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MAKING CONTROL SMARTER

HAT9420LT ATS CONTROLLER USER MANUAL



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Table 1 Software Version

Date	Version	Note
2024-07-03	1.0	Original release.
2024-08-24	1.1	Update the figure of back panel.
2025-03-06	2.0	1. Modify the display interface; 2. Modify the typical application diagram; 3. Modify the start/stop logic of genset.

Table 2 Symbol Instruction

Symbol	Instruction
 NOTE	Highlights an essential element of a procedure to ensure correctness.
 CAUTION	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
 WARNING	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.

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1 OVERVIEW

HAT9420LT Dual Power ATS Controller is made by microprocessor as its core, which can accurately detect 2-way-3-phase voltage, make accurate judgment for occurred abnormal voltages (over/under voltage, loss of phase, over/under frequency). This controller is applicable for Mains-Gen power supply system and can be used for transfer switch of PC class. It has compact structure, advanced circuits, simple wiring and high reliability, and can be widely used in electric power, telecommunications, petroleum, coal, metallurgy, railways, municipal administration, intelligent building, electrical devices, automatic control and testing system etc.

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2 PERFORMANCE AND CHARACTERISTICS

- LCD 132x64 pixel with backlight, multiple language display (Simplified Chinese, English, Other), push button operation and low-temperature heating function;
- LED lamp can directly display current ATS close/open status, power status and whether load is power on;
- System type can be set as S1Mains S2 Mains, S1 Mains S2 Gen, S1Gen S2 Mains, S1Gen S2 Gen;
- S1 master, or S2 master can be set; Auto Transfer Auto Restore and Auto Transfer Non Restore are fitted for master power;
- Collect and display 2-way 3 phase voltage, frequency, and phase sequence status
- Collect and display load active power, reactive power, apparent power, power factor and current;
- Independent overcurrent warning or fault alarm functions for S1/S2;
- NEL trip function is fitted;
- Display of accumulated active power, accumulated reactive power, accumulated close times is fitted;
- Each phase voltage of S1/S2, wave distortion rate of load current and 3-21 odd times harmonic percentage can be measured;
- Display of current power supply time and S1/S2 continuous power supply time is available;
- Auto/Manual synchronous transfer function, and display the voltage difference, frequency difference and phase difference of the two power supplies;
- For energy storage swithes, closing can be performed after the PF (Close Ready) signal becomes active;
- Over/under voltage, over/under frequency, loss of phase, reverse phase sequence monitoring functions are fitted;
- Auto/Manual transfer is fitted, so that breaker can be forced to close or open in manual mode;
- When the local mode is active, the controller only displays data parameters, and switch transfer requires external operation;
- Electrical interlock release function is used to disengage electrical interlocks during parallel switching operations;
- All parameters can be configured on site; password is used to verify in case of non professional wrong operation;
- Custom start screen function is fitted;
- Commissioning can be done manually on site to conduct genset start/stop operations;
- Switch re-close and power-off re-close functions are fitted;
- Close output can be set to pulse or continuous output;
- Applicable to PC-class two-stage switches, PC-class three-stage switches, CB-class switches, and CC-class switches;
- 2 circuit N wire isolated design;
- Real time clock display, and event log function, which can record 200 data circularly;
- Black box function, which can record 5 sets of events of ATS transfer, and 60 detailed data of 50s before one set occurs and 10s after the event;
- Scheduled run/not run function for genset, run for once, run monthly or weekly, and run on load or unload can also be set;

- Two gensets can be controlled and cyclic run, master-slave run, and equalization time run can be realized;
- USB slave port, provides convenience for on-site debugging;
- USB master port, provides convenience for software upgrade;
- 2-way RS485 isolated communication port, makes the controller has remote control, remote communication, remote measurement and remote adjustment by ModBus-RTU; it can remote control genset start/stop, ATS close/open;
- ETHERNET port, makes the controller has remote control, remote communication, remote measurement and remote adjustment functions by ModBus TCP/IP; it can remote control genset start/stop, ATS close/open;
- Suitable for multiple AC system types (3P4W, 3P3W, 1P2W, 2P3W);
- Master and backup power supply can be set; ATS can normally work if one circuit is normal;
- Controller uses metal clips to fix;
- Modular structure design, anti-flammable ABS shell, pluggable wire terminal, built-in installation method with compact structure and easy installation.

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3 SPECIFICATION

Table 3 Performance Parameters

Items	Contents
Working Voltage	DC 8.0V~35.0V, continuous power supply; DC reverse connection protection
Power Consumption	<6W(Standby mode: <3W)
AC Voltage Input	3P4W (L-L) (80~625)V
	3P3W (L-L) (80~625)V
	2P3W (A-B) (80~625)V
	1P2W (L-N) (50~360)V
	Voltage resolution: 1V Accuracy: 1%
AC Frequency	Rated: 50/60Hz Range: 15Hz-75Hz Resolution: 0.01Hz Accuracy: 0.1Hz
AC Current	Rated: 5A Rated: 0A-10A Rated: 0.1A Rated: 2%
Programmable Relay Output 1-2	16A AC250V Volt free output
Programmable Relay Output 3-5	10A AC250V Volt free output
Programmable Relay Output 6-7	Connect power supply (-), Active output
Programmable Input 1-16	power supply (-) connected is active, low voltage 1.5VDC, high voltage 60VDC
RS485 Port	Isolated, half-duplex, 2400/4800/9600/19200 baud rate can be set, Modbus-RTU communication protocol, farthest communication distance 1000m
ETHERNET Port	Self-adaptable 10/100Mbps, Modbus TCP/IP communication protocol
CE-EMC Certification	EN 55032, EN 55024
Virbration	5Hz~8Hz: ±7.5mm 8Hz~500Hz: 2g IEC 60068-2-6
Shock	50g, 11ms, half-sine, three consecutive shocks are applied in each of the three mutually perpendicular directions, i.e. a total of 18 times. IEC 60068-2-27
Bump	20g, 16ms, half-sine IEC 60255-21-2

Items	Contents
Design Standard	Meets GB/T14048.11-2016 & IEC/EN 60947-6-1
Safety Requirements	According to EN61010-1 installation type (overvoltage) III, 300V, pollution class 2, altitude 3000m
Dimensions	242mmx186mmx54mm
Panel Cutout	214mmx160mm
Operating Temperature	(-40~+70)°C
Operating Humidity	(20~93)%
Storage Temperature	(-40~+80)°C
Protection Rank	Front Panel: IP65, when waterproof gasket is installed between controller and control panel; Back Panel: IP20
Insulation Strength	Apply AC2.2kV voltage between high voltage terminal and low voltage terminal and the leakage current is not more than 3mA within 1min.
Weight	0.98kg

4 OPERATION

4.1 CONTROLLER PANEL



Fig. 1 – Front Panel

Table 4 Indicator Description

Indicator	Description
Alarm Indicator	Slow Flashing: flashes when warning alarm occurs (1 time for 1 second); Fast Flashing: flashes when fault alarm occurs (5 times for 1 second);
Running Status Indicator	Lamp on when load is power on, otherwise, it is extinguished.
Load Live Indicator	Lamp On: When S1 close signal input is active, or S2 close signal input is active. Otherwise, it is extinguished.
S1 Power Status Indicator	Lamp On: S1 Power normal; Lamp Flashing: S1 Power abnormal (under/over voltage, under/over frequency, loss of phase, reverse phase sequence); Lamp Off: S1 Power none voltage;
S1 Closed Status Indicator	Lamp On: S1 close auxiliary status input is active;
S2 Power Status Indicator	Lamp On: S2 Power normal; Lamp Flashing: S2 Power abnormal (under/over voltage, under/over frequency, loss of phase, reverse phase sequence); Lamp Off: S2 Power none voltage;
S2 Closed Status Indicator	Lamp On: S2 close auxiliary status input is active;
Auto Mode Indicator	Lamp On: Current mode is Auto mode.
Mute Indicator	Lamp On: press the key of mute alarm Lamp On: press it again to cancel the mute alarm
Manual Mode Indicator	Lamp On: current mode is Manual mode.
Generator Control	Lamp On: controller has sent the engine start signal.

Indicator	Description
Indicator	
Open Indicator	Lamp On: press the open key in Manual mode. Lamp Off: press the close key or Auto key.

4.2 KEY FUNCTION DESCRIPTION

Table 5 Keys Description

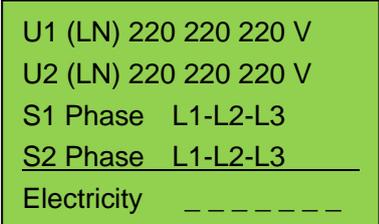
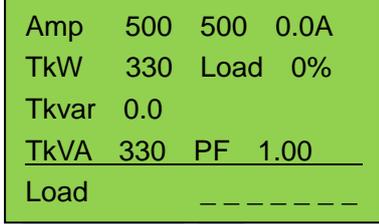
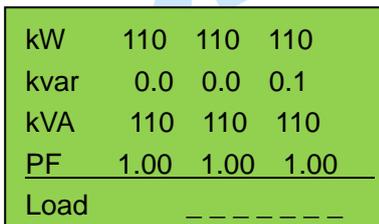
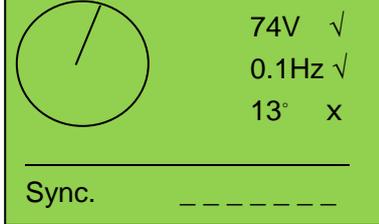
Icon	Key	Description
	S1 Close Key	Active in manual mode; Press and S1 close outputs, S1 connects to load.
	Auto Mode Key	Press and set controller to auto mode.
	Mute Key	Press it to mute alarms.
	Alarm Reset Key	Press it to enter the alarm page, press it again to remove the fault alarm.
	S2 Close Key	Active in manual mode; Press and S2 close outputs, S2 connects to load.
	Manual Mode Key	Press and set controller to manual mode.
	Generator Control	Active in manual mode; Press it to enter the generator test page.
	Open Key	Active in manual mode; Press it to disconnect the load.
	Up Key	After entering menu page, move up cursor or increase the value where the cursor is.
	Left Key	In main page, press it to left scroll the screen. After entering menu page, move left the cursor.
	Set/Confirm Key	In main page, press to enter menu page. After entering menu page, confirm key can move cursor and confirm the set information.
	Right Key	In main page, press it to right scroll the screen. After entering menu page, move right the cursor.
	Down/Lamp Test Key	After entering menu page decrease the value where the cursor is; In main page, pressing longer is lamp test; At lamp test, LCD backlight is on, LCD display is back, and all LEDs on the panel are illuminated.

Icon	Key	Description
	Return/Home Key	Press to return to the previous menu in parameter page while it returns to the first page in main screen; Press longer and it immediately returns to the first page of controller main screen.

5 LCD DISPLAY

5.1 MAIN SCREEN

Table 6 Main Screen Display

Display Contents	Display Description
	S1 Line Voltage (L1-L2, L2-L3, L3-L1) S2 Line Voltage (L1-L2, L2-L3, L3-L1) S1 Frequency S2 Frequency Current mode, alarm status, indication information, other status information.
	S1 Phase Voltage (L1, L2, L3) S2 Phase Voltage (L1, L2, L3) S1 Phase Sequence S2 Phase Sequence Current page content and position, alarm status, indication information, and action countdown.
	3 Phase Current Total Active Power and Current Power Percentage Total Reactive Power Total Apparent Power, Power Factor Current page content and position, alarm status, indication information and action countdown.
	3 Phase Active Power 3 Phase Reactive Power 3 Phase Apparent Power 3 Phase Power Factor Current page content and position, alarm status, indication information and action countdown.
	Synchronous Voltage Difference (the difference of average value of 3 phase voltages) Synchronous Frequency Difference Synchronous Phase Difference and Analogue Synchronous Meter Current page content and position, alarm status, indication information and action countdown.

Display Contents	Display Description
<p>Alarms 01/05</p> <p>Warn Alarm</p> <p>Sync Failure</p> <p>Fault Alarm</p> <p>S2 Close Failure</p>	<p>Alarm Serial No. and Alarm Number</p> <p>Alarm Type (Warning Alarm, Fault Alarm)</p> <p>Alarm Event</p> <p>Alarm Type (Warning Alarm, Fault Alarm)</p> <p>Alarm Event</p>

5.2 STATUS DESCRIPTION

Table 7 S1 Power Status

No.	Status	Description
1	S1 Normal Identify	S1 normal identification delay
2	S1 Abnormal Identify	S1 abnormal identification delay
3	S1 Voltage Normal	Power value is within the specified range.
4	S1 Voltage None	Voltage is 0.
5	S1 Voltage High	Voltage is above the pre-set upper value.
6	S1 Voltage Low	Voltage is below the pre-set lower value.
7	S1 Frequency High	Frequency is above the pre-set upper value.
8	S1 Frequency Low	Frequency is below the pre-set lower value.
9	S1 Loss of Phase	Loss of one or two phase among A, B, C.
10	S1 Reverse Phase Sequence	Wrong phase sequence A-B-C.

