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WTD6XXX Series

Modbus-TCP Protocol
I/O Modbus User's Manual

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Contents

Chapter 1

Basic Information

1.1 Overview

WTD6XXX series is a distributed I/O module of Modbus-TCP communication mode based on Ethernet. This series can be connected via Ethernet to HMI (human machine interface) or PLC (programmable logic controller) and other host computer equipment (hereinafter referred to as host computer) , while the host computer sends transmission and control orders via Modbus-TCP protocols. This series provides signal isolation, digital I/O state control, acquisition and other functions.

Figure1- 1

1.1.1 Characteristics

Multifunction I/O:

- Each DO channel can support open-drain TTL-level output. Moreover, you can set the security values, that is, if the Modbus communication is lost, DO status can be set to a safe value. Meanwhile, DO channel can simultaneously control the PWM output waveform.

- Each DI channel can simultaneously support inputs from dry and wet nodes.
- Every DO/DI has a corresponding LED indicator to display its status.

Built-in watchdog:

WTD6XXX series module includes a built-in hardware watchdog timer, which can be reset automatically in case of module system failure, to ensure the normal operation of such module.

Ethernet connection:

WTD6XXX series module is an Ethernet-based communication mode. Ethernet has high transmission speed, low energy consumption, easy installation, good compatibility and high openness, etc.. Ethernet network can support simultaneous connection of multiple WTD6XXX series modules, instead of RS232 only supporting point to point communication.

Modbus-TCP Communication:

WTD6XXX series module uses Modbus-TCP protocol to communicate with PC. Modbus Protocol is a bus protocol used in industrial field and can be applied to a variety of data acquisition and process monitoring. In this communication network there is only one host, with all the rest slave controllers. While WTD6XXX series modules are as Modbus slave controllers, with host computer as a Modbus master. The network can support as many as 247 slave controllers and traditional devices such as RS-232, RS-422, RS-485.

Cascade installation of support modules:

WTD6XXX series modules can be mounted on any panel, support and DIN rail. They can be stacked together, thus saving space and achieving the objective of installing additional modules.

Three-way isolation and protection:

It can protect the hardware as much as possible from the external environment and has passed CE certification testing. WTD6XXX series module has such designs as three-channel isolation and protection for communication interface, I/O interface and power interface.

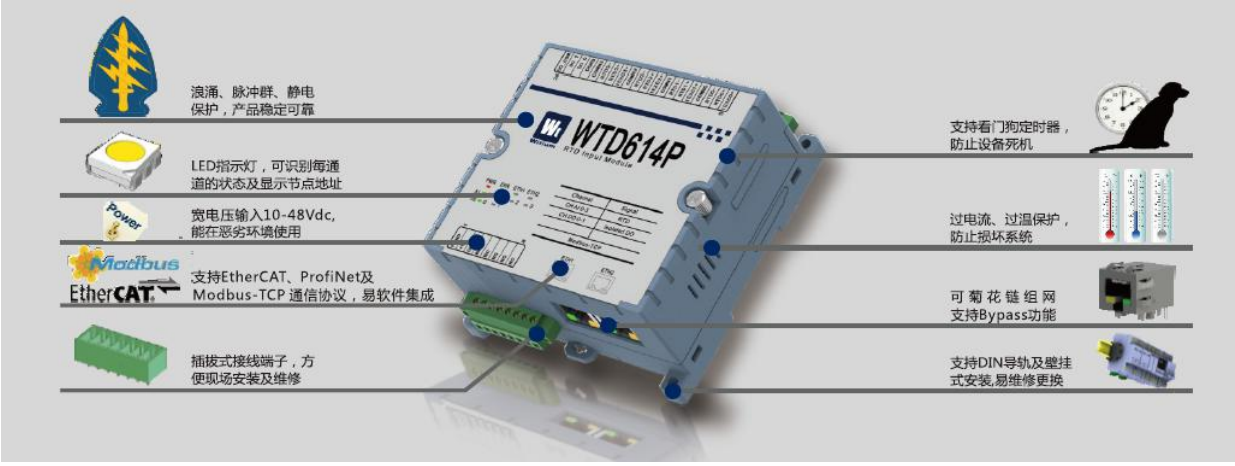

Figure1-2

1.2 Product Front View

Figure1-3

1.3 Installation Dimensions

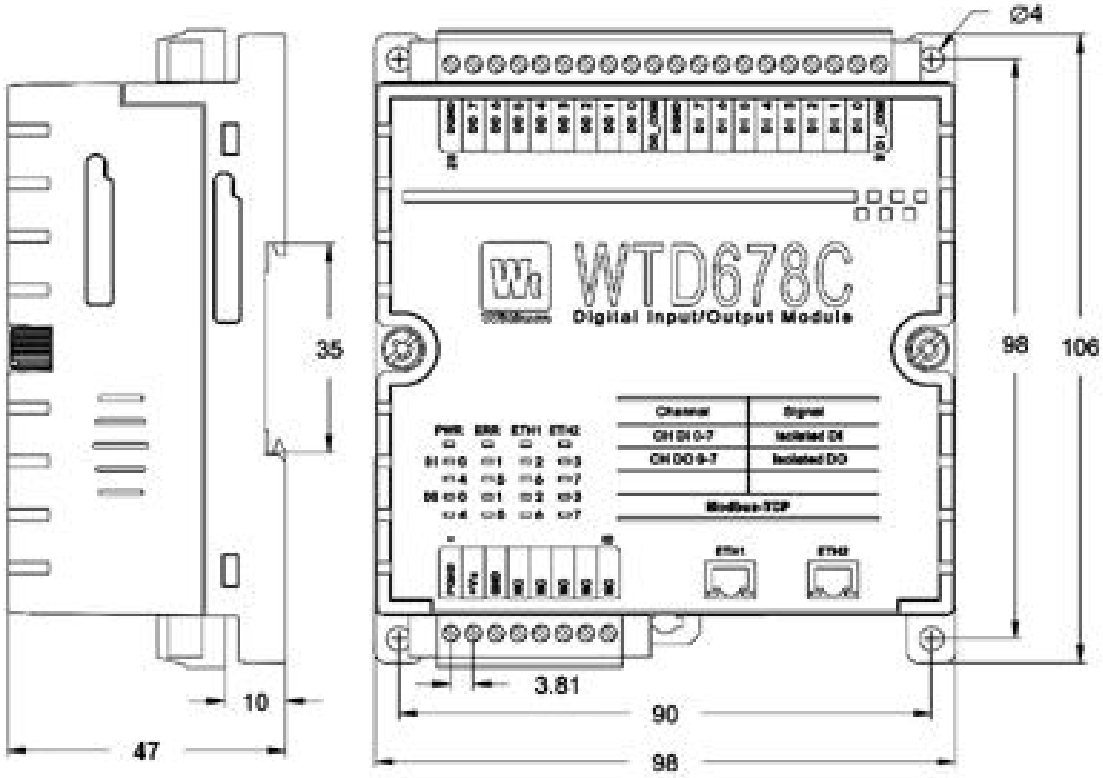

Figure1-4

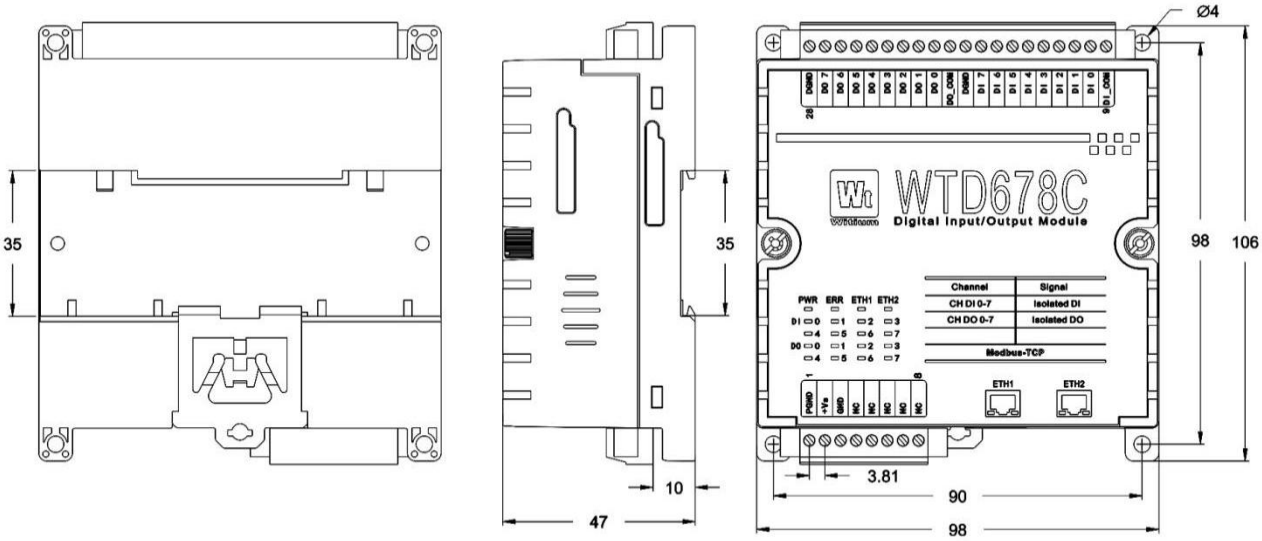

Figure1-5

1.4 Product Family

	Module Name	Module Brief
1	WTD614P	4-channel Pt input
2	WTD618X	8-channel analog quantity/thermocouple input
3	WTD624X	4-channel analog quantity output
4	WTD640X	16-channel isolated digital quantity/count input
5	WTD650C	16-channel isolated digital quantity/PWM output
6	WTD666C	6-channel relay output
7	WTD678C	8/8-channel isolated digital input/output, 8-channel count input, 8-channel PWM output

Table1- 1

1.5 Application

The product can be used for

1. remote data acquisition
2. process monitoring
3. industrial process control
4. energy management
5. security system
6. production testing
7. automatic control

and so on.

Chapter 2

Start

This chapter is used for guidance on how to install and configure the WTD6XXX series module network. It provides a user rapid configuration method of each module prior to the installation of communication network, and the configuration examples of all the modules while using the WTDUtility software.

2.1 Device Setup Wizard

WTD series modules install modules via the guide rail and the installation method is as follows:

1、 First, fix the guide rail.

2、 Pull the movable plate back of the module out, as shown in the following figure.

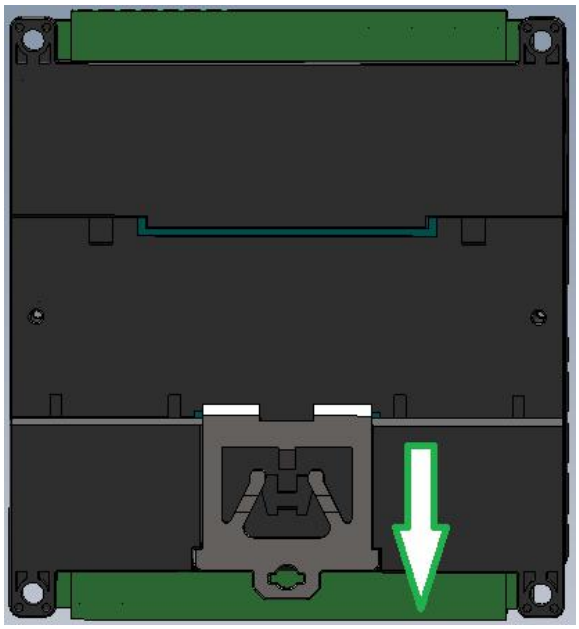

Figure 2- 1Schematic Diagram of Module Back

3、 Install the buckle on the inactive side on the module back on the guide rail.

4、 Then press the other side on the rail.

5、 Finally, reject the movable plate pulled before.

