

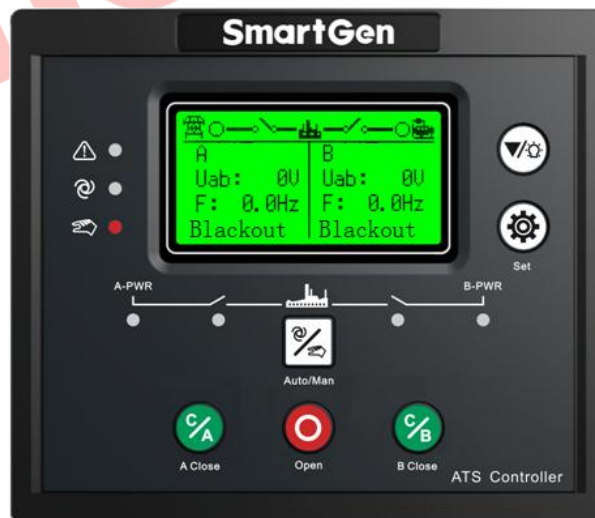
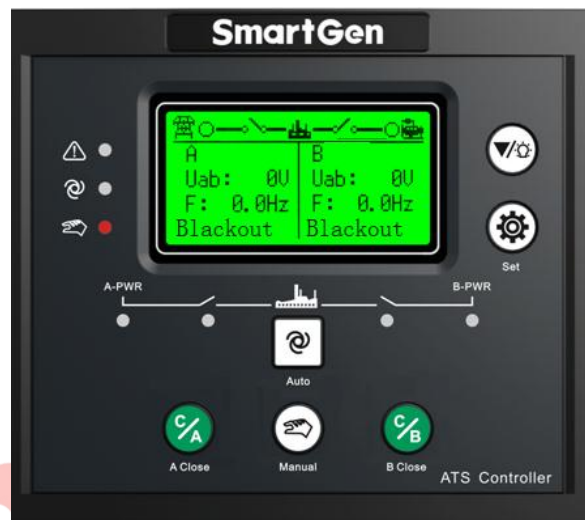


SmartGen
ideas for power

HAT552/HAT553

DUAL POWER ATS CONTROLLER

USER MANUAL



SMARTGEN (ZHENGZHOU) TECHNOLOGY CO., LTD.



Chinese trademark

SmartGen English trademark

SmartGen – make your generator *smart*

SmartGen Technology Co., Ltd.

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

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

+86-371-67981000(overseas)

Fax: +86-371-67992952

Email: sales@smartgen.cn

Web: www.smartgen.com.cn / www.smartgen.cn

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Table 1 Software Version

Date	Version	Note
2019-11-25	1.0	Original release.
2020-05-14	1.1	Fixed AC voltage input range.
2020-08-07	1.2	Fixed Table 22 terminal function description of A1, A2, B1, B2 and power line mark of Typical Wiring Diagram.
2021-04-12	1.3	1. Fixed the "B Power Indicator Description" in Table 5; 2. Upgraded the translation, font, the format of header and footer.
2021-06-16	1.4	1. Fixed "Start Relay" as "Aux. Relay 2", added related function description; 2. Added "A/B Power Abnormal Output" function description.
2022-01-07	1.5	Deleted contactor application diagram.



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1 OVERVIEW

HAT552/HAT553 dual power ATS controller is a dual power transfer module integrated with configurable function, automatic measurement, LCD display, and digital communication. It combines digitalization, intelligence and networking together, which realizes automation for measuring and control process, reducing artificial operation mistakes. It is the ideal product for dual power transfer. HAT552 is applicable for non-breaking switches, while HAT553 is applicable for non-breaking, one-breaking, and two-breaking switches.

HAT552/HAT553 dual power ATS controller is made with the microprocessor in the core, which can precisely measure 2-way 3-phase voltages, make correct judgment and control outputs for occurred voltage abnormal (over voltage, under voltage, over frequency, under frequency, loss of phase, reverse phase sequence). 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 MODEL FUNCTION COMPARISON

Table 2 Model Types

Function						
Type	AC Supply	3-stage Switch Control	2-stage Switch Control	Input Num.	Output Num.	RS485
HAT552	• (170~277) V		•	3	4	•
HAT553	• (170~277) V	•	•	4	6	•

3 PERFORMANCE AND CHARACTERISTICS

- System type can be set to: Mains - Generator, Generator - Mains, Mains - Mains;
- 132x64 LCD with backlight, optional Chinese and English display, push-button operation;
- Measure and display 2-way 3 phase voltage, frequency and phase sequence;
- Display of A/B power accumulated close times;
- Display of present continuous power supply time and A/B power accumulated power supply time;
- Over/under voltage, over/under frequency, loss of phase, reverse phase sequence function;
- Auto/Manual mode transfer function: in manual mode, user can control the switch to close or open;
- All parameters are configurable. Password verification is used to prevent non-professional error operations;
- Commissioning can be done on site manually to execute genset start/stop operations;
- Switch re-closing function is fitted;
- Breaker close output can be set to pulse or continuous output;
- 2-way N wire isolated design;
- Real-time clock (RTC) display, and event log function, which can record 50 data circularly;
- Scheduled start & stop generator function: running once/monthly/weekly, and on-load/off-load running are configurable;
- AC supply power can be phase voltage (L, N), supply range: (170~277)V;
- 1 RS485 isolated communication port, has “remote control, remote measuring, remote communication, remote adjusting” function with ModBus-RTU communication protocol; genset start, genset stop, ATS close/open can be controlled remotely;
- Suitable for various AC system types (3 phase 4-wire, single-phase 2-wire, and 2-phase 3-wire);
- Modular design, self-extinguishing ABS plastic shell, pluggable terminal, built-in mounting, compact structure with easy installation.

4 SPECIFICATION

Table 3 Technical Parameters

Items	Contents		
Operating Voltage	AC supply, voltage range AC(170~277)V		
Power Consumption	≤3W (Standby mode: <2W)		
AC Voltage Input	AC system	HAT553	HAT552
	3P4W (L-L)	(170~277)V	(170~277)V
	3P3W (L-L))	N/A	N/A
	1P2W (L-N)	(170~277)V	(170~277)V
	2P3W (A-B)	(170~277)V	(170~277)V
Rated Frequency	50/60Hz		
Close Relay Capacity	8A AC250V Active output		
Open Relay Capacity	8A AC250V Active output		
Auxiliary Relay Output 1 Capacity	8A AC250V Volts free output		
Dynamo Start Relay	8A AC250V Volts free output		
Digital Close Input	Active when ASW1 and ASW2 short connected; Active when BSW1 and BSW2 short connected.		
Forced to Open Input	GND(B-) connected is active. (not available for HAT552)		
Digital Input 1	GND(B-) connected is active.		
Communication	1. 1 RS485 isolated port, MODBUS Protocol; 2. D-type USB port.		
Case Dimensions	139mmx120mmx50mm		
Panel Cutout	130mmx111mm		
Working Temperature	(-25~+70)°C		
Working Humidity	(20~93)%RH		
Storage Temperature	(-30~+80)°C		
Protection Level	IP65 Gasket: when there is waterproof gasket installed between controller and the control panel.		
Insulation Strength	Apply AC1.5kV voltage between high voltage terminal and low voltage terminal and the leakage current is not more than 3mA within 1min.		
Weight	0.62kg		

5 MEASURED AND DISPLAYED DATA

Table 4 Display Parameters

No.	Measured and Displayed Data Items
1	A/B power phase voltage
2	A/B power line voltage
3	A/B power voltage phase sequence
4	A/B power frequency
5	Present continuous supply time
6	Last continuous supply time
7	A power accumulated supply time
8	B power accumulated supply time
9	A power accumulated close times
10	B power accumulated close times
11	Close/open status
12	Real time clock
13	Event log
14	Alarm information
15	Controller information

6 OPERATING

6.1 OPERATION PANEL

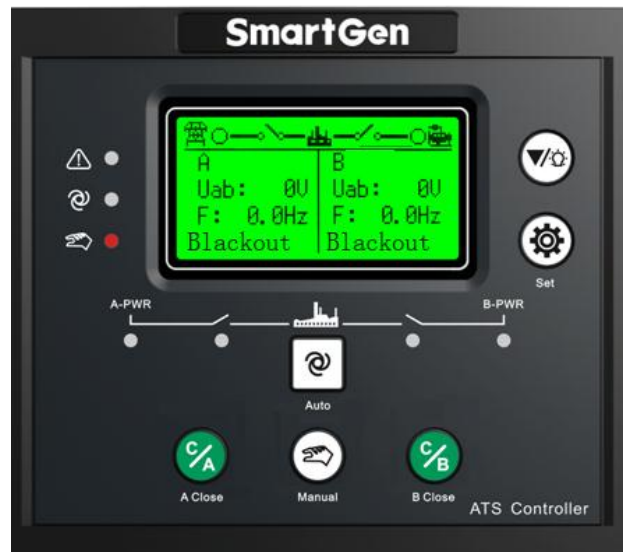


Fig. 1 HAT552 Front Panel



Fig. 2 HAT553 Front Panel









6.2 INDICATOR DESCRIPTION

Table 5 Indicator Description

Indicator Name	Indicator Description
Alarm Indicator	Slow flashing for warning alarms (1 time per second); Fast flashing for fault alarms (5 times per second);
Auto Mode Indicator	Light on when current is Auto mode;
Manual Mode Indicator	Light on when current is Manual mode;
A Power Indicator	Always light on when A AC power is normal; flashing when it is abnormal; light off when it is outage;
A Power Close Status Indicator	Light on when A power switch auxiliary contact is active; light off when it is inactive;
B Power Close Status Indicator	Light on when B power switch auxiliary contact is active; light off when it is inactive;
B Power Indicator	Always light on when B AC power is normal; flashing when it is abnormal; light off when it is outage.

