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1. Description

GU321A is a Genset intelligent controller, which has ATS auto transfer control function. It adopts high performance computer chip, can modify the control procedure and protection parameters of Genset, which incorporated numerous functions, such as measure, control, protection, three remote, and programmable management. It fully meets the auto control requirements of different kinds of Genset for generator user or special assembly factory.

The controller measures and displays the input voltage parameter both for generator and Mains, and all output electric parameters for load, and rpm, oil pressure, coolant temperature, DC source voltage and running hours for engine, and the voltage and current adopted true RMS measure to ensure data accuracy.

Optional Chinese and English menu, large LCD display.

Optional kinds of preset P/T-sensor, parameters can be configured by corresponding software.

Buttons on control panel are used for selecting control modes, starting the running procedure, displaying data, and modifying the parameters of running and protection. LED indicators are used for indicating the operation mode of controller and the running status of Genset, and LCD displays each measuring parameter and status.

Optional communication interface of RS485 or RS232, realizing long distance monitor, or communication with PC, fully realizing functions of remote signaling, telemetering and remote control, can read and set the running parameters of controller.

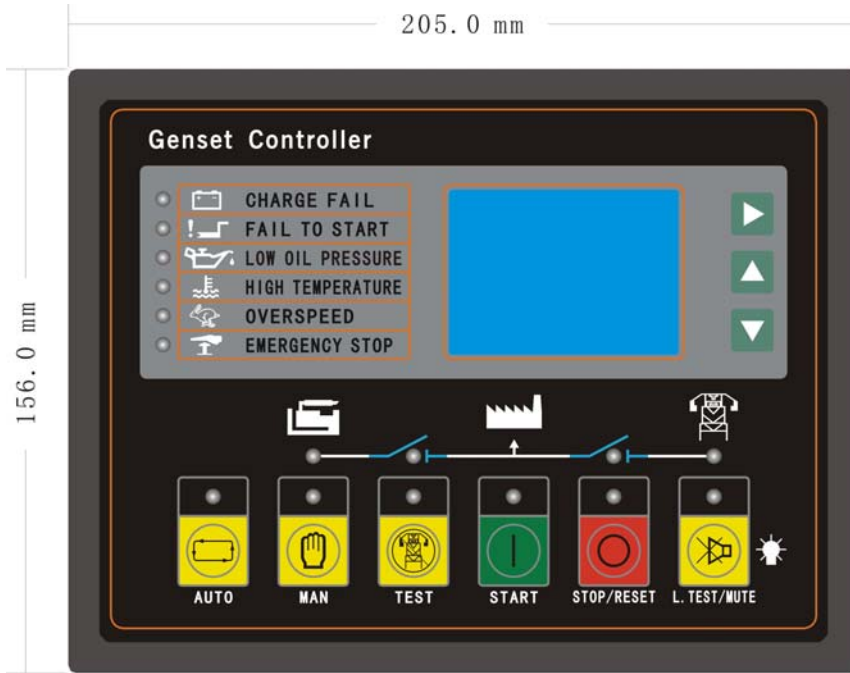
The controller is closely combined by panel and powder coated steel enclosure, and the panel is die-casting by flame-retarded and high strength plastic. All connections of controller are connected by pin-like and locked up terminal, easier and more convenient to connect, move, maintain and replace the device.

This manual only suitable for GU321A generator intelligent controller, user must carefully see this manual first.

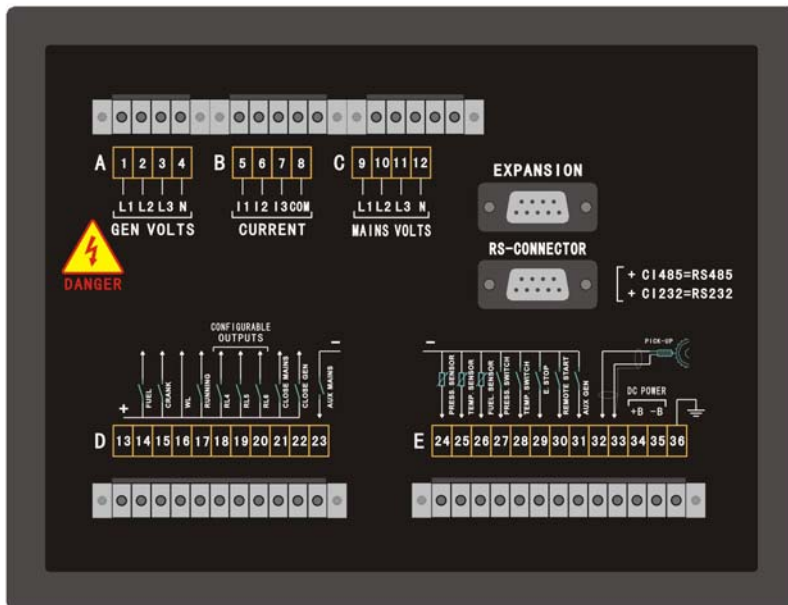
2. The Outline Dimensional Drawings and wirings of Controller

2.1 Following Details:

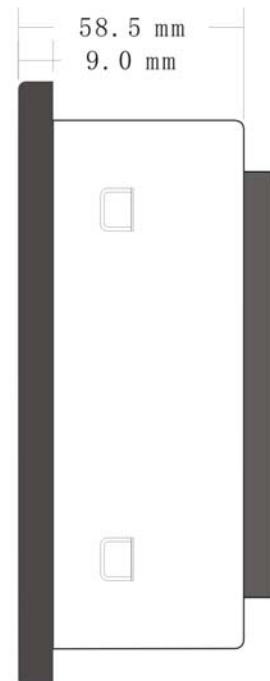
Operation Panel	W205mm×H156mm
Install Hatch	W186mm×H137mm
Thickness	D68mm (unconnected)



Front view



Back view



Side view

NOTE: the controller enclosure must be grounded; well low impedance grounded can reduce the impact from the processes of surge and transient of the electric power system to the meter.

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2.2 Connecting Terminals:

Pin No.	Function Description	Signal	Dim
A1	Gen. A phase voltage input	0-300VAC	1mm ²
A2	Gen. B phase voltage input	0-300VAC	1mm ²
A3	Gen. C phase voltage input	0-300VAC	1mm ²
A4	Gen. Neutral		1mm ²
B5	A phase current input {S1}	0-5A(AC)	1mm ²
B6	B phase current input {S1}	0-5A(AC)	1mm ²
B7	C phase current input {S1}	0-5A(AC)	1mm ²
B8	Current input com. port {S2}	0-5A(AC)	1mm ²
C9	Mains A phase voltage input	0-300VAC	1mm ²
C10	Mains B phase voltage input	0-300VAC	1mm ²
C11	Mains C phase voltage input	0-300VAC	1mm ²
C12	Mains Neutral		1mm ²
D13	Relay output com. port		1mm ²
D14	Fuel solenoid relay output	N.O. dry contact, 3A/30VDC	1mm ²
D15	Start (Crank) relay output	N.O. dry contact, 3A/30VDC	1mm ²
D16	Charger excitation source output	If not use, do not connect to cathode	1mm ²
D17	Genset running output	N.O. dry contact, 3A/30VDC	1mm ²
D18	Configurable output relay 1	N.O. dry contact, 3A/30VDC	1mm ²
D19	Configurable output relay 2	N.O. dry contact, 3A/30VDC	1mm ²
D20	Configurable output relay 3	N.O. dry contact, 3A/30VDC	1mm ²
D21	Gen. close/open relay output	N.O. dry contact, 3A/30VDC	1mm ²
D22	Mains close/open relay output	N.O. dry contact, 3A/30VDC	1mm ²
D23	Mains close auxiliary input	low potential is active	1mm ²
E24	Oil pressure detect	P-sensor (<2KΩ)	1mm ²
E25	Coolant temp detect	T-sensor (<2KΩ)	1mm ²
E26	Fuel level detect	fuel sensor (<2KΩ)	1mm ²

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E27	Oil pressure digital signal	Low potential is active	1mm ²
E28	Temperature digital signal	low potential is active	1mm ²
E29	E-stop signal	low potential is active	1mm ²
E30	Start {external control} signal	low potential is active	1mm ²
E31	Gen. close auxiliary input	low potential is active	1mm ²
E32	Magnetic sensor signal {+}	1-70Vac internal connect to DC source cathode	2 core shield line
E33	Magnetic sensor signal {-}		
E34	Working power source {+}	12V/24V (8-35VDC continuous)	1mm ²
E35	Working power source {-}		1mm ²
E36	Ground		2.5mm ²

NOTE: Pin No. E26 is Fuel for measurement input, the measurable signal is 0-5VDC or 0-20mA or resistance signal. Resistance signal is preset, if requires change please propose in advance for hardware change.

NOTE:



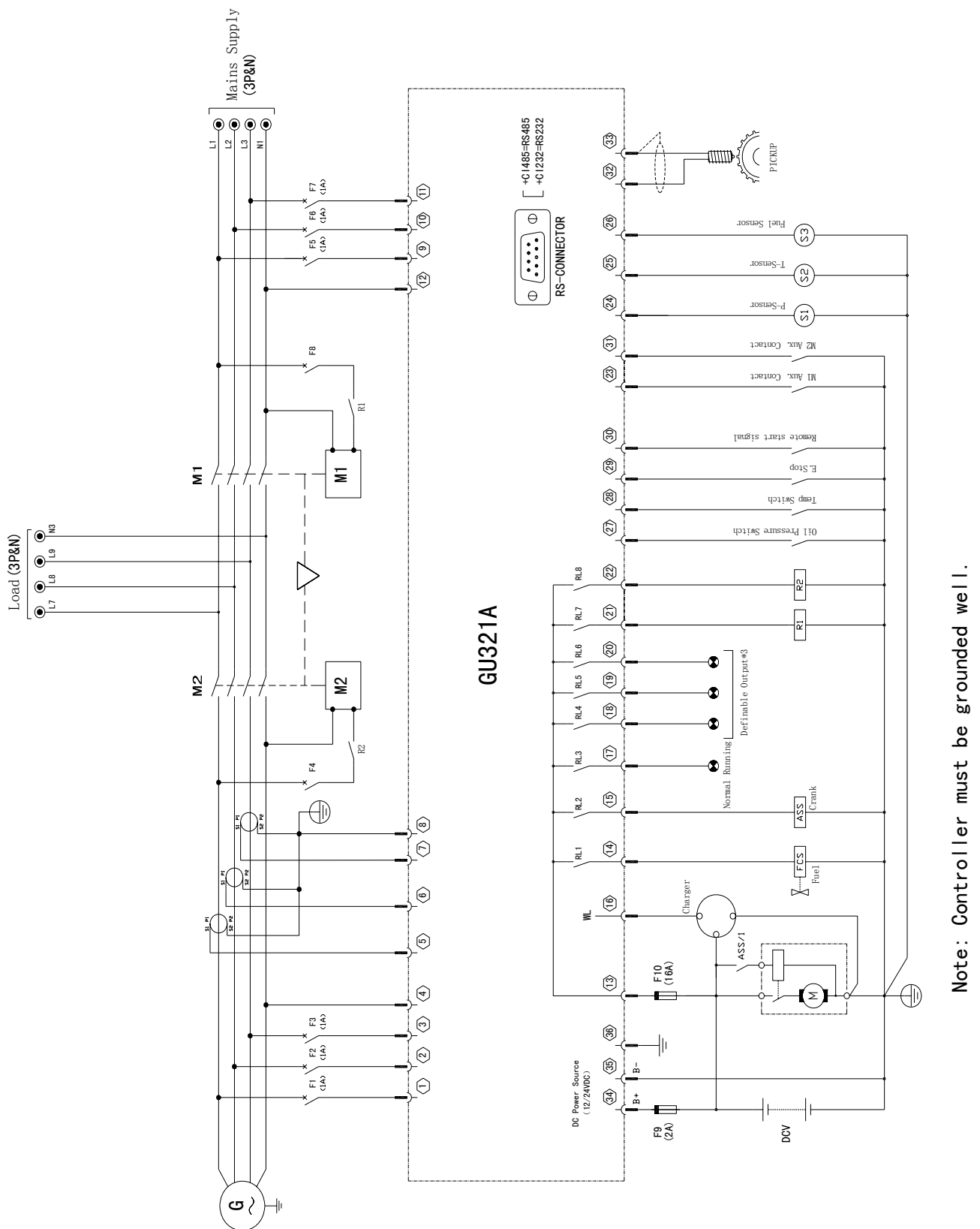
To prevent damage to a controller which uses an alternator or battery-charging device, make sure the charger is turned off before disconnecting the battery from the system.