WTD series module can be cascaded via screws, i.e. change the screws on both sides of module into long ones, and fix the module to the screw on the

lower module by long screws through the module housings on both sides. All WTD series modules can be cascaded, including WTD4XXX series, WTD6XXX series, etc. with the effect diagram as shown in the following figure:

Figure 2- 2Module Cascade Effect Diagram

The explosion diagram of WTD series is shown in the following figure:

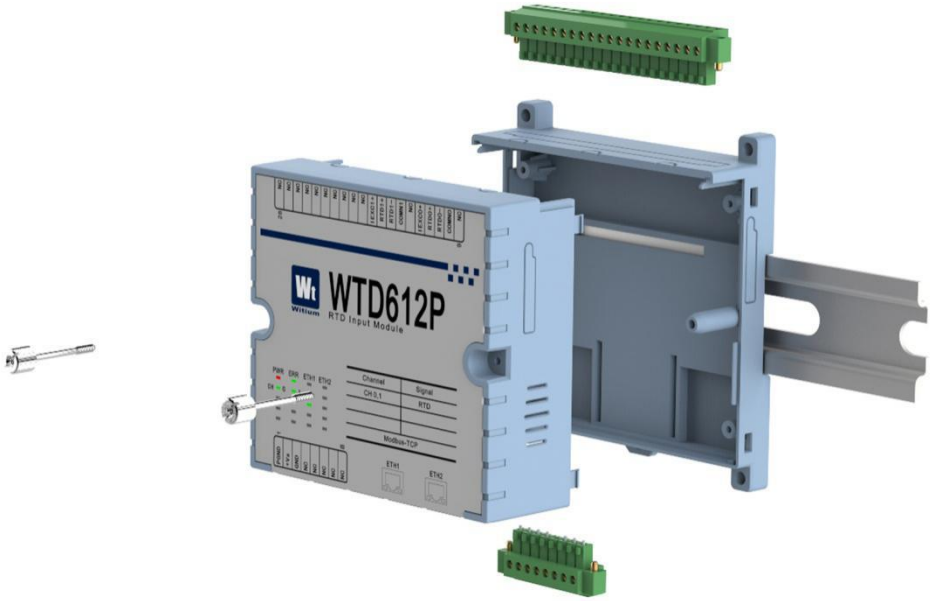

Figure 2- 3 Explosion Diagram of Module

-

2.2 Software Installation and Configuration Wizard

2.2.1 System Environmental Requirements

Host requirements of software installation environment are listed below:

1、 The software is run based on FreeRTOS real time operating system.

2、 Communication interface adopts 2 RJ 45 Ethernet ports supporting Bypass function.

3、 If the host has only RS232 output, then you'll need an RS232-to-RS485 converter (Active converters are recommended to ensure the quality of communication).

2.2.2 Software Installation and Usage Guide

WTD Utility uses Green installation to allow direct running by extraction of software package without tedious installation process. WTD Utility software tool can be obtained from the disc that comes with your module and also from the official website:

http://www.witium.com

The interface after opening the software is shown in the following figure:

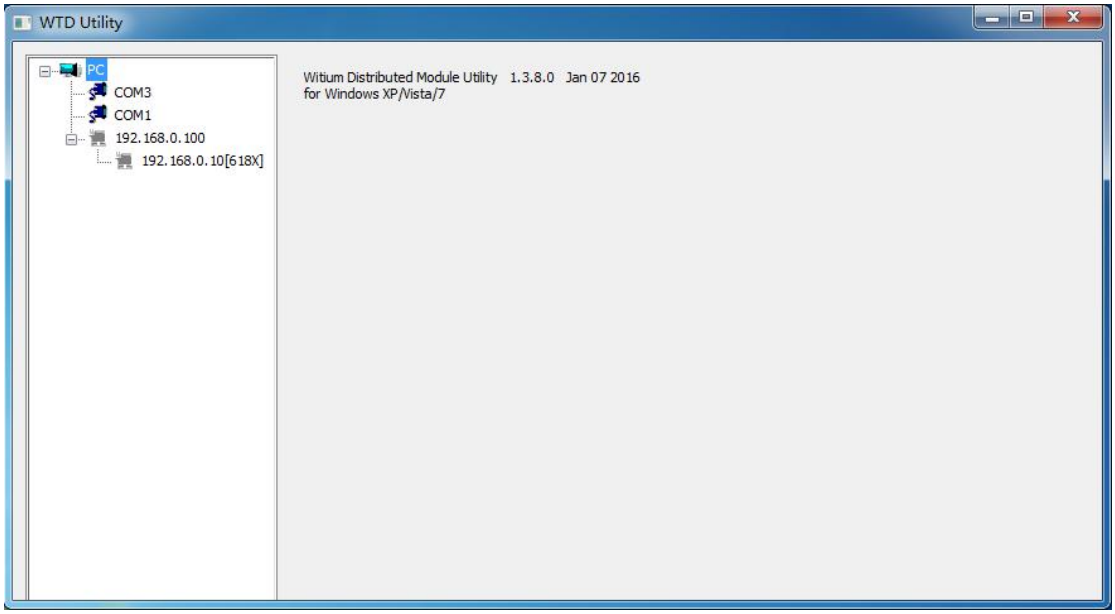

Figure 2-4Main Interface of WTD Utility Software

The list box on the left lists relevant hardware resources of the device, including serial and Ethernet resources. Select and connect the Ethernet IP of the WTD6XXX module used in this device, the search interface can be seen on the right side of the dialog box as shown below:

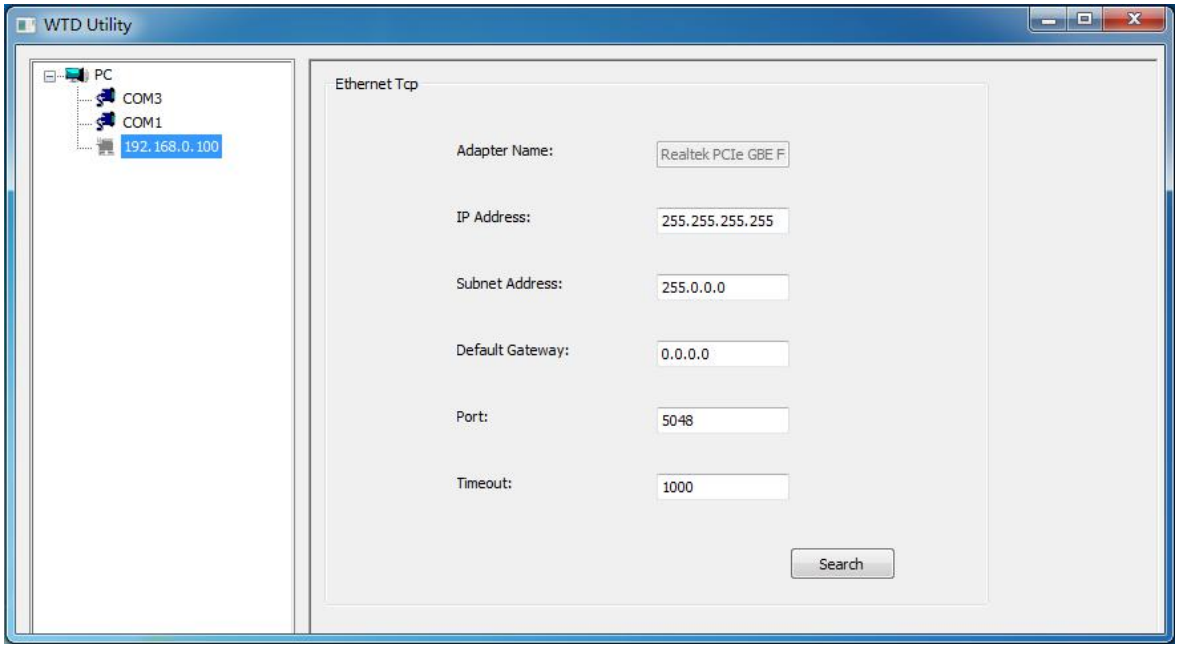

Figure 2-5 WTD Utility Serial Port Search Interface

WTD6XXX module is set for the whole network, after the successful

connection between host computer and WTD6XXX module, click on the search button to search for devices.

2.3 Example

2.3.1 4-channel Platinum Resistance Sampling Module

After finding the device, the following interface can be seen:

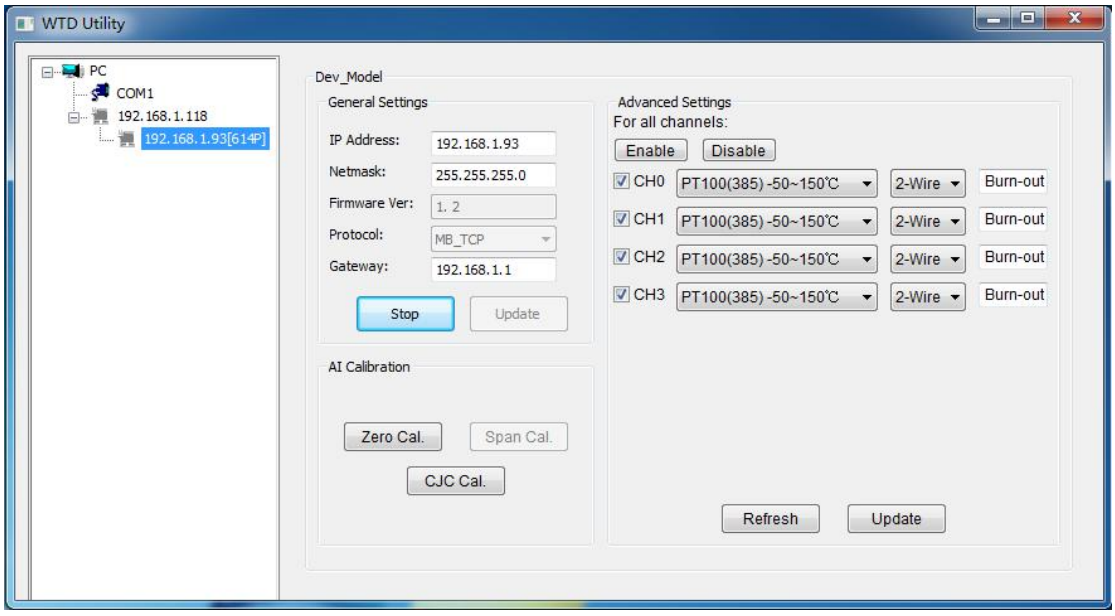

Figure 2-6 WTD614P Main Interface

Discovered devices will be displayed in the corresponding serial node, node name of new devices contains Modbus ID (in brackets) and device name.

General Communication Settings

Click on the device node, the correlated settings and test functions will be displayed in the right window, including general settings, advanced settings, and data display. In common settings, Modbus ID, communication baud rate and protocol can be set, when the parameter setting is completed click on "Update" button to complete the final device parameter settings, if successfully, it will pop up the button for successful parameter settings, as shown in Figure:

Figure 2-7 Successful Setting

If the setting is wrong, please check the module power supply and communication lines.

Advanced Settings

In the advanced settings, the mode setting of each channel is provided, the channel can be selected as desired, select platinum resistance sensors of different types and connection methods of different wiring systems.

Click the selection box in front of each channel to enable or disable the channel:

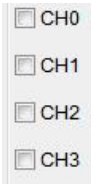

Figure2-8

In each dropdown option of each channel, select the appropriate type of platinum resistance:

Figure 2-9

Also, the corresponding connection method can be selected in each dropdown option of multiple-way system:

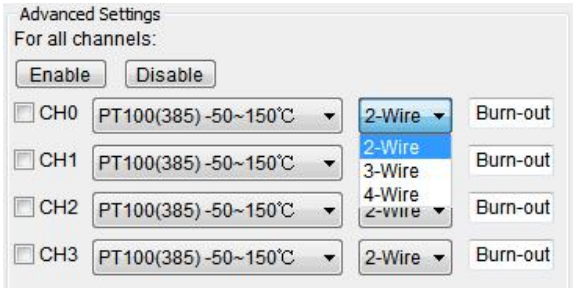

Figure2-10

After the selection is complete, in the advanced settings box, press Update button to save the settings. While Refresh button can be pressed to refresh the channel setting state of the module

2.3.2 8-channel Thermocouple Sampling Module

After finding the device, the following interface can be seen:

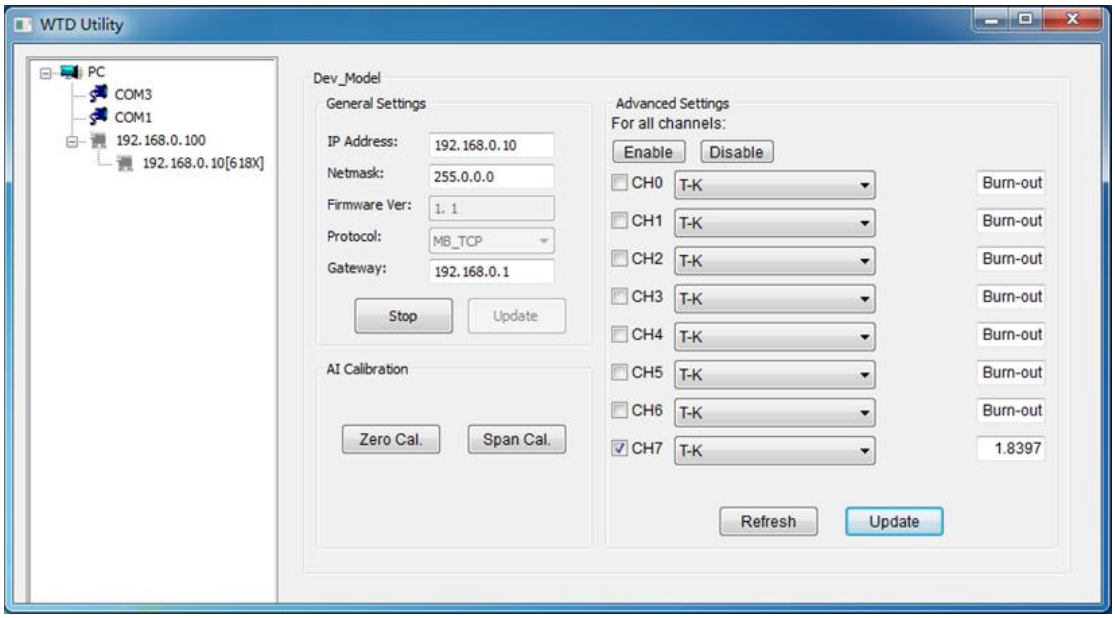

Figure 2-11 WTD614P Main Interface

Discovered devices will be displayed in the corresponding serial node, node name of new devices contains Modbus ID (in brackets) and device name.

