网为电气®
Wangwei Electric

Operation Instruction of
WQ7C Bus Tie Controller

Beijing Wangwei Electric Limited Company

Foreword

Version updates

Date	Version	Contents
2015-12-1	1.0	Start
2016-05-14	1.1	Revise some parameters specification
2017-08-21	1.2	Revision of individual elements

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Contents

1. Introduction

WQ7C Bus Tie Controller is an intelligent bus connect module with automatic measurement, LCD display and digital communication. It integrates digitalization, intelligence, and networking into one and its measurement and control processes are automatic which can reduce human errors. It is an ideal bus connect product.

Constructed on the basis of the key microprocessor, WQ7C Bus Tie Controller can accurately detect voltages of three-phase supply used in two ways, make accurate judgment on the abnormal voltages occurred (overvoltage, undervoltage, phase loss) and output passive switching values. The device fully considers the application of the power supply system of two incoming lines and a bus tie device, and there are two control modes for choice. They are the bus tie automatic bus transfer and the incoming line automatic bus transfer. Because of its compact structure, advanced circuit, simple wiring, high reliability, it can be widely used in electricity, post and telecommunications, petroleum, coal, metallurgy, railway, municipal industry, intelligent building and other industries.

2. Performance and Features

--The Choices of two-way power supply are: electric supply + electric supply, electric supply + electricity generation, electricity generation + electric supply, electricity generation + electricity generation;
--LCD is 128 x 64 pixels with a backlight. Operate by touching buttons;
--Collect and display the phase voltage, line voltage, frequency of three-phase supply used in two ways;
--It can detect overvoltage, undervoltage, phase loss, reverse phase sequence and others;
--Automatic/manual modes can be switched. In manual mode, it is available to switch on/off forcefully;
--All parameters can be set in the field. Password verification is adopted to avoid maloperation from non-professionals;
--With functions of switch reclosing and power off and reenergization after deenergization;
--Separation design of N lines of two-way power supply;
--display of real-time clock. It has the function history recording which can circularly record 50 data;
--The range of alternating current supply is 185-255V;
--It has RS485 communication interface in isolated form, adopts MODBUS communication protocol. It has functions of remote control, remote signaling, telemetry, remote regulation;
--It is suitable for three- phase four-wire system
--Modular structure design. It has flame-retardant ABS shell, pluggable amphenol connector, embedded installation method, compact structure, easy installation.

3. Specification

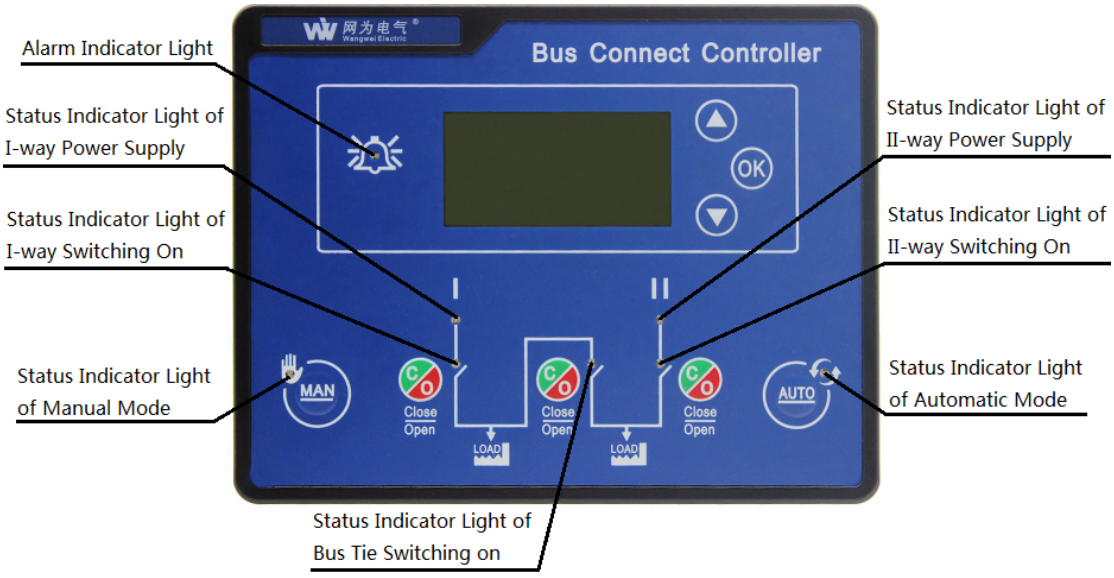
Item	Description	
Operating Voltage	Alternating Current Power Supply of A1-N1/A2-N2 ,Voltage Range is AC 185～255 V;	
Overall Power Consumption	6W(Ready Mode: < 3W)	
AC Input Voltage	Three phase four wire system	185～255 V
Rated Frequency	50Hz	
Output Capacity of Relay	5A/250V (Potential Free Contact)	
Input Interface of Switching Values	It Is Available to Connect Common Port(COM)	
Communication Mode	RS485 Isolated Port，MODBUS Communication Protocol	
Overall Dimension	197mm×152mm×57mm(L×W×H)	
Installation Hole Size	186mm×141mm	
Operating Conditions	Environment Temperature：（-15～+60）℃； Relative Humidity：（20～90）%RH	
Storage Conditions	Relative Temperature：（-25～+70）℃	
Ingress Protection	IP55: When adding a waterproof rubber ring between the controller and the control panel.	
Dielectric Strength	Apply AC2kV voltage between AC high voltage terminal and low voltage terminal, the leakage current is less than 3mA within 1 min	
Weight	0.7 kg	

4. Measurement and Display Data

Phase voltage of I-way and II-way power supply（A-N、B-N、C-N）	●
Line voltage of I-way and II-way power supply（A-B、B-C、C-A）	●
Supply frequency of I-way and II-way power supply	●
Real-time clock	●
Alarm Status	●
History Record	●

5. Operation

5.1 Indicator Light



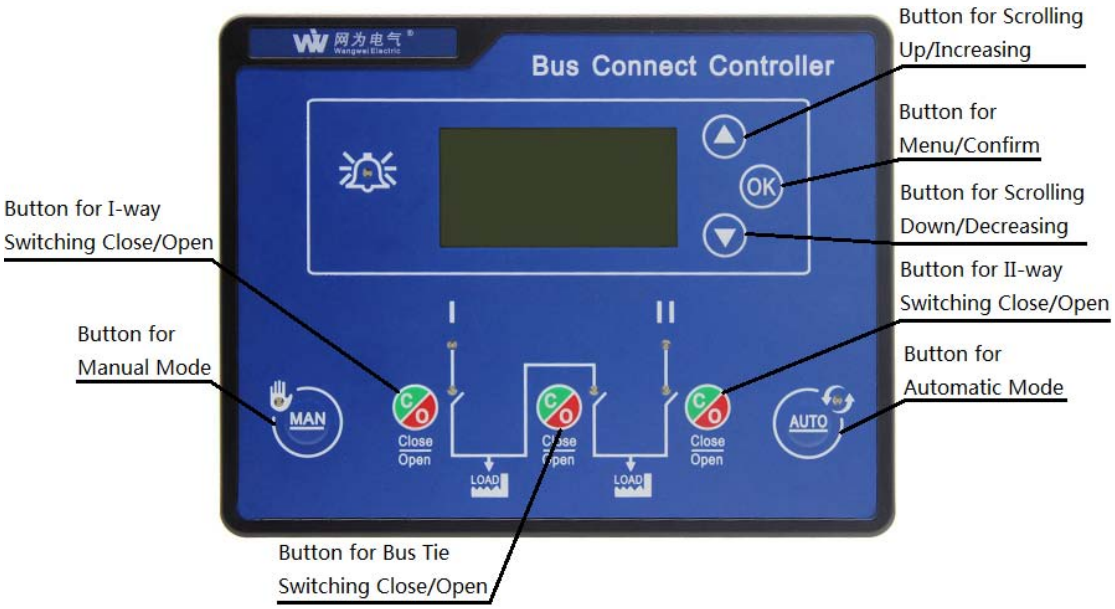
Distribution Diagram of Indicator Lights on the Panel