6.3 KEY FUNCTION DESCRIPTION

Table 6 Key Function Description

Key	Function	Description
	Manual Key	Transfer to Manual mode (HAT552);
	Auto Key	Transfer to Auto mode (HAT552);
	Manual/Auto Key	Transfer to Manual or Auto mode (HAT553);
	A Close Key	Active in manual mode; Press and A power switch closes; load is supplied by A power;
	Open Key	Active in manual mode; Press and load is disconnected (HAT553);
	B Close Key	Active in manual mode; Press and B power switch closes; load is supplied by B power;
	Set/Confirm	In main screen, press and it enters menu interface; After entering menu interface, confirm key can move the cursor and confirm the set information;
	Down/ Lamp Test Key	In main screen, press and scroll down the screen display; After entering menu interface, it can move down the cursor or decrease the value where the cursor is; In main screen, pressing longer is lamp test; when lamp test is done, LCD backlight is illuminated, LCD displays all dark and all LED indicators on the panel are illuminated.

NOTE: Press  and  simultaneously to set backlight on always; Again press both simultaneously or power on afresh to cancel backlight on always.

7 LCD DISPLAY

7.1 MAIN SCREEN

Table 7 Main Screen Display

Item	Display Contents
Homepage	A power status, B power status, generator start status, switch status; A/B power voltage and frequency;
Power	A power line voltage, phase voltage, phase sequence, frequency; B power line voltage, phase voltage, phase sequence, frequency;
Master Status	A/B master setting; Auto Transfer/Restore status; Mutual backup setting;
Alarms	Current alarm information (including warning and fault alarms);
Status Line	Alarm status/working status; Supply system diagram; Real time clock; Status line is displayed on the first row of every page in main screen.

7.2 SECOND LEVEL INTERFACE

Table 8 Second Level Display

Item	Display Contents
Parameter Settings	AC Config; Switch Config; Genset Config; Scheduled Start/Stop Config; Digital Inputs Config; Relay Outputs Config; Module Config;
Event Log	Running mode transfer event; Start/stop event; Fault event;
Auto Trans./Restore	Auto Trans./Restore; Mutual Backup;
Manual Test	Manual Start/Stop;
Date and Time Set	Module date and time setting;
Language	Display language setting;
Accumulated Information	Continuous Supply Time; Last Continuous Supply Time; A Accumulated Supply Time; B Accumulated Supply Time; A Accumulated Close Times; B Accumulated Close Times;
Controller	Controller model, version, release date and start interface.

7.3 STATUS DESCRIPTION

Table 9 A Power Voltage Status

No.	Item	Description
1	A Available	Delay for A power available detection
2	A Unavailable	Delay for A power unavailable detection
3	Power Normal	Power value is within normal range.
4	Blackout	Voltage is 0.
5	Over Volt.	Voltage is above the pre-set upper limit.
6	Under Volt.	Voltage is less than the pre-set lower limit.
7	Over Freq.	Frequency is above the pre-set upper limit.
8	Low Freq.	Frequency is less than the pre-set lower limit.
9	Loss of Phase	One or two phases are lost among L1, L2, L3.
10	Reverse Phase Seq.	Phase sequence is wrong for L1-L2-L3.

Table 10 B Power Voltage Status

No.	Item	Description
1	B Available	Delay for B power available detection
2	B Unavailable	Delay for B power unavailable detection
3	Power Normal	Power value is within normal range.
4	Blackout	Voltage is 0.
5	Over Volt.	Voltage is above the pre-set upper limit.
6	Under Volt.	Voltage is less than the pre-set lower limit.
7	Over Freq.	Frequency is above the pre-set upper limit.
8	Low Freq.	Frequency is less than the pre-set lower limit.
9	Loss of Phase	One or two phases are lost among L1, L2, L3.
10	Reverse Phase Seq.	Phase sequence is wrong for L1-L2-L3.

Table 11 Genset Status

No.	Item	Description
1	Genset Start Delay	Delay time before genset start.
2	Genset Stop Delay	Delay time before genset stop.
3	Scheduled Start	Lasting time for scheduled start is displayed when scheduled start is active.
4	Genset Working	Genset start signal outputs.
5	Genset Standby	No genset start signal outputs.

Table 12 Switch Status

No.	Item	Description
1	Ready to Transfer	Enter switch transfer procedure.
2	Closing A	A power is experiencing close delay.
3	Opening A	A power is experiencing open delay (HAT553).
4	Closing B	B power is experiencing close delay.
5	Opening B	B power is experiencing open delay (HAT553).
6	Transfer Rest	The interval time for switch transfer.
7	Closing A Again	Again close time when A power failed to open for the first time, if Again Close Delay is not set to 0.
8	Opening A Again	Again open time (HAT553) when A power failed to close for the first time, if Again Close Delay is not set to 0.
9	Closing B Again	Again close time when B power failed to open for the first time, if Again Close Delay is not set to 0.
10	Opening B Again	Again open time (HAT553) when B power failed to close for the first time, if Again Close Delay is not set to 0.
11	A On Load	A power is closed and A power takes the load.
12	B On Load	B power is closed and B power takes the load.
13	Off-load	Switch has been open and load is disconnected.

When controller detects warning alarm, warning alarm becomes active, alarm indicator will slow flashes (1 time per second), and when alarm disappears, alarm indicator will extinguish. Warning alarm isn't latched.

Table 13 Warning Alarm

No.	Item	Description
1	Forced Open	Forced to open (fire cutoff input) action is set to Warning; when it is active, the warning alarms (HAT553).

When controller detects fault alarm, fault alarm becomes active, alarm indicator will quick flash (5 times per second). Fault alarm is latched, and it disappears until user resets it manually.

Table 14 Fault Alarm

No.	Item	Description
1	A Failed to Close	Switch didn't close properly after A power close signal is stopped to output.
2	A Failed to Open	Switch didn't succeed to close properly after A power open signal is stopped to output (HAT553).
3	B Failed to Close	Switch didn't close properly after B power close signal is stopped to output.
4	B Failed to Open	Switch didn't succeed to close properly after B power open signal is stopped to output (HAT553).
5	Forced Open Fault	Forced Open Fault (fire cutoff input) action is set to Fault; when it is active, Forced Open Fault alarms.
6	Switch Trip Alarm	Switch trip alarm input is active.
7	Simult. Close	Side switches of A/B power are in closed status.

When reminder information is active, it displays for 2s and then it disappears.

Table 15 Reminder Information

No.	Item	Description
1	Press Reset Alarm	The reminder for manual transfer to auto mode before alarm clear as fault alarm occurs.
2	A Closed	Set it to one breaking or two breakings; reminder information for pressing A power close key as A power is closed. (HAT553)
3	B Closed	Set it to one breaking or two breakings; reminder information for pressing B power close key as B power is closed. (HAT553)
4	Opened	Reminder information for pressing open key as load is disconnected. (HAT553)

Table 16 Other Status Information

No.	Item	Description
1	Start Inhibit	Genset start inhibit input is active.
2	Remote Gen On Load	Remote start on-load input is active.
3	Remote Gen Off Load	Remote start offload input is active.
4	Gen Start Mains NG	Start when Mains is abnormal.
5	Auto Mode	Current is in auto mode.
6	Manual Mode	Current is in manual mode.

7.4 MAIN MENU

In main interface, press  key to enter main menu screen.

<ol style="list-style-type: none"> 1. Exit 2. Parameters Set 3. Event Log 4. Auto Trans./Restore 5. Manual Test 6. Date & Time Set 7. Language 8. Accumulated Information 9. Controller 	<p>Press Down key and select different parameter line (current line turns black) and then press Confirm key, to enter related interface.</p>
--	--

NOTE: Password is needed for entering parameter settings, and default password is "01234"; Operators can change the password to prevent others changing controller configurations randomly. Please remember clearly after the change, or it is forgotten, please contact our company personnel.