General Communication Settings

Click on the device node, the correlated settings and test functions will be displayed in the right window, including general settings, advanced settings, and data display. In common settings, Modbus ID, communication baud rate and protocol can be set, when the parameter setting is completed click on "Update" button to complete the final device parameter settings, if successfully, it will pop up the button for successful parameter settings, as shown in Figure:

Figure 2-12 Successful Settings

If the setting is wrong, please check the module power supply and communication lines.

Advanced Settings

In the advanced settings, the mode setting of each channel is provided, the channel can be selected as desired, select platinum resistance sensors of different types and connection methods of different wiring systems.

Click the selection box in front of each channel to enable or disable the channel:

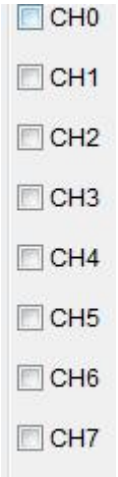

Figure 2-13

In each dropdown option of each channel, select the appropriate type of thermocouple:

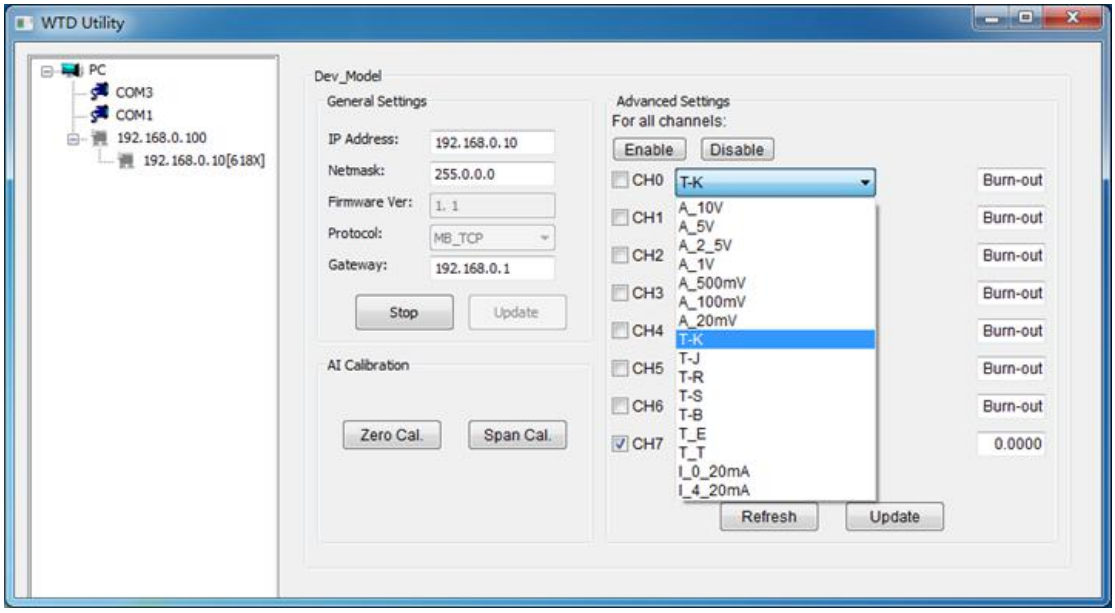

Figure 2-14

Also, the corresponding connection method can be selected in each dropdown option of multiple-way system:

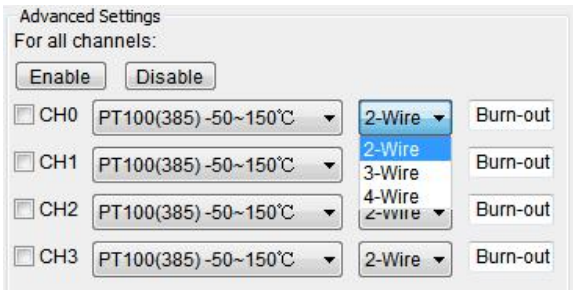

Figure 2-15

After the selection is complete, in the advanced settings box, press Update button to save the settings. While Refresh button can be pressed to refresh the channel setting state of the module

2.3.3 16-channel digital input Module

After finding the device, the following interface can be seen:

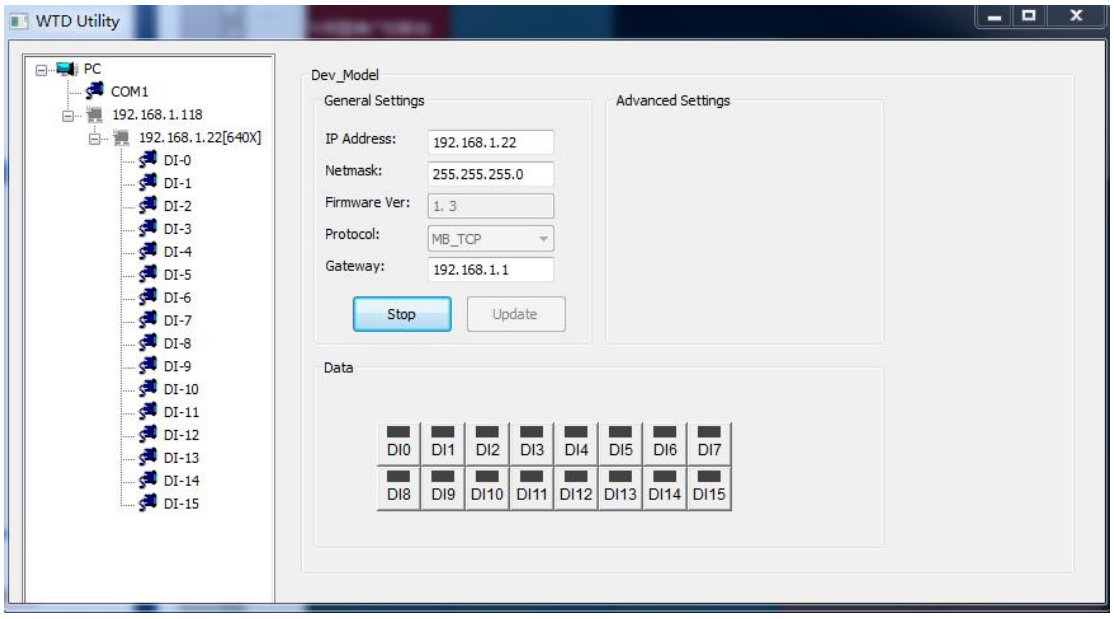

Figure 2-15 WTD614P Main Interface

Discovered devices will be displayed in the corresponding serial node, node name of new devices contains Modbus ID (in brackets) and device name.

General Communication Settings

Click on the device node, the correlated settings and test functions will be displayed in the right window, including general settings, advanced settings,

and data display. In common settings, Modbus ID, communication baud rate and protocol can be set, when the parameter setting is completed click on "Update" button to complete the final device parameter settings, if successfully, it will pop up the button for successful parameter settings, as shown in Figure:

Figure 2- 16 Successful Setting

If the setting is wrong, please check the module power supply and communication lines.

Data Area

Figure 2- 17 WTD640X Data Area Indicator Buttons

Input Port Status

In the data area, the status of all 16 input channels is displayed, if the input channel is 1, the corresponding channel`s button light will be turned on, otherwise it will be turned off.

2.3.4 16-channel Digital Quantity Output Module

After finding the device, the following interface can be seen:

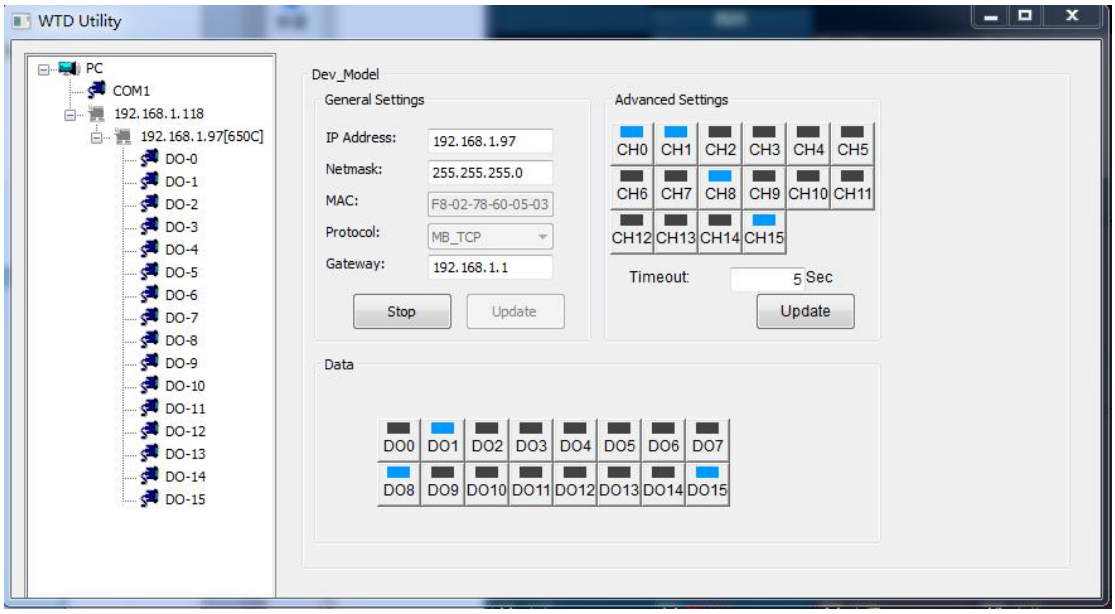

Figure 2-18 WTD614P Main Interface

Similar to the foregoing modules, the discovered devices will be displayed in the corresponding serial node, node name of new devices contains Modbus ID (in brackets) and device name.

General Communication Settings

Click on the device node, the correlated settings and test functions will be displayed in the right window, including general settings, advanced settings, and data display. In common settings, Modbus ID, communication baud rate and protocol can be set, when the parameter setting is completed click on "Update" button to complete the final device parameter settings, if successfully, it will pop up the button for successful parameter settings, as shown in Figure:

Figure 2-19 Successful Setting

Advanced Settings

In advanced settings, some special setting functions are provided, there

are corresponding output protection status setting buttons and the output protection time setting.

Output Protection Status

Output protection status refers to the port`s output status of automatic update when there is no communication and lack of access to the corresponding control commands. When there`s a need to set up some output protection status for some output ports, simply press the corresponding port button to make the button light on, then press the "Update" button in advanced settings to complete the final confirmation of parameter settings.

Output Protection Time

Output protection time refers to the time set within which there is no communication or lack of access to the corresponding control commands, the port`s output protection status will be triggered. For setting output, the protection time is the same as above.

Data Area

Figure 2- 20 WTD650C Data Area Buttons

Output Port Status

A row beneath the data area is mainly used for all 16 channels` output channel status control test. Each time the button is pressed, it will control the corresponding output ports to select the NOT state, while the light on the buttons will show the status output in real time, i.e. originally the off state of the button light indicates the output of '0', and after the button is pressed the output will turn to '1', if the output control is successful, the light will be on.