Controllers contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

Controller must be safely grounded.

Do not disassemble the rear back of controller and touch the components or conductors on a printed circuit board.

2.3 Typical Wiring Diagram:



NOTE: Above input modes of voltage and current are only suitable for 3-phase 4-wires generator system.

3. Operation Panel

The operation panel covers three sections: measuring parameters displayed by LCD, operation switches and running states displayed by LED.

3.1 LCD Display and Control Buttons:

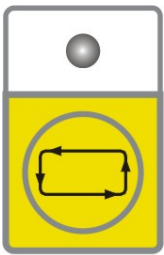
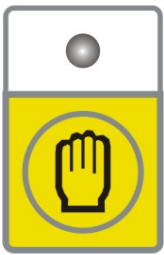
LCD with 128×64 lattices can display multi-row data information in the same time and has the added background-light function that operator can clearly read information day or night. After pressing any button the background-light can auto turn off in a certain time.

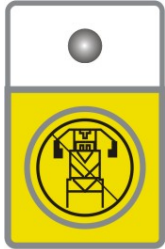
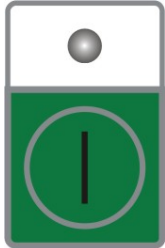
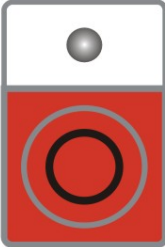
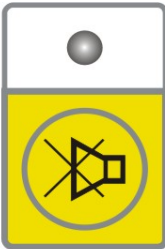
LCD display and control buttons provide a friendly operation interface for operator to conveniently read information and set running parameter.

3.2 LCD Displays Menu System and Running Status:

Function Description	Tag
Enter into submenu / modify / confirm modification	
Scroll up menu / value ascend	
Scroll down menu / value descend	

3.3 Control Buttons and LED

Function Description	Tag
AUTO button / LED The button is used for setting “auto-operation mode”. When controller is running in AUTO mode, LED above the button will illuminate. After Mains failure, according to whether the “remote start input signal” is active or not, it controls generator’s start and stop.	 AUTO
MAN button / LED The button is used for setting “manual-operation mode”. When controller is running in MAN mode, LED above the button lights up. The controller controls generator’s start and stop by pressing “START” and “STOP” buttons.	 MAN

TEST button / LED The button is used for setting “test-operation mode”. When controller is running in TEST mode, LED above the button lights up. At that time, controller simulates the “remote start input signal” is active and Mains failure under auto-operation mode to control generator’s start. When switch to “auto-operation mode” and the “remote start input signal” is inactive, generator stops.	 TEST
START button / LED The button is used for MAN start Genet. When controller is set in MAN mode, press this button can start generator. During the period from controller performs start procedure to Genset is normally running, the normal running LED above the button flashes, and LED illuminates when the Genset is normally running.	 START
STOP/RESET button / LED The button is used for MAN stop generator. When controller is set in MAN mode, this button can stop Genset. Continuously press this button over 2S can release controller from failure shutdown locked if there is failure output. (When controller performs stop procedure, LED above the button illuminates. When fail to stop, LED flashes.)	 STOP/RESET
MUTE/L. TEST button / LED It is mute button for failure alarm and lamp test button. Continuously press the button more than 2S, all LED on the panel will illuminate. This function is used for testing all LED on the panel. When warning or shutdown alarm occurs, buzzer sounds, press this button can mute the buzzer and LED above the button illuminates at that time. Press it again will cancel mute function, if controller holding on failure status, the alarm buzzer will keep sounding..	 L. TEST/MUTE

4. Installation Guide

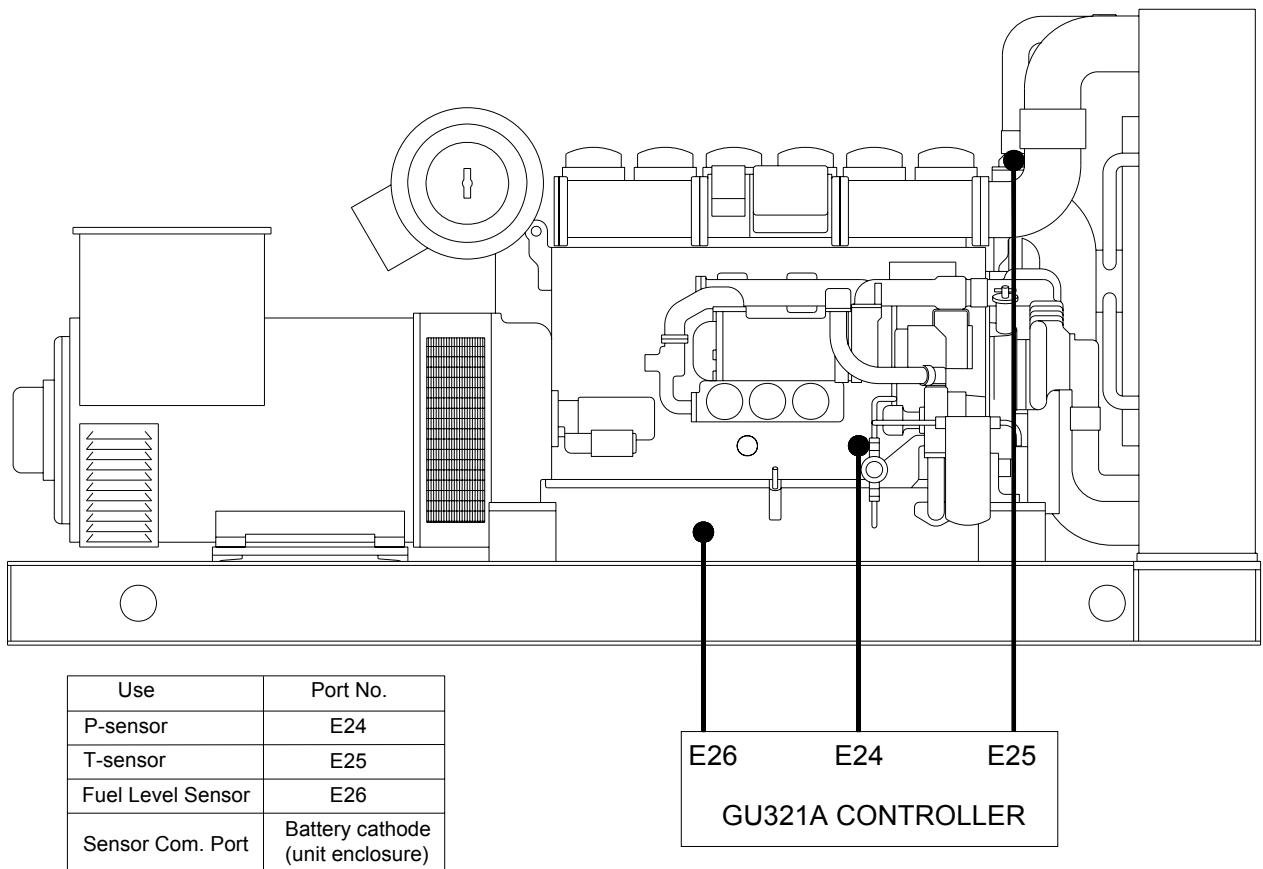
4.1 The dimensional drawing of install hatch on panel, showing as above attached.

The controller is fixed by 4 special mounting screws.

The shock-proof equipment must be installed if the enclosure that installed on controller is directly installed on Genet body or other heavy vibrant device.

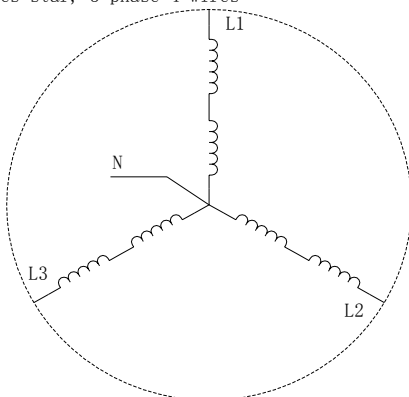
4.2 Please read above 2.3 Typical Wiring Diagram or attached drawing for wiring connecting.

