the output via communication command.
54	Input 1 Status	Aux. Input status.
55	Input 2 Status	
56	Input 3 Status	
57	Input 4 Status	
58	Input 5 Status	
59	Input 6 Status	
60	Input 7 Status	
61	Input 8 Status	
62	Reserved	

No.	Items	Description
63	Reserved	
64	S1 Blackout	S1 power supply status
65	S1 Over Volt	
66	S1 Under Volt	
67	S1 Over Freq	
68	S1 Under Freq	
69	S1 Loss Of Phase	
70	S1 Phase Seq Wrong	
71	Reserved	
72	Reserved	
73	S2 Blackout	S2 power supply status
74	S2 Over Volt	
75	S2 Under Volt	
76	S2 Over Freq	
77	S2 Under Freq	
78	S2 Loss of Phase	
79	S2 Phase Seq Wrong	
80	Reserved	
81	Reserved	
82	Reserved	
83	Reserved	
84	Switching	Output during the switch transfer process.
85	Reserved	
86	Reserved	
87	Reserved	
88	Reserved	
89	Breaker Trip Fault	
90	QS1 Trip Fault	
91	Reserved	
92	Reserved	
93	QTIE Trip Fault	
94	QTIE Close Control	Control QTIE to close
95	QTIE Open Control	Control QTIE to open

11 ATS POWER SUPPLY

Switch 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 and S2 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 and S2 and AC power voltage.