2.3.5 6-channel Relay Output Module

After finding the device, the following interface can be seen:

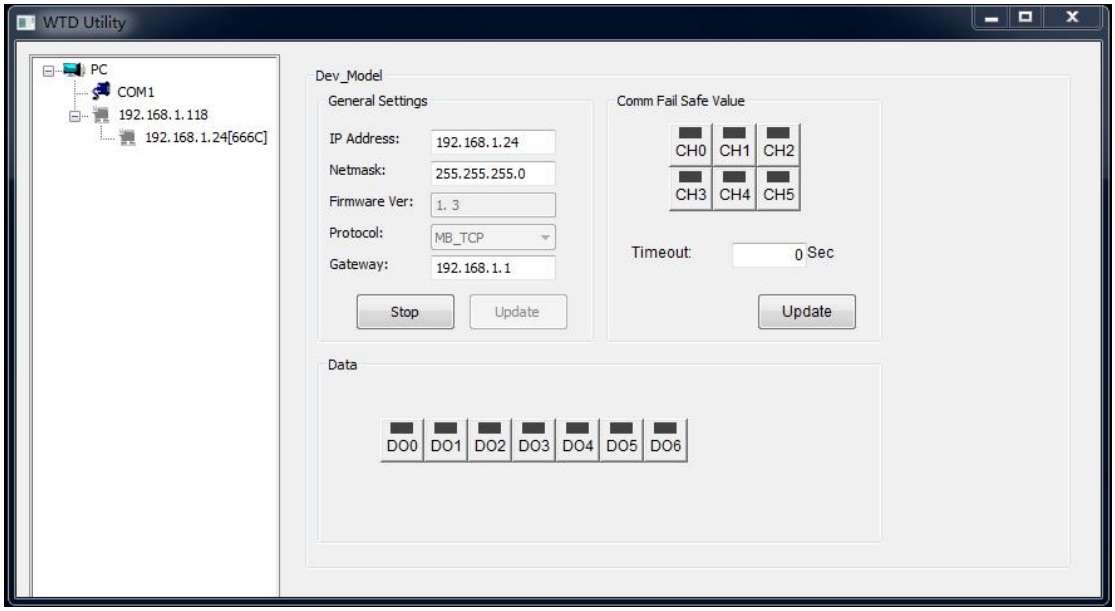

Figure 2-21 WTD666C Main Interface

Similar to the foregoing modules, the discovered devices will be displayed in the corresponding serial node, node name of new devices contains Modbus ID (in brackets) and device name.

General Communication Settings

Click on the device node, the correlated settings and test functions will be displayed in the right window, including general settings, advanced settings, and data display. In common settings, Modbus ID, communication baud rate and protocol can be set, when the parameter setting is completed click on "Update" button to complete the final device parameter settings, if successfully, it will pop up the button for successful parameter settings, as shown in Figure:

Figure 2-22 Successful Setting

Advanced Settings

In advanced settings, some special setting functions are provided, there are corresponding output protection status setting buttons and the output protection time setting.

Output Protection Status

Output protection status refers to the port`s output status of automatic update when there is no communication and lack of access to the corresponding control commands. When there`s a need to set up some output protection status for some output ports, simply press the corresponding port button to make the button light on, then press the "Update" button in advanced settings to complete the final confirmation of parameter settings.

Output Protection Time

Output protection time refers to the time set within which there is no communication or lack of access to the corresponding control commands, the port`s output protection status will be triggered. For setting output, the protection time is the same as above.

Data Area

Figure2-23 WTD666C Output Control Button

Output Port Status

A row beneath the data area is mainly used for all 6 channels` output channel status control test. Each time the button is pressed, it will control the corresponding output ports to select the NOT state, while the light on the buttons will show the status output in real time, i.e. originally the off state of the button light indicates the output of '0', and after the button is pressed the output will turn to '1', if the output control is successful, the light will be on.

2.3.6 8-input & 8-output Digital Quantity Module with Input Count and Output PWM

2.3.6.1 General Input/Output Functions

After finding the device, the following interface can be seen:

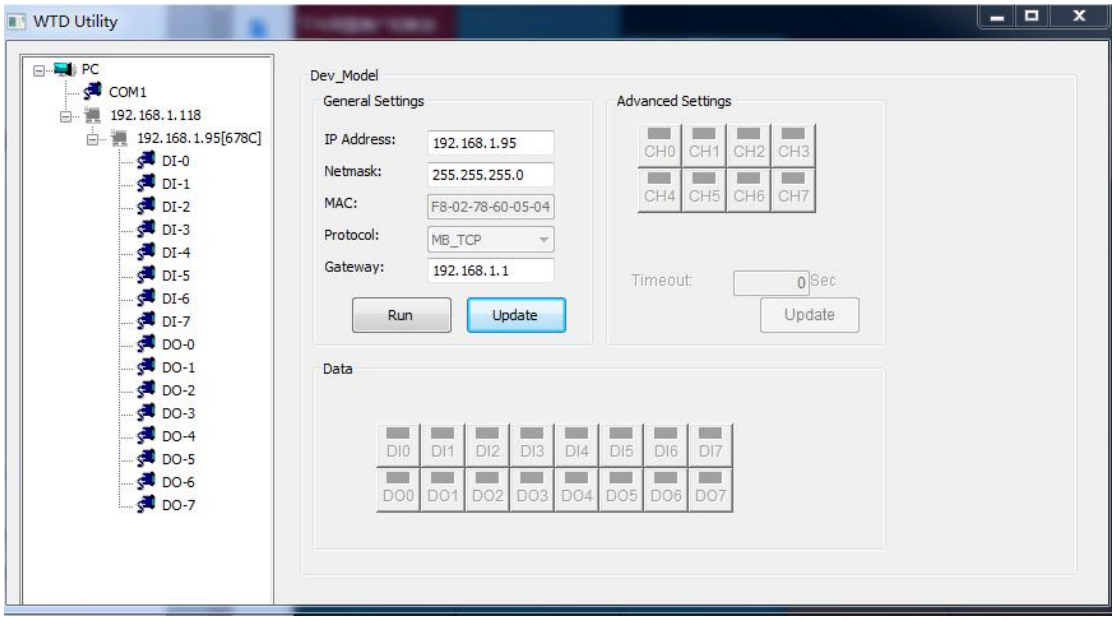

Figure 2-24 WTD678C Main Interface

Similar to the foregoing modules, the discovered devices will be displayed in the corresponding serial node, node name of new devices contains Modbus ID (in brackets) and device name.

General Communication Settings

Click on the device node, the correlated settings and test functions will be displayed in the right window, including general settings, advanced settings, and data display. In common settings, Modbus ID, communication baud rate and protocol can be set, when the parameter setting is completed click on "Update" button to complete the final device parameter settings, if successfully, it will pop up the button for successful parameter settings, as shown in Figure:

Figure 2-25 Successful Setting

Advanced Settings

In advanced settings, some special setting functions are provided, there are corresponding output protection status setting buttons and the output protection time setting.

Output Protection Status

Output protection status refers to the port`s output status of automatic update when there is no communication and lack of access to the corresponding control commands. When there`s a need to set up some output protection status for some output ports, simply press the corresponding port button to make the button light on, then press the "Update" button in advanced settings to complete the final confirmation of parameter settings.

Output Protection Time

Output protection time refers to the time set within which there is no communication or lack of access to the corresponding control commands, the port`s output protection status will be triggered. For setting output, the

protection time is the same as above.

Data Area

Figure2- 26 WTD678C Output Control Button

Input Port Status

In the data area, the upper row displays the status of all 8 input channels is displayed, if the input channel is 1, the corresponding channel`s button light will be turned on, otherwise it will be turned off.

Output Port Status

A row beneath the data area is mainly used for all 8 channels` output channel status control test. Each time the button is pressed, it will control the corresponding output ports to select the NOT state, while the light on the buttons will show the status output in real time, i.e. originally the off state of the button light indicates the output of '0', and after the button is pressed the output will turn to '1', if the output control is successful, the light will be on.

2.3.6.2 Advanced Counting and Pulse Width Output Functions

Enter Counting Function

In the tree diagram on the right, you can see the node as shown in the following figure

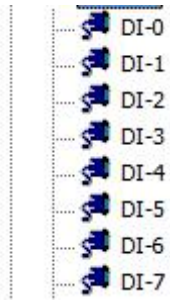

Figure 2-27 WTD678C Input Nodes

DI-0 to DI-7 represent the port channels of 8-channel with counter functions, respectively. Click on any one channel (for example, DI-0 node), the dialog box will appear on the right window as shown below.

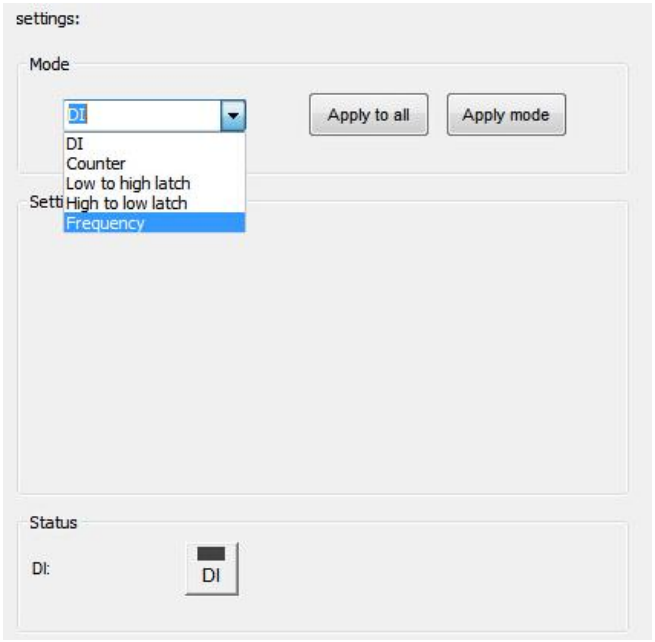

Figure2-28 WTD678C Input Channel Advanced Function Main Interface

Optional modes are DI (digital input), Counter (input count mode), Low to high latch (ascending lock mode), High to low latch (descending lock mode), and Frequency (frequency calculation mode). DI mode is the default mode.

Input Counting Mode

In the mode options, select "Counter", if you just set the single channel, press "Apply mode" button, and if you want to set all channels to the same mode, press the "Apply to all" button. After selection, enter the following dialog box:

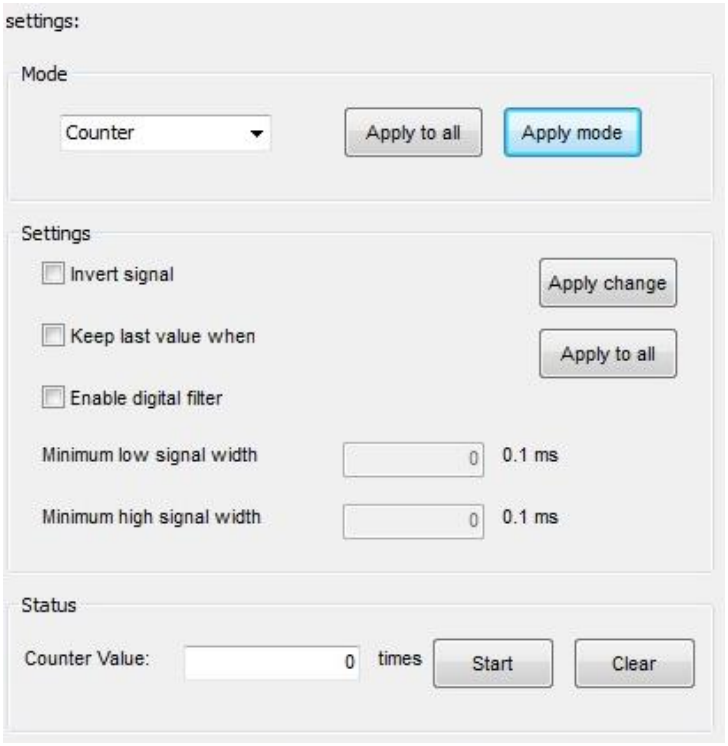

Figure 2-29 WTD678C Counting Mode Main Interface

In the settings in the center, you can set the signal inversion function, count holding function and digital filtering function. In digital filtering capability, you can set filtering signals` maximum and minimum pulse width.

In the status box below, it can display the counting value after starting. You can press "Start" to start counting, and "Clear" to purge count value.