4.3 The installations of P-sensor and T-sensor for engine:

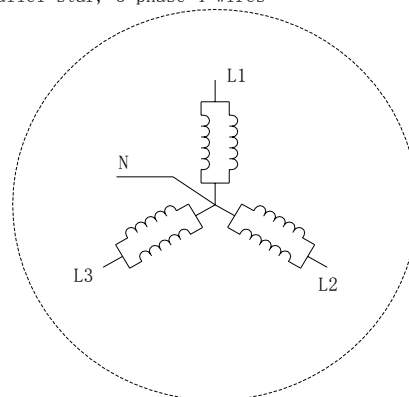


4.4 Kinds of typical connection methods for generator winding:

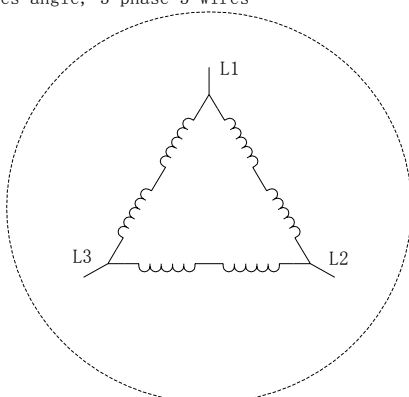
Series star, 3-phase 4 wires



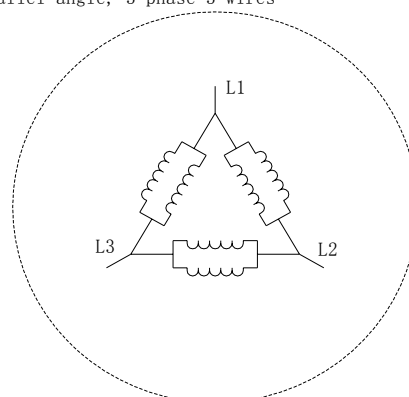
Parallel star, 3-phase 4 wires



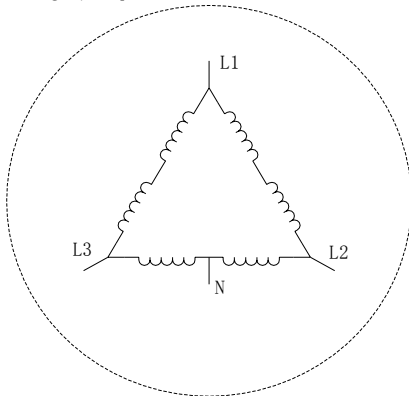
Series angle, 3-phase 3 wires



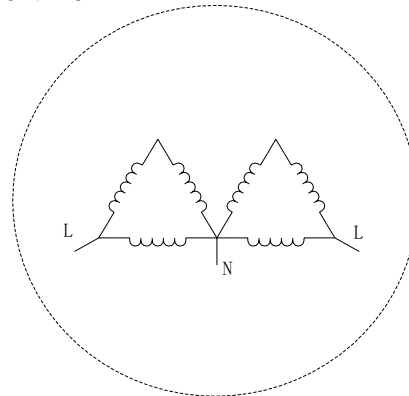
Parallel angle, 3-phase 3 wires



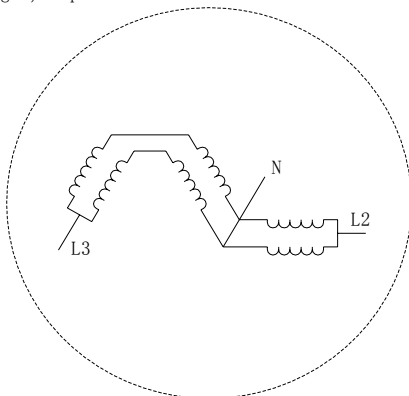
Series angle, 3-phase 4 wires



Biangle, 1-phase 2 wires



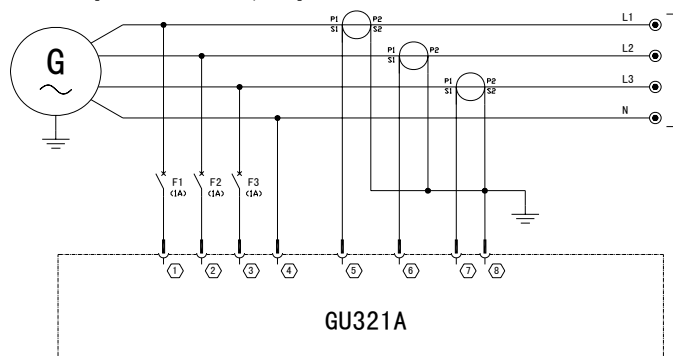
Biangle, 1-phase 3 wires



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4.5 Typical input connection for corresponding voltage and current connected to different kinds of generator winding:

Series parallel start, 3-phase 4 wires



Measure and display data:

3-phase phase voltage L1-N, L2-N, L3-N

3-phase line voltage L1-L2, L2-L3, L3-L1

3-phase current L1 L2 L3

Frequency Hz

3-phase apparent power AL1 AL2 AL3 ΣA

3-phase power and total power PL1 PL2 PL3 ΣP

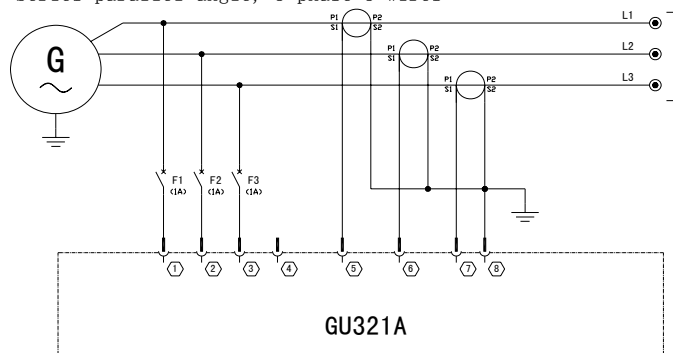
3-phase reactive power and total reactive power QL1 QL2 QL3 ΣQ

3-phase power factor PFL1 PFL2 PFL3

Active energy (KWh) ΣE

Reactive energy (KVarh) ΣE

Series parallel angle, 3-phase 3 wires



Measure and display data:

3-phase line voltage L1-L2, L2-L3, L3-L1

3-phase current L1 L2 L3

Frequency Hz

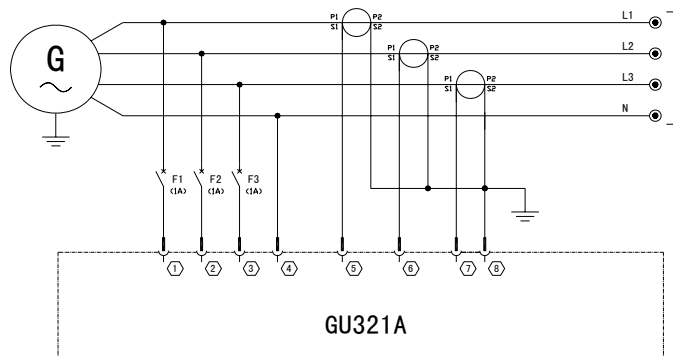
Active power ΣP

Reactive power ΣQ

Active energy (KWh) ΣE

Reactive energy (KVarh) ΣE

Series angle, 3-phase 4 wires



Measure and display data:

3-phase phase voltage L1-N, L2-N, L3-N

3-phase line voltage L1-L2, L2-L3, L3-L1

3-phase current L1 L2 L3

Frequency Hz

Active power ΣP

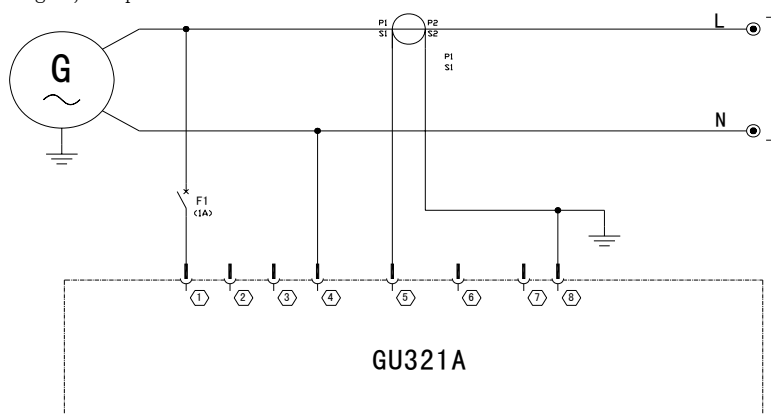
Reactive power ΣQ

Active energy (KWh) ΣE

Reactive energy (KVarh) ΣE

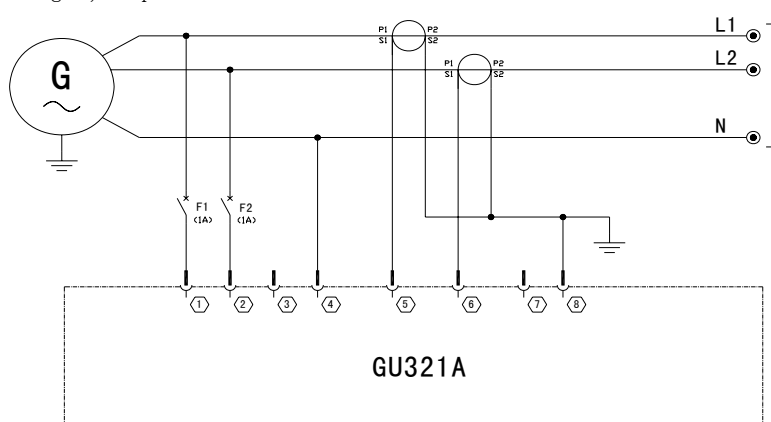
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Biangle, 1-phase 2 wires



Measure and display data:
 Single phase voltage **L-N**
 Single phase current **L1**
 Frequency **Hz**
 Active power **P**
 Reactive power **Q**
 Apparent power **A**
 Power factor **PF**
 Active energy (KWhr) **ΣE**
 Reactive energy (KVAhr) **ΣE**

Biangle, 1-phase 3 wires

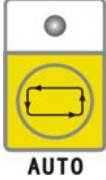


Measure and display data:
 2-phase phase voltage **L1-N, L2-N**
 2-phase current **L1 L2**
 Frequency **Hz**
 Active power **PL1 PL2 ΣP**
 Reactive power **QL1 QL2 ΣQ**
 Apparent power **AL1 AL2 ΣA**
 Power factor **PF1 PF2**
 Active energy (KWhr) **ΣE**
 Reactive energy (KVAhr) **ΣE**

5. Control and Operation Instruction

The controller has 3 control modes: AUTO, MAN and TEST.

5.1 Operation Mode Setting:

Operation	Description
Continuously press “AUTO” button (more than 2s), the LED above the button lights up, controller then running in “AUTO” mode.	
Continuously press “MAN” button (more than 2s), the LED above the button lights up, controller then running in “MAN” mode.	
Continuously press “TEST” button (more than 2s), the LED above the button lights up, controller then running in “TEST” mode.	

NOTE: Only 1 mode can be selected from above 3 modes.