Instruction of Indicator Lights

Name of Indicator Light	Functional Description
Alarm Indicator Light	Flicker when there is an alarm(once in one second)
Status Indicator Light of I-way Power Supply	The light is normally on when the I-way power supply is normal, the light flickers(once in one second) when the power supply is abnormal and the light is off when there is a voltage loss.
Status Indicator Light of I-way Switching On	The light is on when the auxiliary touch input of I-way switching on is effective
Status Indicator Light of II-way Power Supply	The light is normally on when the II-way power supply is normal, the light flickers(once in one second) when the power supply is abnormal and the light is off when there is a voltage loss.
Status Indicator Light of II-way Switching On	The light is on when the auxiliary touch input of II-way switching on is effective
Status Indicator Light of Bus Tie Switching on	The light is on when the auxiliary touch input of bus tie switching on is effective
Indicator Light of Manual Mode	The light is on when the current mode is manual mode

Indicator Light of Automatic Mode	The light is on when the current mode is automatic mode

5.2 Description of Functions of the Buttons



Distribution Map of Buttons on the Panel

Description of Functions of the Buttons

Icon	Name of Button	Functional Description
	Button for I-way Switching Close/Open	(Manual mode valid) Press this button, if I-way switch is open, then it is close; if the I-way switch is close, then the I-way switch is open.
	Button for Bus Tie Switching Close/Open	(Manual mode valid) Press this button, if bus tie switch is open, then it is close; if the bus tie switch is close, then the bus tie switch is open.
	Button for II-way Switching Close/Open	(Manual mode valid) Press this button, if II-way switch is open, then it is close; if the II-way switch is close, then the II-way switch is open.
	Button for Manual Mode	Press this button, set the mode of controller to manual mode.
	Button for Automatic Mode	Press this button, set the mode of controller to automatic mode.

	Button for Menu/Confirm	In the main interface, short press of this button can make the menu interface shown, long press (> 3 seconds) of this button can cancel the alarm state; In the menu interface, short press of this button can make the parameter setting mode available. Long press (> 3 seconds) of this button can make the main interface shown again.
	Button for Scrolling Up/Increasing	In the main interface, press this button to scroll up. In the menu interface, you can move the option or cursor up or increase the number of digits in the cursor position.
	Button for Scrolling Down/Decreasing	In the main interface, press this button to scroll down. In the menu interface, you can move the option or cursor down or decrease the number of digits in the cursor position.

6. OSD(On Scree Display)

6.1 Main Interface

Electric Quantity	
U1(L-N) 220V 220V 220V U2(L-N) 220V 220V 220V F1 50.0Hz F2 50.0Hz Auto Mode	Phase voltage of I-way power supply（A-N、B-N、C-N） Phase voltage of II-way power supply（A-N、B-N、C-N） Frequency of I-way power supply Frequency of II-way power supply Current Status, Alarm Status, Notice, Other Status Information
U1(L-L) 380V 380V 380V U2(L-L) 380V 380V 380V 2015-12-01 12:00:00 Auto Mode	Phase voltage of I-way power supply（A-B、B-C、C-A） Phase voltage of II-way power supply（A-B、B-C、C-A） Current Date Current Time Current Status, Alarm Status, Notice, Other Status Information
Working Status	
1# Normal Voltage 2# Normal Voltage Auto Mode	Voltage status or working status of I-way power supply Voltage status or working status of II-way power supply Voltage status or working status of bus tie Current Status, Alarm Status, Notice, Other Status Information
Input/Output Status	
1 2 3 4 5 6 7 8 IN OUT Auto Mode	Sequence number of input/output ports Status of input port(8-way power supply) Status of output port(8-way power supply) Current Status, Alarm Status, Notice, Other Status Information

Alarm Status	
Alarm (00) No Alarm	Number of alarms Alarm event Alarm event Alarm event
In the main interface, short press of  （Button for Scrolling Up）、  （Button for Scrolling Down） can turn pages； In the main interface, long press of  （Menu Button）（>3seconds)can reset alarm status.	

6.2 Status Description

Voltage Status or Working Status of I-way Power Supply

S/N	Name of Status	Status Description
1	**1# Normal Voltage**	Voltage value is in specialized range
2	**1# Over Voltage**	Voltage value is beyond upper limit set
3	**1# Loss of Voltage**	Voltage value is 0
4	**1# Miss Phase**	A loss of one or two phases in A,B,C
5	**1# Phase seq. wrong**	Phase sequence wrong of A-B-C
6	**1# Under Voltage**	Voltage value is under the lower limit set
7	**1# Close Failed**	Failure of switching on of I-way power supply under the automatic mode
8	**1# Open Failed**	Failure of switching on of I-way power supply under the automatic mode

Voltage Status or Working Status of I-way Power Supply

S/N	Name of Status	Status Description
1	**2# Normal Voltage**	Voltage value is in specialized range
2	**2# Over Voltage**	Voltage value is beyond upper limit set
3	**2# Loss of Voltage**	Voltage value is 0
4	**2# Miss Phase**	A loss of one or two phases in A,B,C
5	**2# Phase seq. wrong**	Phase sequence wrong of A-B-C
6	**2# Under Voltage**	Voltage value is under the lower limit set
7	**2# Close Failed**	Failure of switching on of II-way power supply under the automatic mode
8	**2# Open Failed**	Failure of switching off of II-way power supply under the automatic mode

Working Status or Other Status Information of Bus Tie

S/N	Name of Status	Status Description
1	**Bus Tie Close Failed**	Failure of switching on of bus tie under the automatic mode
2	**Bus Tie Open Failed**	Failure of switching off of bus tie under the automatic mode
3	**Trip alarm**	Input signal of circuit breaker trip is valid
4	**Power Parallel**	I-way, II-way, and bus tie circuit breakers are all closed, so the I-way and II-way power supplies are in parallel connection
5	**Forced Open**	Input signal of compulsive disconnection is valid
6	**Fault Lock**	Input signal of fault interlocking is valid

On-off Status

S/N	Name of Status	Status Description
1	**1# Open Delay**	Delay of I-way power supply switching off under the automatic mode
2	**1# Opening**	I-way power supply is outputting signal of switching off
3	**1# Close Delay**	Delay of I-way power supply switching on under the automatic mode
4	**1# Closing**	I-way power supply is outputting signal of switching on
5	**1# Open Again**	When the first switching on is unsuccessful, the I-way power supply is switching off again
6	**1# Close Again**	When the first switching off is unsuccessful, the I-way power supply is switching on again
7	**2# Open Delay**	Delay of II-way power supply switching off under the automatic mode
8	**2# Opening**	II-way power supply is outputting signal of switching off
9	**2# Close Delay**	Delay of II-way power supply switching on under the automatic mode
10	**2# Closing**	II-way power supply is outputting signal of switching on
11	**2# Open Again**	When the first switching on is unsuccessful, the II-way power supply is switching off again
12	**2# Close Again**	When the first switching off is unsuccessful, the II-way power supply is switching on again
13	**Bus Tie Open Delay**	Delay of bus tie power supply switching off under the automatic mode
14	**Bus Tie Opening**	Bus tie power supply is outputting signal of

		switching off
15	**Bus Tie Close Delay**	Delay of bus tie power supply switching on under the automatic mode
16	**Bus Tie Closing**	Bus tie power supply is outputting signal of switching on
17	**Bus Tie Open Again**	When the first switching on is unsuccessful, the bus tie power supply is switching off again
18	**Bus Tie Close Again**	When the first switching off is unsuccessful, the bus tie power supply is switching on again

Warning Alarm

When the controller detects a warning alarm state, the warning light flickers (once in one second). After the alarm is reset, the warning light will go out and the warning alarm will be released.