Table 8 S2 Power Status

No.	Status Name	Description
1	S2 Normal Identify	S2 normal identification delay
2	S2 Abnormal Identify	S2 abnormal identification delay
3	S2 Voltage Normal	Power value is within the specified range.
4	S2 Voltage None	Voltage is 0.
5	S2 Voltage High	Voltage is above the pre-set upper value.
6	S2 Voltage Low	Voltage is below the pre-set lower value.
7	S2 Frequency High	Frequency is above the pre-set upper value.
8	S2 Frequency Low	Frequency is below the pre-set lower value.
9	S2 Loss of Phase	Loss of one or two phase among A, B, C.
10	S2 Reverse Phase Sequence	Wrong phase sequence A-B-C.

Table 9 Genset Status

No.	Status Name	Description
1	Start Delay	Delay time before genset start.
2	Stop Delay	Delay time before genset stop.
3	Scheduled Not Start	Display Scheduled Not Start lasting time when it is active.
4	Scheduled Start	Display Scheduled Start lasting time when it is active.
5	S1 Cyclic Start	When cyclic start is active, the S1 cyclic start operation indicates a countdown running to completion.
6	S2 Cyclic Start	When cyclic start is active, the S2 cyclic start operation indicates a countdown running to completion.
7	S1 Genset Start	Active only when system type is "S1 Power Generation" or "S2 Power Generation".
8	S2 Genset Start	Active only when system type is "S1 Power Generation" or "S2 Power Generation".
9	S1&S2 Genset Start	Active only when system type is "S1 Power Generation" or "S2 Power Generation".
10	Genset Start	Genset start signal outputs
11	Genset Standby	None genset start signal outputs.

Table 10 Switch Status

No.	Status Name	Description
1	Ready to Transfer	Enter switch transfer process;
2	S1 Closing	S1 closing delay is in progress;
3	S1 Opening	S1 opening delay is in progress;
4	S2 Closing	S2 closing delay is in progress;
5	S2 Opening	S2 opening delay is in progress;
6	Transfer Rest	Interval time between switch transfers;
7	Closing S1 Again	It is the second closing time when the first S1 opening is not successful;
8	Opening S1 Again	It is the second opening time when the first S1 closing is not successful;
9	Closing S2 Again	It is the second closing time when the first S2 opening is not successful;
10	Closing S2 Again	It is the second opening time when the first S2 closing is not successful;
11	Waiting Synch.	Delay time for waiting S1/S2 to meet synch. conditions (voltage difference, frequency difference, phase difference);
12	S1 Sync. Close	S1 synch. close outputs when synch. conditions are satisfied;
13	S2 Sync. Close	S2 synch. close outputs when synch. conditions are satisfied;
14	Waiting S1 PF	S1 is waiting for input setting (S1 gets ready/PF) is active before S1 closes;
15	Waiting S2 PF	S2 is waiting for input setting (S2 gets ready/PF) is active before

No.	Status Name	Description
		S2 closes;
16	Elevator Delay	Delay time before switch transfer, elevator control outputs;
17	S1 On Load	S1 was already closed and S1 is taking load;
18	S2 On Load	S2 was already closed and S2 is taking load;
19	Offload	Switch was already opened and load is disconnected.

When controller detects warning alarm, warning alarm is active, alarm indicator will flash slowly (1 time 1 second); after warning is recovered, alarm indicator will extinguish. Warning alarm is not latched.

Table 11 Warning Alarms

No.	Status	Description
1	S1 Over Current Warn	Action is set to warning; current is over pre-set limit when S1 is taking load;
2	S2 Over Current Warn	Action is set to warning; current is over pre-set limit when S2 is taking load;
3	Forced Open Warn	It alarms when the forced open (Non-firefighting cutoff input) action is warning, and the forced open input is active;
4	Battery Under Volt	Battery voltage is lower than the set limit value;
5	Battery Over Volt	Battery voltage is higher than the set limit value;
6	Fail to Sync. Warn	Sync. failure action is set to warning, and it alarms when sync. delay is over time;
7	Switch Output Voltage Abnormal	Input port is configured to "Output Voltage Abnormal Warn", and when the input is active, warning occurs.
8	Busbar Voltage Abnormal	Input port is configured to "Busbar Voltage Abnormal Warn", and when the input is active, warning occurs.

When controller detects fault alarm, fault alarm is active, alarm indicator will flash fast (5 time per second); Fault alarm is latched and it can be removed until reset it manually.

Table 12 Fault Alarms

No.	Status	Description
1	S1 Failed to Close	S1 fails to close when it closes in auto mode
2	S1 Failed to Open	S1 fails to open when it opens in auto mode;
3	S2 Failed to Close	S2 fails to close when it closes in auto mode;
4	S2 Failed to Open	S2 fails to open when it opens in auto mode;
5	S1 Load Over Current Fault	Action is set to fault; current is over preset limit when S1 is taking load;
6	S2 Load Over Current Fault	Action is set to fault; current is over preset limit when S2 is taking load;
7	Forced Open Fault	It alarms when the forced open (Firefighting input) action is fault, and the forced open input is active;
8	S1 Genset Fault	When the system is configured for S1 or S2 power generation, normal start of the S1 generator cannot be performed.
9	S2 Genset Fault	When the system is configured for S1 or S2 power generation, normal start of the S2 generator cannot be performed.

No.	Status	Description
10	Breaker Trip Alarm	Breaker trip alarm input is active.
11	Sync Fail Fault	Sync. failure action is set to fault, when it is over delay time, fault alarms;
12	S1/S2 Close At the same time	It alarms when S1 close signal input and S2 close signal input are active at the same time for over 300ms;
13	Switch Output Voltage Abnormal	Input is configured to "Output Voltage Abnormal Fault", and when input is active, fault alarms.
14	S1 Switch Trip Alarm	Input is configured to "S1 Switch Trip Alarm", and when input is active, fault alarms.
15	S2 Switch Trip Alarm	Input is configured to "S2 Switch Trip Alarm", and when input is active, fault alarms.

When indication information is active, it disappears after it displays for 2s.

Table 13 Indication Information

No.	Status	Description
1	Please reset the alarm	Reminder information for switching to auto mode manually before alarm is removed when fault alarm occurs;
2	S1 was already closed	In non-parallel mode, the indication information for pressing S2 close key when S1 has been closed;
3	S2 was already closed	In non-parallel mode, the indication information for pressing S1 close key when S2 has been closed;
4	Panel Button Latched	When "panel button latched" input is active, it is the reminder information for pressing panel button (Auto key, Manual key, S1 Close key, S2 Close key, Open key, Alarm Reset key).

Table 14 Other Status Information

No.	Status	Description
1	Start Inhibit	Genset start inhibition input is active.
2	Switch Transfer Inhibit	In Auto Mode, ATS will not transfer when this input signal is active.
3	S1 Load Inhibit	S1 load inhibition input is active.
3	S2 Load Inhibit	S2 load inhibition input is active.
5	NEL 1 Trip	NEL 1 unload outputs.
6	NEL 2 Trip	NEL 2 unload outputs.
7	NEL 3 Trip	NEL 3 unload outputs.
8	Remote Gen On Load	Remote start with load input is active.
9	Remote Gen Off Load	Remote start without load input is active.
10	Mains Abnormal Gen Start	Genset starts when mains is abnormal.
11	Genset Start	Active when genset starts.
12	Auto Mode	Current status is Auto mode.
13	Manual Mode	Current status is Manual mode.
14	Local Mode	Current status is Manual Mode.

6 MAIN MENU INTERFACE

In the main screen, press  key and it can enter the main menu interface.

<ul style="list-style-type: none">1. Parameter Setting2. History Records3. Black Box Records4. Harmonics Analysis5. Auto Trans./Restore	<p>Press  and  to select different parameter line (backlight), and then press  to enter related display screen.</p>
<ul style="list-style-type: none">6. Auto Trans.7. Start/Stop Gense8. Language9. Module Info10. AboutAboutAbout	

NOTE 1: Input password to enter parameter settings; default password "01234"; operator can change the password to prevent others changing controller configurations randomly. After change please remember clearly; If it is forgotten, please contact company personnel.

7 GENSET START/STOP OPERATION

7.1 START/STOP GENSET IN MANUAL MODE

7.1.1 START/STOP GENSET ON PANEL

In main menu interface, select "7. Start/Stop Genset", or press the key on panel to and enter genset start operation manually.

When system type is "S1 Mains/ S2 Gen", "S1 Gen/ S2 Mains", or "S1 Mains/ S2 Mains", the manual start/stop menu Interface displays as follows:

1.Return 2.Genset Stop 3.Genset Start	Press Up/Down key to select different parameter line (backlight), and press Confirm key to confirm.
--	---

Genset Stop: Disconnect the outputted S1 start signal, which is to control genset stop.

Genset Start: Control genset start signal output, which is to control Genset start.

When system type is "S1 Gen/S2 Gen", the manual start/stop menu Interface displays as follows:

1.Return 2.S1 Generator Stop 3.S1 Generator Start 4.S2 Generator Stop 5.S2 Generator Start	Press  and  to select different parameter line (backlight), and then press  to confirm.
---	--

S1 Genset Stop: Disconnect the outputted S1 start signal, which is to control S1 genset stop.

S1 Genset Start: Control S1 start signal output, which is to control S1 genset start.

S2 Genset Stop: Disconnect the outputted S2 start signal, which is to control S2 genset stop.

S2 Genset Start: Control S2 start signal output, which is to control S2 genset start.

7.1.2 REMOTE COMMUNICATION START/STOP

Send remote start/stop commands by RS485 port (Modbus-RTU protocol control), ETHERNET port (Modbus TCP/IP protocol control).

Remote Communication Stop: Disconnect the outputted S1 start signal, which is to control S1 genset stop.

Remote Communication Start: Control genset start signal output, which is to control Genset start.

7.2 START/STOP IN AUTO MODE

7.2.1 START CONDITIONS

—Input Port Start

Configure "Remote Start On Load" or "Remote Start Off Load", they cannot be set at the same time.

Remote Start On Load: Genset start outputs, when generating is OK, gen closes; when it is inactive, genset start output signal is disconnected.

Remote Start Off Load: Genset start outputs, when mains is OK, mains closes; when it is inactive,

genset start output signal is disconnected.

——Mains Abnormal Start

When mains is abnormal, genset start outputs; when generating is OK, gen closes.

7.2.2 START/STOP OF DUAL GENERATOR SETS

With system type configured as "S1 Gen/S2 Gen", input port settings are defined as follows:

Programmable input ports must be set to either "Remote Start On Load " or "Remote Start Off Load", but not both simultaneously.

Remote Start On Load: Activates S1 or S2 start command according to the selected start mode, closes generator circuit breaker upon stable power generation.

Remote Start Off load: Activates S1 or S2 start command according to the selected start mode, neither S1 nor S2 circuit breakers will close after startup.

Start modes of Dual Generator Sets: Cyclic start, master/slave start, equalized runtime start, none.

——Cyclic Start

When remote start is active, S1 and S2 initiate cyclic startup based on equalized runtime. The first startup selects S1 or S2 according to main status (e.g., S1 as main starts first). An S1 runtime countdown begins simultaneously with generator fault identification timing. If S1 generation stabilizes before fault identification expires, it takes load. Upon S1 runtime countdown completion, S2 starts with its own runtime/fault timing. After S2's stabilization and it takes load, S1 shuts down. This cycle repeats until remote start deactivates.

During startup, if any failure occurs (generator power-up timeout, active fault input, closing failure, or load prohibition), the starting unit immediately stops and the alternate unit initiates startup.

If switched to manual mode during cyclic operation, the system maintains current status and pauses all runtime countdown timers.

——Master/Slave Start

When remote start is active, the master generator unit initiates startup. If any failure occurs during startup (generator power-up timeout, active fault input, closing failure, or load prohibition), the starting unit immediately stops and the alternate unit initiates startup. Otherwise, the master unit continues operation until remote start deactivates.

——Equalized Runtime Start

When remote start is active, the generator unit with lower cumulative runtime initiates startup. If failures occur during startup (power-up timeout, active fault input, closing failure, or load prohibition), the starting unit immediately stops and the alternate unit activates. Otherwise, the operating unit continues until remote start deactivates.

For S1/S2 Generator system type operation, the following conditions must be satisfied:

- 1) Function enabled in Auto Mode;
- 2) System type configured as "S1 Gen/S2 Gen";

- 3) Output ports configured for "S1 Genset Start" and "S1 Genset Start"
- 4) Input ports configured for "S1/S2 Genset Fault Inputs", "Remote Start On Load" or "Remote Start Off Load";
- 5) Start mode for S1/S2 Genset must be defined;
- 6) Should configure "Genset Power-up Delay", S1/S2 Runtime Duration (if cyclic start is selected);

S1/S2 Generator Fault Inputs are optional settings. System may alternatively determine faults via power-up delay timeout without input signals.

If start mode is set to "None", there is no start signal output of genset.

For example:

Table 15 Other Status Information

System Types	Start Condition	Result
S1Gen S2 Gen	Input ports active (remote start on load/off load)	S2 genset start outputs
	Master setting: S1 as master	

7.2.3 SCHEDULED GEN START

When "Schedule Gen Enable" function is enabled, users can set scheduled gen start time. Controller will issue start signal when the time is up. When scheduled start lasting time is over, start signal is disconnected. Scheduled Run On Load or Off Load can be set.