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8 GENSET START/STOP OPERATIONS

8.1 MANUAL START/STOP

In main screen, press Set/Confirm key to enter main menu interface; select “5. Manual Test” to enter manual start operation screen.

8.1.1 PANEL START/STOP

When system type is “A Mains B Gen, A Gen B Mains, A Mains B Mains”, the below operation interface is directly entered.

Manual Test	Press Down key to select different parameter line (current line turns black) and press Confirm key to confirm.
Return	
Genset Stop	
Genset Start	

Genset Stop: Disconnect the outputted genset start signal, i.e. control genset stop.

Genset Start: Control genset start signal output, i.e. control genset start.

8.1.2 REMOTE COMMUNICATION START/STOP

Through RS485 port and by using Modbus protocol control, remote start/stop commands can be issued.

Remote Stop: Disconnect the outputted genset start signal, i.e. control genset stop.

Remote Start: Control genset start signal output, i.e. control genset start.

8.2 AUTO START/STOP

8.2.1 START CONDITIONS

8.2.1.1 INPUT PORT START

Set “Remote Start On-load” or “Remote Start Off-load” for configurable input ports, and they are cannot be set at the same time.

Remote Start On-load: Genset start outputs, when generating is Ok, GB closes; when it is inactive, disconnect genset start output signal.

Remote Start Off-load: Genset start outputs, when mains is Ok, MB closes; when it is inactive, disconnect genset start output signal.

8.2.1.2 MAINS ABNORMAL START

When Mains is abnormal, genset start outputs; when generating is Ok, Gen closes.

8.2.2 SCHEDULED START

When “Scheduled Start” is enabled, user can set scheduled start time; Controller will issue start signal when the time is up; when the scheduled start delay time is over start signal is disconnected. Scheduled start can be set to on-load or off-load.

Scheduled Start On-load: genset start outputs, when generating is Ok, GB closes.

Scheduled Start Off-load: genset start outputs, when Mains is Ok, MB closes.

Scheduled Start Cycle Time can be set to Start Monthly/Weekly/Daily.

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



Start Weekly: Start at the same time of several days in a week can be set; for example, from Monday to Friday start at 8:00 every day and last for 10 hours.

Start Daily: Start at the same time for each day can be set.

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9 PARAMETER CONFIGURATION

9.1 ILLUSTRATION

In the first page of the main screen, press  key to enter menu screen; select “Parameters Set” and press Confirm key to confirm and enter parameter setting password check interface. Input correct password and it will enter parameter main interface. If password is wrong, then it directly returns to main interface. Default password is 01234. In parameter setting page, press longer  to directly exit from this screen and return to main screen.

9.2 PARAMETER CONFIGURATION TABLE

Table 17 Parameter Configuration Items

No.	Item	Range	Default	Description
AC Setting				
1	A Available Delay	(0~3600)s	10	The check time from A power abnormal to normal.
2	A Unavailable Delay	(0~3600)s	5	The check time from A power normal to abnormal.
3	B Available Delay	(0~3600)s	10	The check time from B power abnormal to normal.
4	B Unavailable Delay	(0~3600)s	5	The check time from B power normal to abnormal.
5	Master Selection	(0~1)	0	0: A Master 1: B Master
6	System Type Set	(0~2)	0	0: A Mains B Gen 1: A Gen B Mains 2: A Mains B Mains
7	AC System	(0~3)	0	0: 3-Phase, 4-Wire 1: 3-Phase, 3-Wire 2: 2-Phase, 3-Wire 3: Single Phase, 2-Wire Special custom is needed for 3 Phase 3 Wire.
8	Rated Voltage	(0~30000)V	220	Rated voltage value for AC system.
9	Over Volt Set	(0~1)	1	0: Disable 1: Enable
10	Over Volt Value	(0~200)%	120	Voltage upper limit; abnormal when it is over upper limit.
11	Over Volt Return	(0~200)%	115	Voltage upper limit return value; normal when it is lower than return value.
12	Under Volt Set	(0~1)	1	0: Disable 1: Enable
13	Under Volt Value	(0~200)%	80	Voltage lower limit; abnormal when it is lower than this limit.
14	Under Volt Return	(0~200)%	85	Lower limit return value; normal when it is



No.	Item	Range	Default	Description
				above return value.
15	Rated Frequency	(10.0~75.0)Hz	50.0	Rated frequency value for AC system
16	Over Freq. Set	(0~1)	1	0: Disable 1: Enable
17	Over Freq. Value	(0~200)%	110	Frequency upper limit; abnormal when it is above upper limit.
18	Over Freq. Return	(0~ 200)%	104	Upper limit return value; normal when it is lower than return value.
19	Under Freq. Set	(0~1)	1	0: Disable 1: Enable
20	Under Freq. Value	(0~200)%	90	Frequency lower limit value; abnormal when it is lower than this limit.
21	Under Freq. Return	(0~ 200)%	96	Lower limit return value, normal when it is above return value.
22	Loss of Phase	(0~1)	1	0: Disable 1: Enable
23	Reverse Phase Sequence	(0~1)	1	0: Disable 1: Enable
24	PT Fitted	(0~1)	0	0: Disable 1: Enable
25	PT Primary Volt	(30~30000)V	100	
26	PT Secondary Volt	(30~1000)V	100	
Switch Setting				
1	Close Delay	(0.0~20.0)s	5.0	Pulse time for close relay output; continuous output when it is 0.
2	Open Delay	(0.1~20.0)s	5.0	Pulse time for open relay output.
3	Transfer Interval	(0~9999)s	1	Waiting delay time from A open to B close, or B open to A close (HAT553).
4	Over Transfer Delay	(0~20.0)s	0.0	Continuous output time of close relay after detecting closed signal.
5	Again Close Delay	(0~20.0)s	1.0	For the first time switch open failed, then it closes again and close again delay starts; when delay is over, it opens again; if it cannot open, then it issues failed to open alarm signal.
6	Again Open Delay	(0~20.0)s	1.0	For the first time switch close failed, then it opens again and open again delay starts; when delay is over, it closes again; if it cannot close, then it issues failed to close alarm signal. (HAT553)
7	Switch Type	(0~2)	0	0: Two Breaking 1: One Breaking 2: No Breaking (HAT553)
8	Forced Open Action	(0~1)	0	0: Warning 1: Fault
9	Auto Trans/Restore	(0~1)	1	0: Auto Trans/Non Restore 1: Auto Trans/Restore
10	Mutual Backup	(0~1)	1	0: Inactive 1: Active
11	Open Input Enable	(0~1)	0	0: Disable 1: Enable (HAT553)



No.	Item	Range	Default	Description
				If this is not connected, please set it to Disable.
12	No Open Transfer Enable	(0~1)	0	0: Disable 1: Enable When it is set to Enable, controller directly transfers to the other circuit from one circuit; and there is no open control output in the transfer process. (HAT553)
Genset Setting				
1	Genset Start Delay	(0~9999)s	1	Delay starts when genset prepares to start; when delay is over, controller issues genset start signal.
2	Genset Stop Delay	(0~9999)s	5	Delay starts when genset prepares to stop; when delay is over, controller disconnects genset start signal.
Scheduled Start/Stop Setting				
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	Month		<input checked="" type="checkbox"/> January <input checked="" type="checkbox"/> February <input checked="" type="checkbox"/> March <input checked="" type="checkbox"/> April <input checked="" type="checkbox"/> May <input checked="" type="checkbox"/> June <input checked="" type="checkbox"/> July <input checked="" type="checkbox"/> August <input checked="" type="checkbox"/> September <input checked="" type="checkbox"/> October <input checked="" type="checkbox"/> November <input checked="" type="checkbox"/> December
5	Schedule Date	(1~31)	1	Date for genset start for each month.
6	Schedule Weekly	Week		<input checked="" type="checkbox"/> Sunday <input type="checkbox"/> Monday <input type="checkbox"/> Tuesday <input type="checkbox"/> Wednesday <input type="checkbox"/> Thursday <input type="checkbox"/> Friday <input type="checkbox"/> Saturday
7	Schedule Hours	(0~23)h	0	Time for scheduled start.
8	Schedule Minutes	(0~59)min	0	
9	Schedule Work Time	(0~30000)min	30	Lasting time for scheduled start running.
Auxiliary Input Setting				
1	Aux. Input 1	(0~20)	0	Not Used
2	Active Type	(0~1)	0	0: Close to Activate; 1: Open to Activate.
Auxiliary Output Setting				
1	Output 1 Active Type	(0~1)	0	0: Output (N/O); 1: Output (N/C).
2	Output 1 Setting	(0~36)	1	Common Alarm.
3	Output 2 Active Type	(0~1)	1	0: Output (N/O); 1: Output (N/C).
4	Output 2 Setting	(0~36)	16	Genset start.
Module Setting				
1	Power On Mode	(0~2)	0	0: Previous Mode 1: Manual Mode 2: Auto Mode