5.2 The Control Process of ATS auto transfer:

Operation	Description
When controller is in AUTO status, if Mains normal, Mains normal LED above the panel lights up, Mains-ON Delay begins counting. When times out, ATS switch on Mains, power supply by Mains, MAINS supply LED on.	MAINS-ON LOAD 5
After Mains failure is confirmed by Mains alarm delay and the remote input signal is active, controller output Genset start signal to control Genset's start, the start process as following 5.3 descriptions.	START 10
When data such as voltage, frequency of Genset all reach the preset value, LED for Gen. voltage normal lights up, Gen. ON Delay begins counting, when times out, ATS switch on Gen, power supply by Gen, Gen supply LED on.	GEN-ON LOAD 5

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5.3 The Control Process of Start:

Operation	Description	
When controller is running in TEST mode, or Mains failure under AUTO status and the remote start input signal is active, or in MAN status press "START" button, controller begins start procedure, START LED flashes.		
LCD display start delay counting (MAN start delay is inset as 3s):	START	10
Fuel relay takes action, engine fuel solenoid valve opens, start (crank) relay closes, the start motor begins action, cranking begins:	CRANK	1
When engine running speed reaches the condition of crank disconnection, controller will stop the start output and the safety-on delay begins counting:	SAFETY-ON DELAY	60
When controller detects that the normal data such as RPM, output voltage, oil pressure, coolant temp of Genset have been set up, and no other failure, then LCD displays parameters that showed as right: (Scroll page can refer to more details)	U=380V	I=0A
	P=0kW	F=50.0Hz
	SP=1500rpm	OP=470kPa
	TEMP=70°C	Bat=24.0V
	RUN	

When Mains failure and remote start input signal is active, the start delay will be enabled and begin to count. During the period of counting, if the remote start input signal is inactive, start delay will stop counting immediately, controller stop start procedure, and return to original "**READY**" status after stop delay expired.

During cranking or idle, if the remote start input signal is inactive, controller stop the following start procedure immediately and control output of all relays, then stop the start procedure, and return to original "**READY**" status after stop delay expired.

NOTE: During crank, engine ignites, when the output frequency of alternator reaches preset frequency, start motor cut off power. Or the power for start motor will be cut off by one of the following reasons:

- The magnetic pickup device which mounted on engine flywheel detects that the frequency reaches preset value;
- The output voltage of alternator reaches 80% of rated voltage;
- The oil pressure switch of engine is open.

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5.4 The Process of Fail to Start and Restart:

Operation	Description
During the period of crank, engine can not ignite, controller will not output start signal during crank rest. LED for FAIL TO START flashes to make alarm.	CRK-RST 15
Once crank rest times out, controller will attempt to restart engine again.	CRANK 2

Above start phenomena will repeat again and again until engine's successful ignition or reaching the preset crank attempt. If any stop failures occur during start process, controller stops control output immediately, until failure eliminated and reset, then it can be operated again.

5.5 The Status of Fail to Start:

Operation	Description
When above start phenomena repeat again and again and reaches the preset crank attempt, controller will stop control output, LCD displays:	ALARM START FAILURE

NOTE:

If start failure occurs, operator must check the whole Genet system to find out failure reasons, only after eliminating the failure can press "STOP/RESET" button to unlock fault-locked status, and restart the Genet.	 STOP/RESET
---	---

5.6 The Process of Auto Stop:

Operation	Description
When Mains resume to normal or the remote start input signal is inactive, cooling delay begins to count, running signal is cut off (idle delay is not zero), and then LCD displays:	COOL 300
When cooling delay times out, controller opens fuel solenoid valve immediately, the counter for stop delay begins to count, LCD displays:	STOP 20
When stop delay times out, if engine is still running, controller will send out an alarm, LCD displays:	ALARM STOP FAILURE
If engine stops running during allowed stop delay, LCD displays:	READY

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When the remote start input signal is inactive, cooling delay begins counting, during the period, if remote start input signal is active again, cooling delay stops counting immediately, controller reenter into safe-on delay again, recovering to auto running status if normal.

5.7 The Control Process of MAN Stop:

Operation	Description
When Genset is normally running, in MAN mode continuously press "STOP/RESET" button once, controller performs stop process, which is same as auto stop. Press "STOP/RESET" button continuously again, controller opens fuel solenoid immediately, Genset stops.	 STOP/RESET
The counter for stop delay begins counting, LCD displays:	STOP 20
When it times out, if engine is still running, controller will send out an alarm, LCD displays:	ALARM STOP FAILURE
If during allowed stop delay engine stops running gradually, LCD displays:	READY

5.8 The start and stop processes of engine whose fuel solenoid valve is N. O. type (difference from N.C. type):

Start control process:

When start running, the fuel relay of controller de-energizes, fuel solenoid valve is no power, means the electromagnet of solenoid valve de-energizes.

Stop control process:

At the beginning of stop control process, output the power of fuel solenoid valve, fuel solenoid valve takes action, engine begins to stop. After delay (according to the setting stop delay), cut off the power of fuel solenoid valve.

Other control processes are same as engine whose fuel solenoid valve is N. C. type.

5.9 Idle and Preheat function

Select the delay function of idle or preheat through setting "the delay value of idle or preheat", you can select idle or preheat output base on the configurable relay function. When set value at 0, no delay function. When not set at 0, realizing idle and preheat function. Idle covers normal open (N.O.) type and normal close (N.C.) type. When working, they are in opposition to each other on close and open status. Now we take N.C. type for example showing its working principle: when in READY status for idle, idle relay de-energizes, controller performs start procedure, idle relay takes action simultaneously. When start delay times out, fuel relay energizes, when

start (crank) successfully switches off start motor, idle and safety-on delay begins to count at the same time, when idle delay times out, idle relay opens. If each parameter is normal after Safty-on delay times out, unit is running. At stop process, cooling delay begins counting and idle relay takes action simultaneously. After delay expired performs stop action, after stop delay expired, idle relay opens. For preheat function, preheat relay is open in READY status, the timer for start delay begins counting, preheat relay takes action at the same time, if crank successfully, after safety-on delay expired, unit running. Preheat delay begins to count, when times out preheat relay opens, cooling delay for stop, preheat relay de-energizes.

6. Measure and Display Data

6.1 The Measuring Data for Electric Section

Mains Phase Voltage V	L1-N	L2-N	L3-N
Mains Line Voltage V	L1-L2	L2-L3	L3-L1
Generator Phase Voltage V	L1-N	L2-N	L3-N
Generator Line Voltage V	L1-L2	L2-L3	L3-L1
Load Current A	I1	I2	I3
Mains Frequency Hz	Hz		
Generator Frequency Hz	Hz		
Apparent Power KVA	L1 L2 L3 three phase and sum		
Active Power KW	L1 L2 L3 three phase and sum		
Power Factor PF	L1 L2 L3 three phase		
Reactive Power KVAr	L1 L2 L3 three phase and sum		
Gen. Active Energy KW hr			
Gen. Reactive Energy KVAr hr			

Since frequency is measured from L1 phase, the connection in this section must be confirmed no problem when used.

6.2 Other Measuring Data

Oil pressure (kPa)	This data from an external sensor
Coolant temperature (°C)	This data from an external sensor
Fuel level (%)	This data from an external sensor
RPM (RPM)	This data from speed sensor
Running hours (RUN Hour)	Precise to 0.1hour
Battery voltage (V)	Obtain from working power source

7. Warning and Shutdown Alarm

7.1 Warning

(**NOTE:** Warns are non-critical failure conditions and do not affect the operation of the generator system. They serve for drawing the operators' attention to an undesirable condition and removing it to make sure system continuous running. When warns occur, the status indicators flash, but failure will not be locked and the unit will not shutdown. Once failure removed, warning indicator will be automatically turned off.)

Charge Failure if controller detects that voltage has fallen below the preset "ALT. low preALM" from the excitation contact of auxiliary AC charger, LCD status bar displays "**WARN: CHARGE FAILURE**", "**CHARGE FAIL**" LED lights up, alarm buzzer sounds.

Battery Low Voltage if controller detects that battery voltage has fallen below the preset "Batt low preALM", LCD status bar displays "**WARN: BATTERY LOW**", alarm buzzer sounds.

Battery High Voltage if controller detects that battery voltage has exceeded the preset "Batt high preALM", LCD status bar displays "**WARN: BATTERY HIGH**", alarm buzzer sounds.

Low Oil Pressure controller detects that the engine oil pressure has fallen below the preset "Oil-P low preALM" after the safety-on timer has expired, LCD status bar displays "**WARN: LOW OIL PRESS**", "**LOW OIL PRESSURE**" LED flashes, alarm buzzer sounds.

High Temperature controller detects that engine coolant temperature has exceeded the preset "Coolant preALM", LCD status bar displays "**WARN: COOLANT TEMP**", "**HIGH TEMPERATURE**" LED flashes, alarm buzzer sounds.

Overspeed if the engine speed exceeds the preset "Over SP preALM", LCD status bar displays "**WARN: OVER SPEED**", "**OVERSPEED**" LED flashes, alarm buzzer sounds.

Underspeed if the engine speed falls below the preset "Under SP preALM", LCD status bar displays "**WARN: UNDER SPEED**", alarm buzzer sounds.

Gen High Voltage if controller detects that the output voltage of generator has exceeded the preset "Gen-V High preALM", LCD status bar displays "**WARN: GEN. V HIGH**", alarm buzzer sounds.

Gen Low Voltage if controller detects that the output voltage of generator has fallen below the preset "Gen-V Low preALM", LCD status bar displays "**WARN: GEN. V LOW**", alarm buzzer sounds.

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Mains High Voltage if controller detects that the input voltage of Mains has exceeded the preset “Mains-V High Alarm”, after delay confirmed, transfer switch breaks Mains.

Mains Low Voltage if controller detects that the input voltage of Mains has fallen below the preset “Mains-V low Alarm”, after delay confirmed, transfer switch breaks Mains.

Over Current If controller detects that the output current of generator has exceeded the preset “I High preALM”, LCD status bar displays **“WARN: OVER CURRENT”**, alarm buzzer sounds.

7.2 Shutdown Alarm

(NOTE: shutdown failures immediately lock system and stop generator. The controller only can be operated again after removing failures and pressing rest button to unlock.)

Fail to Start if engine does not fire after the preset number of crank attempt has been made, means fail to start. LCD status bar displays **“ALARM: START FAILURE”**, **“FAIL TO START”** LED lights up, alarm buzzer sounds, alarm output relay closes.

Fail to Stop if engine does not stop after the stop delay expired. LCD status bar displays **“ALARM: STOP FAILURE”**, alarm output relay closes.

Emergency Stop when emergency stop input signal is active, controller immediately stops all relay control output except alarm, LCD status bar displays **“ALARM: E. STOP”**, **“EMERGENCY STOP”** LED lights up, alarm buzzer sounds, alarm output relay closes.