Scheduled Start On Load: genset start outputs, and when generating is OK, gen closes;

Scheduled Start Off Load: genset start outputs, and when mains is OK, mains close.

Scheduled Start cycle time can be set to start monthly, weekly, or daily.

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

Schedule Weekly: start at the same time for multiple days in a week can be set. For example: Set it from Monday to Friday, start at 8:00 and last 10 hours.

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

7.2.4 SCHEDULED NOT WORK

After Schedule Not Work function is enabled, users can set scheduled not work time. Controller will disconnect start signal when the scheduled time is due. Start signal is prohibited before the end of Scheduled Not Work lasting time.

Scheduled Not Work cycle time can be set to Not Run Monthly, Weekly, Daily, three methods.

Scheduled Not Work Monthly: Which month to not run can be set, so do not run date and time;

Scheduled Not Work Weekly: Not run for multiple days in a week can be set; For example: Set it from Monday to Friday, not run at 19:00 every day, lasting for 12 hours;

Scheduled Not Work Daily: Not run at the same time every day can be set.

▲NOTE: Schedule Not Work is prior to Schedule Start Operation.

8 PARAMETER SETTINGS

8.1 ILLUSTRATION

In the first page of the main screen, press  key and enter menu page. Select "1. Configuration", and press  to confirm, so it enters parameter setting password interface. Input correct password to enter parameter main screen. If password is wrong, it directly returns back to main screen. Default factory password: 01234. In parameter configuration screen, press  key to return to the previous directory.

8.1.1 PARAMETER CONFIGURATION LIST

Table 16 Parameter Setting Items

No.	Item	Range	Default	Description
AC Settings				
1	S1 Available Delay	(0~3600) s	10	The check time for S1 from abnormal to normal;
2	S1 Unavailable Delay	(0~3600)s	5	The check time for S1 from normal to abnormal;
3	S2 Available Delay	(0~3600)s	10	The check time for S2 from abnormal to normal;
4	S2 Unavailable Delay	(0~3600)s	5	The check time for S2 from normal to abnormal;
5	Master-Slave Set	(0~1)	0	0: S1 Master 1: S2 Master
6	System Type	(0~3)	0	0: S1 Mains S2 Gen 1: S1 Gen S2 Mains 2: S1 Mains S2 Mains 3: S1 Gen S2 Gen
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
8	PT Fitted	(0~1)	0	0: Disable 1: Enable
9	PT Primary Voltage	(30~35000)V	100	Primary voltage of AC PT ratio;
10	PT Secondary Voltage	(30~1000)V	100	Secondary voltage of AC PT ratio;
11	Rated Voltage	(0~35000)V	220	Rated voltage of AC system;
12	Over Volt Set	(0~1)	1	0: Disable 1: Enable
13	Set Value	(0~200)%	120	Upper limit value of voltage; it is abnormal if the value has exceeded the set value.
14	Return Value	(0~200)%	115	Upper limit return value of voltage; it is normal only when the value has fallen

No.	Item	Range	Default	Description
				below the set value.
15	Under Volt Set	(0~1)	1	0: Disable 1: Enable
16	Set Value	(0~200)%	80	Lower limit value of voltage; it is abnormal if the value has fallen below the set value.
17	Return Value	(0~200)%	85	Lower limit return value of voltage; it is normal only when the value has exceeded the set value.
18	Rated Frequency	(10.0~75.0)Hz	50.0	Rated frequency of AC system
19	Over Frequency Set	(0~1)	1	0: Disable 1: Enable
20	Set Value	(0~200)%	110	Upper limit value of frequency; it is abnormal if the value has exceeded the set value.
21	Return Value	(0~ 200)%	104	Upper limit return value of frequency; it is normal only when the value has fallen below the set value.
22	Under Frequency Set	(0~1)	1	0: Disable 1: Enable
23	Set Value	(0~ 200)%	90	Lower limit value of frequency; it is abnormal if the value has fallen below the set value.
24	Return Value	(0~ 200)%	96	Lower limit return value of frequency; it is normal only when the value has exceeded the set value.
25	Reverse Phase Sequence Monitoring	(0~1)	1	0: Disable 1: Enable
Switch Settings				
1	Definite C/O Time	(0~1)	0	0: Disable 1: Enable Disable: Detect output time according to close status when close/open pulse outputs; longest time is the set time; Enable: close/open pulse output time is the set close/open time;
2	Close Time	(0.1~20.0)s	5.0	Outputted pulse time of close relay;
3	Open Time	(0.1~20.0)s	5.0	Outputted pulse time of open relay;
4	Transfer Time	(0~9999)s	1	Delay time from S1 open to S2 close; or from S2 open to S1 close;
5	Auto Trans./Restore	(0-1)	1	0: Auto transfer/non restore 1: Auto transfer/restore
6	Again Close Time	(0~20.0)s	1.0	If the first switch open is not successful, then the second close starts and again close delay starts; when the delay is

No.	Item	Range	Default	Description
				over, then the second open starts; if the open cannot be conducted, then open failure alarm signal shall be sent out;
7	Again Open Time	(0~20.0)s	1.0	If the first switch close is not successful, then the second open starts and again open delay starts; when the delay is over, then the second close starts; if the close cannot be conducted, then close failure alarm signal shall be sent out;
8	Switch Type	(0~2)	0	0: PC Three-stage (For PC switch with neutral, S1 open control is needed.) 1: PC Two-stage (For PC switch without neutral) 2: CB/CC (Requires S1 trip and S2 trip control for breaking)
9	Forced Open Action	(0~1)	0	0: Warn Alarm 1: Fault Alarm
10	Continually Close	(0~1)	0	0: Disable 1: Enable It needs to be enabled when close control is continuous signal and close/open time is inactive at this time;
11	Mutual Backup	(0-1)	1	0: Disable 1: Enable
12	Parallel Mode Set	(0-1)	0	0: Non-parallel 1: Manual auto parallel; 2: Automatic parallel; 3: Manual parallel.
13	Volt Diff. Enabled	(0~1)	0	0: Disable 1: Enable
14	Volt Diff.	(0~50)V	5	Max. voltage difference when sync. is completed;
15	Freq Diff.	(0~0.50)Hz	0.20	Max. frequency difference when sync. is completed;
16	Phase Diff.	(0~20) °	5	Max. phase difference when sync. is completed;
17	Fail to Sync Action	(0~1)	0	0: Warn Alarm 1: Fault Alarm It continues to wait for sync when sync fails until it closes after sync; For warning alarm, it is removed when sync is completed or exit from sync. For fault alarm, it needs to press alarm reset to remove alarm.
18	Transfer in Sync Fail	(0~1)	0	0: Disable

No.	Item	Range	Default	Description
				1: Enable After sync fails, close without sync shall be conducted and fail to sync alarm also isn't issued;
19	Fail to Sync Delay	(0~9999)s	120	Time for waiting for sync success; if it is over time, then sync fails.
20	Sync. Close/Open Detection Time	(0.1~1.0)s	0.6	At the time of sync transfer, sync close/open output delay starts; during this period if correct close status is detected, then stop close/open pulse output; if delay is over and close status is not detected, then close/open failure alarm shall be initiated;
21	Synchronization Function Enable	(0~1)	0	0: Disable 1: Enable
22	Load SW Transfer Time	(0~9999)s	1	Load switch outputs of 4 circuits are configured by output ports; time interval for each switch output;
23	Load Close Time	(0~20.0)s	5.0	Output time for load switch; when it is set 0, load switch output is continuous output;
24	ATS Power Type	(0~1)	1	0: DC Power Supply 1: AC Power Supply
25	ATS Power Low Point	(0~200)%	70	Min. AC supply voltage for switch; if it is lower than this value, then switch cannot be transferred;
26	ATS Power High Point	(0~400)%	130	Max. AC supply voltage for switch; if it is higher than this value, then switch cannot be transferred;
27	S1 PF Input Delay	(0-20.0)s	0	
28	S2 PF Input Delay	(0-20.0)s	0	
29	No Opening Transfer Enabled	(0-1)	0	0: Disable 1: Enable
30	Auto Restore Waiting Time	(0-30000)min	0	
31	Start Time (Hour)	(0-23)h	0	
32	Start Time (Minute)	(0-59)min	0	
33	Stop Time (Hour)	(0-23)h	0	
34	Stop Time (Minute)	(0-59)min	0	
Genset Settings				
1	Genset Start Delay	(0~9999)s	1	When genset prepares to start, delay starts, and when the delay is over, genset starting signal is sent out.
2	Genset Stop Delay	(0~9999)s	5	When genset prepares to stop, delay

No.	Item	Range	Default	Description
				starts, and when the delay is over, genset starting signal is disconnected.
3	S1Gen S2Gen Start Mode	(0~2)	0	0: Cyclic Start 1: Master-Slave Start 2: Equalized Runtime start 3: None
4	S1 Cyclic Runtime	(0~9999)min	720	Runtime of S1 during cyclic start.
5	S2 Cyclic Runtime	(0~9999)min	720	Runtime of S2 during cyclic start.
6	Genset Power-on Delay	(0~9999)s	120	The time delay from issuing the generator start command until normal voltage output is achieved. If the voltage remains unstable after this delay expires, the generator set triggers a fault alarm.
7	Battery Volt Enable	(0~1)	0	0: Disable 1: Enable
8	Battery Under Volt Warn Enable	(0~1)	0	0: Disable 1: Enable
9	Battery Under Volt Warn	(0~100.0)V	10.0	It occurs when battery voltage is lower than the set value.
10	Battery Under Volt Return	(0~100.0)V	10.5	When battery voltage is higher than the set return value, warning is removed.
11	Battery Under Volt Delay	(0-3600)s	60	Delay time for battery volt lower than the warning limit; after delay the under volt warning occurs.
12	Battery Over Volt Warn Enable	(0~1)	0	0: Disable 1: Enable
13	Battery Over Volt Warn	(0~100.0)V	30.0	It occurs when the battery voltage is higher than the set value;
14	Battery Over Volt Return	(0~100.0)V	29.5	It shall be removed if the battery voltage is lower than the set value;
15	Battery Over Volt Delay	(0-3600)s	60	Delay time for battery volt higher than the warning limit, when the delay is over, over volt warning occurs.
Scheduled Start/Stop Settings				
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	(1~4095)	4095	Bit0: January Bit1: February Bit2: March

No.	Item	Range	Default	Description
				Bit3: April Bit4: May Bit5: June Bit6: July Bit7: August Bit8: September Bit9: October Bit10: November Bit11: December
5	Schedule Date	(1~31)	1	Date of genset start in every month
6	Schedule Weekly	(1~127)	1	Bit0: Sunday Bit1: Monday Bit2: Tuesday Bit3: Wednesday Bit4: Thursday Bit5: Friday Bit6: Saturday
7	Schedule Hours	(0~23)h	0	Scheduled start time;
8	Schedule Minutes	(0~59)min	0	
9	Schedule Work Time	(0~30000)min	30	The lasting time for scheduled start running;
10	Gen Inhibit Work	(0~1)	0	0: Disable 1: Enable
11	Inhibit Period	(0~2)	0	0: Monthly 1: Weekly 2: Daily
12	Inhibit Monthly	(1~4095)	4095	Bit0: January Bit1: February Bit2: March Bit3: April Bit4: May Bit5: June Bit6: July Bit7: August Bit8: September Bit9: October Bit10: November Bit11: December
13	Inhibit Date	(1~31)	1	Date of not start in every month;
14	Inhibit Weekly	(1~127)	1	Bit0: Sunday Bit1: Monday Bit2: Tuesday Bit3: Wednesday Bit4: Thursday

No.	Item	Range	Default	Description
				Bit5: Friday Bit6: Saturday
15	Inhibit Hours	(0~23) h	0	Time for scheduled non-start;
16	Inhibit Minutes	(0~59) min	0	
17	Inhibit Rest Time	(0~30000)min	30	The lasting time for scheduled non-start;
Load Settings				
1	Current CT Enable	(0~1)	1	0: Disable 1: Enable
2	CT Ratio/5	(5~6000)A	500	Primary Current of CT
3	S1 Full Load Rating	(5~6000)A	500	Current of S1 full load
4	S2 Full Load Rating	(5~6000)A	500	Current of S2 full load
5	S1 Max kW Rating	(1~20000)kW	200	Max. active power of S1 full load
6	S2 Max kW Rating	(1~20000)kW	200	Max. active power of S2 full load
7	Over Current Enable	(0~1)	1	0: Disable 1: Enable
8	Over Current	(0~200)%	120	Limits for over current;
9	Over Current Protection	(0~1)	0	0: Warn 1: Fault
10	Over Current Type	(0~1)	0	0: Definite 1: Inverse Definite
11	Definite Delay Set (Value)	(0~3600)s	10	Over current delay value for definite time
12	Inverse Delay Set (Multiplier)	(1~36)	36	Over current delay multiplier for inverse definite
13	Elevator Enable	(0~1)	0	0: Disable 1: Enable
14	Elevator Delay	(0~300)s	300	Delay time for load power off or before switch transfer; used to control the running elevator stop at the nearest level until switch transfer is finished;
15	NEL Enable	(0~1)	0	0: Disable 1: Enable
16	NEL Over Power Val 1	(0~200)%	90	When load power is over the set value, unload control outputs after delay;
17	NEL Over Power Delay 1	(0~3600)s	5	
18	NEL Over Power Val 2	(0~200)%	100	When load power is over the set value, unload control outputs after delay;
19	NEL Over Power Delay 2	(0~3600)s	1	
20	NEL Return Enable	(0~1)	0	0: Disable 1: Enable
21	NEL Return Value	(0~200)%	50	When load power is lower than the set value, unload control is disconnected after delay;
22	NEL Return Delay	(0~3600)s	5	
23	NEL Num	(1~3)	3	NEL numbers;