No.	Item	Range	Default	Description
2	Language	(0~1)	0	0: Simplified Chinese 1: English
3	Password	(00000~65535)	01234	Password for entering parameter setting.
4	Module Address	(1~254)	1	Communication address for RS485 network.
5	Comm. Baud Rate	(0~3)	2	0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps
6	Comm. Parity Bit	(0~2)	0	0: None 1: Odd Parity 2: Even Parity
7	Comm. Stop Bit	(1~2)	2	1 or 2 stop bits can be set.
8	Date/Time Setting			
9	Communication Set	(0~3)	0	0: Enable Remote Adj/Ctrl 1: Disable Remote Control 2: Disable Remote Adjust 3: Disable Remote Adj/Ctrl

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9.3 DIGITAL INPUT/OUTPUT FUNCTION DESCRIPTION

9.3.1 INPUT PORT FUNCTION DESCRIPTION

Table 18 Input Port Function Description

No.	Item	Description
0	Not used	Invalid.
1	Reserved	
2	Remote Gen On Load	Genset start outputs; when Mains is normal, gen closes.
3	Remote Gen Off Load	Genset start outputs; when Mains is normal, Mains closes.
4	Lamp Test	LED lamps are all illuminated on the panel, LCD backlight is on, LCD is all dark.
5	Reserved	
6	Reserved	
7	Start Inhibit Input	Inhibit genset start signal output; In auto mode, after stop delay is over, controller disconnects genset start signal output; In manual mode, if genset is started, manual stop is needed; after stop manual start is inactive.
8	Breaker Trip Input	Breaker trip fault input.
9	A Master Input	Force to set A Master.
10	B Master Input	Force to set B Master.
11	A Close Key	Same as A Close key on the panel; Auto reset key is needed.
12	B Close Key	Same as B Close key on the panel; Auto reset key is needed.
13	Open Key	Same as Open key on the panel; Auto reset key is needed (HAT553)
14	Forced Manual Mode	Force controller mode to manual mode.
15	Forced Auto Mode	Force controller mode to auto mode.
16	Alarm Reset	Reset current alarm.
17	Remote Control Inhibit	Remote operation is inactive when this is active.
18	Auto Trans/Restore	
19	Open IN	Open auxiliary feedback input; if switch needs open IN, please first set Open IN Enable (HAT553).
20	Reserved	

9.3.2 OUTPUT PORT FUNCTION DESCRIPTION



Table 19 Output Port Function Description

No.	Item	Description
0	Not Used	Invalid.
1	Common Alarm	Common alarms include fault alarm, warning alarm.
2	Common Fault Alarm	Fault alarm includes switch transfer failure.
3	Common Warn Alarm	Warning alarms include A phase sequence wrong, B phase sequence wrong, and forced to open.
4	Transfer Fault	Switch transfer failures include A failed to close, A failed to open, B failed to close, and B failed to open.
5	Audible Alarm	When fault alarms are active, external annunciator can be connected.



No.	Item	Description
		After delay for 60s, clear the audible alarm output.
6	Reserved	
7	A/B Abnormal	Output when one of A and B is abnormal.
8	Transfer Output	Relay outputs when switch close/open transfers; it stops outputting when transfer is over; shortest output time is 1s.
9	A&B Abnormal	Output when A and B both are abnormal.
10	A Available	Output when A is normal.
11	A Unavailable	Output when A is abnormal.
12	B Available	Output when B is normal.
13	B Unavailable	Output when B is abnormal.
14	Auto Mode	Output when controller is in auto mode.
15	Manual Mode	Output when controller is in manual mode.
16	Genset Start	Control genset to start.
17	Forced Open	Output when Forced to Open is active (HAT553).
18	A Close Control	Control A breaker close.
19	A Open Control	Control A breaker open (HAT553).
20	B Close Control	Control B breaker close.
21	B Open Control	Control B breaker open (HAT553).
22	Open Control	Control A and B breaker open (HAT553).
23	Reserved	
24	Reserved	
25	A Closed Input	A breaker closed status is outputted when switch is at I position.
26	B Closed Input	B breaker closed status is outputted when switch is at II position.
27	Opened Input	Breaker open status is outputted when switch is at 0 position and it needs to enable open input function and configure input to open input; when this input is active, it outputs (HAT553).
28	Reserved	
29	Reserved	
30	Reserved	
31	Reserved	
32	Reserved	
33	Reserved	
34	Remote Control	Communication command control output by RS485.
35	Reserved	
36	Reserved	

10 EVENT LOG

In the first page of the main interface, press  key, and enter menu page. Select “Event Log”, and then select  to confirm. In this way Event Log interface is entered.

Each item of Event Log contents includes:

- Date and time;
- Type of record;
- Event of record;
- A power status;
- B power status;
- A power 3-phase voltage;
- B power 3-phase voltage;
- A power frequency;
- B power frequency.

Event log can be recorded up to max. 50 items. The first one is the newest. Users can check each item via Down key. When recorded items are over 50, new item will cover the newest record.


Record type includes: Action Event, Warn Event, Fault Event. Fault events are all fault alarms, warn events are all warning alarms.


Table 20 Action Events

No.	Action Event	Description
1	Closing A	Record when A power close is outputted;
2	Closing B	Record when B power close is outputted;
3	Opening A	Record when A power open is outputted; (HAT553)
4	Opening B	Record when B power open is outputted; (HAT553)
5	Simult. Close	Record when A power and B power take load simultaneously;
6	Genset Start	Record when genset start signal is outputted;
7	Genset Stop	Record when genset start signal is disconnected;
8	Auto Mode	Record when it is transferred to Auto mode;
9	Manual Mode	Record when it is transferred to Manual mode.

11 SWITCH OPERATION RUNNING




11.1 MANUAL OPERATION RUNNING

Press manual/auto transfer key , and manual status indicator is illuminated; Controller is in manual status (HAT553).

Press manual key , and manual status indicator is illuminated; Controller is in manual status (HAT552).


After the switch transfer key is pressed, switch transfers immediately; When the switch is transferred to the position, the related indicator is illuminated always.

Table 21 Manual Transfer Key

Icon	Key Name	Function Description
	A Power Close	Press and if load is in open status, A power closes, and load is supplied by A power.
	B Power Close	Press and if load is in open status, B power closes, and load is supplied by B power.
	Open Key	Press and load is disconnected (HAT553).

11.2 AUTO OPERATION RUNNING

11.2.1 ILLUSTRATION

Press manual/auto transfer key , and auto status indicator is illuminated; Controller is in auto status (HAT553).

Press auto key , auto status indicator is illuminated; Controller is in auto status (HAT552).

In auto mode, controller will transfer switch based on the status of A power and B power, transfer priority and auto trans./restore status to ensure supply for load. The following illustrates control logics by the example of "A power master" and "A Mains B Gen".

11.2.2 AUTO TRANS./RESTORE

When Auto Trans./Restore is set, A power is master; if A power is normal, then A power closes; if A power is abnormal, B power is normal, then A power opens, B power closes; if A power recovers normal, then B power opens, A power closes.