Low Oil Pressure if controller detects that the oil pressure level still falls below the preset “Oil-P low Alarm” or oil pressure switch is closing after the safety-on timer has expired, engine stops immediately, LCD status bar displays **“ALARM: LOW OIL PRESS”**, **“LOW OIL PRESSURE”** LED lights up, alarm buzzer sounds, alarm output relay closes.

High Temperature if controller detects that engine coolant temperature has exceeded the preset “coolant Alarm” or temperature switch is closing, engine stops immediately, LCD status bar display **“ALARM: COOLANT TEMP”**, **“HIGH TEMPERATURE”** LED lights up, alarm buzzer sounds, alarm output relay closes.

Overspeed if controller detects that engine speed exceeds the preset “over SP Alarm”, engine stops immediately. LCD status bar displays **“ALARM: OVER SPEED”**, **“OVERSPEED”** LED lights up, alarm buzzer sounds, alarm output relay closes.

Underspeed if controller detects that engine speed falls below the preset “Under SP Alarm”, engine stops immediately. LCD status bar displays **“ALARM: UNDER SPEED”**, alarm buzzer sounds, alarm output relay closes.

Gen High Voltage if controller detects that the output voltage of generator has exceeded the preset “Gen-V High Alarm” and is confirmed after Alarm delay expired, engine stops. LCD status bar displays **“ALARM: GEN. V HIGH”**, alarm buzzer sounds, alarm output relay closes.

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Gen Low Voltage after the safety-on timer has expired, if controller detects that the output voltage of generator has fallen below the preset “Gen-V Low Alarm” and is confirmed after Alarm delay expired, engine stops. LCD status bar displays “**ALARM: GEN. V LOW**”, alarm buzzer sounds, alarm output relay closes.

Over Current if controller detects that the output current of generator has exceeded the “I High Alarm” and is confirmed after Alarm delay expired, engine stops. LCD status bar displays “**ALARM: OVER CURRENT**”, alarm buzzer sounds, alarm output relay closes.

NOTE:

- ◆ The warnings or shutdown alarms of oil pressure and coolant temp digital signal can be realized by setting No. 3.31 and 3.32 menus, the data is detected from the digital status (on or off) of oil pressure and temperature.
- ◆ The warnings or shutdown alarms of the oil pressure and coolant temp analog signal can be realized by setting the parameters range on No. 3.23, 3.24, 3.25 and 3.26 menus, the data is measured from the analog input ranges of P-sensor and T-sensor.
- ◆ The engine speed is generated from the frequency of pickup sensor, which mounted on engine flywheel, if system do not mount pickup sensor, controller will auto use the output voltage frequency of generator as the parameters of control and failure protection, for user's convenience, some data expressed by rpm, $RPM = Hz \times 30$.
- ◆ Generator failure occurs during running: after occur high temperature, low oil pressure, overspeed or underspeed occurs, and it stops immediately without delay. During cooling delay, the protection function of underspeed and low oil pressure can only be active after setting idle delay at “0”.

8. Parameters Setting

8.1 System

No.	Item	Default	Value Range
1.0	QUIT		
1.1	CT	100	1~5000
1.2	VT	1	1~100
1.3	Voltage Type	1	1~5
1.4	Comm. Address	1	1~255
1.5	Pre-set AUTO	0	0~1
1.6	Send SMS count	0	0~99
1.7	Default Settings		
1.8	Language>中文		
1.9	Firmware Update		

NOTE: the changed communication address is active after restarting the working power source.

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8.2 Generator

No.	Item	Default	Value Range
2.0	QUIT		
2.1	Gen-V Low Alarm	0V	AC45~20000V / 0 (not set)
2.2	Gen-V Low preALM	198V	AC45~20000V / 0 (not set)
2.3	Gen-V High preALM	253V	AC45~20000V / 29999 (not set)
2.4	Gen-V High Alarm	29999V	AC45~20000V / 29999 (not set)
2.5	Gen-Hz Low Alarm	45.0Hz	10.0~100.0Hz / 0.0 (not set)
2.6	Gen-Hz High Alarm	57.0Hz	10.0~100.0Hz / 999.9 (not set)
2.7	I High preALM	9999A	1~9999A / 9999 (not set)
2.8	I High Alarm	9999A	1~9999A / 9999 (not set)
2.9	Alarm delay	10S	0~600S

8.3 Engine

No.	Item	Default	Value Range
3.0	QUIT		
3.1	Rated speed	1500RPM	99~9999 RPM
3.2	Pickup frequency	3000Hz	1~9999 Hz
3.3	Set pickup now		
3.4	Pair of Poles	2	1~4
3.5	Fuel mode	0	0 N.C. Type / 1 N.O. Type
3.6	T-sensor mode	1	0~8 / 0 (not used)
3.7	P-sensor mode	1	0~9 / 0 (not used)
3.8	H-sensor mode	0	0 not used / 1 used
3.9	Start delay	10S	0~300 S
3.10	Crank attempt	3 Times	1~10 Times
3.11	Crank time	8S	0~30 S
3.12	Crank rest	15S	0~300 S
3.13	Crank disconnect	300RPM	1~9999 RPM
3.14	Idle delay	0S	0~9999 S
3.15	Pre-heat delay	0S	0~9999 S
3.16	Safety-on delay	60S	0~600 S
3.17	Cooling delay	300S	0~600 S
3.18	Stop delay	20S	0~60 S
3.19	Under SP Alarm	0RPM	0~9999 RPM / 0 (not set)
3.20	Under SP preALM	1440RPM	0~9999 RPM / 0 (not set)
3.21	Over SP preALM	1600RPM	1~9999 RPM / 9999 (not set)

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3.22	Over SP Alarm	1710RPM	1~9999 RPM / 9999 (not set)
3.23	Oil-P low Alarm	140kPa	0~300 kPa / 0 (not set)
3.24	Oil-P low preALM	220kPa	0~300 kPa / 0 (not set)
3.25	Coolant preALM	95℃	70~320℃ / 9999 (not set)
3.26	Coolant Alarm	105℃	70~320℃ / 9999 (not set)
3.27	Batt low preALM	8.0V	1.0~25.0 V / 0.0 (not set)
3.28	Batt high preALM	35.0V	1.0~35.0 V / 99.9 (not set)
3.29	External Alarm	0	0 warning / 1 stop
3.30	Fuel level input	2	0 not used 1 the unit is “%” according to resistance sensor data 2 configurable input
3.31	Oil-P Stop	1	0 warning / 1 stop
3.32	Coolant Stop	1	0 warning / 1 stop
3.33	Fuel pump ON	20%	0~100%
3.34	Fuel pump OFF	70%	0~100%
3.35	User Relay 1	2	0~80
3.36	User Relay 2	3	0~80
3.37	User Relay 3	4	0~80
3.38	ALT. low preALM	8.0V	1.0~25.0 V / 0.0 (not set)

8.4 ATS Control

No.	Item	Default	Value Range
4.0	QUIT		
4.1	GEN. ON Delay	5	1~9999 S
4.2	GEN. Alarm Delay	5	1~9999 S
4.3	Mains-V low Alarm	198V	AC45~20000V / 0 (not set)
4.4	Mains-V High Alarm	29999V	AC45~20000V / 29999 (not set)
4.5	Mains-Hz low Alarm	45.0Hz	10.0~100.0Hz / 0.0 (not set)
4.6	Mains-Hz High ALM	57.0Hz	10.0~100.0Hz / 999.9 (not set)
4.7	Mains ON Delay	5	1~9999 S
4.8	Mains Alarm Delay	5	1~9999 S

8.5 Name Explanation on View Menu

Menu	Definitions	Menu	Definitions
0. QUIT	Quit	1. System	System parameters
2. Generator	Generator parameters	3. Engine	Engine parameters
4. ATS Control	Transfer control		

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Appendix: The Configurable Content of Relay

Code	Define Failure Type	Code	Define Failure Type
0	Not Used	1	Over Current Output
2	Alarm Output	3	Warning Output
4	Idle Output (N. C.)	5	Preheat Output
6	Speed Up	7	Speed Down
8	Fuel Pump Control	9	Running
10	System in AUTO Mode	11	System in Test Mode
12	System in MAN Mode	13	Reserve
14	Idle Output (N. O.)	15	Mains Fail to Close (within 5S)
16	Gen. Fail to Close (within 5S)	17	Fail to Start
18	Reserved	19	Preheat 1 Output

Voltage Type: the connection mode for voltage that corresponding to different generator winding, selected by menu.

1. Series parallel star, 3-phase 4 wires	2. Series parallel angle, 3-phase 3 wires
3. Island angle, 3-phase 4 wires	4. Biangle, 1-phase 2 wires
5. Biangle, 1-phase 3 wires	

NOTE:

- ◆ When above No. 3.8 (H-sensor mode) is set at “0” not used, engine speed is set by No. 3.4 (Pair of Poles); when No.3.4 is set at “2”, and then running speed is 1500 RPM, set at “1” then running speed is 3000 RPM.
- ◆ When above No. 3.8 is set at “1” used, the input value of No. 3.2 (pickup frequency) is set by MAN; engine speed is set by No. 3.1 (rated speed).
- ◆ When above No. 3.8 is set at “1” used, if the input value of No. 3.2 (pickup frequency) is automatically set by the method of 11.6 (showed as below), both the value of No. 3.4 (Pair of Poles) and No. 3.1 (rated speed) must be correctly set.

8.6 The Definitions of P-sensor and T-sensor

For P-sensor and T-sensor, according to below table where different No. stand for different sensor mode, if the used sensor is not listed in the table, through software write the sensor data into controller, and the sensor mode in the parameters setting should be selected as “custom (configurable)” that is listed as the last mode in below table.

No.	P-Sensor Mode	T-Sensor Mode
0	Not used	Not used
1	VDO 10 bar	VDO 120℃
2	KD 10 bar KD	KD 120℃ KD
3	YG962 1J1M ZJ	WGJ 900131 ZJ
4	KP 6 bar KP	KP 130℃ KP
5	3846 N-010-B2 DX	21YB054 DX
6	3967251 KL	3967250 KL
7	MHI 10 bar XL	MHI 98℃ XL
8	Datcon 10 bar	Custom (Base on sensor data)
9	Custom (Base on sensor data)	

9. LCD Display and Menu System

Adopting 128×64 lattice LCD can display multi-row data information at the same time. LCD has a background-light function, after pressing any key the background-light can auto turn off in a certain time. Each page is set a different parameter to control and each electrical loading parameter are displayed in main page, press “▲” and “▼” scroll to display each electrical parameter and engine measuring data. If no failure occurs, LCD keeps at current page, when failure occurs, LCD display failure information in status bar immediately, when more then one failure occur, LCD just displays one of them.