S/N	Name of Status	Status Description
1	**1# Phase Seq. Wrong**	Phase sequence wrong of A-B-C of I-way power supply
2	**2# Phase Seq. Wrong**	Phase sequence wrong of A-B-C of II-way power supply
3	**Forced Open**	When the input of compulsive disconnection is valid, warning alarm of compulsive disconnection occurst
4	**Fault Lock**	When the input of fault interlocking is valid, warning alarm of fault interlocking occurs.
5	**Power Parallel**	I-way, II-way, bus tie circuit breakers are all closed, the warning alarm of I-way and II-way power supplies being connected in parallel occurs

Fault Alarm

When the controller detects a fault alarm state, the warning light flickers (once in one second). After the alarm is locked, the warning alarm will not be released until the alarm is manually reset.

S/N	Name of Status	Status Description
1	**1# Close Failed**	Failure of I-way power supply switching on under the automatic mode
2	**1# Open Failed**	Failure of I-way power supply switching off under the automatic mode
3	**2# Close Failed**	Failure of II-way power supply switching on under the automatic mode
4	**2# Open Failed**	Failure of II-way power supply switching off under the automatic mode
5	**Bus Tie Close Failed**	Failure of bus tie power supply switching on under the automatic mode

6	**Bus Tie Open Failed**	Failure of I-way power supply switching on under the automatic mode
7	**1# Trip alarm**	The signal of I-way circuit breaker trip is valid
8	**2# Trip alarm**	The signal of II-way circuit breaker trip is valid
9	**Bus Tie Trip alarm**	The signal of bus tie circuit breaker trip is valid

Other Status Information

S/N	Name of Status	Status Description
1	**Manual Mode**	Current mode is manual mode
2	**Auto Mode**	Current mode is automatic mode

6.3 Alarm Query Interface

Short press of (Menu Button) in alarm interface, the alarm query interface will be shown.

Alarm Query Interface

Alarm (01/04)	Sequence number and quantity of alarms
1# Trip alarm	Alarm Event
2# Trip alarm	Alarm Event
Bus Tie Trip alarm	Alarm Event

Short presses of (Button for Scrolling Up) and (Button for Scrolling Down) in the alarm query interface, list of alarm events can be looked up by scrolling
(Note: when the number of alarms >3, looking up by scrolling is necessary.)

Short press of (Menu Button) in the alarm query interface, the interface will be shifted back to the main alarm interface.

Long press(>3seconds) of (Menu Button) in the alarm query interface, the alarm status will be released.

6.4 Main Menu

Short press of (Menu Button) in the main interface, the interface of main menu will be shown

Long press of (Menu Button) in the interface of main menu, the interface will be shifted back to the main interface

Interface of Main Menu

1. History Record	
2. Configuration	
3. Calibration	

4. Information	
Sort press of （Button for Scrolling Up）、（Button for Scrolling Down）can choose different parameter line(current line is black) and another short press of （Confirm Button）can make the corresponding interface of menu will be shown.。	

Note 1: the password is required to enter the function of parameter setting. The default password is "00000". The operator can change the password to prevent others from changing the controller configuration. Please remember to change your password. If you forget your password, please contact the service staff of the company.

Note 2: The calibration is specialized for the manufacturer's calibration controller data. It only can be used by inputting manufacturer`s password. Consumers cannot use it.

7. History Record

7.1 History Record Interface

Choose the "History Record" of the interface of the main menu. Then press (Menu Button) shortly and the history record interface will be shown. Long press （>3seconds） of (Menu Button) in the history record interface, the interface will be shifted back to the Main interface.	
Query of History Records	
B#OFF/1#ON/2#ON 01/50	Recording Events, SN/ the total number of records
1# Normal Voltage	Status of I-way power supply
2# Normal Voltage	Status of II-way power supply
2017-01-01 10:00:00	Recording data, recording time
Short press of (Button for Scrolling Up),(Button for Scrolling Down) can check every page of history records; Short press of (Menu Button), current page of history records will be turned into the mode of detailed query Long press of (Menu Button)(>3 seconds), the interface will be shifted back to the Main interface	
Detailed Query of History Records	
B#OFF/1#ON/2#ON 01/50	Recording Events, SN/ the total number of records;(shown in black)
1# Normal Voltage	Status of I-way power supply
2# Normal Voltage	Status of II-way power supply

2017-01-01 10:00:00	Recording data, recording time
B#OFF/1#ON/2#ON 01/50 U1(L-N)220V 220V 220V U2(L-N)220V 220V 220V F1 50.0Hz F2 50.0Hz	Recording Events, S/N/ the total number of records;(shown in black) Phase voltage of I-way power supply（A-N、B-N、C-N） Phase voltage of II-way power supply（A-N、B-N、C-N） Frequency of I-way power supply Frequency of II-way power supply
Short press of (Button for Scrolling Up),(Button for Scrolling Down) can check the details of current history record by turning pages Short press of (Menu Button) can return back to the query mode of history records. Long press of (Menu Button)(>3 seconds), the interface will be shifted back to the Main interface	

The history records include: recording events, status of I-way power supply, status of II-way power supply, three-phase voltage of I-way power supply, phase three-phase voltage of two-way power supply, frequency of I-way power supply, frequency of II-way power supply and recording date as well as recording time.

Types of recording events include: warning events, failure events, and action events.

he warning events include two warning alarms, they are " Forced Open " and " Fault Lock ".

Failure events are all failure warnings.

Action events are the events when the following events occur:

List of Action Events

S/N	Action Events	Description
1	B#OFF/1#ON/2#ON	Record when bus tie switching off, I-way switching on and II-way switching on occur.
2	2#OFF/1#ON/B#ON	Record when II-way switching off, I-way switching on and bus tie switching on occur.
3	1#OFF/2#ON/B#ON	Record when I-way switching off, II-way switching on and bus tie switching on occur.
4	ALL OFF	Record when I-way switching off, II-way switching on and bus tie switching on occur.

8. Parameter Setting

8.1 nterface of Parameter Setting

Choose the “Parameter Setting” of the interface of main menu. Then short press of (Menu Button) can make the interface of password confirmation of parameter setting. Input the correct password, the main parameter interface will be shown,

otherwise, the interface will be shifted back to the main interface. Default password is :00000. Long press (>3 seconds)of (Menu Button) in the parameter setting interface, the interface will be shifted back to the main interface.

密码输入 Password Input

Password 0****	Current setting of password for entering "Parameter Setting" is shown in black

Short press of (Button for Scrolling Up), (Button for Scrolling Down) can set current password;

Short press of (Menu Button) can set next number of password. Short press of (Menu Button) when finishing setting password can check the password.

Parameter Query

01 1# Close Delay	S/N and Name of Parameter
Range (0-9999)S	Range and unit of parameter values
Default: 0010	Default values(for reference only)
Current: 0010	Current Setting Values

Short press of (Button for Scrolling Up) and (Button for Scrolling Down) can check every parameter page.

Short press of （Menu Button） can make the current parameter page be the mode of setting whose first line is shown in black;

Long press（>3seconds） of（Menu Button） can make the interface be shifted back to the main interface.

Parameter Setting

01 1# Close Delay	S/N and Name of Parameter(shown in black)
Range (0-9999)S	Range and unit of parameter values
Default: 0010	Default values(for reference only)
Current: 0010	Current values, current number to be set is shown in black

Short press of（Button for Scrolling Up）、（Button for Scrolling Down）can set current values;

Short press of （Menu Button）can set next parameter number. Another press of (Menu Button) when finishing setting parameter values can save the parameter values, quit the mode of parameter setting and make the interface be shifted back to the interface of parameter query.

Long press（>3 seconds） of (Menu Button) can make the interface be shifted back to the main interface.