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

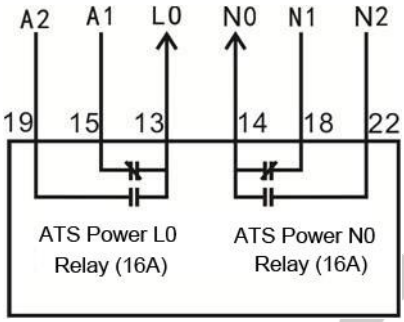


Fig.2 – Internal Wiring of ATS Power LO-NO Output

13 TERMINALS

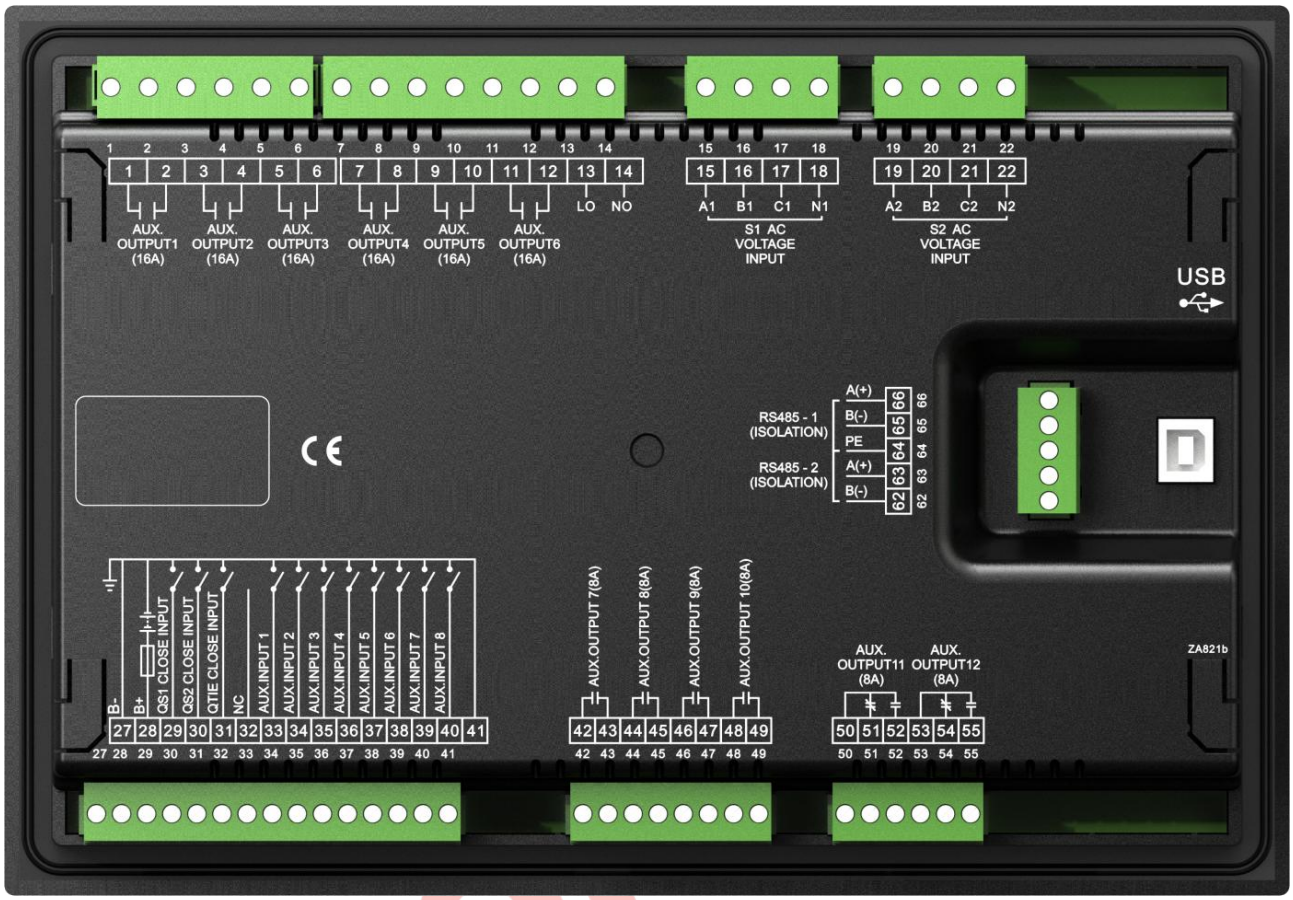


Fig.3 – Controller Rear Panel Drawing

Table 23 – 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	AUX.OUTPUT5	Relay Output5	Default: QTIE Close Control

No.	Items	Description	Remark
10			Volts free; Relay contact; Normally Open output. Capacity: 250V16A
11	AUX.OUTPUT6	Relay Output6	Default: QTIE Open Control
12			Volts free; Relay contact; Normally Open output. Capacity: 250V16A
13	LO	ATS Power L	Power supply for ATS switching
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		
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	QS1 CLOSE INPUT	QS1 Close Status Input	Detect QS1 close status, volts free, relay contact. Ground connected is active.
30	QS2 CLOSE INPUT	QS2 Close Status Input	Detect QS2 close status, volts free, relay contact. Ground connected is active.
31	QTIE CLOSE INPUT	QTIE Close Status Input	Detect QTIE close status, volts free, relay contact. Ground connected is active.
32	NC	Null	This terminal is not defined.
33	AUX. INPUT 1	Digital Intput1	Default: Forced Open Ground connected is active.
34	AUX. INPUT 2	Digital Intput2	Default: QS1 Trip Fault Ground connected is active.
35	AUX. INPUT 3	Digital Intput3	Default: QS2 Trip Fault Ground connected is active.
36	AUX. INPUT 4	Digital Intput4	Default: QTIE Trip Fault

No.	Items	Description		Remark
				Ground connected is active.
37	AUX. INPUT 5	Digital Intput5		Default: Not Used Ground connected is active.
38	AUX. INPUT 6	Digital Intput6		Default: Not Used Ground connected is active.
39	AUX. INPUT 7	Digital Intput7		Default: Not Used Ground connected is active.
40	AUX. INPUT 8	Digital Intput8		Default: Not Used Ground connected is active.
41	B-(GND)	Ground terminal		Connect to B- internally.
42 43	AUX. OUTPUT 7	Relay Output7		Default: Costom Combined 1 Volts free; Relay contact; Normally Open output. Capacity: 250V8A
44 45	AUX. OUTPUT 8	Relay Output8		Default: Common Alarm 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	Relay Output11	Default: Not Used Volts free; Relay contact; Normally Open/Close output. Capacity: 250V8A
51		Normally Close		
52		Normally Open		
53	AUX. OUTPUT 12	COM	Relay Output12	Default: Not Used Volts free; Relay contact; Normally Open/Close output. Capacity: 250V8A 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	Ground terminal		

No.	Items	Description	Remark
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

NOTE: When the external connected lead of the digital input port exceeds 5 meters, it is recommended to extend the input lead through an external relay.