Ascending Lock Mode

In the mode options, select "Low to high latch", if you just set the single channel, press "Apply mode" button, and if you want to set all channels to the same mode, press the "Apply to all" button. After selection, enter the following dialog box:

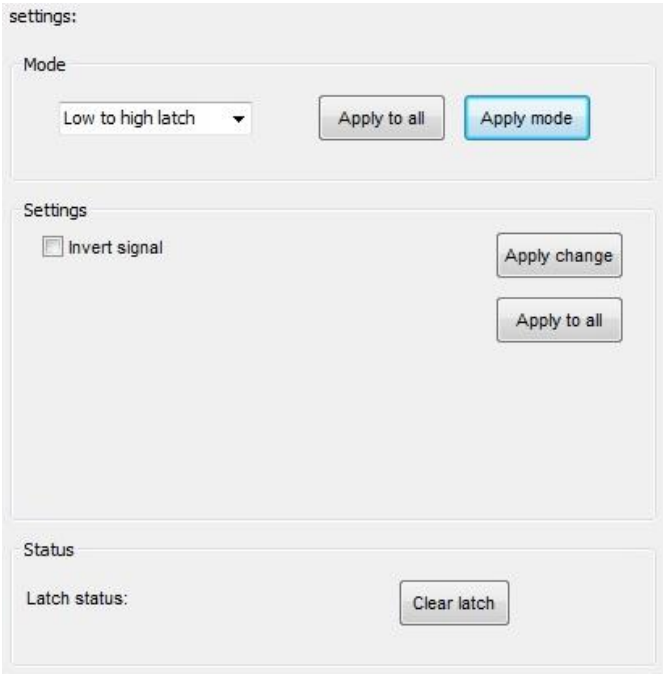

Figure 2- 30 WTD678C Ascending Lock Mode Main Interface

In the settings box, you can check the signal inversion function, and in the status bar you can view the lock status.

Descending Lock Mode

In the mode options, select "High to low latch", if you just set the single channel, press "Apply mode" button, and if you want to set all channels to the same mode, press the "Apply to all" button. After selection, enter the following dialog box:

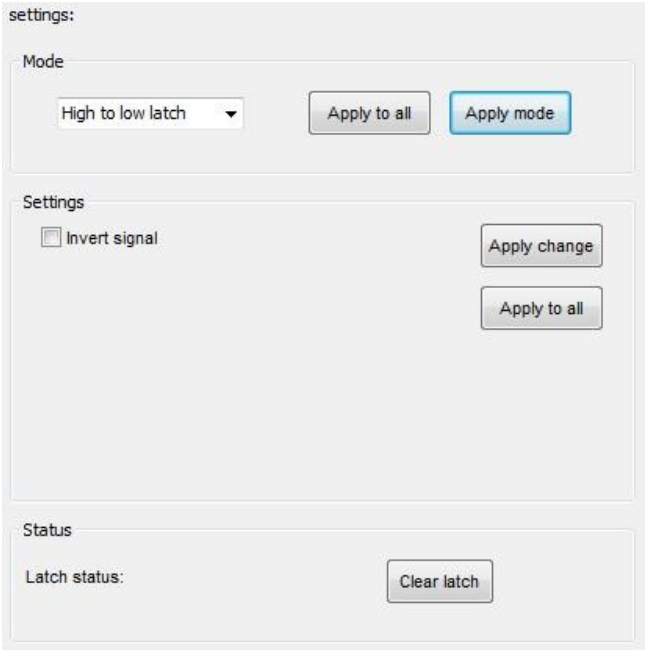

Figure 2- 31 WTD678C Descending Lock Mode Main Interface

In the settings box, you can check the signal inversion function, and in the status bar you can view the lock status.

Frequency Calculation Mode

In the mode options, select "Frequency", if you just set the single channel, press "Apply mode" button, and if you want to set all channels to the same mode, press the "Apply to all" button. After selection, enter the following dialog box:

Figure 2- 32 WTD678C Frequency Calculation Mode Main Interface

In the status box at the bottom you can see the frequency value read.

Output Pulse Width Modulation Function

In the tree diagram on the right, you can see the node as shown in the following figure

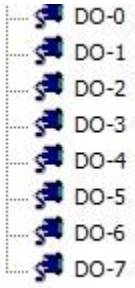

Figure 2- 33 WTD678C Output Node List

DO-0 to DO-7 represent the port channels of 8-channel with counter functions, respectively. Click on any one channel (for example, DO-0 node), the dialog box will appear on the right window as shown below.

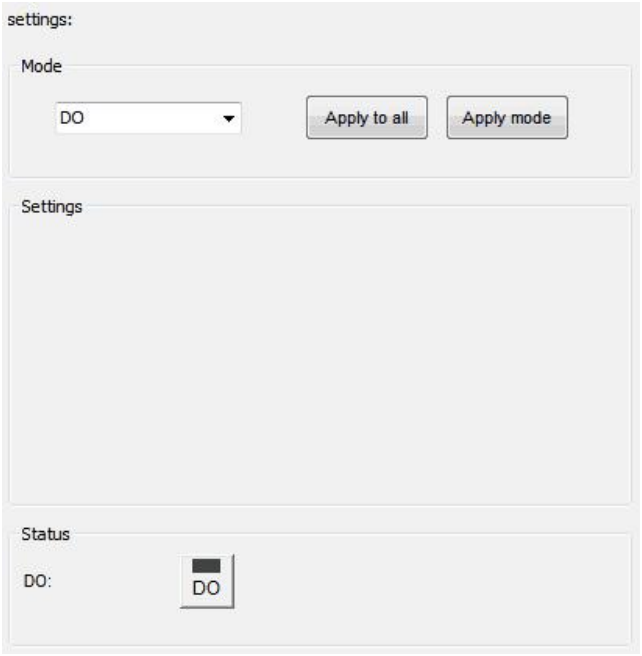

Figure 2- 34 WTD678C Advanced Output Function Main Interface

Optional modes are DO (digital output mode), Pulse output (pulse width mode), Low to high latch (ascending lock mode), High to low latch (descending lock mode). DO mode is the default mode.

Pulse Width Output Mode

In the mode options, select "Pulse output", if you just set the single channel, press "Apply mode" button, and if you want to set all channels to the same mode, press the "Apply to all" button. After selection, enter the following dialog box:

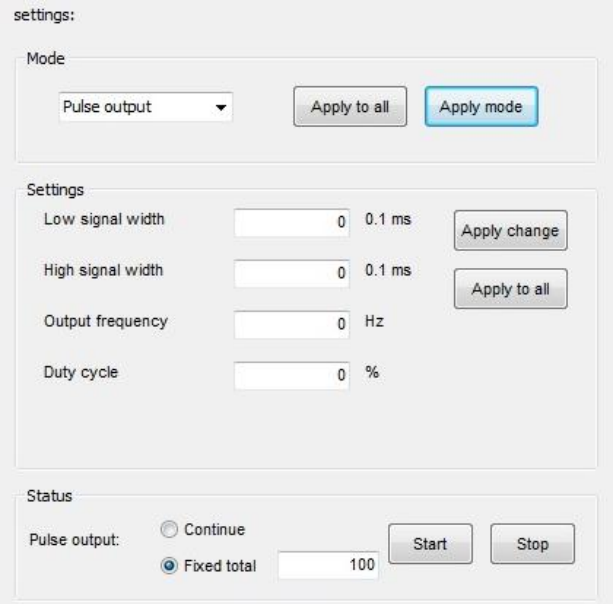

Figure 2- 35 WTD678C Pulse Width Output Mode Main Interface

In the settings box, you can set the pulse width time, output frequency and duty cycle of high and low signals, after the setting is complete, press the "Apply change" to save the settings.

In the status box, you can select the output pulse width mode, including constant and fixed pulse width outputs. After the selection is complete, press the "Start" button to open the output function.

Ascending Lock Mode

In the mode options, select "Low to high latch", if you just set the single channel, press "Apply mode" button, and if you want to set all channels to the same mode, press the "Apply to all" button. After selection, enter the following dialog box:

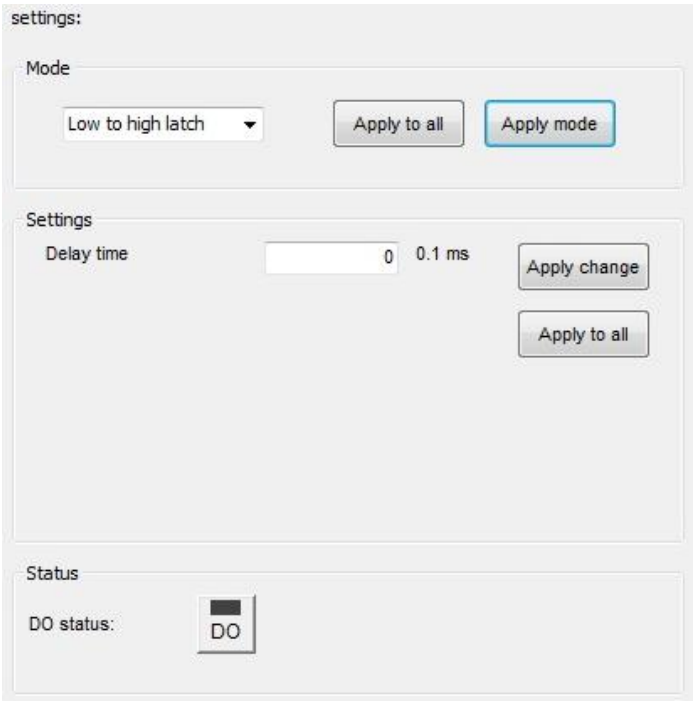

Figure 2- 36 WTD678C Output Ascending Lock Mode Main Interface

The lock delay time can be set in the settings box, and in the status bar, you can control DO port output.

Descending Lock Mode

In the mode options, select "High to low latch", if you just set the single channel, press "Apply mode" button, and if you want to set all channels to the same mode, press the "Apply to all" button. After selection, enter the following dialog box:

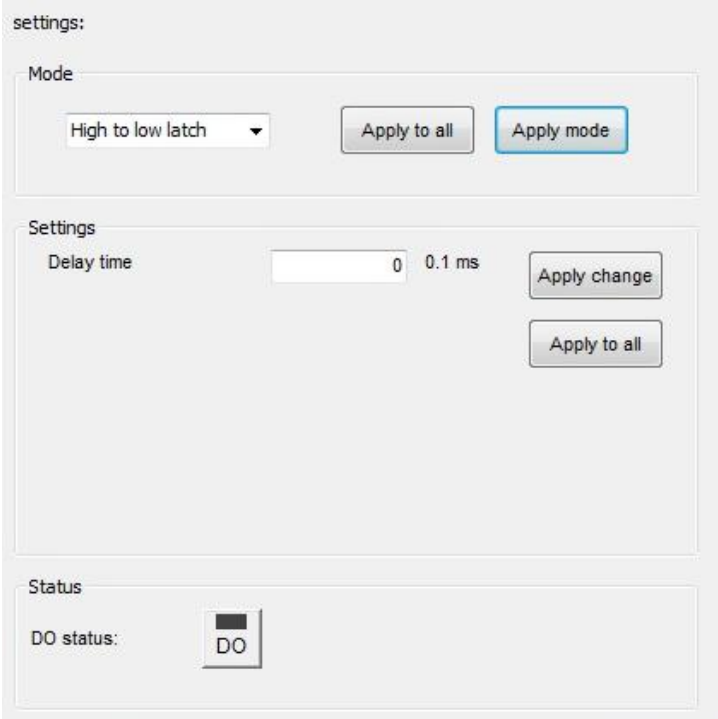

Figure 2- 37 WTD678C Output Descending Lock Mode Main Interface

The lock delay time can be set in the settings box, and in the status bar, you can control DO port output.

Chapter 3

I/O Module Description

3.1 WTD640X

3.1.1 Brief Introduction of WTD640X Function

WTD640X is a digital input module with isolation. The module has 16-channel isolated digital quantity input, which can support switch contact signal or level signal, and is suitable for collecting the digital signal from industrial scenes.