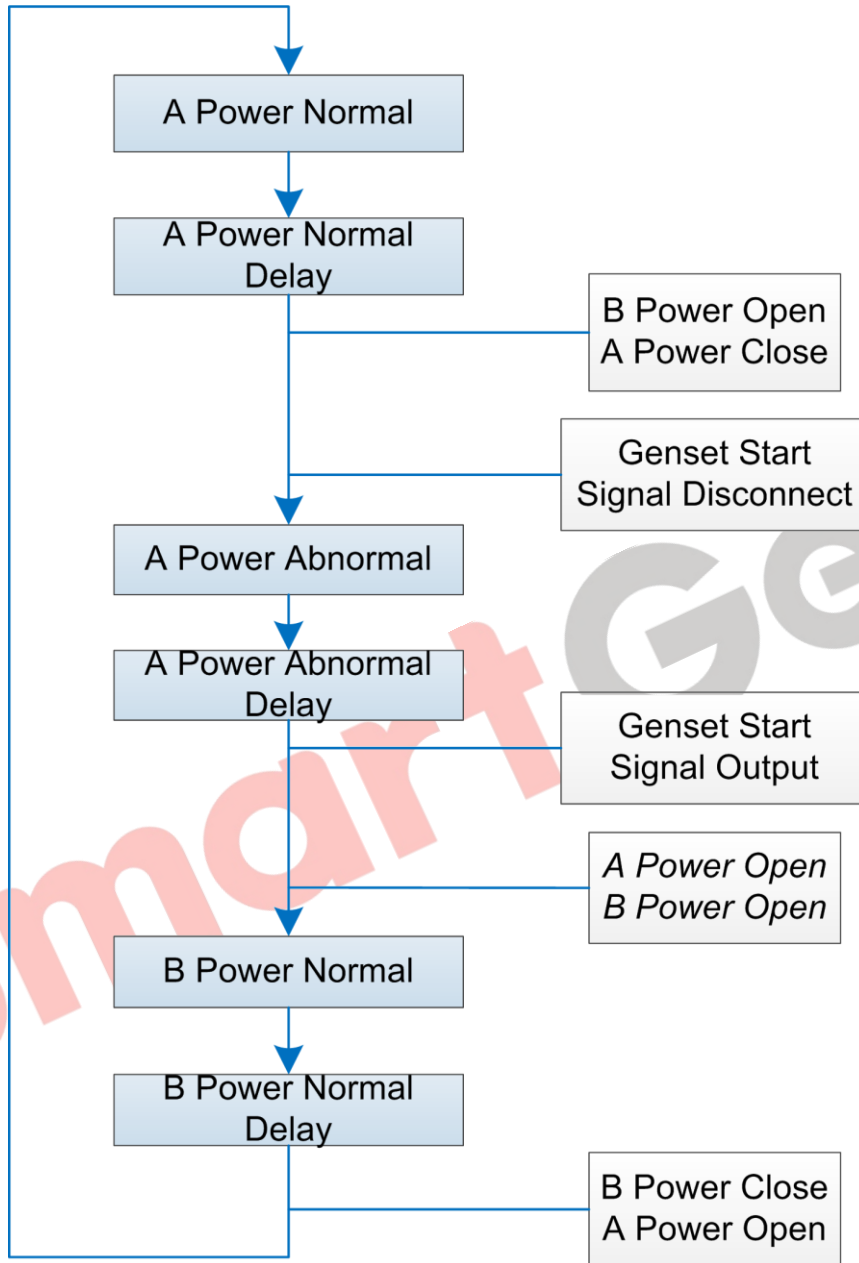


Fig. 3 Auto Trans./Restore Flow Chart

11.2.3 AUTO TRANS./NONE RESTORE (ACTIVE FOR MUTUAL BACKUP)

When Auto Trans./None Restore is set, and Mutual Backup is active, A power is master. If A power is normal, then A power closes; if A power is abnormal, B power is normal, then A power opens, and B power closes; if A power recovers normal, B power is normal, then switch keeps at B power close status.

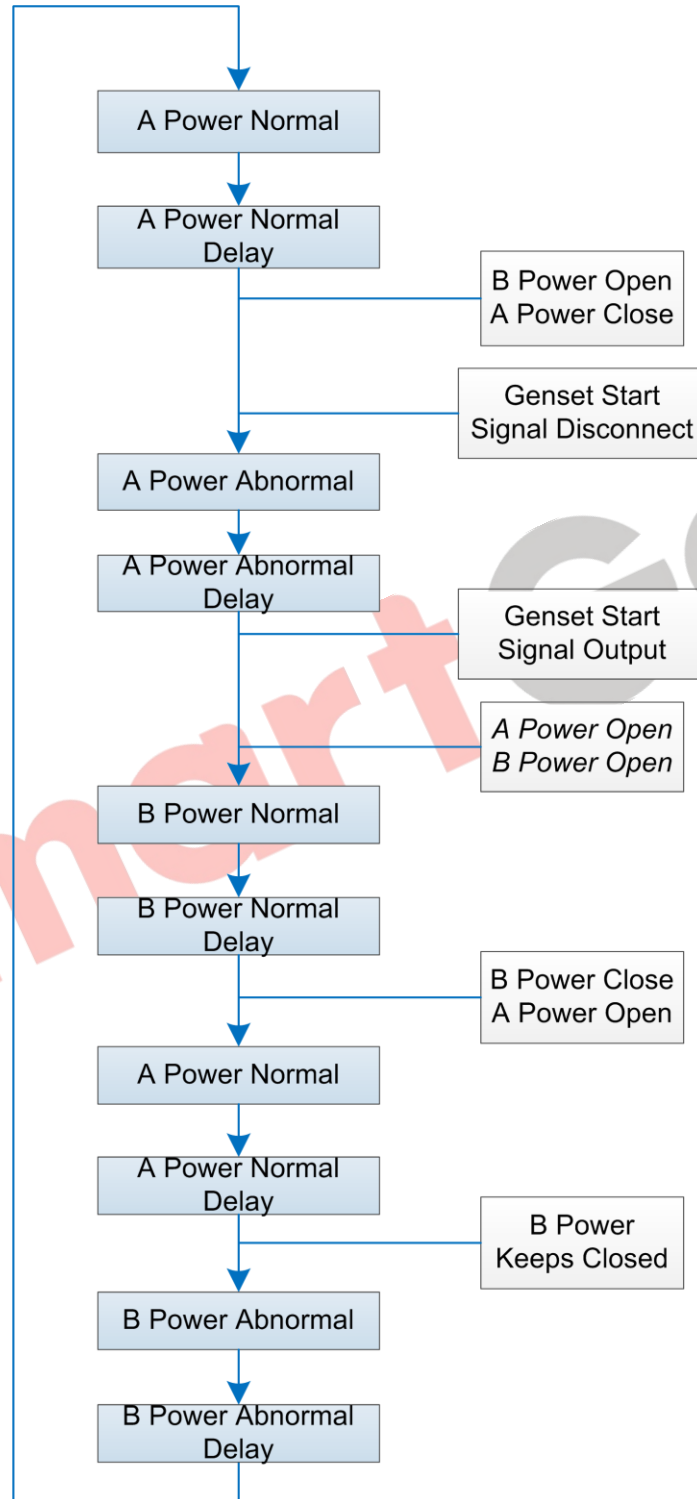


Fig. 4 Auto Trans./Restore (Active for Mutual Backup) Flow Chart

11.2.4 AUTO TRANS./NONE RESTORE (INACTIVE FOR MUTUAL BACKUP)

When Auto Trans./None Restore and Mutual Backup is inactive, A power is master. If A power is normal, and A power closes, when A power is abnormal, B power is normal, then A power opens, B power closes; if A power recovers normal, then switch keeps at B power close status; when B power is abnormal, B power opens; even though A power is normal, A power doesn't close.

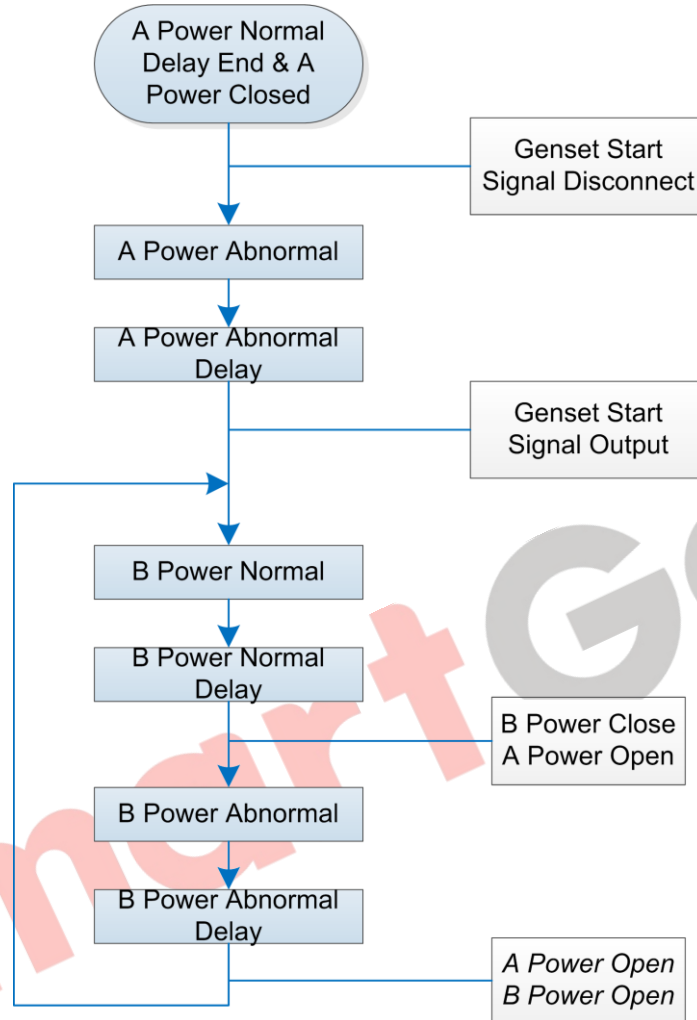


Fig. 5 Auto Trans./Non Restore (Inactive for Mutual Backup) Flow Chart

NOTE: Master power (A power) close needs to transfer to manual mode and by key operation close, otherwise in auto mode, switch only transfers between open and backup power (B power) position.

11.2.5 NONE OPEN TRANSFER

When none open transfer is enabled, controller will not execute open operation. Detailed setting method: Enter "switch setting" interface in parameter setting interface, find "None Open Transfer" and set it enabled. The following illustrates control logics by the example of "A power master", "A Mains B Gen".