The configuration and modification for parameters adopt gradually increase and decrease, when continuously press increase or decrease button, the unit digit changed one by one, then the tens digit changed after ten unit digit changed, follow this logic, and the hundreds digit changed after tens. Continuously press “▶” 2s at any page can enter into setting status, press “▶” can enter into sub menu, use “▲” and “▼” scroll page up and down at that time. Press “▶” enter into modify, key in password “▲” “▲” “▶” “▼” “▶” “▼” (221313), after finishing modification continuously press “▶” 2s to quit setting status.

9.1 Static LCD display:

When controller is in ready status

Operation	Description	
Controller has not detected engine data such as running speed, oil pressure, coolant temperature, etc. The related data display as “0”, LCD displays:	U=0V P=0kW SP=0rpm TEMP=0℃ READY	I=0A F=0.0Hz OP=0.0kPa Bat=24.0V

When P/T-sensor are not used

Operation	Description	
Controller does not detected engine data, such as oil pressure, coolant temperature, etc. in standby or running status the related data all displayed as “---”, LCD displays:	U=0V P=0kW SP=0rpm TEMP= - - - READY	I=0A F=0.0Hz OP= - - - Bat=24.0V

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When controller is normally running

Operation	Description	
The voltage/current value displayed on this page is the average value of the 3 phase. Press "  " or "  " can switch display page.	U=380V P=0kW SP=1500rpm TEMP=70℃ RUN	I=0A F=50.0Hz OP=470kPa Bat=25.4V
Press "  " can switch display page	V1=220V I1=0A P1=0kW Q1=0kVAr RUN	U12=380V A1=0kVA PF1=1.00
Press "  " can switch display page	V2=220V I2=0A P2=0kW Q2=0kVAr RUN	U23=380V A2=0kVA PF2=1.00
Press "  " can switch display page	V3=220V I3=0A P3=0kW Q3=0kVAr RUN	U31=380V A3=0kVA PF3=1.00
Press "  " can switch display page	Run Hour=12.0 KWHr=1000 KVAhR=250 AI = OPEN RUN	
Press "  " can switch display page Relay Outputs express relay output status Digital Inputs express digital input status when active, it is expressed by 0	Relay Outputs ----- Digital Inputs ----- RUN	
Press "  " can switch display page	P=0KW A=0KVA Q=0KVAr RUN	
Press "  " can switch display page	V2a=0V	U12=0V
	V2b=0V	U23=0V
	V2c=0V	U31=0V
	F2=0.0Hz RUN	

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9.2 Setting running parameters

For example: (configure CT ration at 1000/5, then CT should be set at 200)

Operation	Description
Continuously press “  ” 2s, enter into parameters setting menu, then LCD displays:	<<SETTING/参数设定>> 0. QUIT
Press “  ” and “  ”, and then press “  ” again, then LCD displays:	1. CT =1000
Press “  ” and then press “  ”, it prompts to key in password, key in password: “  ” “  ” “  ” “  ” “  ” “  ”	1. CT Password: *****
Press “  ” or “  ” to change parameter, change at 200, then LCD displays:	1. CT 200
After changing press “  ” to confirm, then press “  ” and “  ”, then LCD displays:	<<SETTING/参数设定>> 1. System
Press “  ” and “  ” again for quit, or continuously press “  ” more than 2s also can quit, then LCD displays:	READY

For example: (setting controller's crank attempt at 2)

Operation	Description
Continuously press “  ” 2s, enter into parameters setting menu, then LCD displays:	<<SETTING/参数设定>> 0. QUIT
Press “  ” 3 times and then press “  ”, then LCD displays:	3. Engine 0. QUIT
Press “  ” 10 times and then press “  ”, then LCD displays:	10. Crank attempt =3
Press “  ”, it prompts to key in password, key in modify password: “  ” “  ” “  ” “  ” “  ” “  ”	10. Crank attempt Password: *****
Press “  ” or “  ” to change parameter, change at 2, press “  ” to confirm change, and then continuously press “  ” 2s can quit parameters setting menu.	10. Crank attempt =2

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For example: (resume parameters of controller to factory default)

Operation	Description
Continuously press “  ” 2s, enter into parameters setting menu, then LCD displays:	<<SETTING/参数设定>> 0. QUIT
Press “  ” and “  ”, and then press “  ” 3 times, then LCD displays:	7. Default Settings
Press “  ”, it prompts to key in password, key in modify password: “  ” “  ” “  ” “  ” “  ” “  ”	7. Default Settings Password: *****
Press “  ” to recover to default, press “  ” again and then continuously press “  ” 2s can quit parameters setting menu.	7. Default Settings DONE

For example: (set controller as online program mode)

Operation	Description
Continuously press “  ” 2s, enter into parameters setting menu, then LCD displays:	<<SETTING/参数设定 >> 0. QUIT
Press “  ” and “  ”, and then press “  ” once, then LCD displays:	9. Firmware Update
Press “  ”, it prompts to key in password, key in modify password: “  ” “  ” “  ” “  ” “  ” “  ”.	9. Firmware Update Password: *****
Press “  ” again enter into program mode, in this mode the power supply must be normal, controller will automatically reset and operate over again after the procedure was correctly duplicated via program software, or it will not exit this status until switching off working power. Then LCD displays:	Firmware Update Download from PC. Don't turnoff power, Before finished!

The setting and operation method for other parameters are similar to above method.

10. Communication Function

(It is an optional function, user can determine whether equip or not according to detailed condition)

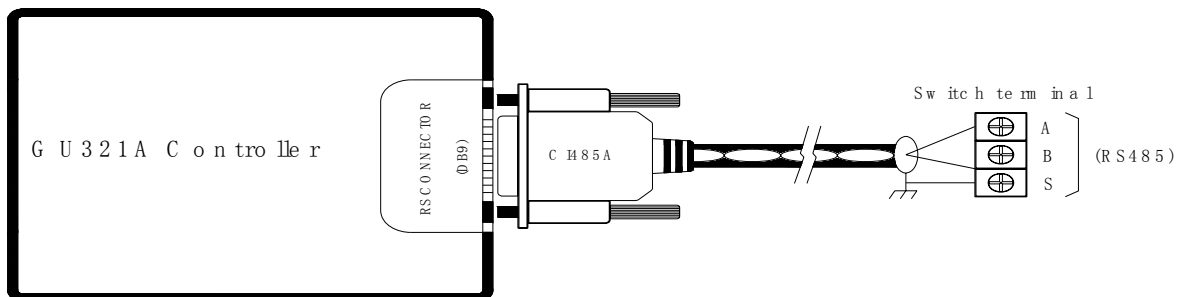
10.1 Brief Introduction

The controller has an “RS CONNECTOR” communication interface, if the interface equips with CI485A (CI232A) communication interface module, controller has “RS485/RS232” industrial standard COM immediately. The communication interface adopts photoelectricity seclusion design and has circuit protection function to prevent interference from common module voltage and damage result by error connection, the RS485 adopts 9600 baud rate. The controller that has communication function has following features:

- **100% remote signaling**, including running status and failure status.
- **100% remote regulating**, including all settable parameters of controller.
- **100% telemetering**, including all measuring data of controller.
- **100% remote control**, covering all control functions on panel.

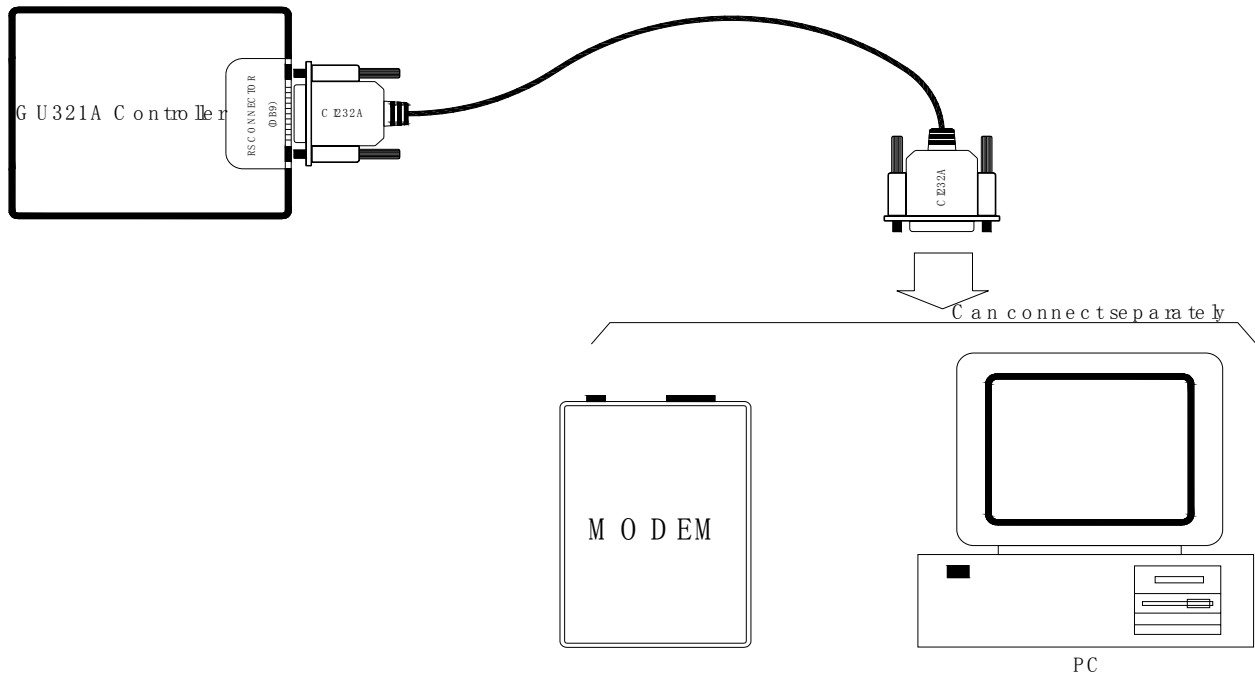
10.2 The Communication Connection for CI485

Controller has RS485 COM after adding CI485A accessory, following typical wiring diagram:



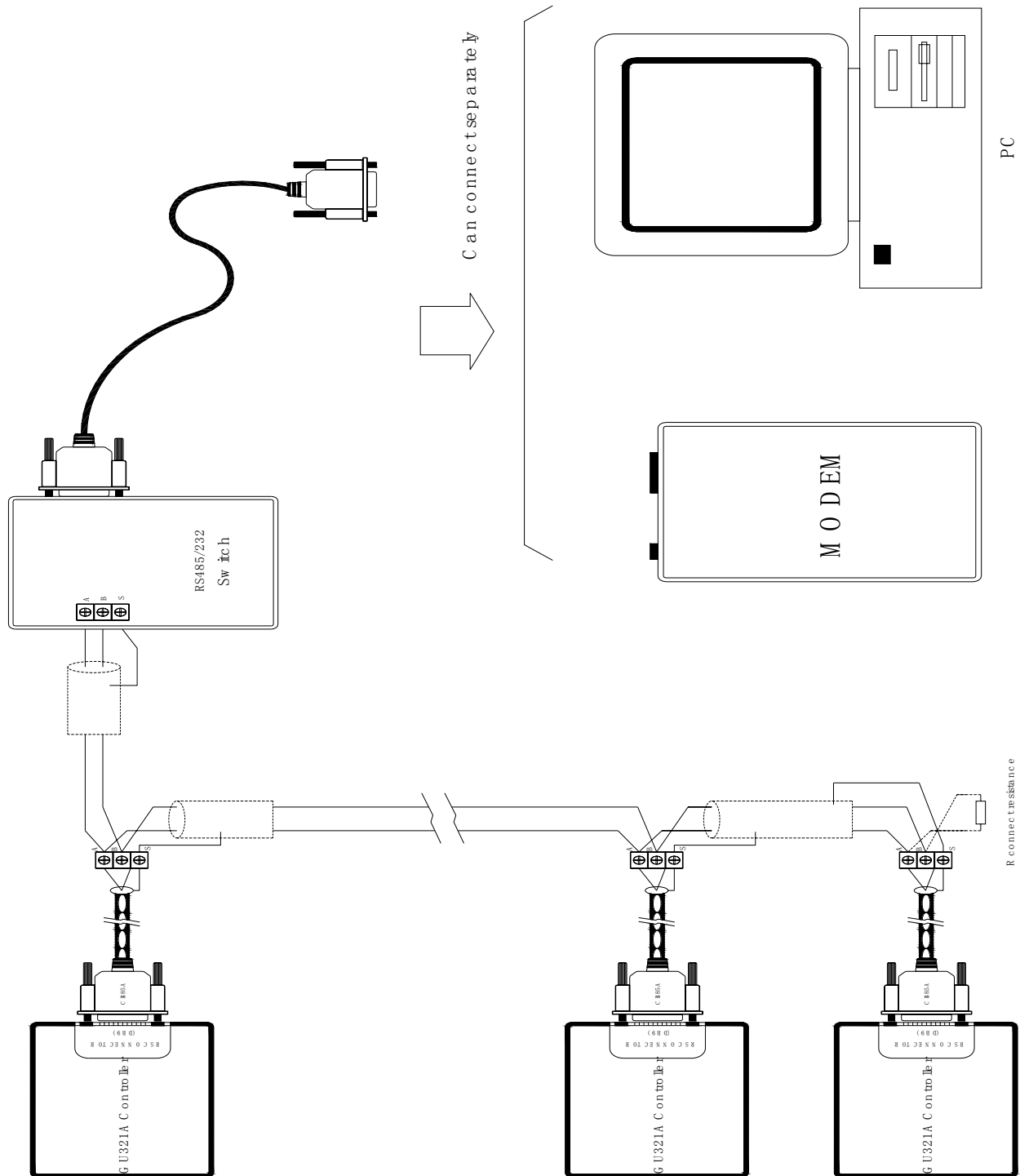
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Controller has RS232 COM after adding CI232A accessory, following typical wiring diagram:



The communication interface offers user a route: from which you can get more information that can not get from panel, the matching software can display all measured parameters and status information, and can set all parameters.

The controller that has RS485 COM allows 1 communication bus can mostly connect 247 same series of controllers by wiring connection mode, each device has one and only one ID NO., only can connect to PC or MODEM by matching with another RS485/RS232 shifter in that time. Following typical wiring diagram:



NOTE: Communication cable used high quality shielded twisted-pair cable, and its amount length must not exceed 1000m. The anode and cathode of RS485 in each controller must be correctly connected, and the cable shield only can be grounded at one side.

10.3 Communication Protocol

When working, controller adopts 9600 baud rate and MODBUS-RTU communication protocol. Computer will send an instruction character string to controller and then wait for the return data string. Modbus protocol is a kind of universal language which is applied in electronics controller. Via this protocol, communication between controllers or between controller and other device through network (such as Ethernet) can be achieved. It has become a universal industry standard and contributed to making industry network and centralized monitor to the various control devices that produced by different manufacturers.

This protocol defines a message construction that can be identified by controllers no matter which network it used to communicate, and the process of accessing other devices. Such as respond to the request of other devices and how to detect the errors and make a record. It has set up message structure and the common format of content.

When communicating in Modbus network, this protocol makes each controller know necessarily their device address, identify message from which address and take what action according to it. If respond is required, controller will calculate and send out the feed back message by the Modbus protocol. In other network, the message including Modbus protocol will be translated into frame or package structure of this network. This translation expends the resolvent of detecting node address, router path and error in certain network.

Data frames format

Address	Function Code	Data Quantity	Data 1	...	Data n	CRC High Bit	CRC Low Bit
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Communication Agreement

Using RTU mode, sending message needs at least 3.5 characters interval to start, which is the most accessible by network baud rate (Shown as the following figure T1-T2-T3-T4). The first transmitted field is device address. The transmission character that can be used is hexadecimal 0...9, A...F. The network device keeps detecting network bus, even in the interval. After received the first field (address field), each device decode it to judge whether it is sent to itself. When the last character is transmitted, an interval at least 3.5 characters indicates the end of the whole message. And a new message can start after this interval.

The entire message frame must be transmitted as a continuous flow. Receiver will refresh uncompleted message and assume the next byte is an address field of a new message if there is an interval of more than 1.5 characters before finishing transmitting. Likewise, if there is an interval of less than 3.5 characters between a new message and the last message, receiver will identify the new one as the continuation of the last message. It will cause an error, because the value in the final CRC field is incorrect. Typical message frame is as following:

Start Bit	Device Address	Function Code	Data	CRC Parity	Stop Bit
T1-T2-T3-T4	8Bit	8Bit	n*8Bit	16Bit	T1-T2-T3-T4

Address code

The address field of message frame is including two characters: ASCII or 8 bit RTU. The potential slave address is 0...247(alorism). The address range for single device is 1...247. Master selects slave by putting the salve address into the address filed of message. When slave send out response message, it will put its address into the response address field so as to make master know which device sends out response.

Address 0 is used as broadcast address, so that it can be identified by all slaves. When Modbus protocol is used in higher level network, broadcast may be not allowed or it will replayed by other form.

Function Code

1. Read register command code (03H) read the maximum (word) for 40
2. Write register command code (10H) write the maximum (word) for 38

Data Field

Data field is structured by two hex numbers and the range is 00...FF. According to the network transmission mode, it can be structured by 1 pair of ASCII or an RTU characters.

Additional message in the data field which sent from master to the slave: slave must process what the functional code identifies, including discontinuous register addresses, the quantity of items need to be handled and the actual number of data bytes in the field.

For example, if master requires reading a set of hold register (function code 03 hex) from slave, the start register and the quantity of register to be read are assigned by data field. If master writes a set of slave register (function code 10 hex), then data field assigns start register and the quantity of register to be wrote. Data bytes in data field need to write into register data.

If there is no error, the returning data field from slave is including request data. If error occurs, this field will include an exception code which master application bases on to take next action.

In some message, data field can be inexistent (0 length). For example, master requires slave response to communication record (function code 0B hex), then slave do not need any additional message.

Error Correction Code (CRC)

Standard Modbus network has two error-detected methods. Content in error detect field depends on the selected detected method.

When RTU mode is selected as character frame, error detect field contains a 16 bits value (it can be achieved by two 8 bits character). Content in error detect field is calculated by message content detected by CRC. When adding bytes, it inputs from low byte to high byte. CRC is attached at the end of the message, so the high byte of CRC is the last byte of the sent out message.

Using RTU mode, message contains an error detect field which based on CRC method. CRC field detects the entire message content.

CRC field covers two bytes, including a 16 bits binary value, which is added into message after calculated by transmission device. Receiver recalculates the received message CRC and makes a comparison with the value in CRC field. If any difference occurs, there must be some errors.

CRC firstly introduces a 16 bit register that all value at "1", and then processes the value in the current register and the continuous 8-bits byte in message. Only 8 bit data in each character is active for CRC, start bit, stop bit and parity bit are inactive.

During producing CRC, each 8 bit character will OR with register content respectively. The result moves to LSB (least significant bit) and the MSB (most significant bit) is filled with 0. LSB is extracted for detection, if LSB is 1, register OR with the preset value; if LSB is 0, then no action. The whole process will repeat 8 times. After finishing the last bit (the eighth bit), the next 8-bits will OR with the current value of register respectively. At last, the value in register is CRC value after all bytes in message are processed.

The format example for information frame

Example for Using RTU Mode to Read Entire Data

Master Request						
Address	Function Code	High address of the first register	Low address of the first register	High bit on the register quantity	Low bit on the register quantity	Error Correction
01	03	00	38	00	01	XX

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Slave Response					
Address	Function Code	Byte quantity	Data high byte	Data low byte	Error Correction
01	03	2	41	24	XX
The algorithm integer of hex 4124 is 16676. Error correction is based on the transmission mode.					

Controller Data Cell Address

Address	Byte	Content	Unit
\$1000	1	Gen V_{Ph-N} L3-N	V
\$1001	1	Gen V_{Ph-N} L2-N	V
\$1002	1	Gen V_{Ph-N} L1-N	V
\$1003	1	Gen V_{Ph-Ph} L3-L1	V
\$1004	1	Gen V_{Ph-Ph} L2-L3	V
\$1005	1	Gen V_{Ph-Ph} L1-L2	V
\$1006	1	Gen current I3	A
\$1007	1	Gen current I2	A
\$1008	1	Gen current I1	A
\$1009	1	Gen power factor PFL3	
\$100A	1	Gen power factor PFL2	
\$100B	1	Gen power factor PFL1	
\$100C	1	Gen Frequency	0.1Hz
\$100D	1	Gen apparent power AL3	KVA
\$100E	1	Gen apparent power AL2	KVA
\$100F	1	Gen apparent power AL1	KVA
\$1010	1	Gen active power PL3	KW
\$1011	1	Gen active power PL2	KW
\$1012	1	Gen active power PL1	KW
\$1013	1	Gen reactive power QL3	KVAr
\$1014	1	Gen reactive power QL2	KVAr
\$1015	1	Gen reactive power QL1	KVAr
\$1016	1	Tacho (magnetic pick-up RPM)	RPM
\$1017	1	Oil pressure	kPa
\$1018	1	Coolant temperature	°C
\$1019	1	VBAT (battery voltage)	0.1V
\$101A	1	VALT (charging excitation voltage)	0.1V