3.1.1.1 Main Technical Parameters

3.1.1.1.1 Digital Input

♦Input Channels: 16

♦Input Type: Switch contact signal or level signal

♦Isolation Voltage: 3000 VDC

♦ Switch Contact Input: Disconnection: Digit 0

Close: Digit 1

♦ Level Input Range: High Level (Figure 1): +10 v to +50V

Low Level (Digital0）：≤+3V

3.1.1.1.2 System Parameters

♦ CPU: 32-bit ARM Processor

♦ Operating system: Real-time Operating system

♦ Supply Voltage：+10VDC to +48VDC

♦ Working Temperature Range：-40℃ to +85℃

♦ Plastic Casing,Standard DIN Guide Rail Installation

♦ Communication Interface: ESD Protection

3.1.1.2 Functional Block Diagram

The functional block diagram of WTD640X module is shown in the following figure. The module consists of power supply, digital input circuit, 2xRJ45 communication interface, MCU and other components. The module`s micro-controller uses 32-bit ARM chips and has extremely fast data processing capability. Inside the chip, there`s watch-dog circuit, which makes the system to restart in case of accident, allowing the system to be more stable and reliable. WTD640X is designed for industrial applications, uses 2xRJ45 interface, can connect daisy chain network and support Bypass function.

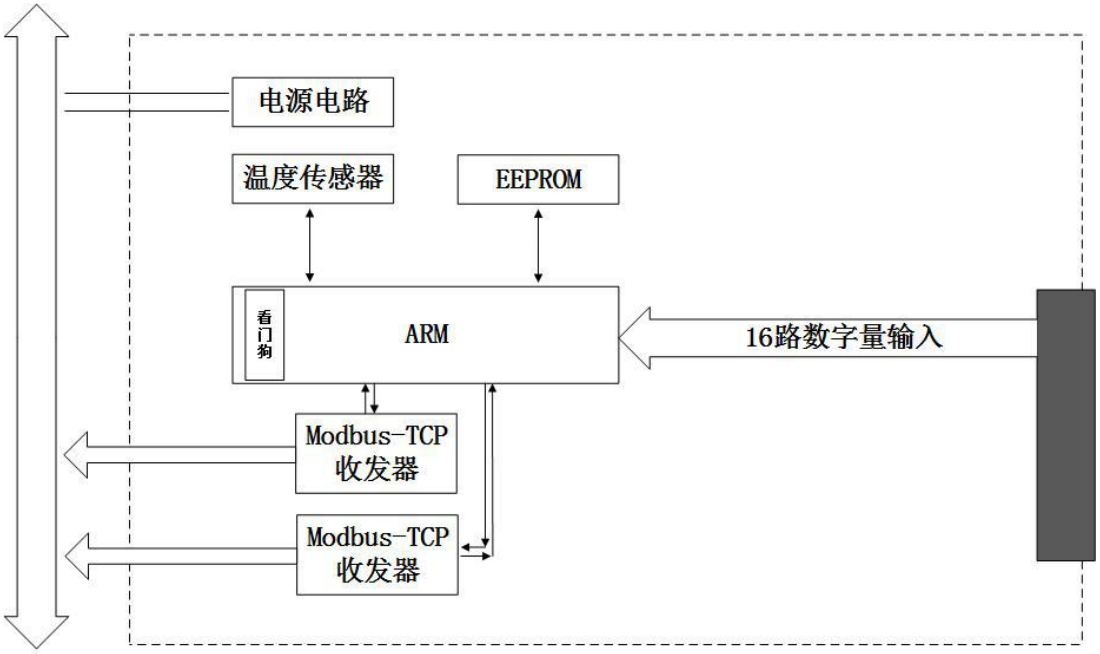

Figure 3-1 WTD640X Module`s Functional Block Diagram

3.1.1.3 Terminal Function

3.1.1.3.1 Terminal Function Arrangement

WTD640X has a total of 28 terminals, with terminal function arranged as shown in the following figure.

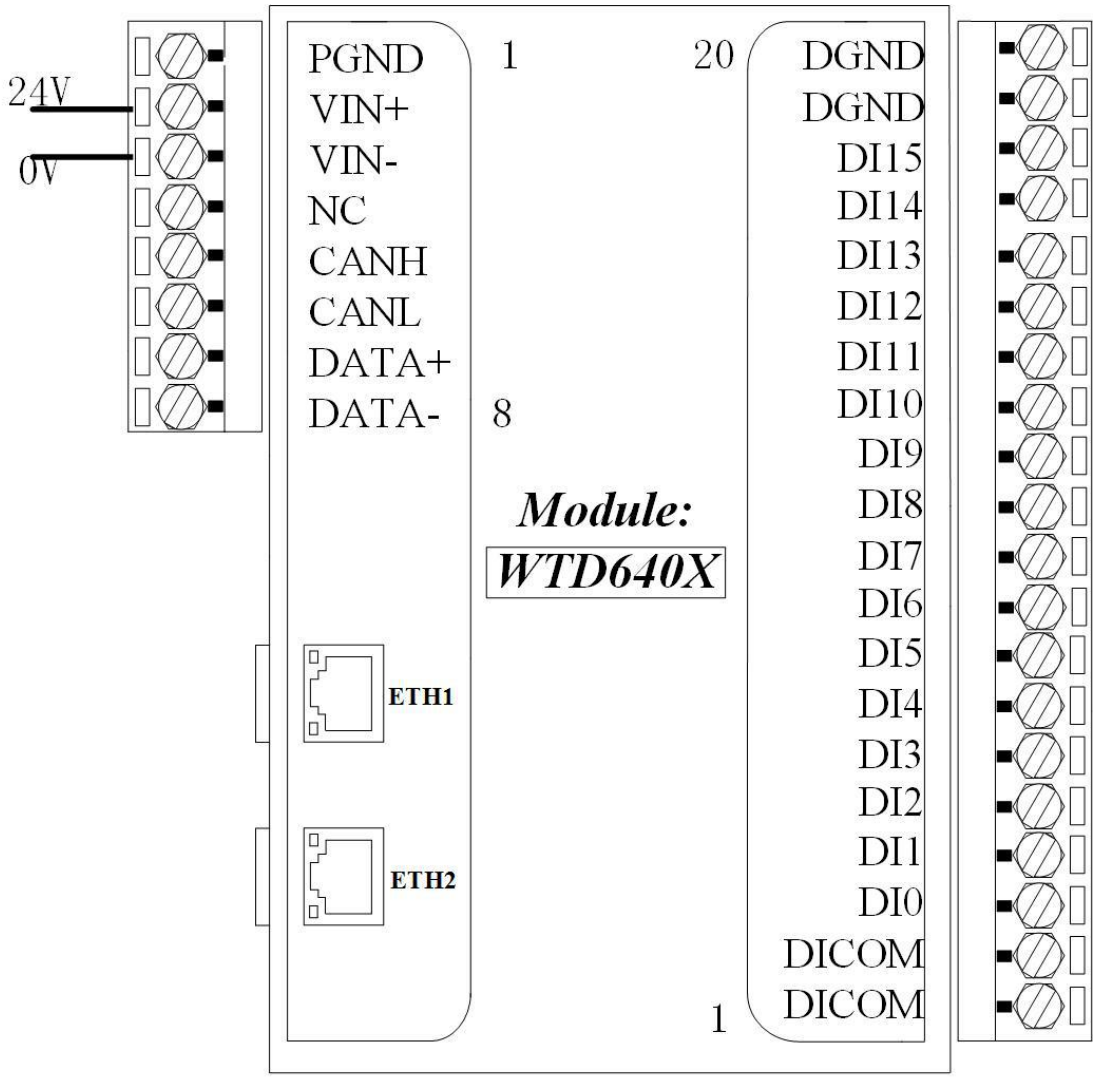

Figure 3-2 WTD640X Terminal Function Arrangement

3.1.1.3.2 Terminal Function Description

The terminal function of WTD640X is defined as follows:

♦ PGND、VIN+ and VIN- is the input terminal of the module, PGND is the power ground, VIN+ connects to power positive terminal and VIN- connects to power negative terminal.

♦ DATA+ and DATA- are RS-485 interface terminals, and DATA+ connects to Terminal A of RS-485 transceiver, and DATA- connects to Terminal B of RS-485 transceiver.

♦ DI0~DI15 are 16-channel isolated digital input channels of the module;

♦ DGND is the common side of dry contact input (switch contact signal) of the

module;

♦ DICOM is the common side of wet contact input(active level)of the module;

3.1.1.4 Digital Input Connection Mode

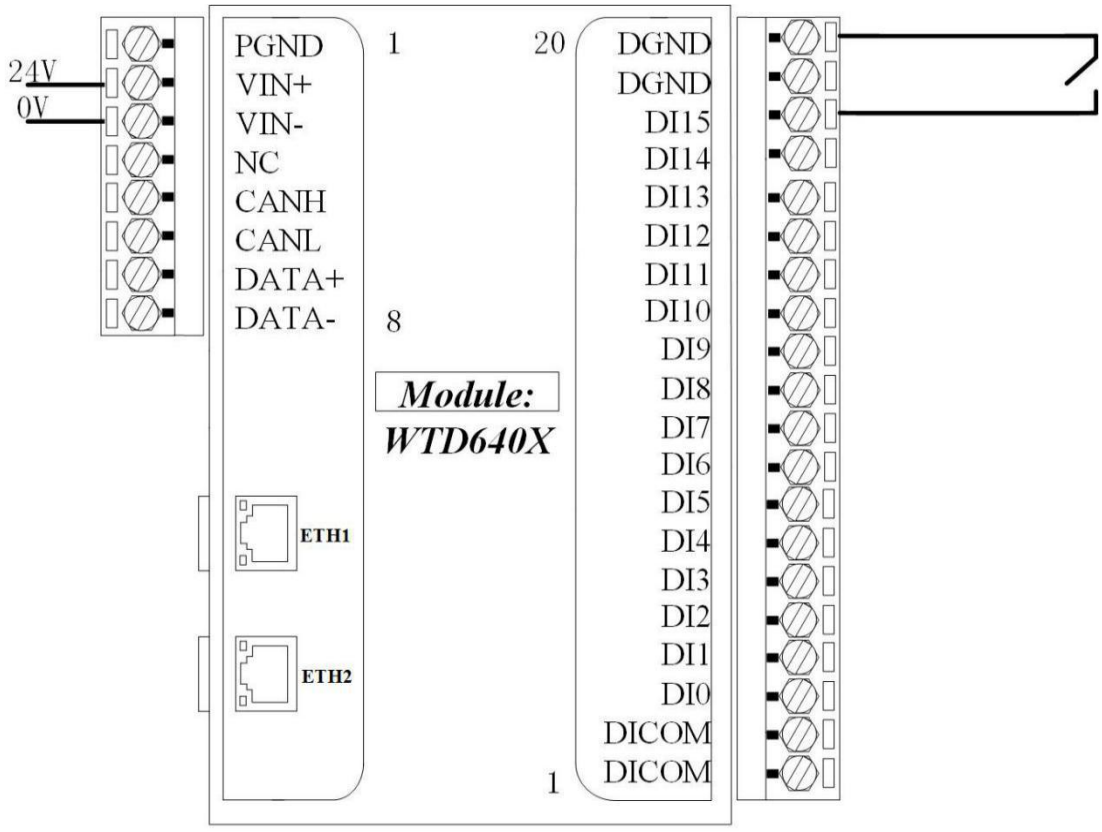

Figure 3-3 WTD640X Digital Input Dry Node Wiring Diagram

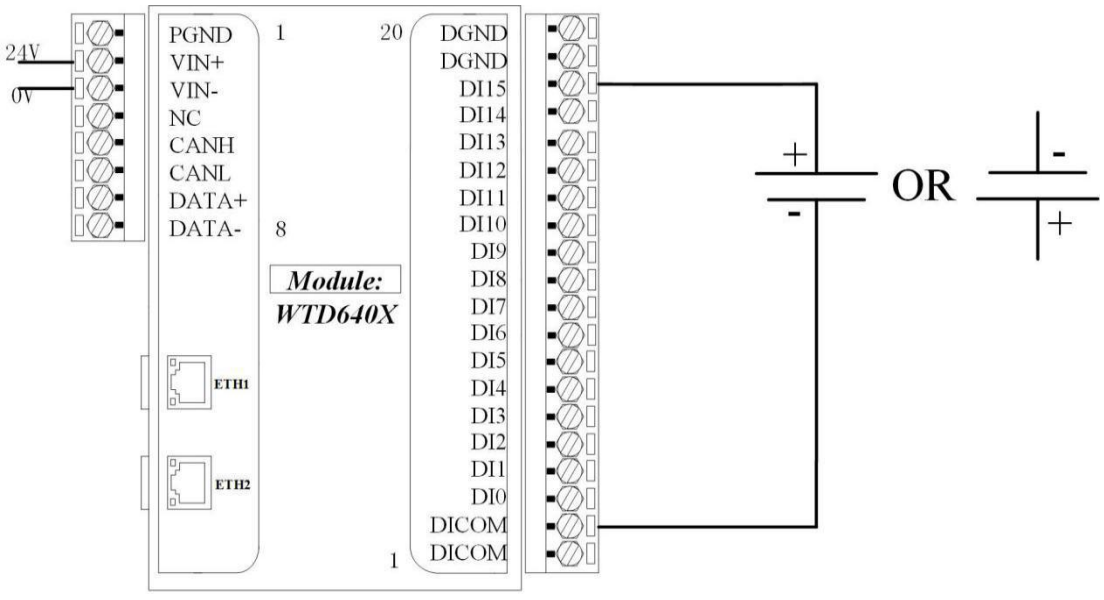

Figure 3-4 WTD640X Digital Input Dry Node Wiring Diagram

3.2 WTD650C

3.2.1 Brief Introduction of WTD650C Function

WTD650C is a digital input module with isolation. The module has 16-channel isolated digital outputs and the digital output uses open-drain output, with the maximum load of up to 50V and 200mA. The module is suitable for industrial field control power relays, etc.