8.2 Parameter Configuration Table

List of Parameter Configuration

S/N	Name of Parameter	Setting Range	Default	Description
Setting of Switching On/Off				
1	**1# Close Delay**	（0-9999）Seconds	10	The delay time of starting from preparation of switching on to officially outputting signal of switching on of I-way circuit breaker
2	**1# Open Delay**	（0-9999）Seconds	10	The delay time of starting from preparation of switching off to officially outputting signal of switching off of I-way circuit breaker
3	**2# Close Delay**	（0-9999）Seconds	10	The delay time of starting from preparation of switching on to officially outputting signal of switching on of II-way circuit breaker
4	**2# Open Delay**	（0-9999）Seconds	10	The delay time of starting from preparation of switching off to officially outputting signal of switching off of II-way circuit breaker
5	**BusTie Close delay**	（0-9999）Seconds	10	The delay time of starting from preparation of switching on to officially outputting signal of switching on of bus-tie circuit breaker
6	**BusTie Open delay**	（0-9999）Seconds	10	The delay time of starting from preparation of switching off to officially outputting signal of switching on of bus-tie circuit breaker
7	**Reclose Delay**	（0-9999）Seconds	3	When the circuit breaker has switched off(on) under the automatic mode and the status of switching off(on) is different

				with the predetermined status, another switching off(on) should be operated after the time of "Delay of Closing/Opening Circuit breaker Again"
8	**Trip Detect Delay**	（0-99.9）Seconds	3.0	The delay time of starting from detecting the signal of fault detect to signaling the failure warning.
9	**Close Time**	（0-999.9）Seconds	1.0	Pulse time of output of closing relay
10	**Again Close Time**	（0-99.9）Seconds	1.0	In the automatic mode, when the first switching off is unsuccessful, the switch starts to being closed again. And after the delay of reclosing, the switching off is being operated again. If it is not possible to switch off, then a failure alarm signal of switching off will be issued.
11	**Open Time**	（0-999.9）Seconds	1.0	Pulse time of output of closing relay
12	**Again Open Time**	（0-99.9）Seconds	1.0	In the automatic mode, when the first switching on is unsuccessful, the switch starts to being opened again. And after the delay of reopening, the switching on is being operated again. If it is not possible to switch on, then a failure alarm signal of switching on will be issued.
13	**Exceed Transfer**	（0-99.9）Seconds	0.0	Time of continuous output of closing relay after detect the signal of status of switching on
Setting of Alternating Current				
14	**1# Over Voltage**	（100-355）VAC	255	Upper limit value of voltage of I-way power supply. It is abnormal that a value is greaterthan the upper limit value
15	**1# Return**	（100-355）VAC	245	Upper limit recovery value of

	Overvolt			voltage of I-way power supply. It is normal that a value is smaller than the recovery value
16	**2# Over Voltage**	（100-355）VAC	255	Upper limit value of voltage of II-way power supply. It is abnormal that a value is greater than the upper limit value
17	**2# Return Overvolt**	（100-355）VAC	245	Upper limit recovery value of voltage of II-way power supply. It is normal that a value is smaller than the recovery value
18	**1# Under Voltage**	（100-355）VAC	185	Lower limit value of voltage of I-way power supply. It is abnormal that a value is smaller than the lower limit value
19	**2#Return Undervolt**	（100-355）VAC	195	Lower limit recovery value of voltage of II-way power supply. It is normal that a value is greater than the recovery value
20	**2# Under Voltage**	（100-355）VAC	185	Lower limit value of voltage of II-way power supply. It is abnormal that a value is smaller than the lower limit value
21	**2#Return Undervolt**	（100-355）VAC	195	Lower limit recovery value of voltage of II-way power supply. It is normal that a value is greater than the recovery value
Function Setting				
22	**Work Mode**	Bus Tie/Incoming Line	Bus Tie	Modes of bus-tie automatic bus transfer and incoming-line automatic bus transfer are both available working mode of controller
23	**Priority Mode**	No Priority/ 1# Priority/ 2# Priority	1# Priority	Modes of equal incoming lines, priority of I-way power supply and priority of II-way power supply are available under the mode of incoming-line automatic bus transfer
24	**Bus Tie Reset Mode**	Auto Reset /Manual Reset	Auto Reset	Modes of self-reset and manual reset are both available under the mode of bus-tie automatic bus transfer.
25	**Check Phase**	Enable/Disable	Disable	Phase sequence detection

	Seq.			enabled settings
Other Settings				
26	**Device Address**	1～255	1	Communication Address Set for Network Communication of RS485
27	**Com Baud Rate**	4800/9600/ 19200/38400	9600	Communication Baud Rate Set for Network Communication of RS485
28	**Language**	中文/English	中文	Set interface display language
29	**Password Set**	/	00000	Password for Entering Parameter Setting
30	**Date & Time Set**	/	/	Set Date and Time of Real-time Clock

Note:

a. Settings of Time of Switching Off, Time of Switching On and Over-conversion Time:

The setting should pay attention to the continuous conduction time allowed by the opening coil and the closing coil of circuit breaker. The sum of the closing time and the over-conversion time cannot be more than the allowable continuous conduction time of the closing coil, or the closing coil may be damaged. The opening time cannot be more than the allowable continuous conduction time of the opening coil, or the opening coil may be damaged partly.

b. Limiting Set Values of Overvoltage and Restoration after Overvoltage:

Limiting set value of overvoltage should exceed the limiting value of restoration after overvoltage, or controller may operate abnormally.

There should be a certain degree of difference between the limiting value of overvoltage and the limiting value of restoration after overvoltage so as to avoid frequent switching between the overvoltage and the normal state of the controller.

c. Limiting Set Values of Undervoltage and Restoration after Undervoltage:

Limiting set value of overvoltage should exceed the limiting value of restoration after overvoltage, or controller may operate abnormally.

There should be a certain degree of difference between the limiting value of overvoltage and the limiting value of restoration after overvoltage so as to avoid frequent switching between the overvoltage and the normal state of the controller.

9. Operation

9.1 Manual Operation

Press the Button for Manual Mode  , the indicator light of manual status is on, and the controller is in manual mode.

Press the button for I-way switching on/off  , I-way closing relay outputs. After the delay of switching on, I-way closing relay disconnects, I-way supplies power to load. Press the button for I-way switching on/off  again, the I-way opening relay outputs. After the delay of switching off, the I-way opening relay disconnects, I-way stops supplying power to the load.

Press the button for II-way switching on/off  , II-way closing relay outputs. After the delay of switching on, II-way closing relay disconnects, II-way supplies power to load. Press the button for II-way switching on/off  again, the II-way opening relay outputs. After the delay of switching off, the II-way opening relay disconnects, II-way stops supplying power to the load.

Press the button for bus tie switching on/off  , bus-tie closing relay outputs. After the delay of switching on, bus-tie closing relay disconnects, two-way load busbars connect in parallel and receive power supply. Press the button for bus tie switching on/off  again, the bus-tie opening relay outputs. After the delay of switching off, the bus-tie opening relay disconnects, two-way load busbars disconnect.

Note: If any two circuit circuit breakers have already been in the closing state and when another button for switching on/off is pressed, the closing relay will not operate, and the controller will send out the prompt message of "No Parallel of Power".