A power is normal, A power closes; When A power is abnormal, B power is normal, controller issues B power close order; switch directly transfers from A power loading to B power loading. A power open steps in the middle are omitted.

NOTE: This function is only suitable for switches with breakings and switches allowing to transfer directly from A power loading to B power loading (HAT553).

11.3 AUXILIARY CONTACT FEEDBACK INPUT OF SWITCH OPEN

If switch needs to access to open feedback input, please firstly set open input enabled. Detailed setting method: Enter “switch setting” interface in parameter setting interface, find “Open Input Enable” and set it enabled; Then set auxiliary input port 1 “19: Open IN”, when auxiliary input 1 detects low electrical level, open input is active.

During the transfer process, if failed to close of A power occurs, A power switch won't execute close action, B power is Ok, and B power close is executed. If failed to open occurs, controller won't execute switch close/open actions.

12 COMMUNICATION CONFIGURATION AND CONNECTION

12.1 ILLUSTRATION

HAT553_HAT552 dual power ATS controller has RS485 communication port, USB communication port. Between them RS485 communication port allows to connect LAN of open structure. Communication port applies Modbus communication protocol, by the running software on PC or data collecting system, to provide a simple and practical dual power transfer management method of factories, telecommunication, industries and civil buildings, realizing “remote control, remote measuring, remote communication” functions of dual power monitoring.

For detailed information of communication protocol please refer to *HAT552_HAT553 Communication Protocol*.

12.2 RS485 COMMUNICATION PORT

Communication Protocol: Modbus-RTU

Communication Parameters

Module Address	1 (Range: 1~254)
Baud Rate	9600bps (2400/4800/9600/19200bps)
Data Bit	8-bit
Parity Bit	None (None, Odd, Even)
Stop Bit	2-bit (1 bit or 2 bits)

12.3 USB COMMUNICATION PORT

D-type USB communication port, can be used to connect PC test software and configure parameters and at the same time it can be used for module program upgrade.

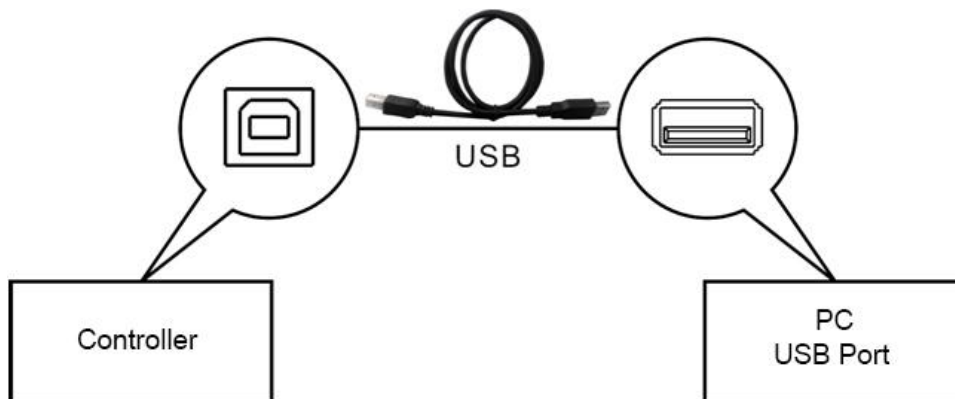


Fig. 6 USB Connecting Diagram

13 DEFINITION OF CONNECTING TERMINALS

13.1 DESCRIPTION OF CONNECTING TERMINALS

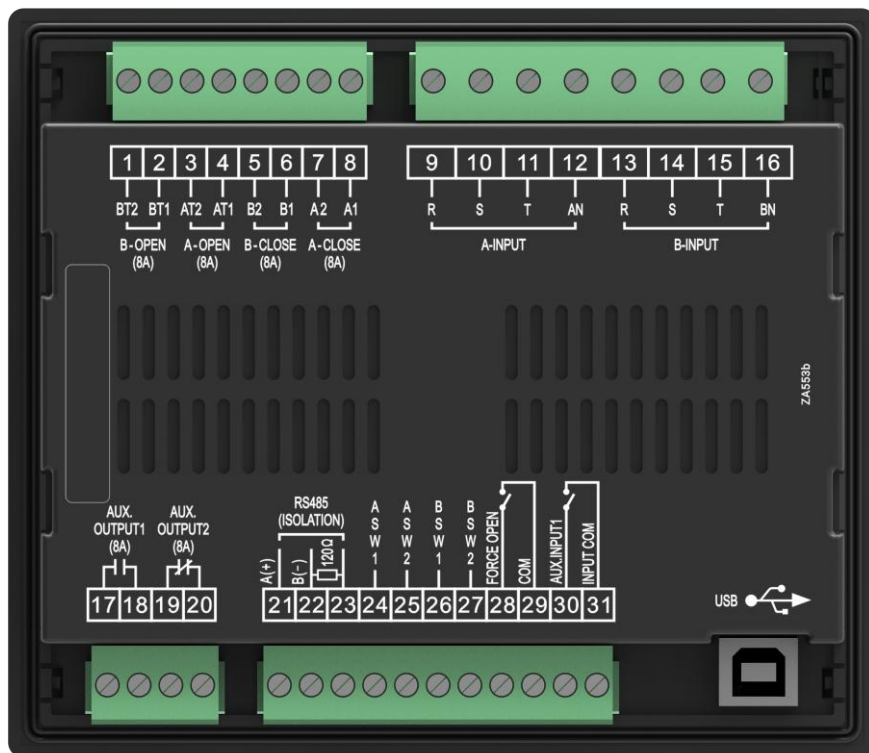


Fig. 7 Controller Back Panel

Table 22 Terminal Function Description

No.	Functions	Description	Remark
1	BT2	B disconnects output N	Output AC power; control B power switch to disconnect, rated 8A.
2	BT1	B disconnects output L	
3	AT2	A disconnects output N	Output AC power; control A power switch to disconnect, rated 8A.
4	AT1	A disconnects output L	
5	B2	B puts into output N	Output AC power; control B power switch to put into, rated 8A.
6	B1	B puts into output L	
7	A2	A puts into output N	Output AC power; control A power switch to put into, rated 8A.
8	A1	A puts into output L	
9	R	AC 3 Phase 4 Wire voltage input of A power	For single phase input, only connect R and AN.
10	S		
11	T		
12	AN		
13	R	AC 3 Phase 4 Wire voltage input of B power	For single phase input, only connect R and BN.
14	S		
15	T		
16	BN		
17	AUX. OUTPUT1	Auxiliary output 1	Default: common alarm output, N/O output, capacity 8A 250VAC.
18			
19	AUX. OUTPUT2	Auxiliary output 2	Default: genset start control output, N/C output, capacity 8A 250VAC.
20			
21	A(+)	RS485 communication port	120Ω Resistor (for impedance matched) has been connected inside.
22	B(-)		
23	120Ω Resistor	RS485 impedance matched resistor	Users need to connect this terminal to Terminal 21 based on on-site network arrangement; used to connect with the 120 resistor inside the controller.
24	ASW1	A switch close status input	Detect A switch close status, volt free contact input, active when ASW1 and ASW2 are short connected.
25	ASW2		
26	BSW1	B switch close status input	Detect B switch close status, volt free contact input, active when BSW1 and BSW2 are short connected.
27	BSW2		
28	FORCE OPEN	Forced open input	Forced open, active when it is short connected.
29	COM		
30	AUX. INPUT1	Auxiliary Input 1	Default: not used, active when it is short connected.
31	INPUTCOM		
USB	USB	D-type USB communication port	Configure parameters and upgrade program by connecting with PC.

13.2 DESCRIPTION OF CONTROLLER SUPPLY

Controller is AC supplied by the two AC sampling terminals directly.