No.	Item	Range	Default	Description
24	Mains Load NEL Enable	(0~1)	0	0: Disable 1: Enable
Digital Input Settings				
1	Digital Input 1	(0~45)	36	S1 closed signal input
2	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
3	Digital Input 2	(0~45)	37	S2 closed signal input
4	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
5	Digital Input 3	(0~45)	2	Remote start on load.
6	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
7	Digital Input 4	(0~45)	3	Remote start off load.
8	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
9	Digital Input 5	(0~45)	29	Local mode
10	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
11	Digital Input 6	(0~45)	13	S1 close key input.
12	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
13	Digital Input 7	(0~55)	14	S2 close key input.
14	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
15	Digital Input 8	(0~45)	1	Forced open.
16	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
17	Digital Input 9	(0~45)	8	Switch tripping input.
18	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
19	Digital Input 10	(0~45)	28	Open key input
20	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
21	Digital Input 11	(0~45)	15	Alarm reset
22	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
23	Digital Input 12	(0~45)	16	Alarm mute
24	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
25	Digital Input 13	(0~45)	21	Forced manual mode.
26	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate

No.	Item	Range	Default	Description
27	Digital Input 14	(0~45)	22	Forced auto mode.
28	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
29	Digital Input 15	(0~45)	44	Reserved.
30	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
31	Digital Input 16	(0~45)	24	Synchronous transfer disabled.
32	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
Digital Output Settings				
1	Digital Output 1 Active Type	(0~1)	0	0: Output (N/O); 1: Output (N/C)
2	Digital Output 1	(0~82)	39	ATS power L1
3	Digital Output 2 Active Type	(0~1)	0	0: Output (N/O); 1: Output (N/C)
4	Digital Output 2	(0~82)	42	ATS power N
5	Digital Output 3 Active Type	(0~1)	0	0: Output (N/O); 1: Output (N/C)
6	Digital Output 3	(0~82)	24	S1 closed control output
7	Digital Output 4 Active Type	(0~1)	0	0: Output (N/O); 1: Output (N/C)
8	Digital Output 4	(0~82)	25	Switch open control output
9	Digital Output 5 Active Type	(0~1)	0	0: Output (N/O); 1: Output (N/C)
10	Digital Output 5	(0~82)	26	S2 closed control output
11	Digital Output 6 Active Type	(0~1)	0	0: Output (N/O); 1: Output (N/C)
12	Digital Output 6	(0~82)	1	Common alarm input.
13	Digital Output 7 Active Type	(0~1)	0	0: Output (N/O); 1: Output (N/C)
14	Digital Output 7	(0~82)	22	Genset start.
Module Settings				
1	Power On Mode	(0~2)	0	0: Last Mode (reserved the mode before power off) 1: Manual 2: Auto
2	Module Address	(1~254)	1	RS485 communication address
3	Language	(0~2)	0	0: Simplified Chinese 1: English 2: Other (Users can self-define module language by PC software; default: English.)

No.	Item	Range	Default	Description
4	Password	(00000~65534)	01234	For entering parameter setting
5	Com 1 Baud Rate	(0~3)	2	0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps
6	Com 1 Stop Bit	(1~2)	2	1/2 bit can be set
7	Com 1 Parity	(0~2)	0	0: None 1: Odd Parity 2: Even Parity
8	Com 2 Baud Rate	(0~3)	2	0: 2400bps 1: 4800bps 2: 9600bps 3: 19200bps
9	Com 2 Stop Bit	(1~2)	2	1/2 bit can be set
10	Com 2 Parity	(0~2)	0	0: None 1: Odd Parity 2: Even Parity
11	Com1 Function Setting	(0~3)	0	0: Remote adjustment/control enabled 1: Remote control disabled 2: Remote adjustment disabled 3: Remote adjustment/control disabled
12	Com2 Function Setting	(0~3)	0	0: Remote adjustment/control enabled 1: Remote control disabled 2: Remote adjustment disabled 3: Remote adjustment/control disabled
13	Date/Time Setting			
14	LCD Backlight Delay	(1-3600)min	5	Enlightened time for LCD backlight;
15	Controller Information 1	(0-20) characters		Information displayed in ABOUT page; Users can input any character (letter is 1 character; while Chinese character is 2 characters), and it needs to set on PC by software.
16	Controller Information 2	(0-20) characters		
17	Controller Information 3	(0-20) characters		
18	Parameter Set Disabled in Auto Mode	(0~1)	0	0: Disable 1: Enable
Network Settings				
1	Network Enable	(0~1)	1	0: Disable 1: Enable
2	IP Address	192.168.10.100		ETHERNET communication parameters
3	Subnet Mask	255.255.255.0		
4	Gateway	192.168.10.1		

8.2 DIGITAL INPUT PORT FUNCTION DESCRIPTION

Table 17 Input Port Function Description

No.	Item	Description
0	Not Used	Inactive.
1	Forced Open	Forced cutoff (firefighting input) is only suitable for switches with breaker control; when it is active, switches shall changeover to neutral no matter in manual mode or in auto mode.
2	Remote Start on Load	Genset start outputs, and when mains is normal, close the generating breaker.
3	Remote Start off Load	Genset start outputs, and when mains is normal, gen breaker will not close.
4	Lamp Test	LED indicators are all light; LED backlight is light; LED is all dark.
5	S1 Genset Fault Input	S1 Genset start is disabled (Applies during cyclic start operations).
6	S2 Genset Fault Input	S2 Genset start is disabled (Applies during cyclic start operations).
7	Start Inhibit Input	Prohibit genset start signal output; In auto mode, disconnect start signal output when stop delay is over; In manual mode, start is inactive after genset stop when it is stopped manually if it has started;
8	Switch Trip Input	Breaker trip fault input.
9	S1 Close Inhibit	S1 close on load are prohibited; In manual mode, manual close is prohibited; if it is closed, then it needs to open manually; In auto mode, if it is closed then load is disconnected or S2 takes load;
10	S2 Close Inhibit	S2 close on load are prohibited; In manual mode, manual close is prohibited; if it is closed, then it needs to open manually; In auto mode, if it is closed then load is disconnected or S1 takes load;
11	S1 Breaker PF IN	S1 close ready signal input; waiting for S1 PF input is active before S1 close;
12	S2 Breaker PF IN	S2 close ready signal input; waiting for S2 PF input is active before S2 close;
13	Key S1 Close	Same as S1 close key on the panel, and it is needed to select auto reset button.
14	Key S2 Close	Same as S2 close key on the panel, and it is needed to select auto reset button.
15	Alarm Reset	Remove current alarm;
16	Alarm Mute	Stop audible alarm output;
17	NEL Trip Key	Control NEL unload manually; it is needed to select auto reset button;
18	NEL Return Key	Control NEL to load again manually; it is needed to select auto reset button;
19	S1 Master Input	Forcibly set S1 switch priority the highest;
20	S2 Master Input	Forcibly set S2 switch priority the highest;

No.	Item	Description
21	Forced Manual Mode	Forcibly set controller mode as manual mode.
22	Forced Auto Mode	Forcibly set controller mode as manual mode.
23	Panel Lock	Panel button operation is prohibited; Up/Down/Set/Return/Alarm Reset can be used;
24	Sync Inhibit	Sync transfer function is inactive;
25	Scheduler Inhibit	Scheduled start and scheduled not start functions are inactive;
26	Simulate S1 OK	Simulate S1 power is normal; S1 voltage detection is inactive;
27	Simulate S2 OK	Simulate S2 power is normal; S2 voltage detection is inactive;
28	Open IN	Same as panel open key, used to control switch open, please use auto reset button.
29	Local Mode	Close/open is inactive when controller is in monitoring status.
30	Auto Trans./Restore	After this port is configured, it is Auto Trans./Restore when it is active; it is Auto Trans./Non Restore when it is inactive.
31	Switch Output Voltage Abnormal Fault	After this port is configured, fault alarm occurs when it is active.
32	Switch Output Voltage Abnormal Warn	After this port is configured, warning alarm occurs when it is active.
33	Remote Control Inhibit	When it is active, all remote control commands by communication port are inactive.
34	Transition Inhibit	In Auto mode, after this signal is active, it can inhibit ATS to transfer.
35	Busbar Voltage Abnormal	After this port is configured, warning alarm occurs when it is active.
36	S1 Closing Signal Input	To detect the closing status of S1 switch.
37	S2 Closing Signal Input	To detect the closing status of S2 switch.
38	Non Parallel	Set the parallel mode as "non-parallel", the parallel mode is inhibited in this mode.
39	Auto Parallel	Set the parallel mode as "auto parallel", in auto mode, the auto restore of main power will be automatically transferred in parallel.
40	Manual Parallel	Set the parallel mode as "manual parallel", in auto mode, the controller can be manually transferred in parallel.
41	Manual Auto Parallel	Set the parallel mode as "manual auto parallel", both manual and auto modes (auto restore) can be transferred in parallel.
42	S1 Tripping Input	S1 switch tripping inputs.
43	S2 Tripping Input	S2 switch tripping inputs.
44	Reserved	
45	Reserved	

8.3 DIGITAL OUTPUTPORT FUNCTION DESCRIPTION

Table 18 Output Port Function Description

No.	Items	Description
0	Not Used	Output port is inactive.
1	Common Alarm	It includes fault alarm and warning alarm.
2	Common Fault Alarm	It includes "Transfer Fault" alarm, and "Over Current" fault

No.	Items	Description
		alarm.
3	Common Warn Alarm	It includes reverse phase sequence of S1, reverse phase sequence of S2, load over current and forced open.
4	Transfer Fault	It includes "S1 Fail to Close" alarm, "S1 Fail to Open" alarm, "S2 Fail to Close" alarm, "S2 Fail to Open" alarm.
5	Audible Alarm	It can be connected with annunciator externally when common alarm is active. When "alarm mute" input is active or 60s delay has expired, it can remove the alarm.
6	Reserved	
7	Genset Start Delay	Output when genset start delay is initiated;
8	Genset Stop Delay	Output when genset stop delay is initiated;
9	Elevator Control	Output before load is power off or switch transfer; used to control running elevator to stop at the nearest level until transfer is finished;
10	Fire Control Linkage	Output when forced to open (Fire) input signal is active and ATS succeeds to open.
11	Busbar Voltage Abnormal Output	Output when busbar voltage abnormal warning input is active.
12	Reserved	
13	S1 Available	Output when S1 voltage is normal.
14	S1 Unavailable	Output when S1 voltage is abnormal.
15	S2 Available	Output when S2 voltage is normal.
16	S2 Unavailable	Output when S2 voltage is abnormal.
17	S1 Over Current	Output when S1 is over current with load;
18	S2 Over Current	Output when S2 is over current with load;
19	Local Mode	Output when the local mode is active.
20	Auto Mode	Output when the genset is in Auto mode.
21	Manual Mode	Output when the genset is in Manual mode.
22	Genset Start Output	Control the genset starting.
23	Reserved	
24	S1 Close Control	Control the S1 switch to close.
25	S1 Open Control	Control the S1 switch to open.
26	S2 Close Control	Control the S2 switch to close.
27	S2 Open Control	Control the S2 switch to open.
28	Reserved	
29	Reserved	
30	NEL1 Trip Control	Control NEL unload when output is active; used to control NEL unload and return (on load) when output is inactive;
31	NEL2 Trip Control	
32	NEL3 Trip Control	
33	Reserved	
34	Reserved	
35	S1 Closed Status	The closed status of S1;
36	S2 Closed Status	The closed status of S2;
37	S1 Genset Start	Control S1 genset start

No.	Items	Description
38	S2 Genset Start	Control S2 genset start
39	ATS Power L1	Power supply for ATS.
40	ATS Power L2	
41	ATS Power L3	
42	ATS Power N	
43	Remote Control Output	Output via remote control port.
44	Input 1 Status	Programmable input status
45	Input 2 Status	
46	Input 3 Status	
47	Input 4 Status	
48	Load 1 Close	Load 1-4 close in order after S1 load supply or S2 load supply; After ATS open, load switch close outputs are all disconnected;
49	Load 2 Close	
50	Load 3 Close	
51	Load 4 Close	
52	Reserved	
53	Reserved	
54	S1 Blackout	S1 power status
55	S1 Over Volt	
56	S1 Under Volt	
57	S1 Over Freq	
58	S1 Under Freq	
59	S1 Loss Of Phase	
60	S1 Reverse Sequence	
61	Reserved	
62	Reserved	
63	S2 Blackout	S2 power status;
64	S2 Over Volt	
65	S2 Under Volt	
66	S2 Over Freq	
67	S2 Under Freq	
68	S2 Loss Of Phase	
69	S2 Reverse Sequence	
70	Reserved	
71	Reserved	
72	Sync Fail	Output when synchronization fails.
73	Sync Waiting	Output when waiting for synchronization.
74	Switching	Output in the process of switch transfer.
75	Battery Under Volt	Output at battery under voltage alarm.
76	Battery Over Volt	Output at battery over voltage alarm.
77	Gen Inhibit Work	Output in continuous time for scheduled not start.
78	Scheduler Gen Start	Output in continuous time for scheduled start.
79	Close Fault of Two Circuits at the same time	Output when the two circuits close at the same time.
80	Electrical Interlock Release	When parallel mode is active, the electrical interlock release

No.	Items	Description
		will output.
81	Unload Output	Unload outputs when mains is offload.
82	Reserved	

9 HISTORICAL RECORDS

In menu interface, select "2. Historical Records", press  key to enter historical record interface.