3.2.1.1 Main Technical Parameters

3.2.1.1.1 Isolated Digital Output

♦ Output Channels: 16

♦ Output Type: Open Drain Output

♦ Maximum Load Voltage: 50VDC

♦ Maximum Load Current: 50VDC

3.2.1.1.2 System Parameters

♦ CPU: 32-bit ARM Processor

♦ Operating system: Real-time Operating system

♦ Supply Voltage：+10VDC to +48VDC

♦ Working Temperature Range：-40℃ to +85℃

♦ Plastic Casing,Standard DIN Guide Rail Installation

♦ Communication Interface: ESD Protection

3.2.1.2 Functional Block Diagram

The functional block diagram of WTD640X module is shown in the following figure. The module consists of power supply, digital output circuit, 2xRJ45 communication interface, MCU and other components. The module`s micro-controller uses 32-bit ARM chips and has extremely fast data processing capability. Inside the chip, there`s watch-dog circuit, which makes the system to restart in case of accident, allowing the system to be more stable and reliable. WTD650C is designed for industrial applications, uses 2xRJ45 interface, can connect daisy chain network, supports Bypass function, and has ESD protection.

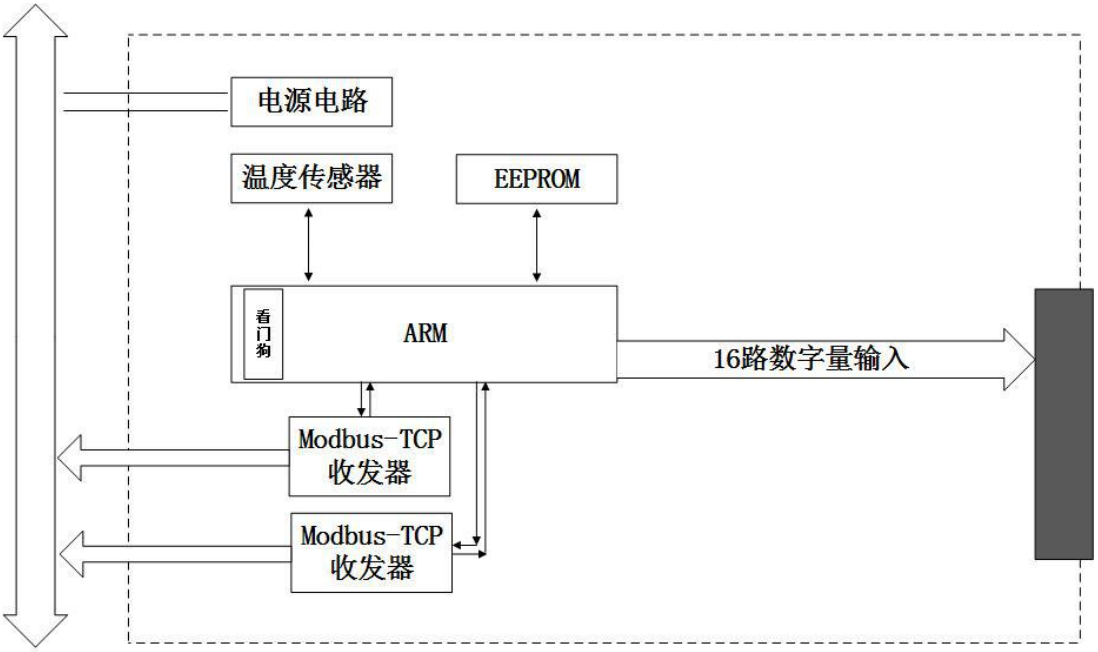

Figure 3-5 WTD650C Module`s Functional Block Diagram

3.2.1.3 Terminal Function

3.2.1.3.1 Terminal Function Arrangement

WTD650C has a total of 28 terminals, with terminal function arranged as shown in the following figure.

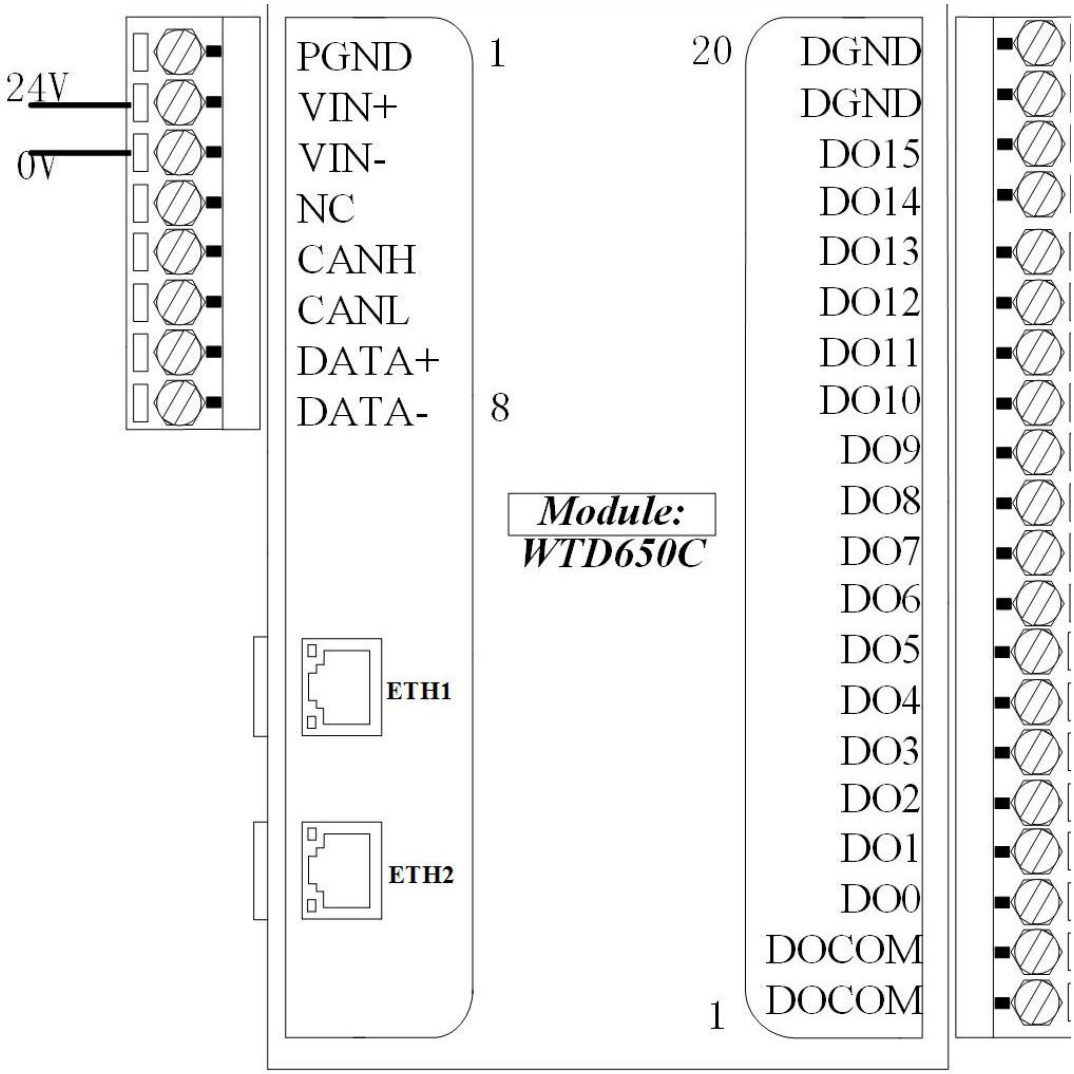

Figure 3- 6 WTD650C Terminal Function Arrangement

3.2.1.3.2 Terminal Function Description

The terminal function of WTD640X is defined as follows:

♦ PGND、VIN+ and VIN- is the input terminal of the module, PGND is the power ground, VIN+ connects to power positive terminal and VIN- connects to power negative terminal.

♦ DATA+ and DATA- are RS-485 interface terminals, and DATA+ connects to Terminal A of RS-485 transceiver, and DATA- connects to Terminal B of RS-485 transceiver.

♦ DO0~DO15 are 16-channel isolated digital output channels of the module;

♦ DGND is the ground of isolated digital output of the module;

♦ DOCOM is the common port of the isolated digital output of the module;

3.2.1.4 Digital Input Connection Mode

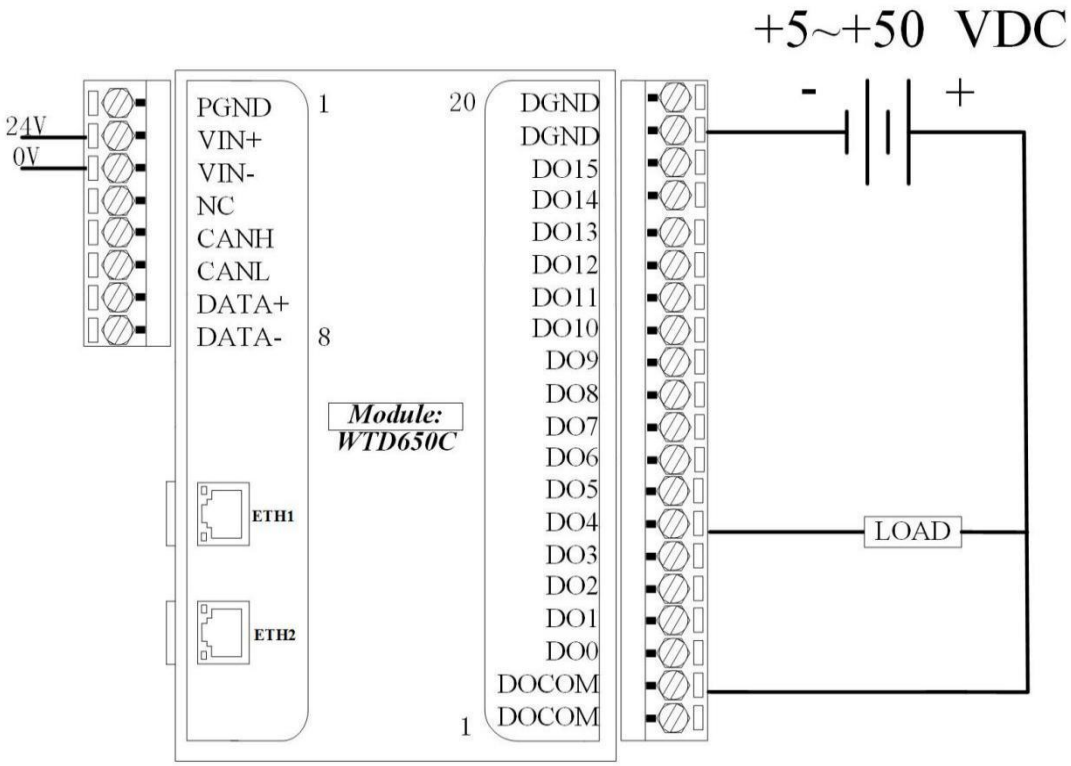

Figure 3-7 WTD650C Digital Input Dry Node Wiring Diagram

3.3 WTD666C

3.3.1 Brief Introduction of WTD666C Function

WTD666C is a relay output module with isolation. The module has 6-channel relay outputs, in which 3 channels are Type C and 3 channels are Type A. It is suitable for small power electric equipment in industrial field control.