14 TYPICAL WIRING DIAGRAM

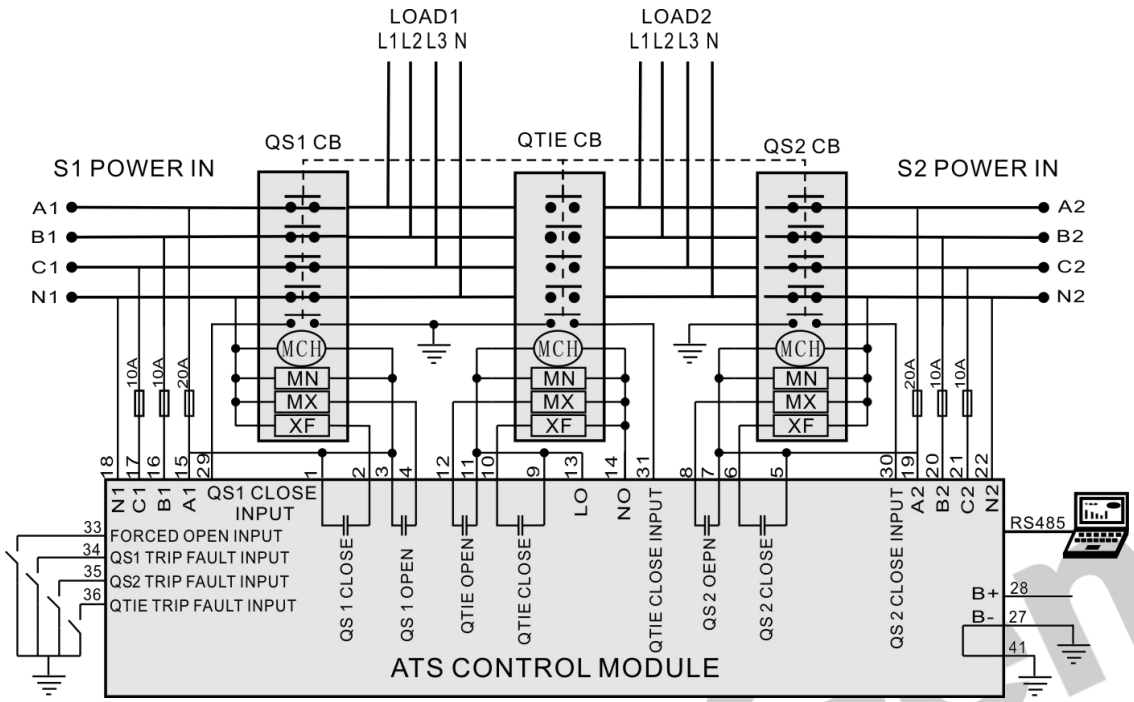


Fig.4 –Breaker Application Diagram

MCH: Stored Energy Motor; MN: Under Voltage Trip; MX: Open Relay; XF: Close Relay;

In the drawing, MCH, MN and MX/XF are all AC220V.

Table 24 – Corresponding Settings

Partial Parameters Setting	
Aux. Output 1	QS1 Close
Aux. Output 2	QS1 Open
Aux. Output 3	QS2 Close
Aux. Output 4	QS2 Open
Aux. Output 5	QTIE Close
Aux. Output 6	QTIE Open
Aux. Input 1	Forced Open
Aux. Input 2	QS1 Trip Fault
Aux. Input 3	QS2 Trip Fault
Aux. Input 4	QTIE Trip Fault
In actual application, three breakers need to add external electric interlock circuits to avoid three breakers are closed at the same time in accident.	