Enter historical record page, press  and  to check every record.

Action Event 010/200 Closing S2 S1 Blackout S2 Available 2024-06-07 09: 18: 26	Record type, serial No./total record number; Record event; S1 power status; S2 power status; Record date and time;
--	--

Press  to check the detailed information of current records.

Action Event 010/200 Closing S2 U1(LN) 0 0 0V U2(LN) 220 221 219V F1 0.00Hz F2 50.00Hz	Record type, serial No./total record number; Record event; S1 phase voltage; S1 phase voltage; S1 frequency, S2 frequency;
--	--

Press  and  to check the detailed information of current records. Press  or  key to exit current detailed information check.

Action Event 010/200 Closing S2 Amp 130 145 136A TkW 86 PF 1.00	Record type, serial No./total record number; Record event; Load current; Load active power and power factor;
--	---

10 BLACK BOX RECORDS

In main menu interface, select "3. Black Box Records", press  to enter black box records interface.

Enter black box record interface, press  and  to check every record; press  to return main menu interface.	
1: 2019-09-24 09: 25: 30 2: 2019-09-28 10: 07: 18 3: 2019-10-06 10: 13: 56 4: 2019-10-23 11: 45: 20	Record time of the first data; Record time of the second data; Record time of the third data; Record time of the four data;
Closing S2	Current selected event;
Press  to check one data of the current records; Press  and  to check every data of current records; Press  to return back to black box record interface.	
Closing S2 19-09-28 10: 07: 18 +10s	Record event; Record time (60 time points between 50s before record event and 10s after the event occur)
S1 Available U1(LN) 220 221 219V F1 50.00Hz	S1 power status; S1 phase voltage; S1 frequency;
Press  and  key to check S1 Voltage, S2 Voltage, Current and Power of current time point. Press  or  to exit the detailed data interface.	
Closing S2 19-09-28 10: 07: 18 +10s	Record event; Record time point;
S1 Available U1(LN) 220 221 219V F1 50.00Hz	S1 power status; S1 phase voltage; S1 frequency;
Closing S2 19-09-28 10: 07: 18 +10s	Record event; Record time point;
S2 Available U2(LN) 220 221 219V F2 50.00Hz	S2 power status; S2 phase voltage; S2 frequency;
Closing S2 19-09-28 10: 07: 18 +10s	Record event; Record time point;
Amp 130 145 136A	Load current;

TkW	86	PF	1.00	Load active power and power factor;
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Black box records max. 5 items. Every event records the status information during the 60s before and after the event occur. It records once per second. When record items is up to 5, new item will cover the newest record. The first item is the newest. Users can check each record by Confirm key and check the 60 detailed data status in each item by Up and Down key.

Record type: Action events during the close and open transfer in Auto mode.

Table 19 Action Events are Ones at Below Time

No.	Action Event	Description
1	Opening	Opening in Auto mode.
2	Closing S1	S1 close in Auto mode.
3	Closing S2	S2 close in Auto mode.

11 HARMONIC ANALYSIS

Controller has harmonic analysis function for voltage and current, which can monitor harmonic distortion rate and 3-21 times harmonic component of voltage/current of all phases.

In main menu interface, select "4. Harmonic Analysis", and press  key to enter harmonic analysis interface.

Enter harmonic analysis page, press  and  key to select the voltage needed to analyze; press  to return main menu screen.			
>U1 Volt. Harmonic	Harmonic analysis of S1 power 3 phases;		
>U2 Volt. Harmonic	Harmonic analysis of S2 power 3 phases;		
>Current Harmonic	Harmonic analysis of load 3 phase current;		
Press  to check harmonic analysis data of current phase; press  and  to check data of next phase; press  to return the previous menu.			
THDu-U1-A	0%	Harmonic distortion rate of U1 A phase voltage;	
3-7	0	0	0%
3-7 times harmonic display of U1 A phase voltage;			
9-13	0	0	0%
9-13 times harmonic display of U1 A phase voltage;			
15-19	0	0	0%
15-19 times harmonic display of U1 A phase voltage;			
21	0 %	21 times harmonic display of U1 A phase voltage;	

12 AUTO RESTORE SETTING

In menu page, select "6 Auto Restore Time Set", press  to enter the setting interface.

When auto trans./auto restore and the voltage of main power is normal:
 Auto restore delay is due, the current time is greater than or equal to the start time but less than the stop time, the process of auto restore is performed.
 Auto restore delay is due, the auto restore process is performed when start time and stop time are equal.

Waiting Time	00000min	Auto restore delay time (min): (0-30000) min
Start Time	00:00(h:m)	Start time (h): 0~23h, min: 0~59m
Stop Time	00:00(h:m)	Stop time (h): 0~23h, min: 0~59m

13 SWITCH OPERATION

Press  key, and manual status indicator is illuminated. Controller is in manual mode.

Table 20 Manual Transfer Key

Icon	Keys	Description
	S1 Close Key	Press and if load is disconnected, then S1 closes and load is supplied by S1.
	S2 Close Key	Press and if load is disconnected, then S2 closes and load is supplied by S2.
	Open Key	Press and load is disconnected.

13.1 AUTOMATIC OPERATION RUNNING

Press  key, and auto mode indicator is light on and the controller is in the auto mode.

In auto mode, the controller will switch automatically to ensure power supply for loading according to S1&S2 status, switch priority and Auto Trans./Restore status. The following illustrates the control logics by the example of "S1 Master", "S1 Mains S2 Gen".

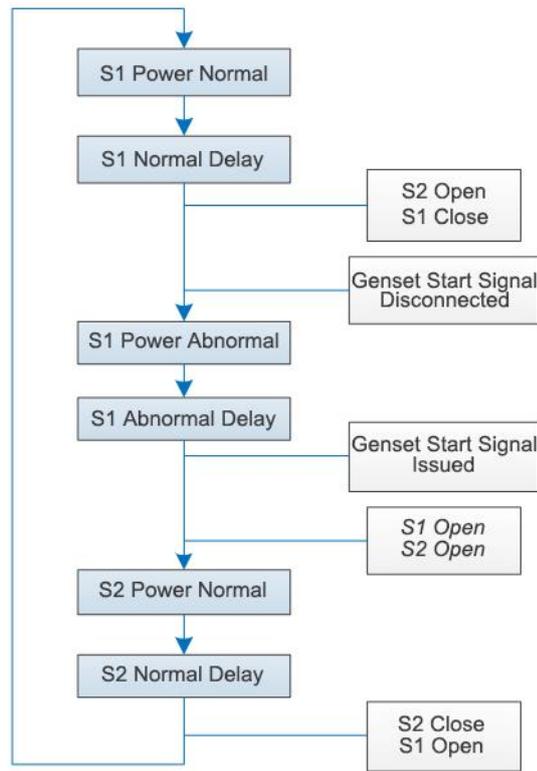


Fig. 2 Auto Trans./Restore Diagram

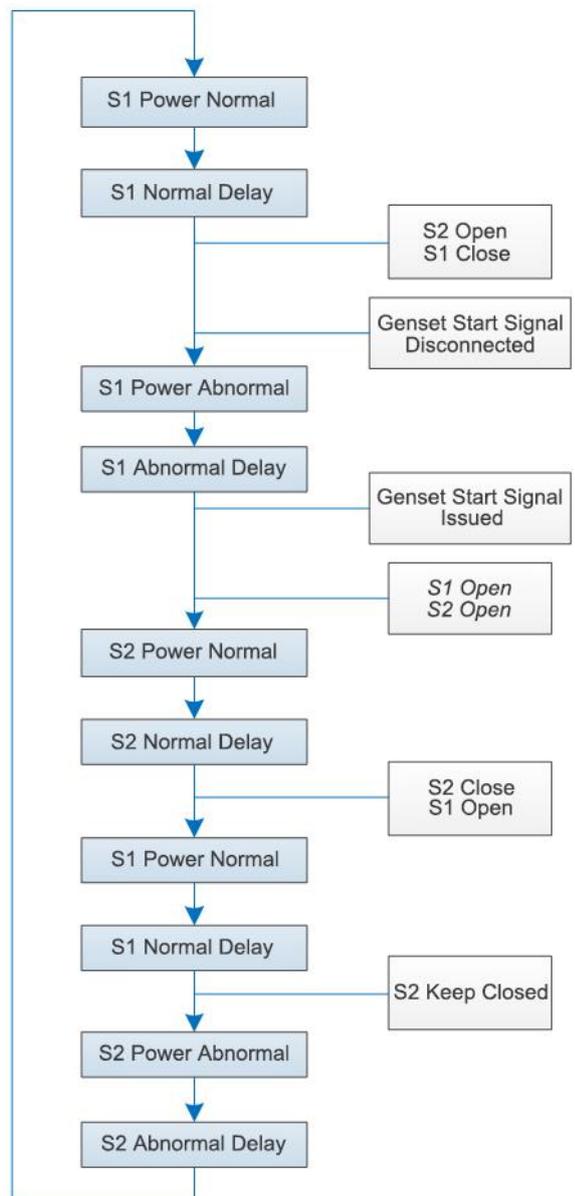


Fig. 3 Auto Transfer Non Restore Diagram (Mutual Backup Active)

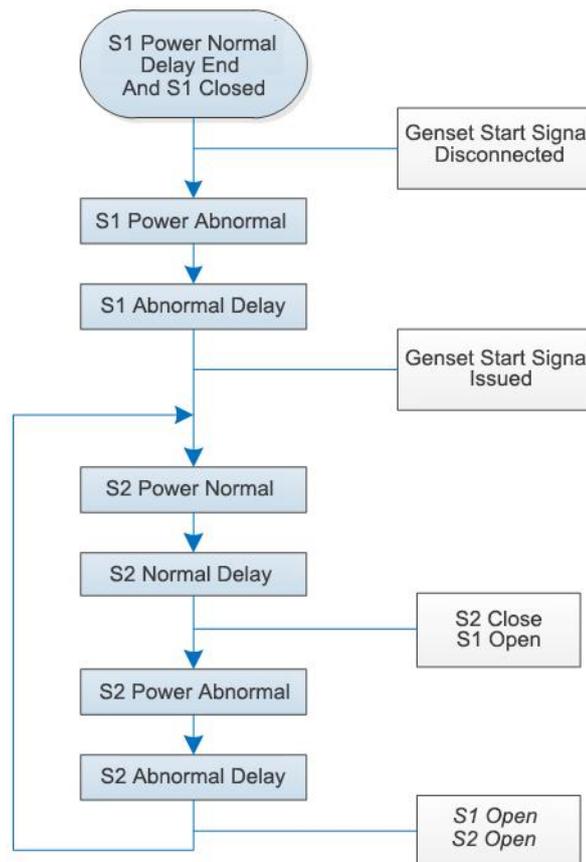


Fig. 4 Auto Transfer Non Restore Diagram (Mutual Backup Inactive)

NOTE: Master power (S1) close needs to transfer to manual mode by close operation key, otherwise, in auto mode switch only transfers at the position of open and backup power (S2).

13.2 SYNCHRONIZING CLOSE

Synchronizing close is transferring current power side to the other power supply under normal condition of both S1 and S2. During this process synchronizing transfer is needed.

Parallel Mode: When select parallel mode and the corresponding functions of input port, sync close function is active, when select non-parallel mode, sync. close function cannot be executed.

Sync. Volt Difference: Maximum volt difference between S1 and S2 at synchronization; if it is enabled, volt difference won't be detected in synchronizing process.

Sync. Freq. Difference: Maximum frequency difference between S1 and S2 at synchronization.

Sync. Phase Difference: Maximum phase difference between S1 and S2 at synchronization. Usually phase difference shall not be set too big. Otherwise, load impact will be too big at closing.

Fail To Sync Action: Warning alarm or fault alarm can be set; after sync failure, it continues waiting for sync until sync close is finished. For warning alarm when sync is completed or it exits from sync, alarm shall be cleared; for fault alarm, it needs alarm reset key to clear the alarm.

Transfer On Sync Fail: When this is enabled, after sync fails, non sync close will be conducted and no sync failure alarm shall be issued.

Fail To Sync Delay: Waiting time for sync; it shall issue sync failure alarm when it is overtime.

Breaker Feedback Time: Pulse time for synchronizing close; at the time of synchronizing transfer, sync close/open output delay starts; in the delay process if correct close status is detected, then stop the close/open pulse output; if after delay is over, correct close status still cannot be detected, close/open failure alarm shall be initiated.