9.2 Automatic Operation

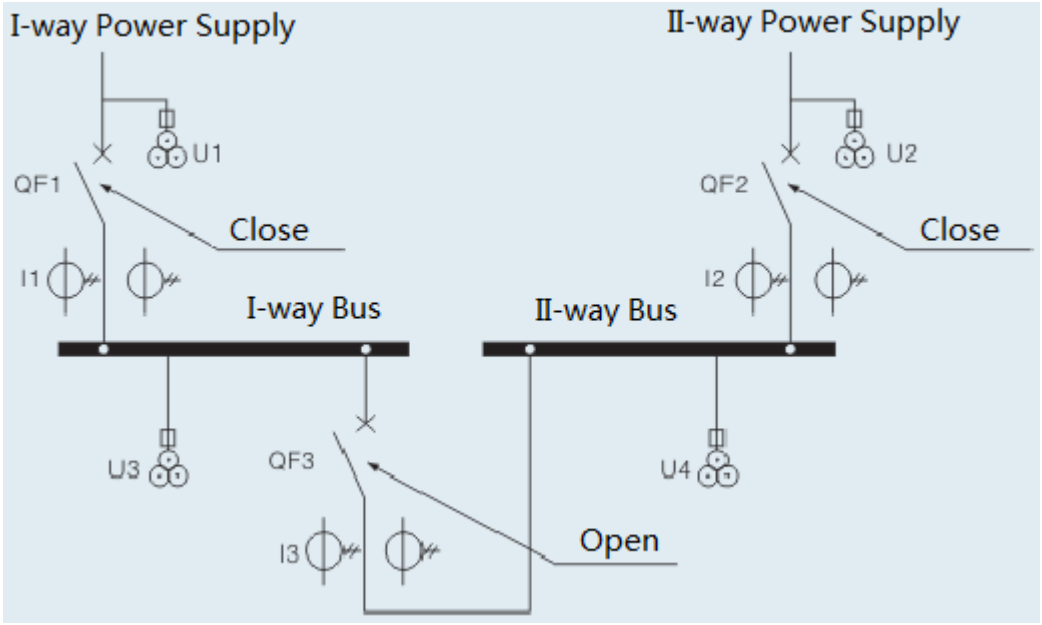
Press Button for Automatic Mode  , the indicator light of automatic mode is on and the controller is under the automatic mode. It automatically controls the switching on/off of circuit breaker based on function setting and other conditions.

Two Operating Modes:

- Bus Tie Automatic Bus transfer

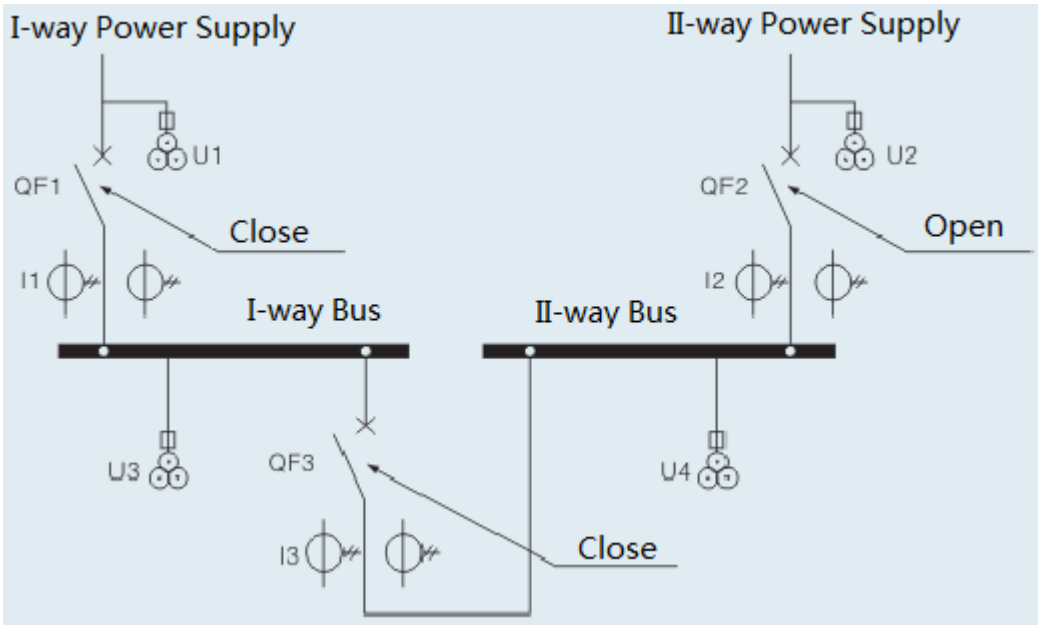
1. When the I-way power supply and the II-way power supply are both normal: open the switch ofQF3 firstly, then close the switches of QF1 and QF2;
2. When the power of the I-way power supply is abnormal and the II-way power supply is normal: open the switch of QF1 firstly, then close the switches of QF2 and QF3;
3. When the I-way power supply is normal and the II-way power supply is abnormal: open the switch of QF2 firstly, then close the switches of QF1 and QF3;
4. When both the I-way power supply and the II-way power supply are abnormal:

open all switches of QF1, QF2, and QF3.



- Incoming Line Automatic Bus Transfer

1. When the I-way power supply and the II-way power supply are both normal: open the switch ofQF2 firstly, then close the switches of QF1 and QF3;
2. When the power of the I-way power supply is abnormal and the II-way power supply is normal: open the switch of QF1 firstly, then close the switches of QF2 and QF3;
3. When the I-way power supply is normal and the II-way power supply is abnormal: open the switch of QF2 firstly, then close the switches of QF1 and QF3;
4. When both the I-way power supply and the II-way power supply are abnormal: open all switches of QF1, QF2, and QF3.



Note: If there is a warning alarm or fault alarm under automatic mode, it will

automatically switch back to the manual mode. After removing all alarms and dismissing the alarm indications, press the Button for Automatic Mode again to enter the automatic mode again.

10. Power Supply of Bus Tie Circuit breaker

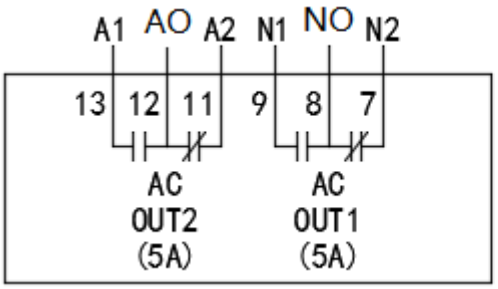
Power supply of bus tie circuit breaker is provided by the controller. As long as there is a normal voltage, the normal power supply of bus tie circuit breaker can be guaranteed and it can switch normally.

User needs to select the supply voltage (phase voltage or line voltage) according to the circuit breaker model.

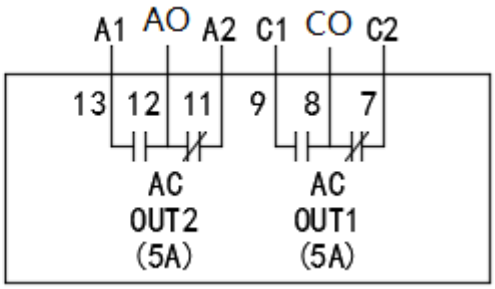
If it is supplied by the phase voltage, please connect I-way and II-way with Terminals 13 and 11 respectively and Phase N of I-way and II-way with Terminals 9 and 7 respectively. And then please connect Power Supply Output Terminals 12 and 8 with power supply of the bus tie circuit breaker.

If the bus tie circuit breaker is supplied by line voltage, please use the same method as above. You just need to connect Phase N by line voltage.

Connection methods are as follows:



Power supply by phase voltage of circuit breaker



Power supply by line voltage of circuit breaker

Note1: AO/NO is AC220V circuit breaker working power supply
Note2: AO/CO is AC380V circuit breaker working power supply
Note3: Normally open terminal must connect with I-way voltage.

11. Communication Configuration and Connection

The WQ7C Bus Tie Controller has an RS485 communication port that allows connection to a local area network with an open network. It applies the ModBus communication protocol. With the software running on PC or data collection system, it can provide a simple and practical communication management scheme of supply busbars of factories, telecommunications, industrial and civil buildings to realizes four remote functions of “remote control, telemetry, remote communication, remote adjustment” of busbar contact monitoring.

For details of communication protocol, see the <*Communication Protocol of WQ7C Bus Tie Controller*> Users need to externally connect 120 ohm impedance of matched resistance according to on-site networking conditions.