15 INSTALLATION

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

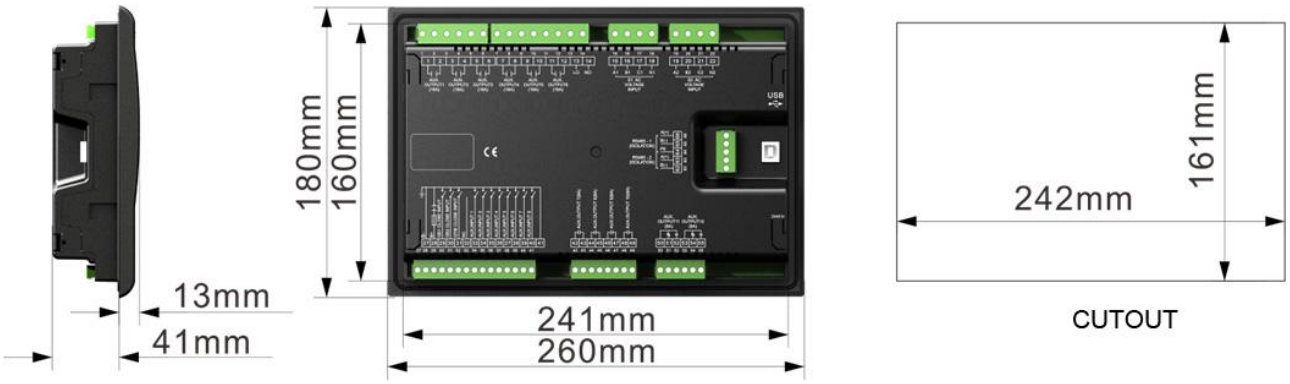


Fig.5 – Overall & Cutout Dimensions

16 CLIPS INSTALLATION

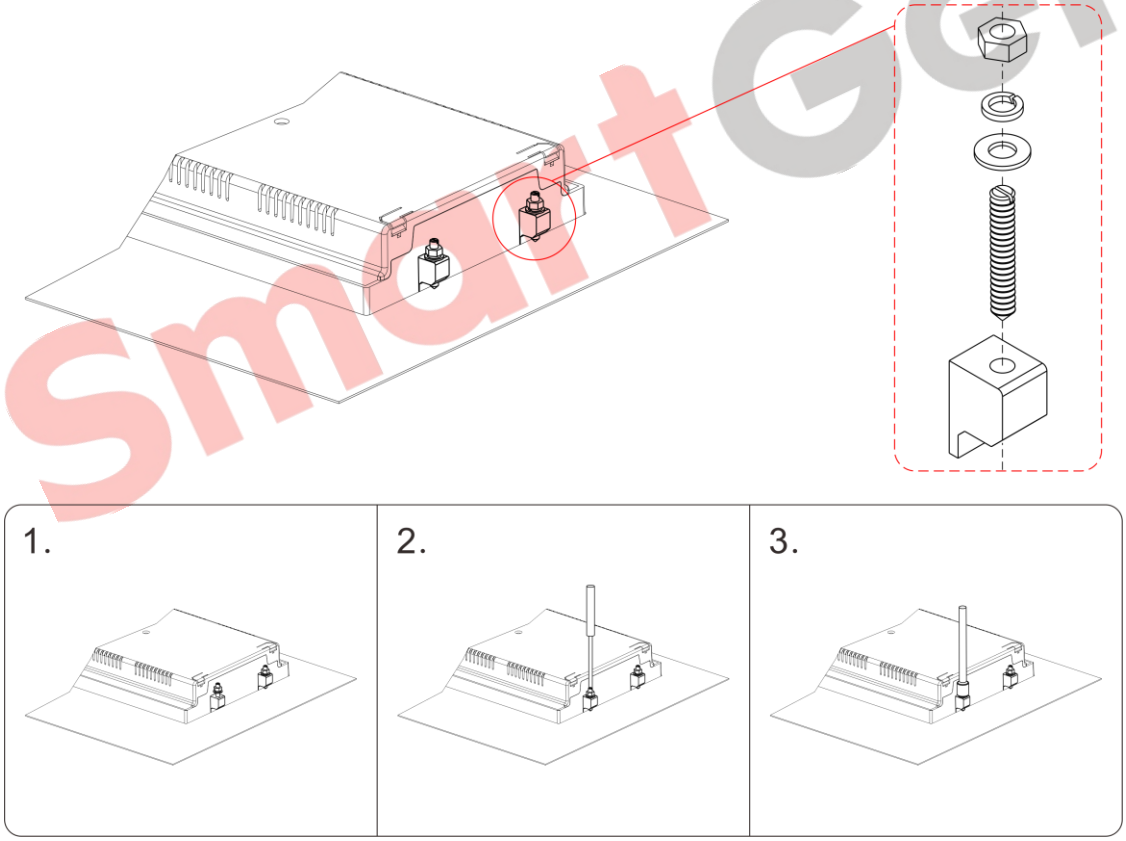


Fig.6 – Clips Installation Drawing

Installation Steps:

1. Install these 4 clips (put into grooves in front panel) in turn.
2. Tighten the screws by using straight screwdriver.
3. Tighten the 4 hex nuts by using M4 sleeve.

17 TROUBLE SHOOTING

Table 25 - Troubleshooting

Symptoms	Possible Solutions
Controller no response with power.	Check DC voltage. Check DC fuse. Check AC Power supply.
RS485 communication is abnormal	Check RS485's connections of A and B is reverse connect or not. Check RS485 transfer model whether damage or not. Check the module address. If above methods can't solve the problem, parallel connection 120Ω resistor between RS485 A terminal and B terminal is recommended.
Auxiliary Output Error	Check auxiliary output connections, pay attention to normally open contact and normally close contact. Check the output settings in parameters settings.
Auxiliary Input Abnormal	Ensure that the auxiliary input is soundly connected to GND when it's active, while hung up when it is inactive. (⚠Note: The input port will be possibly destroyed when connected with voltage) Check the input settings in parameters settings.
Genset running while ATS not transfer	Check ATS. Check the connection wirings between the controller and the ATS. Check ATS parameter settings.