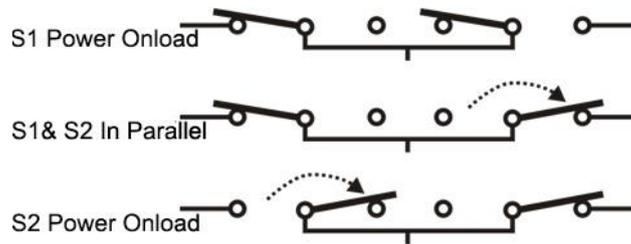


Fig. 5 Sync Transfer Diagram

13.2.1 S1 SYNC CLOSE

S1&S2 power voltages are normal. S2 is onload, and S1 close pulse outputs. Until S1 close status is detected or delay is up to sync close/open detection time, disconnect S1 close pulse output. At the same time S2 open pulse outputs; until S2 open status is detected or delay is over sync close/open detection time, disconnect S2 open pulse outputs. In synchronizing process if close/open time is over sync close/open detection time, then close/open failure alarm is initiated.

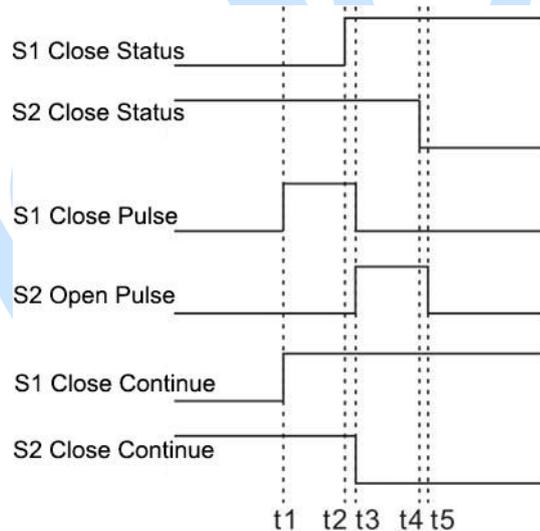


Fig.6 S1 Sync Close Procedure Oscillogram

13.2.2 S2 SYNC CLOSE

S1&S2 power voltages are normal. S1 is on load, and S2 close pulse outputs. Until S2 close status is detected or delay is up to sync close/open detection time, disconnect S2 close pulse output. At the same time S1 open pulse outputs; until S1 is opened or delay is over sync close/open detection time, disconnect S1 open pulse outputs. In synchronizing process if close/open time is over sync close/open detection time, then close/open failure alarm is initiated.

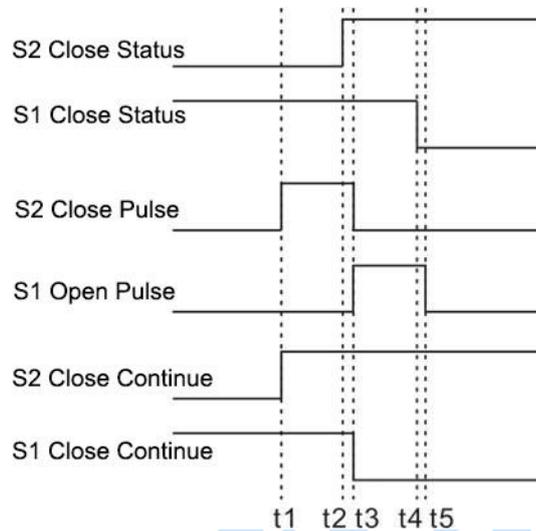


Fig.7 S2 Sync Close Procedure Oscillogram

13.2.3 MANUAL SYNC CLOSE

When it is manual mode, and S1&S2 power are normal, if S1 is closed, press S2  key and S2 closes synchronously. If S2 is closed, press S1  key, and S1 closes synchronously. In the process of waiting for sync, press close key again and sync close is stopped. If sync waiting is overtime, sync failure warning alarm is initiated; but it will continue waiting to sync, until sync is completed, or cancel sync close by pressing close key.

13.2.4 AUTO SYNC CLOSE

When it is auto mode and backup power is normal and backup is closed, master will sync close if master power recovers.

NOTE:

Controller is in auto mode, if failed to close or close inhibit occur in transferring process, corresponding switch won't execute close action, but execute other switch that can control close to supply for load. If failed to open occurs, switch won't execute action.



HAZARD:

When controller is in auto mode, direct switch operation is inhibited!

13.3 LOCAL MODE RUNNING

The local mode is controlled by the programmable input port (external knob). When the local mode is active, the controller only displays “not control”, the output port of electrical interlock release will not output, electrical interlock is active (Parallel Inhibit).

14 ATS SUPPLY POWER

14.1 DC SUPPLY

Configure switch power supply to DC supply. When switch is DC supply, it is considered that switch can be transferred at any time, including the time of S1/S2 power off.

14.2 AC SUPPLY

If AC supply is used, ATS power is supplied by controller smartly. If there is only one voltage normal, it can ensure ATS power supply normal and make it normally transfer.

Please confirm the following parameters when AC supply is used:

- Switch supply type is AC supply;
- The upper and lower thresholds of AC supply voltage meet requirements;
- ATS supply power of output port setting is phase voltage or line voltage.

For example: taking ATS power supply as phase voltage (A-N):

Set AC supply rated voltage to 220V, and set AC supply voltage lower limit to 70% rated, upper limit to 130% rated. Set configurable output 1 to "ATS power L1", and set configurable output 2 to "ATS power N".

Connect phase voltage L1 of S1 and S2 to N/C terminal 15 and N/O terminal 17 of configurable output 1, connect phase N of S1 and S2 to N/C terminal 20 and N/O terminal 18 of configurable output 2, and then connect COM of output 1 and output 2 to ATS supply power. Connecting method is as below:

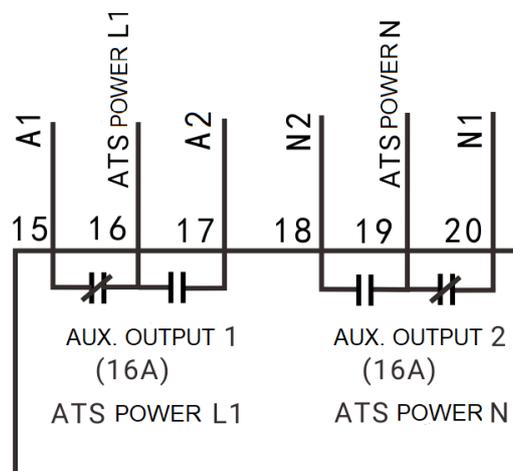


Fig.8 ATS Power Phase Voltage Supply

When ATS power is line voltage supply, the setting method is as above. The only thing needs to do is change N phase to line voltage. Change configurable output 2 based on the setting. Reset upper and lower limits of AC supply voltage based on rated voltage. Connecting method is as below:

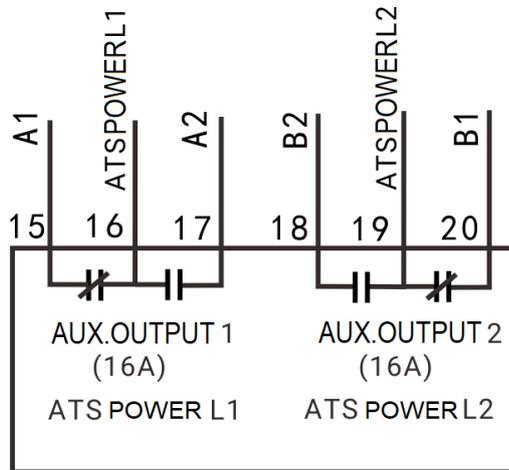


Fig.9 ATS Power Line Voltage Supply

NOTE 1: N/C terminal voltage must be S1 voltage.

NOTE 2: Only when controller detects ATS power normal, can it issue switch close/open actions. If output port is not set for ATS power, system default is to make L1-N supply for ATS power.

15 NEL CONTROL

15.1 ILLUSTRATION

Non-essential Load is NEL for short, which refers to the load that can be unloaded first when genset power is not enough.

Controller can control 3 ways of NEL trip and the essentiality is: NEL 3>NEL 2>NEL 1.

15.2 AUTOMATIC OPERATION

When NEL auto trip is enabled: If genset power has exceeded NEL trip value, after trip delay NEL1 will trip for the earliest, and next is NEL2, NEL3;

When NEL auto reconnection is enabled: If genset power has fallen below the auto reconnection set value, after the auto reconnection delay NEL3 will be reconnected for the earliest, and next is NEL2, NEL1;

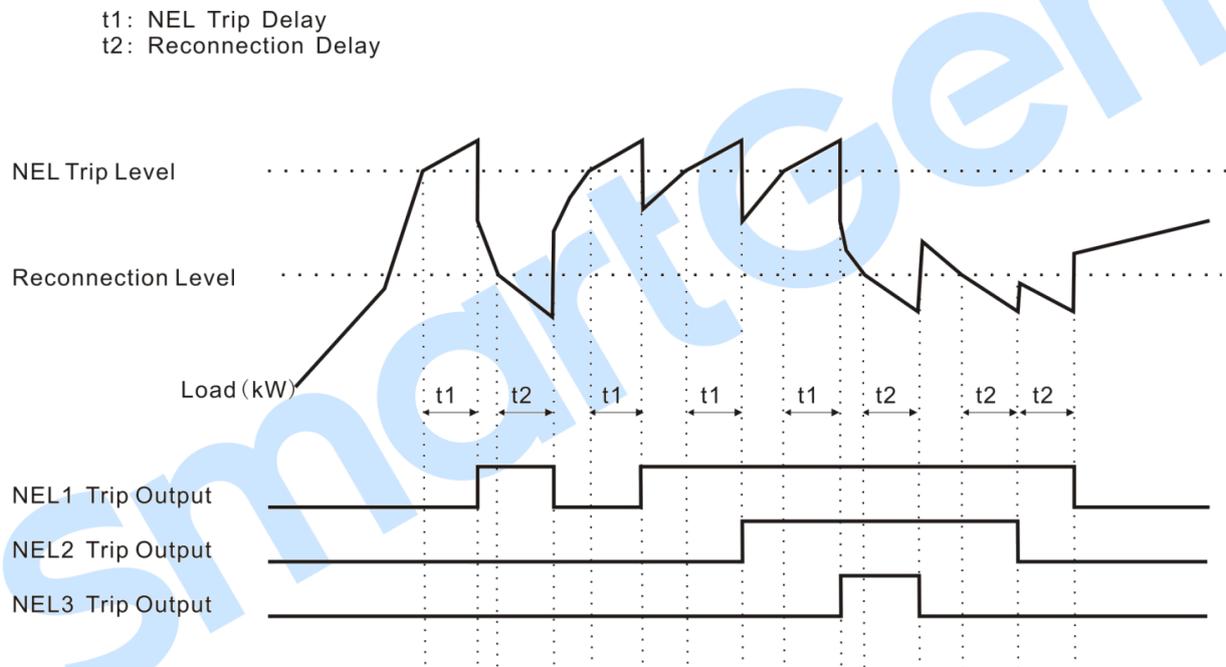


Fig.10 NEL Control Time Sequence

15.3 MANUAL OPERATION

If NEL manual trip input is active (falling edge is active), NEL1 will trip without delay; If NEL manual trip input is active again, NEL2 will trip; If NEL manual trip input is active for the third time, NEL3 will trip. During this process, the controller does not detect if the genset power has exceeded the NEL trip value or not.

If NEL manual reconnection input is active (falling edge is active), NEL3 will be reconnected without delay; If NEL manual reconnection input is active again, NEL2 will reconnect; If NEL manual reconnection input is active for the third time, NEL1 will reconnect. During this process, the controller detects the genset power: if the genset power has fallen below the NEL reconnection value, then the input is active; if it doesn't, the input is deactivated.

NOTE: When auto trip and auto reconnection are enabled, manual trip is still active.

16 COMMUNICATION CONFIGURATION AND CONNECTION

16.1 ILLUSTRATION

HAT9420LT ATS controller has two RS485 communication ports, USB communication port, ETHERNET communication port. Both the RS485 and ETHERNET communication ports support connectivity to open-structured local area networks. Utilizing the Modbus communication protocol across both interfaces, this system enables a simple and practical management solution for dual-power transfer in factories, telecommunications facilities, industrial plants, and civil buildings. Through PC-based or data acquisition software, it achieves comprehensive three-remote functions (“remote control, remote measurement and remote communication”) for dual-power supply monitoring.

16.2 RS485 COMMUNICATION PORT

Communication Protocol: Modbus-RTU

Communication Parameters,

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

16.3 USB COMMUNICATION PORT

D form USB communication port can be used to connect PC test software to configure parameters.