Communication Parameters

Baud Rate	9600 bps(4800/9600/19200/38400 bps are optional)
Data Bit	8 bits
Parity Bit	Null
Stop Bit	2 bits
Address	1(range: 1-255)

12. Port Definitions and Application Diagram

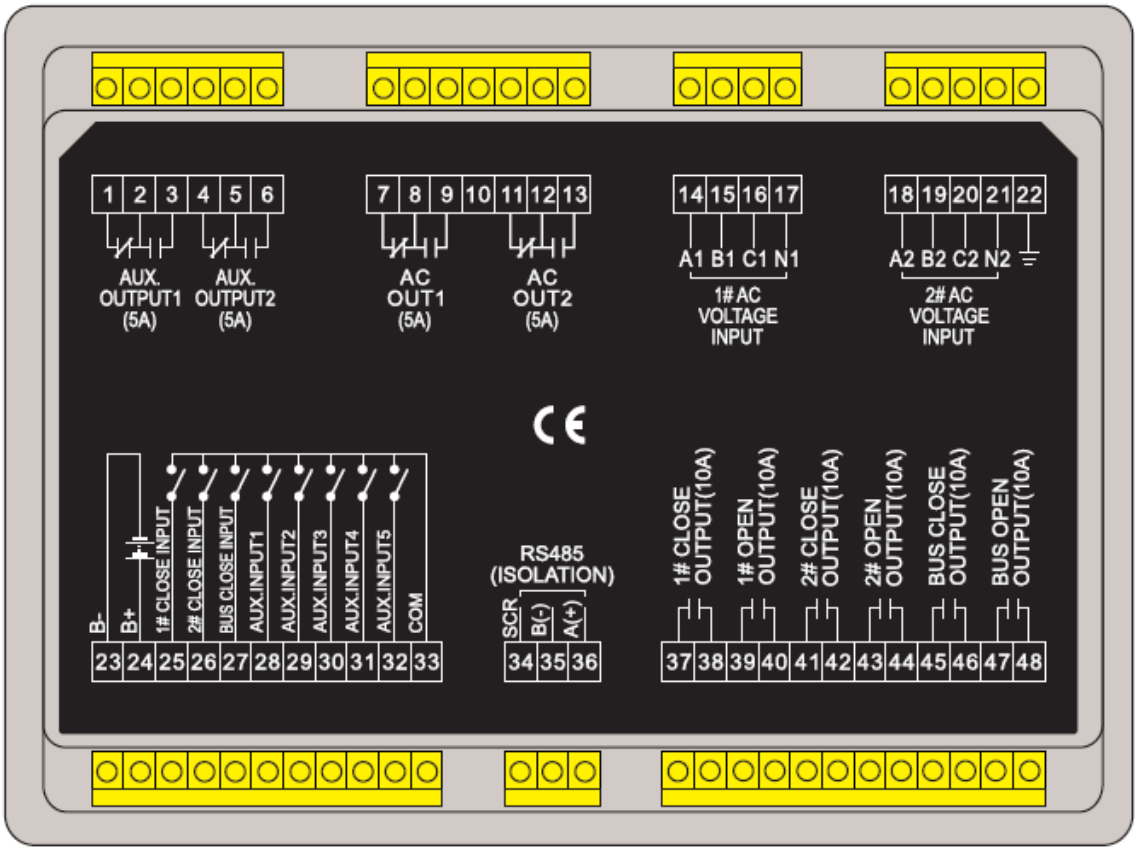


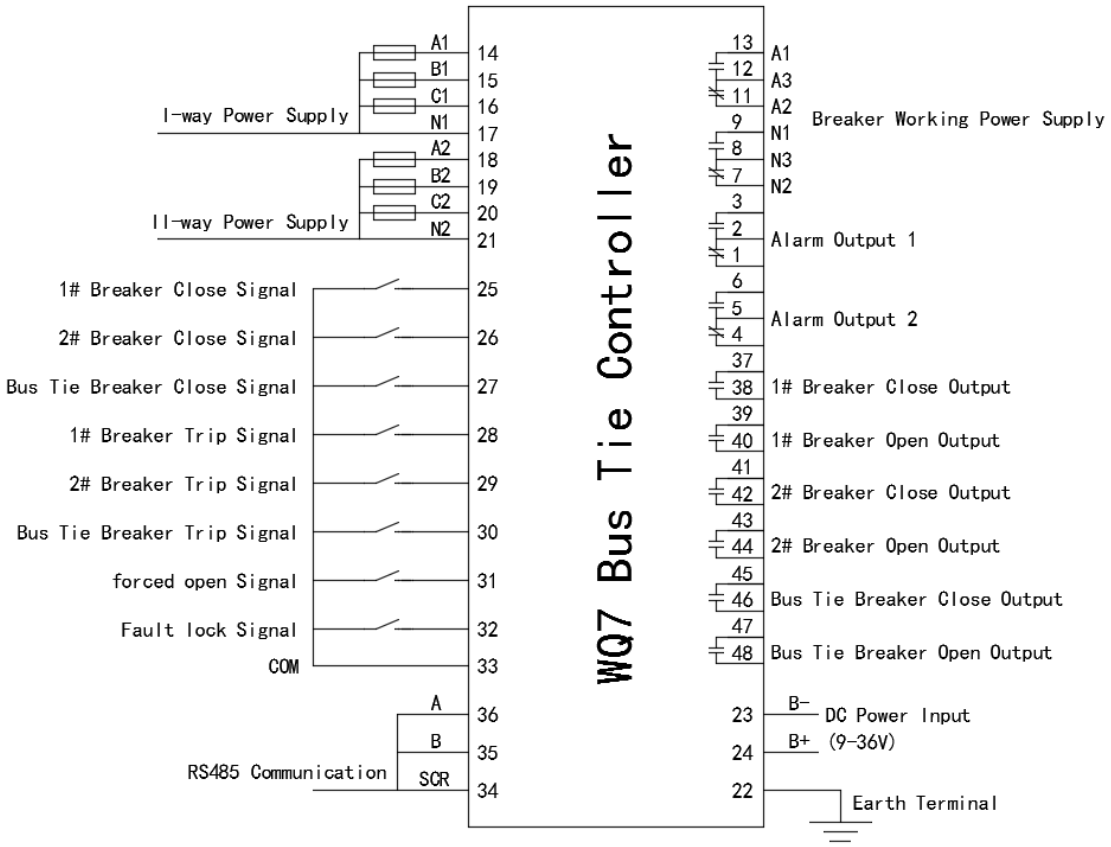
Figure of Back Panel of Controller

Functional Description of Ports of Input and Output

Number of Terminal	Item	Functional Description		Note
1	Alarm Output 1	NC	Potential Free Contact Output	250V/5A
2		COM		
3		NO		
4	Alarm Output 2	NC	Potential Free Contact Output	250V/5A
5		COM		
6		NO		
7	Power Supply	NC	Potential Free Contact Output	250V/5A
8		COM		

9	Output 1	NO		
10	NC	Null		
11	Power Supply Output 2	NC	Potential Free Contact Output	250V/5A
12		COM		
13		NO		
14	A1	I-way Voltage Input (Three-phase Four-wire)		
15	B1			
16	C1			
17	N1			
18	A2	II-way Voltage Input (Three-phase Four-wire)		
19	B2			
20	C2			
21	N2			
22	GND	Earth Terminal		
23	B-	Negative Electrode of Direct Current Supply of Controller		(Optional)
24	B+	Positive Electrode of Direct Current Supply of Controller		
25	Input of I-way Switching on	Check the status of switching on of I-way circuit breaker		Potential free contact input, Paired with the COM terminal.
26	Input of II-way Switching on	Check the status of switching on of II-way circuit breaker		
27	Input of Bus Tie Switching on	Check the status of switching on of bus tie circuit breaker		
28	Input of trip of I-way Switch	Check the status of trip of I-way circuit breaker		
29	Input of trip of II-way Switch	Check the status of trip of II-way circuit breaker		
30	Input of trip of Bus Tie Switch	Check the status of trip of bus-tie circuit breaker		
31	Input of Forced Open	Check the status of compulsive disconnection(input of fire protection)		
32	Input of Fault Lock	Check the status of fault interlocking		
33	COM	Common Terminal of Input Signal		
34	SCR	RS485 Communication Terminal (Users need to externally connect 120		
35	B(-)			