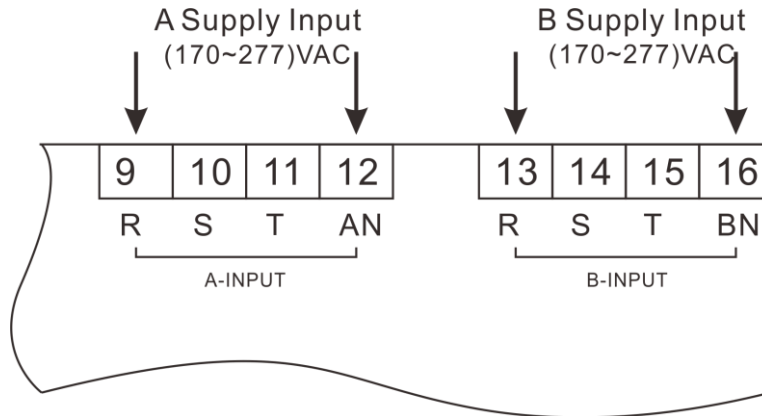
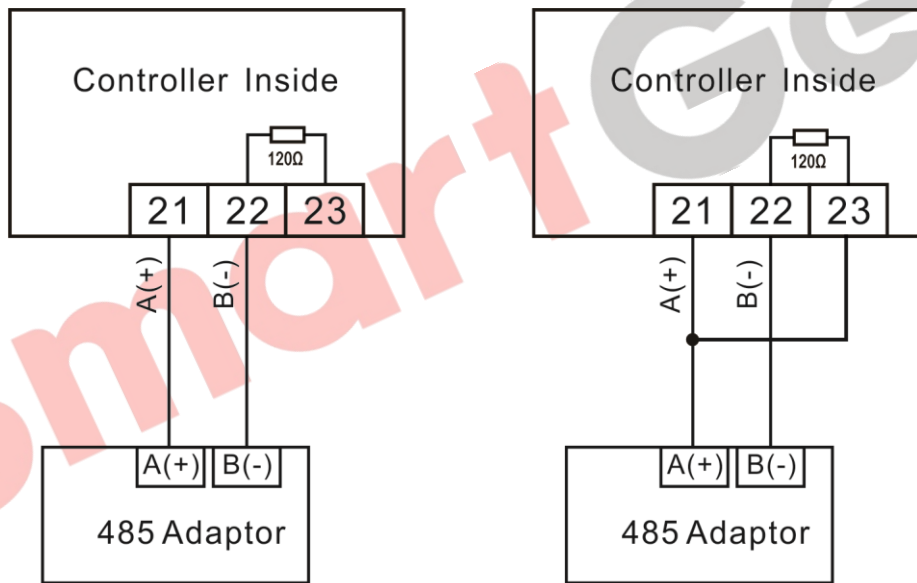


Fig. 8 AC Supply Diagram

13.3 DESCRIPTION OF RS485 CONNECTION

Connecting of RS485 and adaptor is like below:



Resistor is not connected inside. 120Ω resistor is connected inside.

Fig. 9 RS485 Connecting Diagram

14 TYPICAL WIRING DIAGRAM

14.1 APPLICATION DIAGRAM

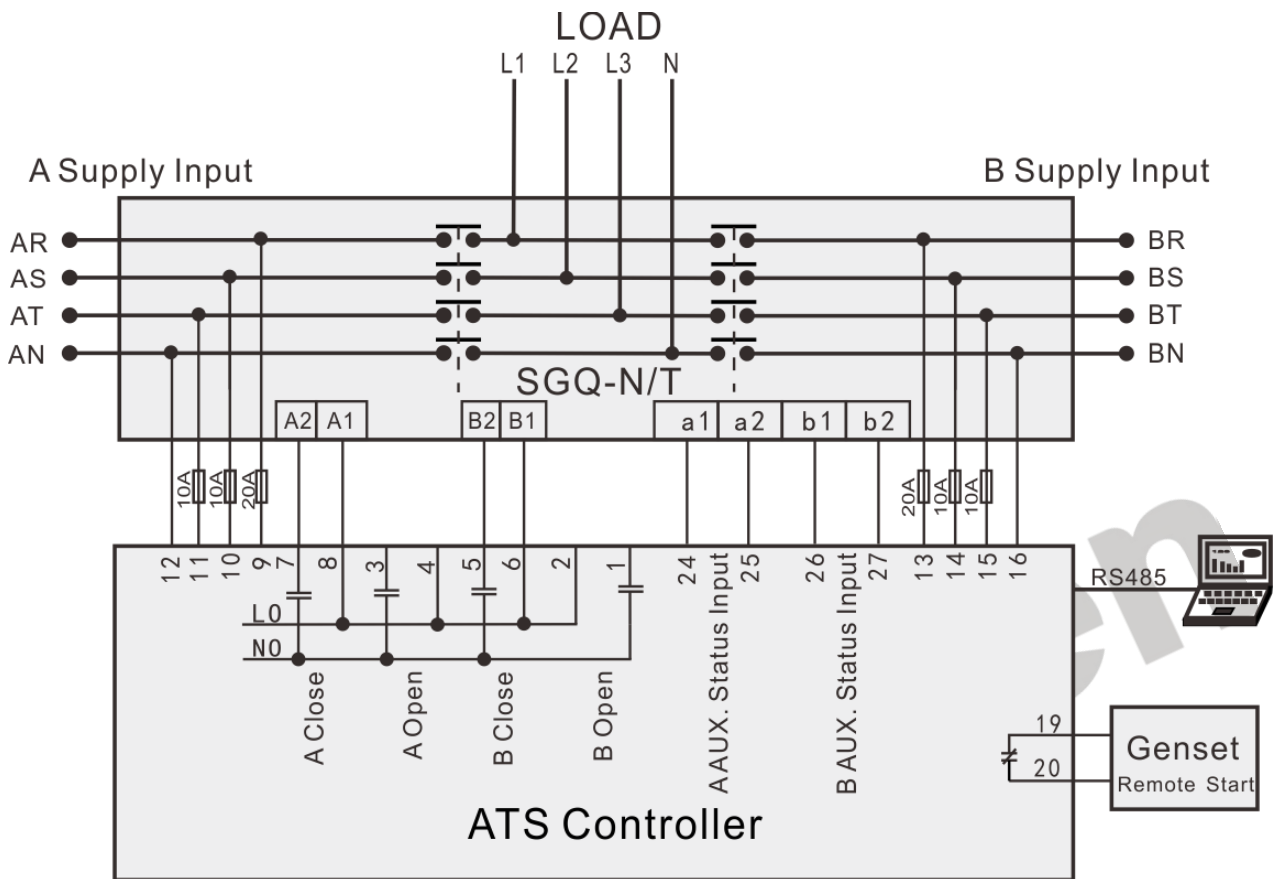


Fig. 10 SGQ-N/T Application Diagram

Table 23 Related Settings

Partial Parameter Setting	
Switch Type Setting	No breaking (available for HAT553; not available for HAT552)

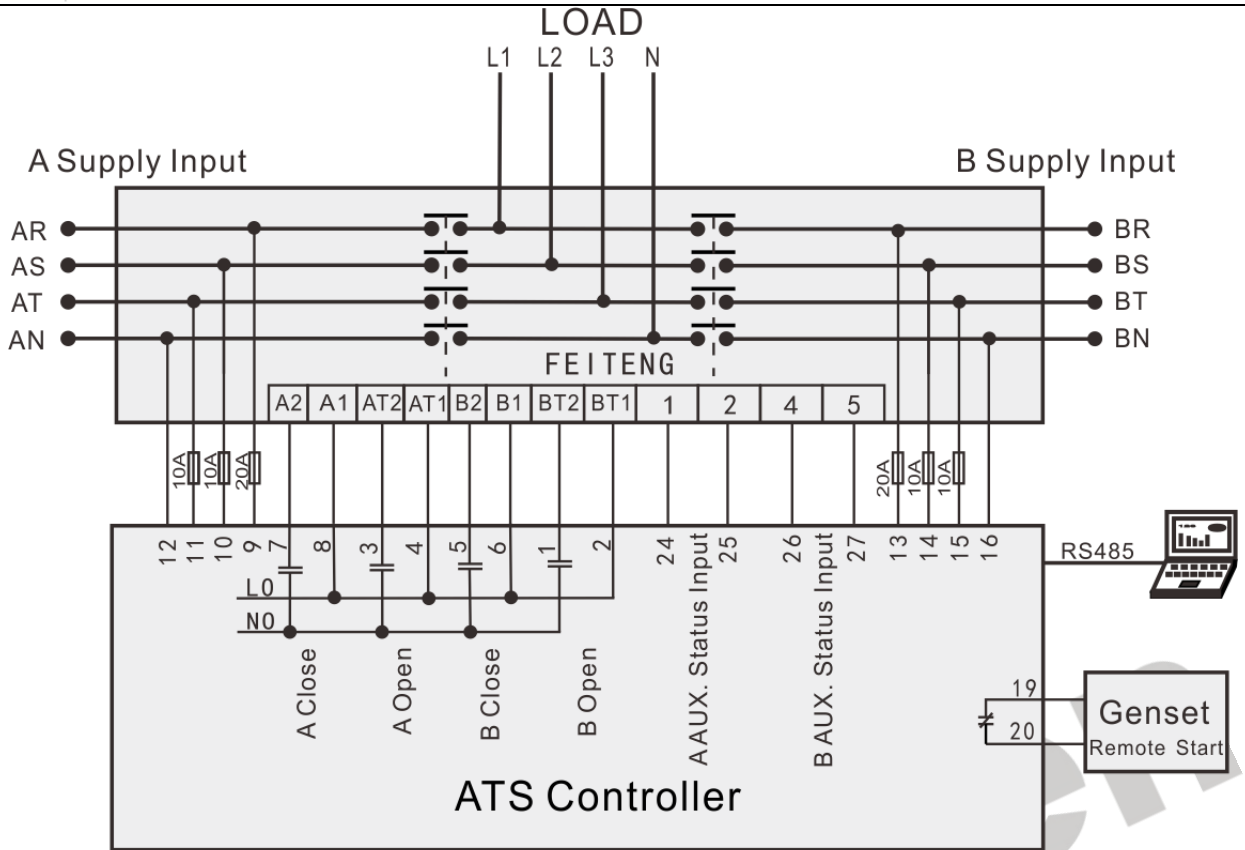


Fig. 11 FEITENG Application Diagram

Table 24 Related Settings

Partial Parameter Setting	
Switch Type Setting	Two breakings (HAT553)