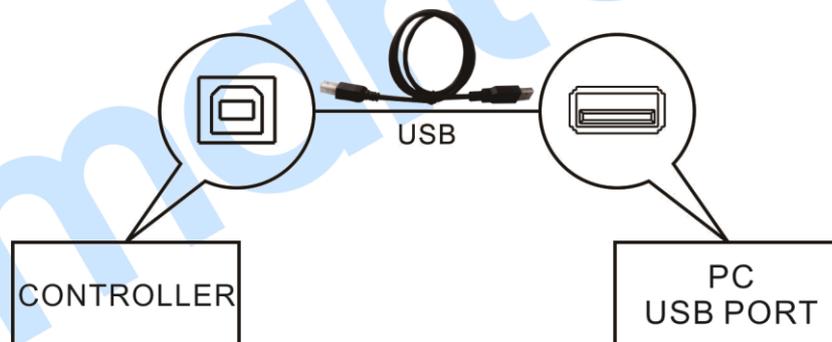


Fig.11 USB Connection

16.4 ETHERNET COMMUNICATION PORT

Communication protocol: Modbus TCP/IP

Self-adaptable 10/100Mbps working mode, not supportive of autopolarity inversion function. Users need to use direct connecting wire to connect with converter or router, use cross wire to connect with terminal device (e.g. PC). If the device connecting with controller has autopolarity inversion function, then users can use any wire to connect with the device.

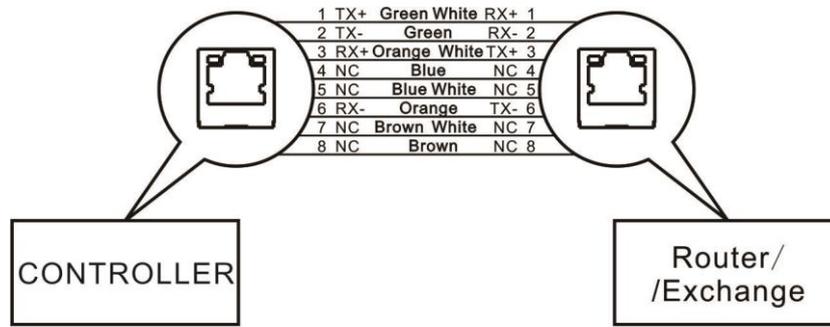


Fig.12 Direct Connection Between Controller and Router

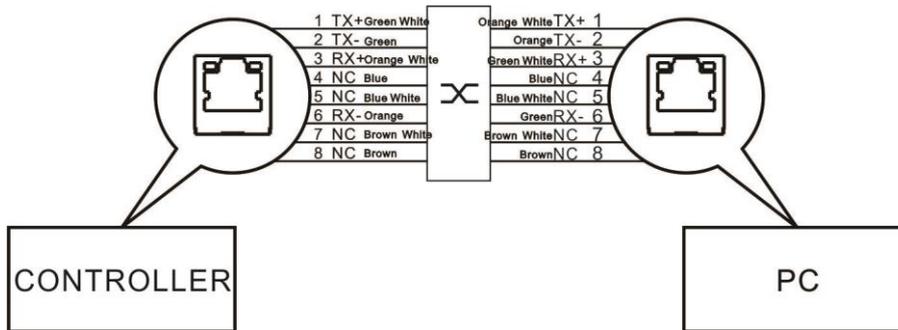


Fig.13 Cross Connection Between Controller and PC

NOTE: Generally direct wiring is enough to connect controller and PC.

17 TERMINAL DESCRIPTION

17.1 TERMINAL DESCRIPTION

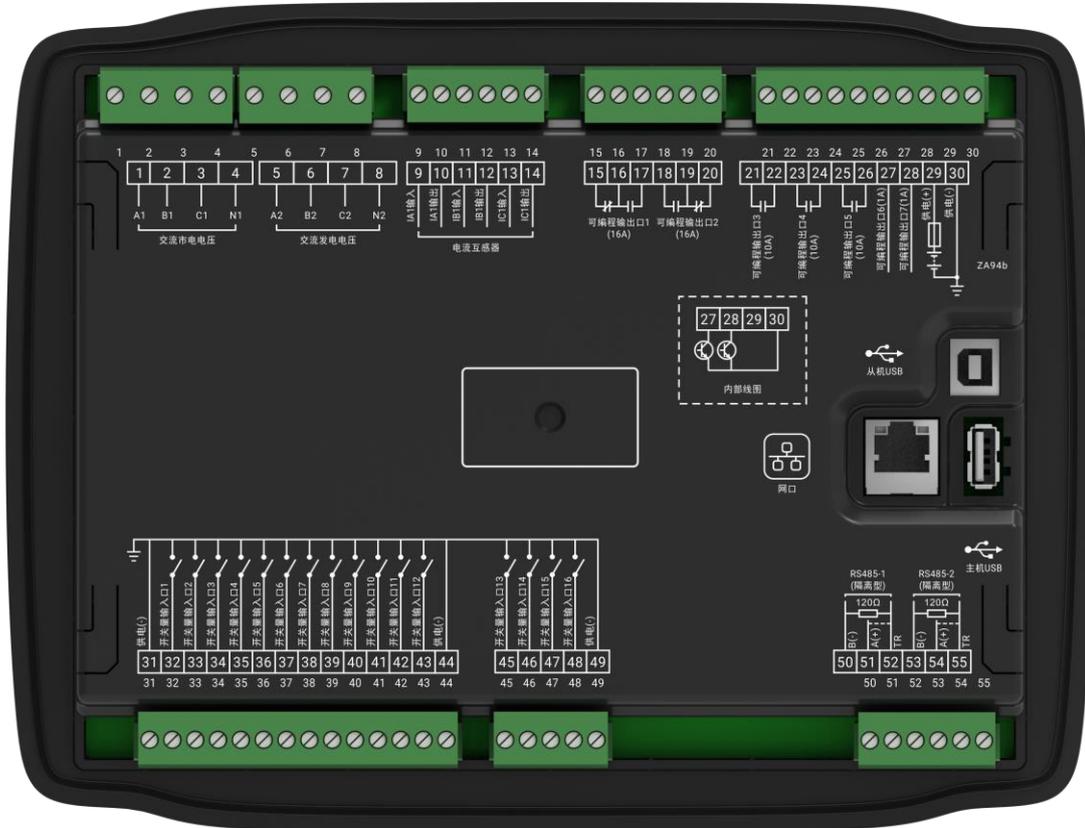


Fig.14 Controller Back Panel

Table 21 Terminal Description

No.	Item	Description		Remark
1	A1	S1 AC 3-phase 4 wire voltage input		For single phase, only connect A1, N1
2	B1			
3	C1			
4	N1			
5	A2	S2 AC 3-phase 4 wire voltage input		For single phase, only connect A2, N2
6	B2			
7	C2			
8	N2			
9	IA Input	Input of CT Secondary phase A current		Rated current 5A
10	IA Output			
11	IB Input			
12	IB Output			
13	IC Input	Input of CT Secondary phase C current		
14	IC Output			
15	Aux. output 1	N/C	Default: power of ATS of L1	Volt-free relay contact output: capacity 16A 250VAC
16		Common		

No.	Item	Description		Remark
17		N/O	output.	
18	Aux. output 2	N/C	Default: ATS power of N output.	Volt-free relay contact output: capacity 16A 250VAC
19		Common		
20		N/O		
21	Aux. output 3	Default: S1 close control		Volt-free relay contact output: capacity 10A 250VAC
22				
23	Aux. output 4	Default: S1 open control		Volt-free relay contact output: capacity 10A 250VAC
24				
25	Aux. output 5	Default: S2 close control		Volt-free relay contact output: capacity 10A 250VAC
26				
27	Aux. output 6	Default: common alarm output		DC30V supply (negative) output (transistor), rated 1A
28	Aux. output 7	Default: S2 genset start output		DC30V supply (negative) output (transistor), rated 1A
29	Power Supply (+)	Connect start battery positive when starting the genset		DC positive input (8~35)V, controller power
30	Power Supply (-)	Connect genset start battery negative		Module GND connected terminal
31	Power Supply (-)			
32	Digital Input 1	User defined	Default: S1 closed signal input Power supply (-) connected is active	
33	Digital Input 2		Default: S2 closed signal input Power supply (-) connected is active	
34	Digital Input 3		Default: remote start on load Power supply (-) connected is active	
35	Digital Input 4		Default: remote start off load Power supply (-) connected is active	
36	Digital Input 5		Default: local mode Power supply (-) connected is active	
37	Digital Input 6		Default: S1 close key input Power supply (-) connected is active	
38	Digital Input 7		Default: S2 close key input Power supply (-) connected is active	
39	Digital Input 8		Default: forced open Power supply (-) connected is active	
40	Digital Input 9		Default: switch tripping input Power supply (-) connected is active	
41	Digital Input 10		Default: open key input Power supply (-) connected is active	
42	Digital Input 11		Default: alarm reset Power supply (-) connected is active	
43	Digital Input 12		Default: alarm mute Power supply (-) connected is active	
44	Power supply (-)			

No.	Item	Description	Remark
45	Digital Input 13	User defined	Default: forced manual mode Power supply (-) connected is active
46	Digital Input 14		Default: forced auto mode Power supply (-) connected is active
47	Digital Input 15		Default: reserved Power supply (-) connected is active
48	Digital Input 16		Default: synchronous transfer disabled Power supply (-) connected is active
49	Power supply (-)		
50	RS485-1 B-	RS485 communication port	
51	RS485-1 A+		
52	120Ω Resistor	RS485 Impedance matching resistance	Users need to connect this terminal with terminal 51 based on the on-site situation to connect this 120Ω resistor into the controller.
53	RS485-2 B-	RS485 communication port	
54	RS485-2 A+		
55	120Ω Resistor	RS485 Impedance matching resistance	Users need to connect this terminal with terminal 54 based on the on-site situation to connect this 120Ω resistor into the controller.
56	USB Slave	D form USB communication port	Connect PC to configure the parameters
57	Ethernet port	Used for communication	
58	USB Master	Used to upgrade programs	

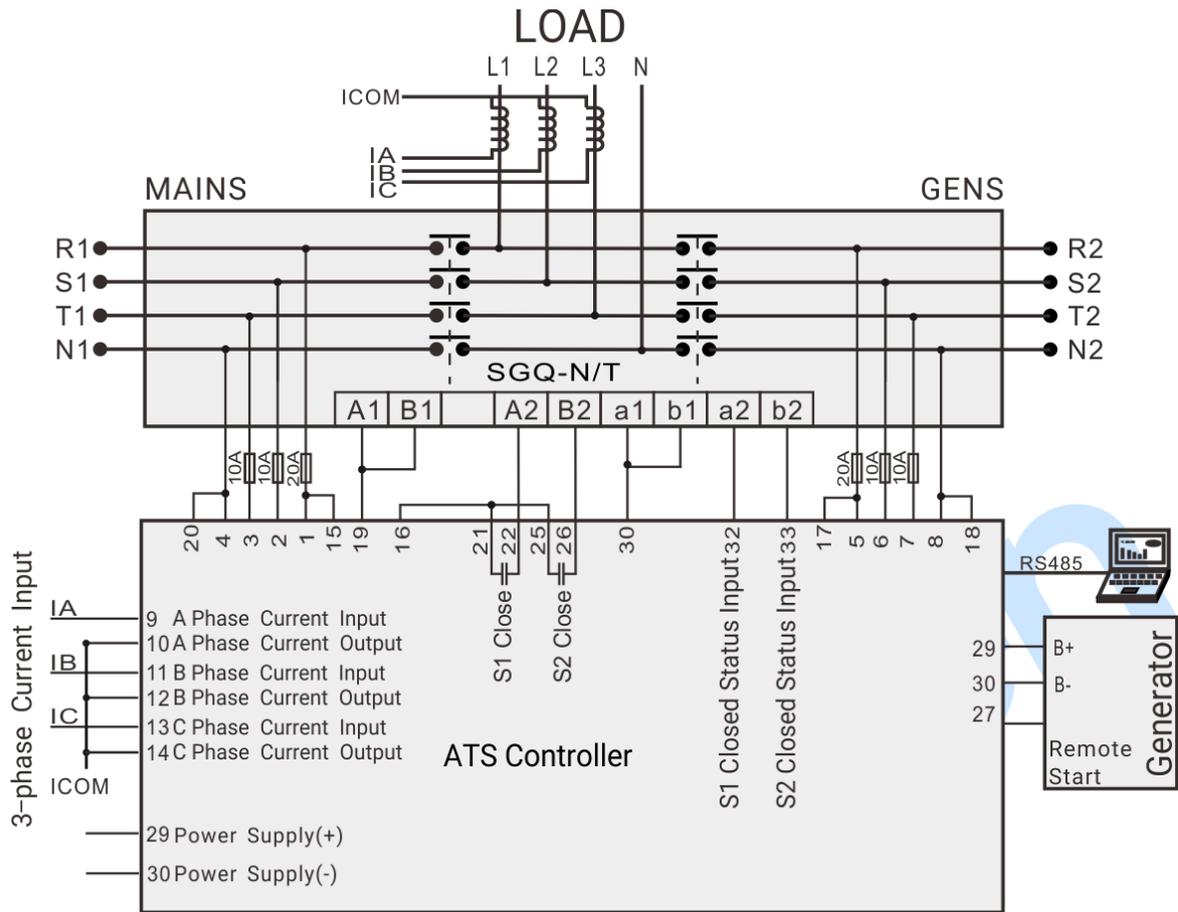


Fig.15 SGQ-N/T Typical Application Diagram

Table 22 Related Settings

Part of Parameter Settings	
Switch Type Setting	PC two-stage
Aux. Output 1	ATS Power L
Aux. Output 2	ATS Power N
Aux. Output 3	S1 Switch Close Control
Aux. Output 5	S2 Switch Close Control
Aux. Output 6	Genset Start
Aux. Input 1	S1 Closed Signal Input
Aux. Input 2	S2 Closed Signal Input