36	A(+)	ohm impedance of matched resistance according to on-site networking conditions)		
37	Output of I-way Switching On	NO	Potential Free Contact Output	250V/10A
38				
39	Output of I-way Switching Off	NO	Potential Free Contact Output	250V/10A
40				
41	Output of II-way Switching On	NO	Potential Free Contact Output	250V/10A
42				
43	Output of II-way Switching Off	NO	Potential Free Contact Output	250V/10A
44				
45	Output of Bus Tie Switching On	NO	Potential Free Contact Output	250V/10A
46				
47	Output of Bus Tie Switching Off	NO	Potential Free Contact Output	250V/10A
48				



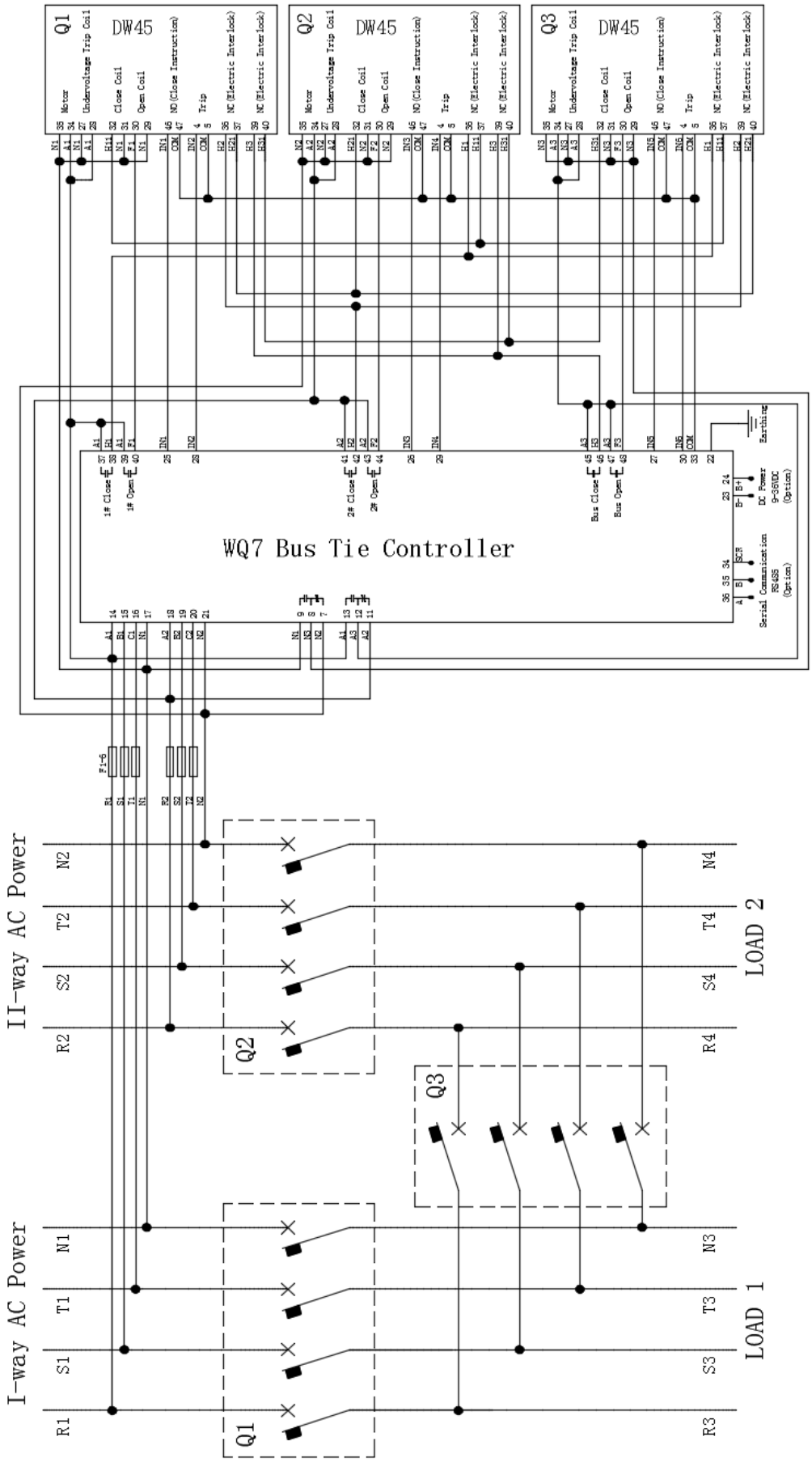
Application Diagram

13. Description of Connection between WQ7C Bus Tie Controller and circuit breaker

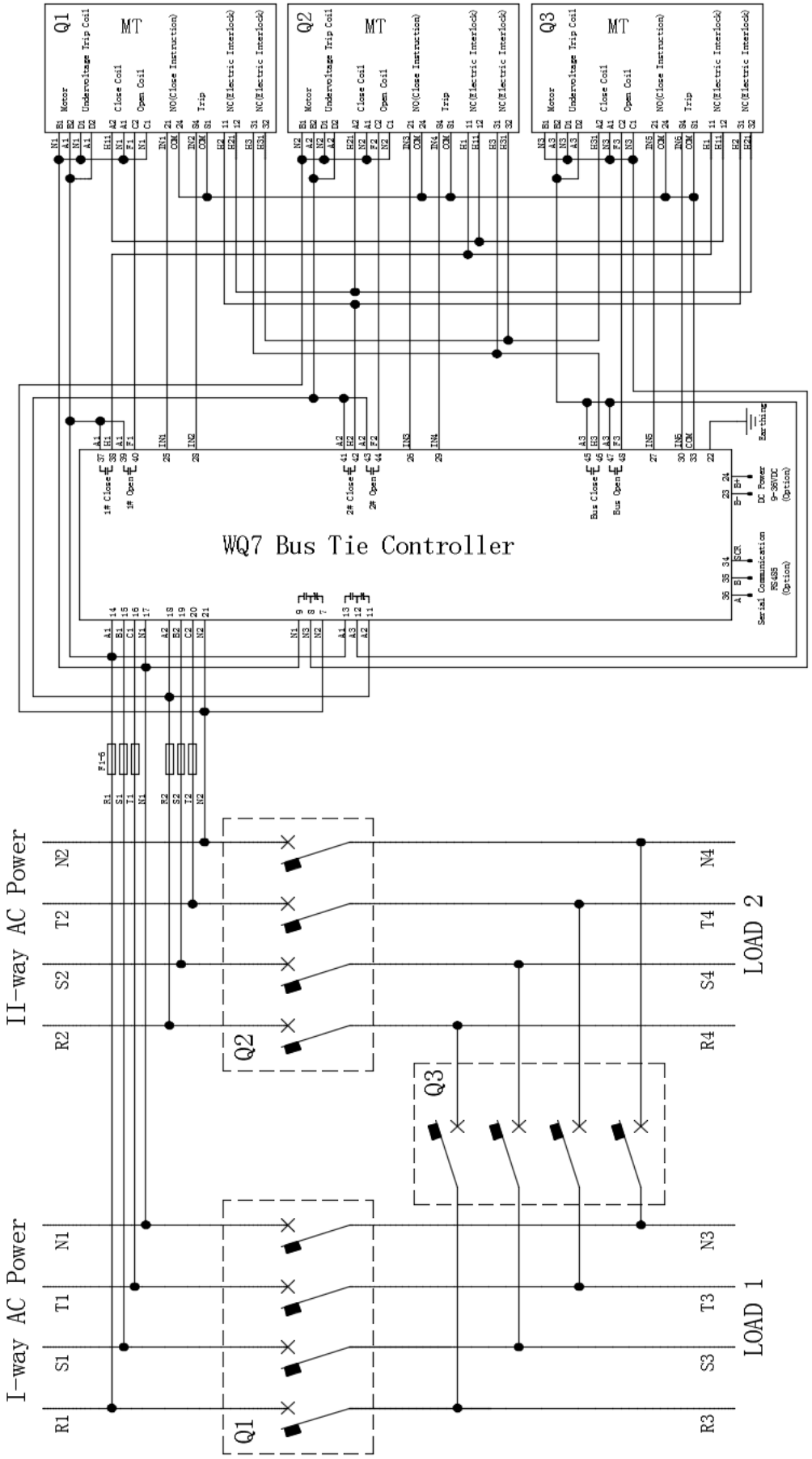
1、The circuit breakers with a electric operating mechanism can be connected to the controller, such as DW45, ABB Emax, MT, DW17, DW15, etc.; maximum current is 6300A; each circuit breaker needs to be equipped with a undervoltage release.