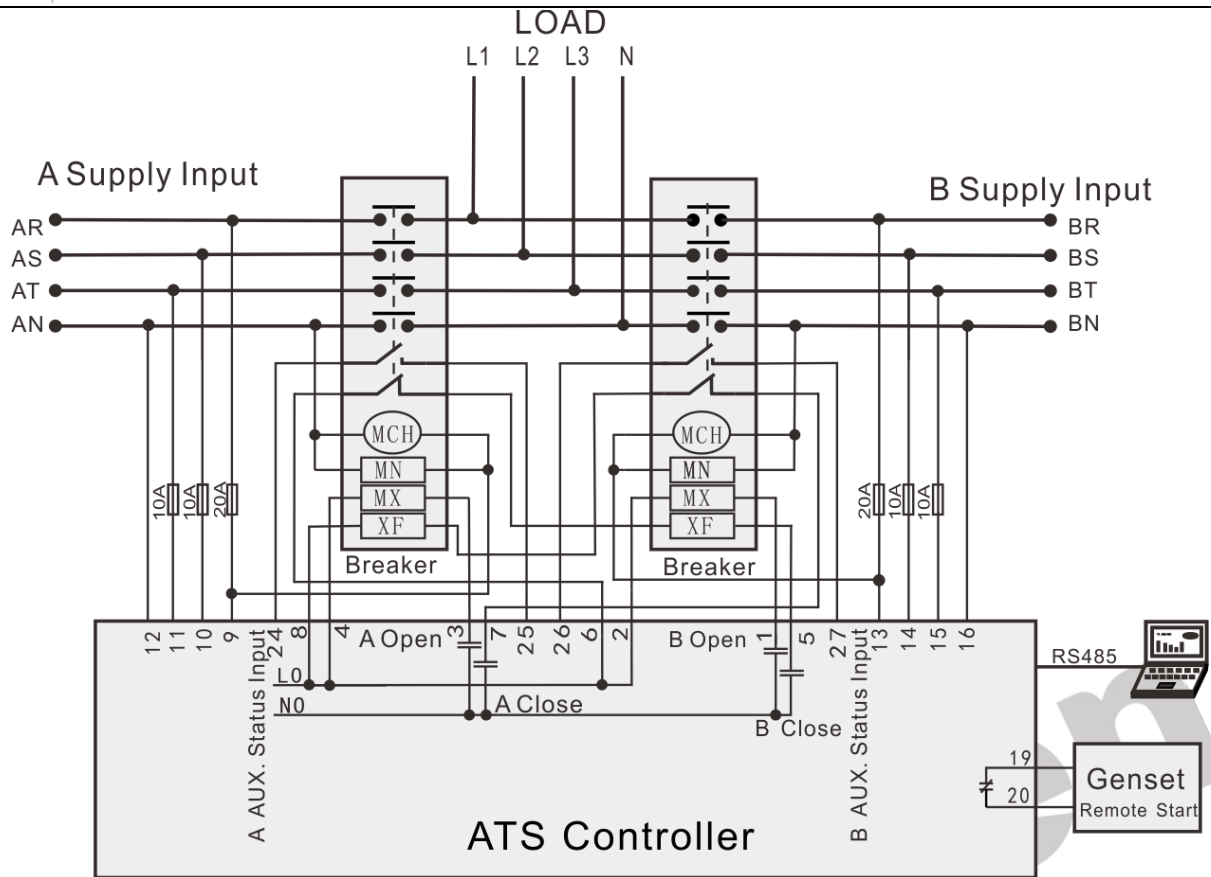


Fig. 12 Breaker (ACB) Application Diagram

MCH: Energy-saving motor; MN: Undervoltage trip; MX: Open coil; XF: Close coil.

Table 25 Related Settings

Partial Parameter Setting	
Switch Type Setting	Two breakings (HAT553)

NOTE: Above diagrams are only examples; Users shall connect wires based on the real occasions.

14.2 ATTACHED ILLUSTRATION FOR LO, NO CONNECTION INSIDE CONTROLLER

HAT553/HAT552 controller has automatic transfer function of ATS power supply inside. Only if one voltage of A power and B power is normal, by transfer between N/O contact and N/C contact of intermediate relay 1 and intermediate relay 2 ensure ATS power supply normal. The output is LO, NO. Output value is LN voltage value of A power or LN voltage value of B power. Internal wiring is as below: R1, N1 is AR, AN input of A power; R2, N2 is BR, BN input of B power.

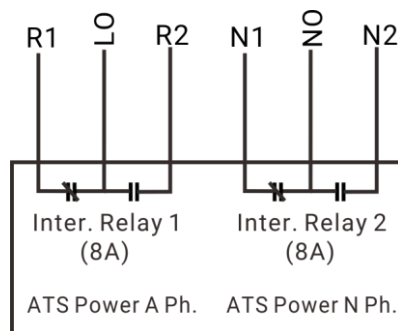


Fig. 13 Internal LO, NO Connection

15 INSTALLATION

The controller is designed by panel installation method, and is fixed by clips for installation.

Unit: mm

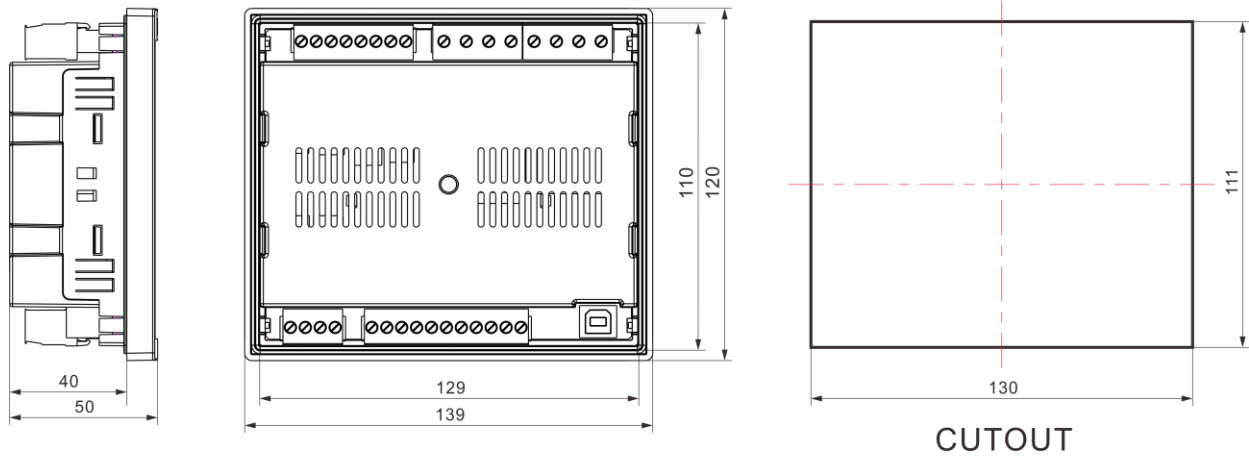


Fig. 14 Overall Dimensions and Cutout

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16 FAULT FINDING

Table 26 Fault Finding

Symptom	Possible Solutions
Controller No Response with Power	<p>Check DC supply voltage;</p> <p>Check DC fuse;</p> <p>Check AC power.</p>
RS485 Communication Abnormal	<p>Check whether RS485 positive and negative are correctly connected;</p> <p>Check RS485 converter is normal or not;</p> <p>Check module address in the parameter settings is correct or not;</p> <p>If above methods are unsuccessful, please try to parallel in 120Ω resistor between A and B of controller RS485.</p>
Auxiliary Output Error	<p>Check auxiliary output connecting wire, pay attention to N/O, N/C contacts;</p> <p>Check output port setting function and output type in parameter settings.</p>
Auxiliary Input Abnormal	<p>Check whether aux. input port is GND connected when it's active, and it shall hang up when it is inactive; (NOTE: The input port will be possibly destroyed when connected with high voltage.)</p> <p>Check the input setting function of parameter settings and active type.</p>
ATS Transfer Abnormal	<p>Check ATS;</p> <p>Check the connection wirings between controller and ATS;</p> <p>Check ATS related parameter settings.</p>
Genset Start Control Abnormal	<p>Check system type settings;</p> <p>Check output function settings and output type;</p> <p>Check start/stop function settings of all items.</p>