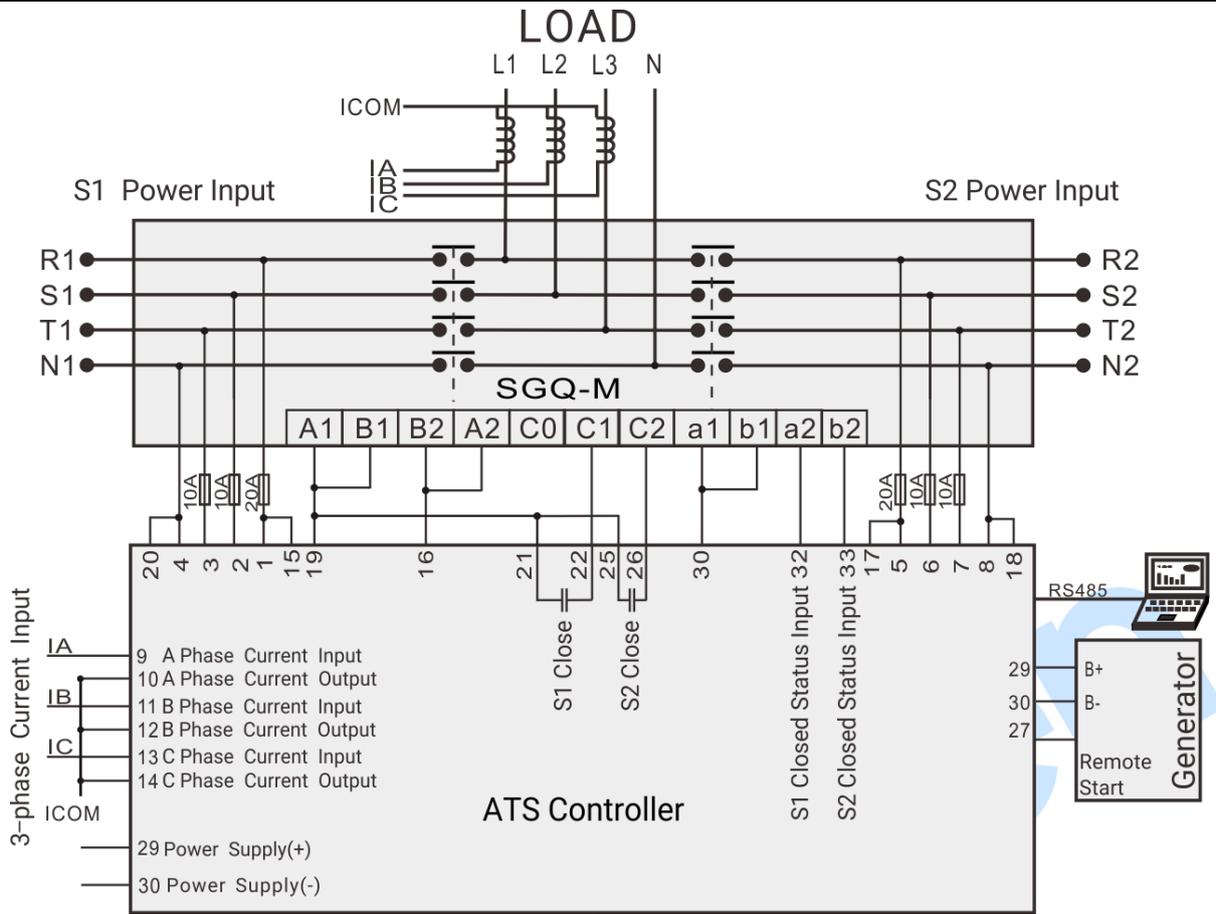


Fig.16 SGQ-M Typical Application Diagram

Table 23 Related Settings

Part of Parameter Settings	
Switch Type Setting	PC two-stage
Aux. Output 1	ATS Power L
Aux. Output 2	ATS Power N
Aux. Output 3	S1 Switch Close Control
Aux. Output 5	S2 Switch Close Control
Aux. Output 6	Genset Start
Aux. Input 1	S1 Closed Signal Input
Aux. Input 2	S2 Closed Signal Input

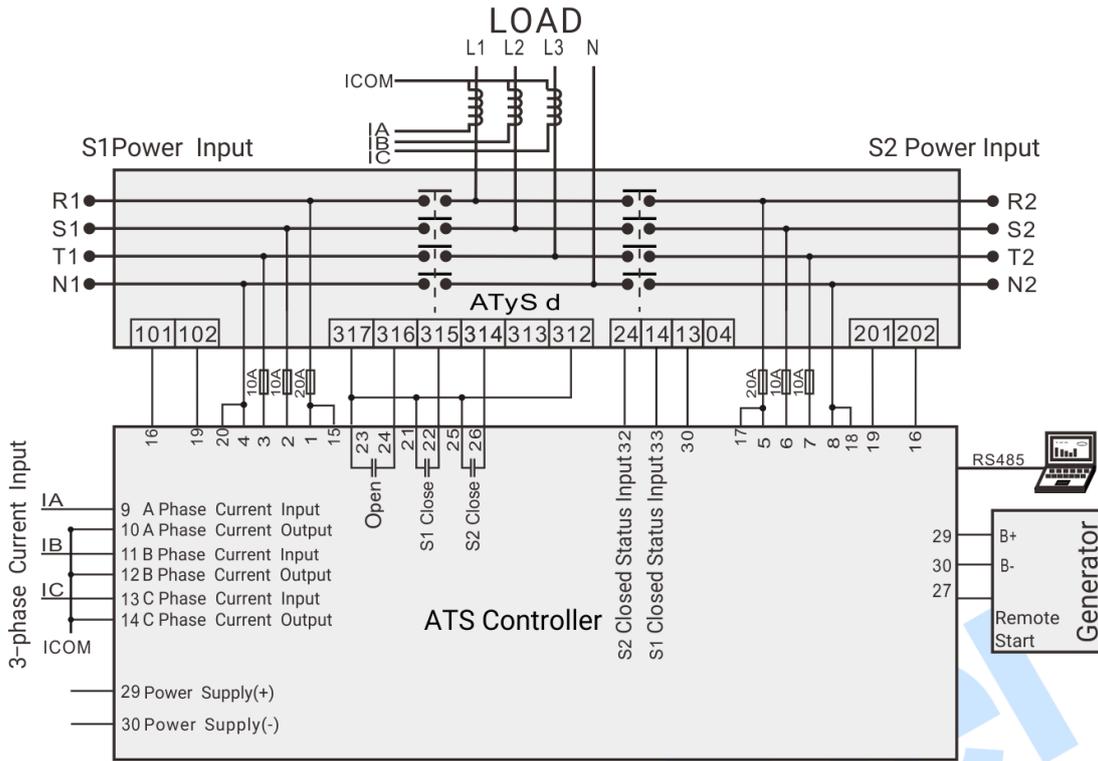


Fig.17 AtyS d Typical Application Diagram

Table 24 Related Settings

Part of Parameter Settings	
Switch Type Setting	PC three-stage
Aux. Output 1	ATS Power L
Aux. Output 2	ATS Power N
Aux. Output 3	S1 Switch Close Control
Aux. Output 4	S1 Switch Open Control
Aux. Output 5	S2 Switch Close Control
Aux. Output 6	Genset Start
Aux. Input 1	S1 Closed Signal Input
Aux. Input 2	S2 Closed Signal Input

The controller is panel installation designed and needs to be fixed by clips.

Unit: mm

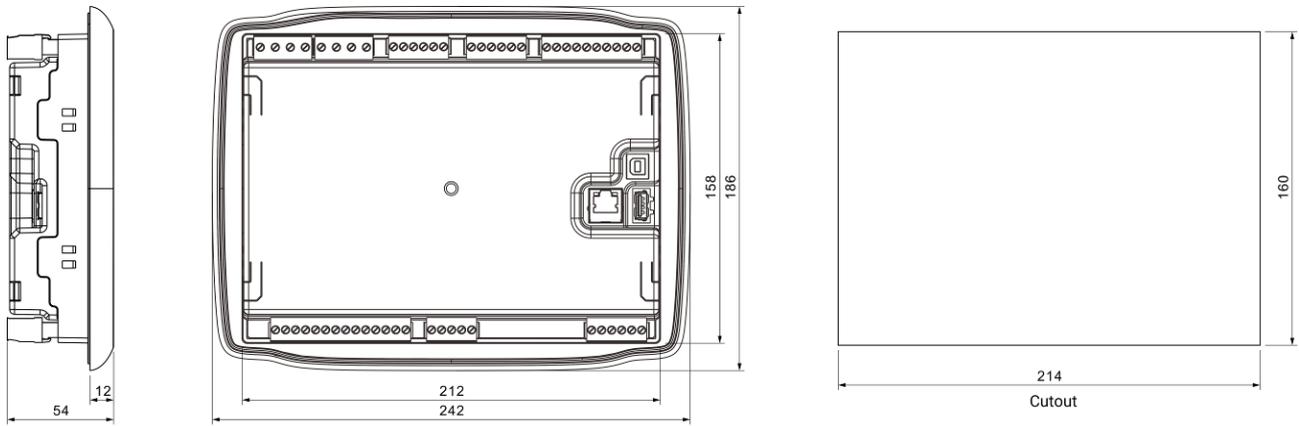


Fig. 18 Case Dimensions and Cutout

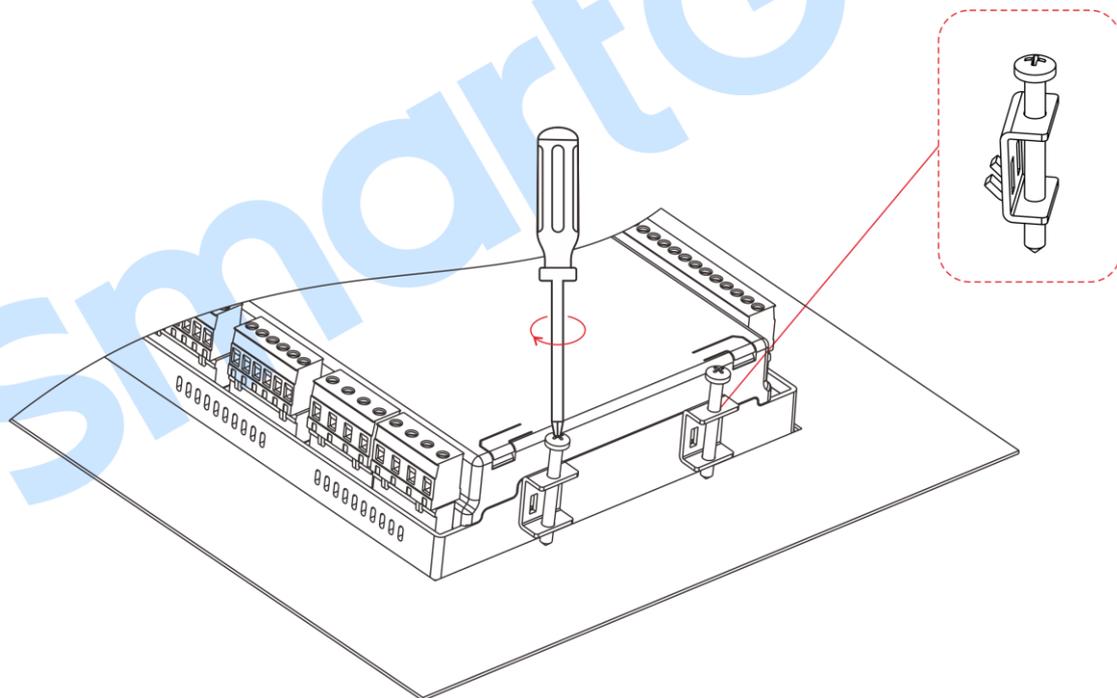


Fig. 19 Clips Installation Illustration

Table 25 Fault Finding

Fault Symptom	Possible Solutions
Controller no response	Check DC supply voltage; Check DC fuse.
RS485 communication failure	Check whether the RS485 is wrong connected between negative and positive. Check whether the RS485 adapter is abnormal. Check whether the parameter settings in the module addresses are incorrect. Check whether the matching resistance of the RS485 is correct.
ETHERNET communication failure	Check network communication is enabled or not; Check whether controller IP address, Gateway, Port Number etc. are correctly set; Check whether network wires are correctly connected;
Programmable output error	Check programmable output connections, pay attention to Normally opened and closed; Check the output parameters settings and output types;
Programmable input abnormal	Check whether the input ports are GND connected when they are active; Ensure they are hung up when they are inactive; (NOTE: The input will be possibly destroyed when connected with over high voltage.) Check the input function settings and input active types in the parameter settings;
ATS transfer abnormal	Check ATS; Check the connection wire between controller and switch; Check whether switch type setting is in accordance with switch; Check ATS power settings and connection wires;
Genset start control abnormal	Check system type settings; Check output function settings and output types; Check start/stop function settings of all items.