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\$101B	1	AI (fuel level input)	%
\$101C	1	Bit0—Oil pressure	controller digital Input
		Bit1—Coolant temp	
		Bit2—Emergency stop	
		Bit3—Remote start signal	
		Bit4—Gen. close	
		Bit5—	
		Bit6—Mains close	
		Bit7—	
\$101D	1	Bit0—Gen. close/open	Controller relay output
		Bit1—Mains close/open	
		Bit2—Configurable relay 3	
		Bit3—Configurable relay 2	
		Bit4—Configurable relay 1	
		Bit5—Unit normal running status	
		Bit6—Engine crank	
		Bit7—Engine fuel	
\$101E	1	Bit0—Mains normal LED	
		Bit1—Mains closed LED	
		Bit2—START button / LED	
		Bit3—TEST button / LED	
		Bit4—AUTO button / LED	
		Bit5—MAN button / LED	
		Bit6—L.TEST/MUTE button / LED	
		Bit7—STOP button / LED	
		Bit8—Gen. normal LED	
		Bit9—Gen. closed LED	
		Bit10—CHARGE FAIL LED	
		Bit11—FAIL TO START LED	
		Bit12—LOW OIL PRESSURE LED	
		Bit13—HIGH TEMPERATURE LED	
		Bit14—OVERSPEED LED	
		Bit15—EMERGENCY STOP LED	
\$101F	1	Palarm Pre-alarm (warning) code	Refer to the list of failure code below
\$1020	1	Alarm alarm code	
\$1021	1	01: Man. transfer to Mains	
		02: Man. transfer to Gen.	
		03: Engine stop	
		04: Engine start	
		05: Enter into TEST status	
		06: Enter into MAN status	
		07: Enter into AUTO status	
		08: Reset	

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\$1022	1	SN serial number	
\$1023	1	Reserve	
\$1024	1	Reserve	
\$1025	1	Reserve	
\$1026	1	Bit0—Gen. phase sequence	1 for failure
		Bit1—Mains phase sequence	
\$1027	1	Reserve	
\$1028	1	Mains Frequency	0.1Hz
\$1029	1	Mains V_{Ph-N} L3-N	V
\$102A	1	Mains V_{Ph-N} L2-N	V
\$102B	1	Mains V_{Ph-N} L1-N	V
\$102C	1	Mains V_{Ph-Ph} L3-L1	V
\$102D	1	Mains V_{Ph-Ph} L2-L3	V
\$102E	1	Mains V_{Ph-Ph} L1-L2	V
\$102F	1	Reserve	
\$1030	1	Reserve	
\$1031	1	Reserve	
\$1032		Reserve	
\$1033		Reserve	
\$2001	1	Comm Address	
\$2002	1	Language	
\$2003	1	CT	
\$2004	1	Gen-V Low Alarm	V
\$2005	1	Gen-V Low preALM	V
\$2006	1	Gen-V High preALM	V
\$2007	1	Gen-V High Alarm	V
\$2008	1	I High preALM	A
\$2009	1	I High Alarm	A
\$200A	1	GEN-Hz low Alarm	0.1Hz
\$200B	1	Reserve	
\$200C	1	Reserve	
\$200D	1	GEN-Hz High Alarm	0.1Hz
\$200E	1	Reserve	
\$200F	1	Reserve	
\$2010	1	Reserve	
\$2011	1	Alarm delay	S
\$2012	2	Active energy	Kwhr
\$2014	2	Reactive energy	KVAhr
\$2016	1	VT	
\$2017	1	Pair of Poles	
\$2018	1	Nominal speed	RPM
\$2019	1	Pickup frequency	RPM
\$201A	1	Fuel mode	

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\$201B	1	T-sensor mode	
\$201C	1	P-sensor mode	
\$201D	1	H-sensor mode	
\$201E	1	Start delay	S
\$201F	1	Crank attempt	
\$2020	1	Crank time	S
\$2021	1	Crank reset	S
\$2022	1	Crank disconnect	RPM
\$2023	1	Idle delay	S
\$2024	1	Safety-on delay	S
\$2025	1	Cooling delay	S
\$2026	1	Stop delay	S
\$2027	1	Under SP Alarm	RPM
\$2028	1	Under SP preALM	RPM
\$2029	1	Over SP preALM	RPM
\$202A	1	Over SP Alarm	RPM
\$202B	1	Oil-P Alarm	kPa
\$202C	1	Oil-P preALM	kPa
\$202D	1	Coolant preALM	°C
\$202E	1	Coolant Alarm	°C
\$202F	1	Batt low preALM	0.1V
\$2030	1	RUNHr	HOUR
\$2031	1	Ext. Alarm mode	
\$2032	1	Fuel level input	0 : V 1-2: %
\$2033	1	Oil Stop	
\$2034	1	Coolant Stop	
\$2035	1	Pre-Heat delay	S
\$2036	1	Fuel pump on level	%
\$2037	1	Fuel pump off level	%
\$2038	1	User Relay 1	
\$2039	1	User Relay 2	
\$203A	1	User Relay 3	
\$203B	1	Batt high preALM	0.1V
\$203C	1	ALT. low preALM	0.1V
\$203D	1	Reserve	
\$203E	1	Reserve	
\$203F	1	Gen. L1 offset	
\$2040	1	Gen. L2 offset	
\$2041	1	Gen. L3 offset	
\$2042	1	I1 offset	
\$2043	1	I2 offset	
\$2044	1	I3 offset	
\$2045	1	Reserve	

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\$2046	1	Oil pressure offset	
\$2047	1	Coolant temperature offset	
\$2048	1	Battery voltage offset	
\$2049	1	Alt. V offset	
\$204A	1	Fuel level offset	
\$204B ——— \$205E are P-sensor data table, input the resistance (0.1Ω) from small to big one by one in order of “risistance - corresponding value - risistance”.			
\$205F ——— \$2072 are T-sensor data table, input the resistance (0.1Ω) from small to big one by one in order of “risistance - corresponding value - risistance”.			
\$2073 ——— \$2086 are Fuel level sensor data table, input the resistance (0.1Ω) from small to big one by one in order of “risistance - corresponding value - risistance”.			
\$2087	1	Mains L1 offset	
\$2088	1	Mains L2 offset	
\$2089	1	Mains L3 offset	
\$20CA	1	GEN. Alarm Delay	S
\$20CB	1	GEN. ON Delay	S
\$20CC	1	Mains-V low Alarm	V
\$20CD	1	Mains-V High Alarm	V
\$20CE	1	Mains-Hz low Alarm	0.1Hz
\$20CF	1	Mains-Hz High ALM	0.1Hz
\$20D0	1	Mains Alarm Delay	S
\$20D1	1	Mains ON Delay	S
\$20D2	1	Voltage Type	

Appendix: Failure Code

Code	Failure Type		Code	Failure Type
0	NO ERROR		8	START FAIL
1	NO PICKUP		9	STOP FAIL
2	OVER SPEED		10	BATTERY LOW
3	UNDER SPEED		11	BATTERY HIGH
4	P-SENSOR OPEN		12	CHARGE FAILURE
5	LOW OILPRESS		13	GEN. V LOW
6	T-SENSOR OPEN		14	GEN. V HIGH
7	COOLANT TEMP		15	OVER Current

11. Preparation before Start the Controller

- 11.1** Make sure controller is fixed well its installation meets ambient requirements.
- 11.2** Confirm all wiring connections of the controller meet the correct electric specification and correspond to “2.3 typical wiring diagram”. Ensure the correct polarity of the DC supply source and that it has been protected by an external fuse. Otherwise damage to the controller may occur.
- 11.3** Controller must be grounded well.
- 11.4** We recommend mounting an “E-Stop” button externally. The emergency stop input terminal could be connected to N.O. contact of “E-Stop” button, and the other contactor point be connected to the cathode of battery source.
- 11.5** Switch on DC working power source, make sure the preset parameters meet practical condition, such as current rate, H-sensor mode, P-sensor mode, T-sensor mode, etc.
- 11.6** If H-sensor is electromagnetic mode sensor, follow the steps below to adjust the measuring parameters of speed:

Method 1:

After switch on power source, set controller in MAN operation mode, LED above “MAN” button illuminates. H-sensor input frequency (F) is calculated by the rated speed and the fly wheel teeth, $F = \text{teeth} \times \text{Rate speed} \div 60$, just input this calculated value to controller directly and setting is finished, detailed steps as following:

Operation	Description
Controller is in ready status:	READY
Continuously press “  ” 2s, enter into parameters setting menu, then LCD displays:	<<SETTING/参数设定>> 0. QUIT
Press “  ” 3 times and then press “  ”, then LCD displays:	3. Engine 0. QUIT
Press “  ” 2 times and then press “  ”, then LCD displays:	2. Pickup frequency =0
Press “  ”, it prompts to key in password, key in modify password: “  ” “  ” “  ” “  ” “  ” “  ”	2. Pickup frequency Password: *****
At this time can press “  ” or “  ” to change parameters, input the calculated value of H-sensor input frequency, then LCD displays the setting value:	2. Pickup frequency =

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Press “  ” to make confirmation and then continuous press “  ” 2s can quit parameters setting menu, then LCD displays:	READY
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Method 2:

Operation	Description
Controller is in ready status:	READY
Continuously press “  ” 2s, enter into parameters setting menu, then LCD displays:	<<SETTING/参数设定>> 0. QUIT
Press “  ” 3 times and then press “  ”, then LCD displays:	3. Engine 0. QUIT
Press “  ” 3 times again then LCD displays:	3. Engine 3. Set pickup now
Start engine, after engine running stably press “  ”, controller will compare the H-sensor speed with generator’s voltage frequency immediately, and transfer the running speed 1500RPM to the measuring frequency. When “ DONE ” disappears, setting is finished immediately. Press “  ” and then continuously press “  ” 2s to quit parameters setting menu, stop Genset.	3. Engine 3. Set pickup now DONE

NOTE: during the period of adjusting the measuring speed parameters, the protection of controller is incomplete, so operator should pay more attention to Genset running status. When abnormal appears, stop adjusting immediately and check out failure reason before adjust again. If possible, we recommend the operator install a protection circuit or device externally according to the practical condition.

12. Technical Parameters

Voltage range: 12V/24V (8-35V) Continuous
 Max working current: @12V 0.4A, @24V 0.2A
 AC input voltage: phase voltage 15-300VAC RMS (AC frequency ≥ 40 Hz)
 AC current input: 0.05-5A true RMS.
 AC measure precision: 0.5 class
 AC input frequency: 3-70Hz (voltage ≥ 15V)
 Relay output: 3A/30VDC
 Working ambient temperature: -20~50℃
 Storage ambient temperature: -40~80℃
 Humidity: (20%-75%) RH
 Atmospheric pressure: (86-106) kPa

Version: 059A091230