2、The product has been rigorously tested before leaving the factory. Improper wiring and tests will damage the controller.

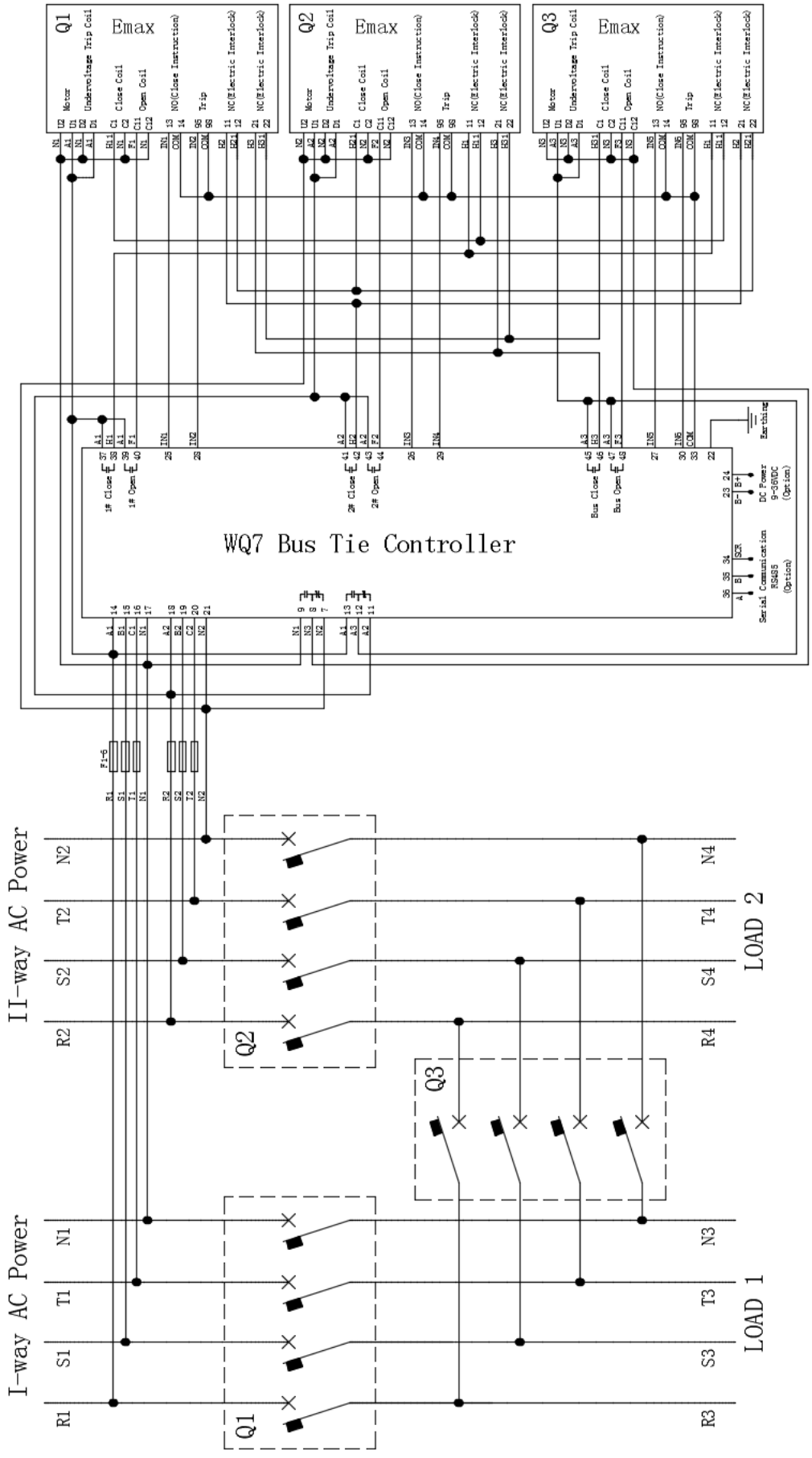
Wiring Diagram of WQ7C being Used in DW45



Wiring Diagram of WQ7C being Used in Schneider MT

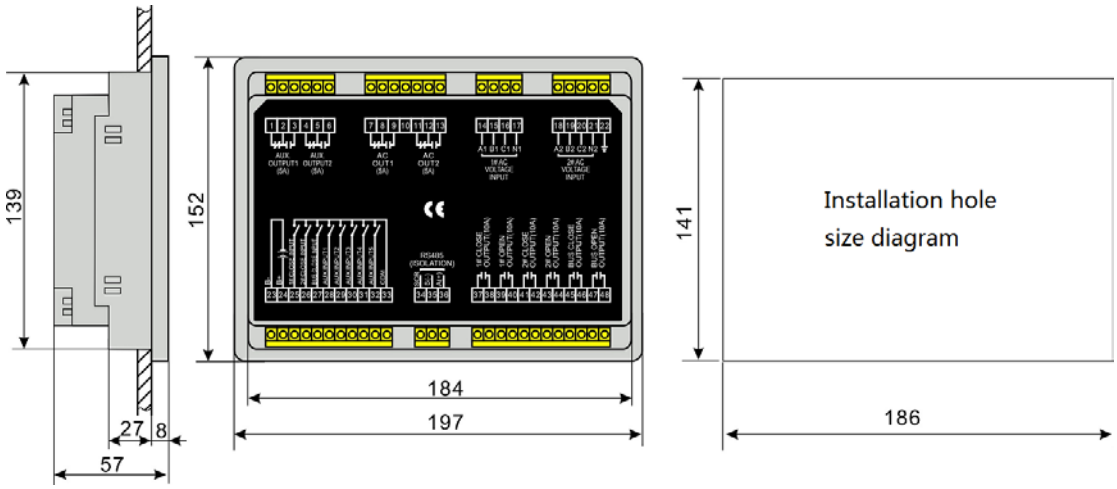


Wiring Diagram of WQ7C being Used in ABB Emax



14. Installation Dimension

The controller is designed as a panel-mounted type and is fixed by clamping parts during installation.



Note: unit(mm)

15. Trouble Removal

Trouble Phenomenon	Possible Reasons and Measures
No responses of controller	Check AC power; Check communication insurance; Check whether the AC wiring is correct; If it is DC power supply, check the DC power supply voltage.
Wrong output from output port	Check the output port connection line, pay attention to normally open and close terminals; Check the output function and output type.
Irregular input port	Check whether the input port is a passive contact input one (Note: If the input port connects with excessively high voltage, it maybe burnt); Check whether the COM end can be connected when the input is valid. Check the input port function and input valid type.
Operation abnormality of circuit breaker	Check circuit breaker; Check the connection line between the controller and the circuit breaker; Check whether the parameter setting is consistent with the circuit breaker; Check the power settings and wiring of circuit breaker power supply .

Irregular RS485 communication	Check whether the RS485 port is correctly connected; Check whether the RS485 converter is normal; Check whether the device number and Baud rate in the parameter settings are correct. Check whether the data bits, stop bits, and check bits are set correctly. If none of the above methods can solve the problem, try to incorporate a 120 ohm resistor between the A and B terminals of the controller RS485.