3.3.1.1 Main Technical Parameters

3.3.1.1.1 Relay output:

♦ Output Channels: 6

♦ Output Type: 3 channels of Type C and 3 channels of Type A

♦ Output Load: Type A relay: NO：AC 5A@250V
DC 3A@30V
Type C relay: NO：AC250V@5A
DC：24V@5A
NC：AC250V@5A
DC：24V@5A

♦ Contact Resistance: Type A Relay, less than 100mΩ
Type C Relay, less than 100mΩ

• Dielectric Strength:

Type A Relay: 4000Vrms between contact and coil (1 minute)
750 Vrms between contacts(1 minute)
Type C Relay: 2000Vrms between contact and coil (1 minute)
750 Vrms between contacts(1 minute)

♦ Service Life:

Type A relay: Mechanical Life: 5 000 000 times
Electrical Life: 200 000 times @125VAC 5A
Electrical Life: 200 000 times @30VDC 3A
Electrical Life: 100 000 times @250VAC 5A
Type C Relay: Mechanical Life: 10 000 000 times
Electrical Life: 100 000 times

♦ Maximum Operating Time:

Type A Relay: Less than 10ms

Type C Relay: Less than 10ms

♦ Maximum Release Time: Type A Relay: Less than 10ms

Type C Relay: Less than 5ms

3.3.1.1.2 System Parameters

♦ CPU: 32-bit ARM Processor

♦ Operating system: Real-time Operating system

♦ Supply Voltage：+10VDC to +48VDC

♦ Working Temperature Range：-40℃ to +85℃

♦ Plastic Casing,Standard DIN Guide Rail Installation

♦ Communication Interface: ESD Protection

3.3.1.2 Functional Block Diagram

The functional block diagram of WTD666C module is shown in the following figure. The module mainly consists of power supply, relay output circuit,R2xRJ45 communication interface, MUC and other components. The module`s micro-controller uses 32-bit ARM chips and has extremely fast data processing capability. Inside the chip, there`s watch-dog circuit, which makes the system to restart in case of accident, allowing the system to be more stable and reliable. WTD666C is designed for industrial applications, uses 2xRJ45 interface, can connect daisy chain network, supports Bypass function, and has ESD protection.

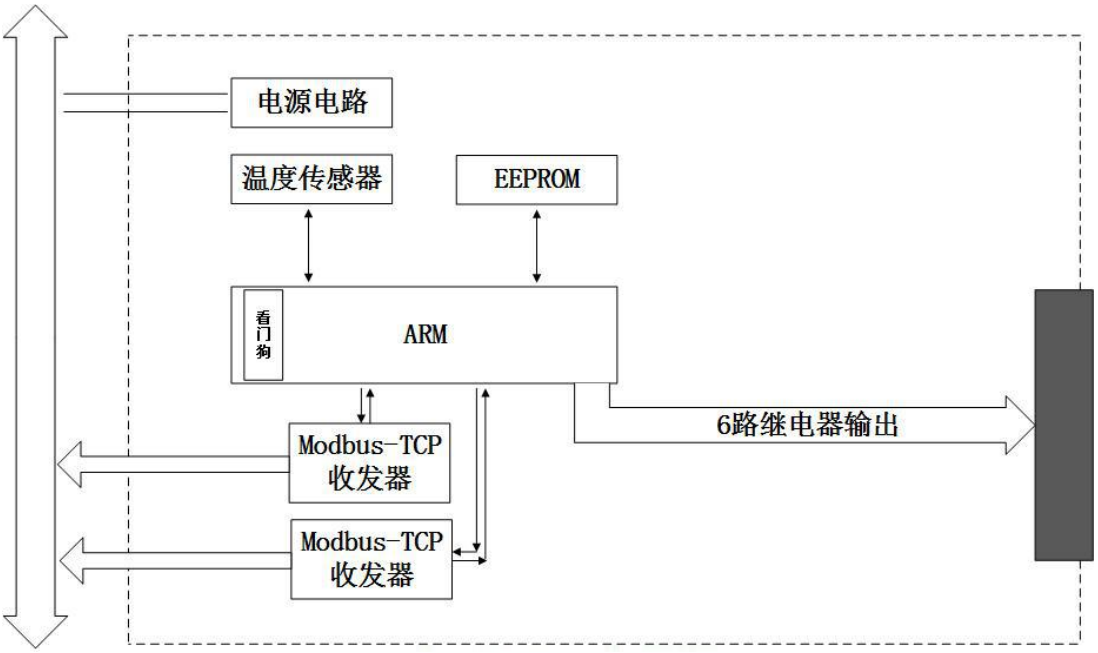

Figure 3-8 WTD666C Module`s Functional Block Diagram

3.3.1.3 Terminal Function

3.3.1.3.1 Terminal Function Arrangement

WTD666C has a total of 28 terminals, with terminal function arranged as shown in the following figure.

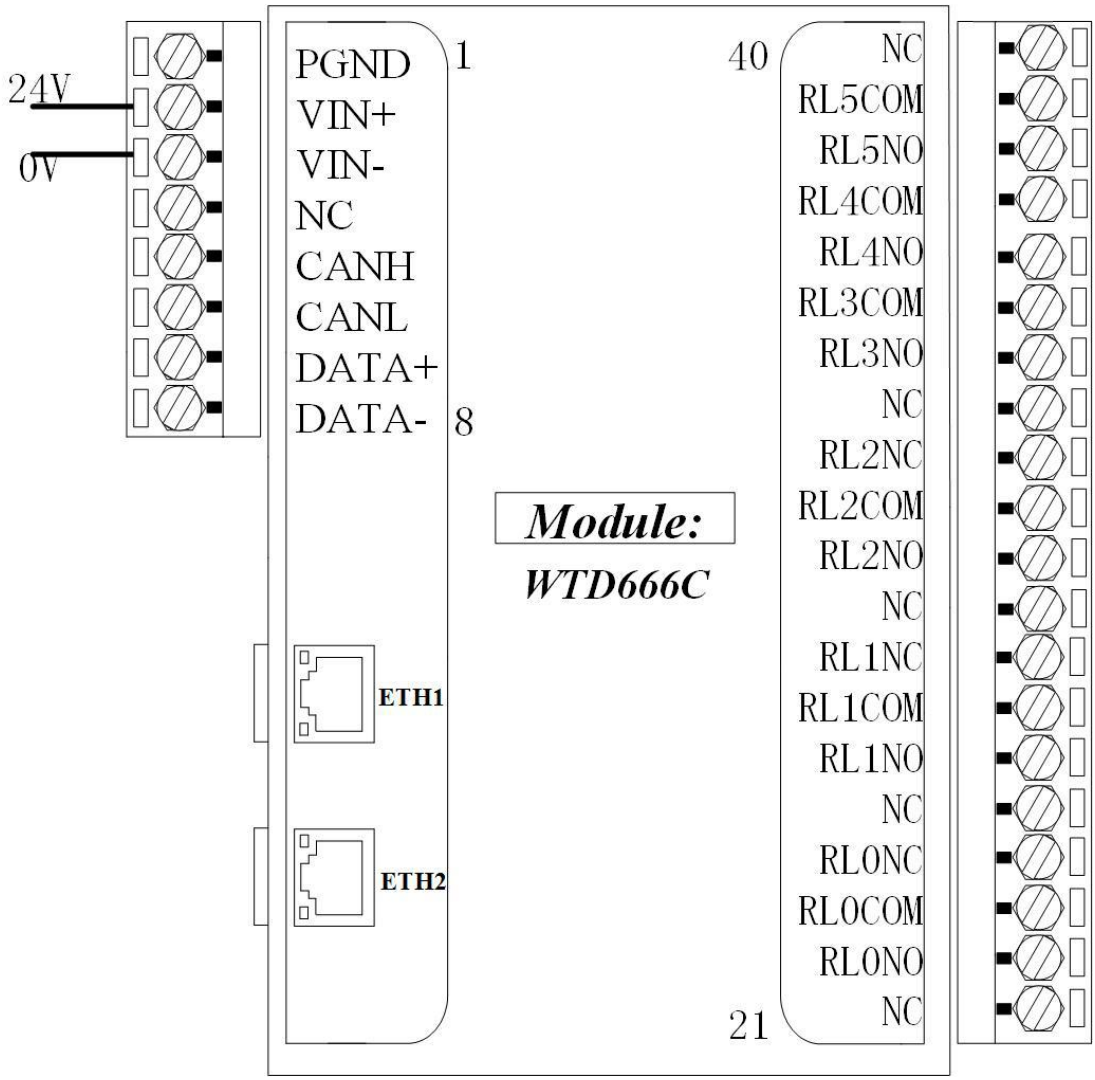

Figure 3- 9 WTD666C Terminal Function Arrangement

3.3.1.3.2 Terminal Function Description

The terminal function of WTD666C is defined as follows:

♦ PGND、VIN+ and VIN- is the input terminal of the module, PGND is the power ground, VIN+ connects to power positive terminal and VIN- connects to power negative terminal.

♦ DATA+ and DATA- are RS-485 interface terminals, and DATA+ connects to Terminal A of RS-485 transceiver, and DATA- connects to Terminal B of RS-485 transceiver.

♦ R0NO~R5NO are the normally open contact output end of the relay;

♦ R0NC~R2NC are the normally closed contact output end of the relay;

♦ R0COM~R5COM are the common terminal of the relay output;

3.3.1.4 Relay Output Wiring Method

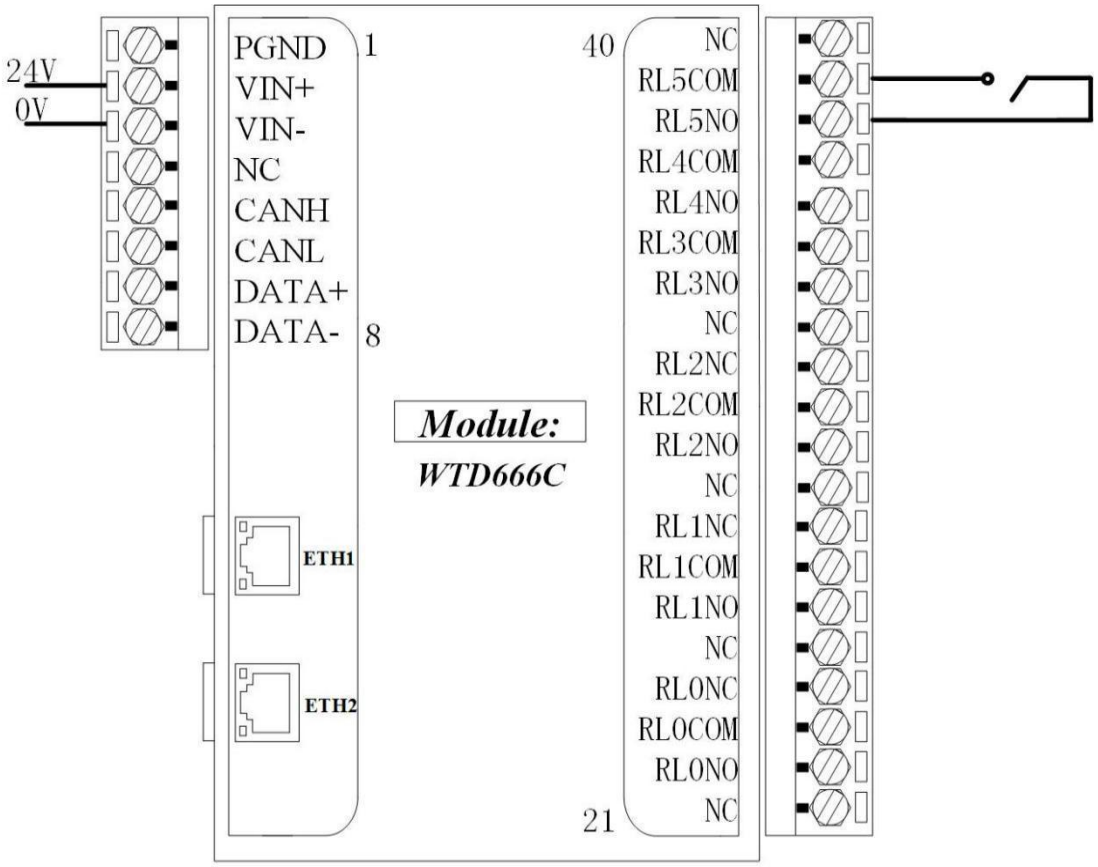

Figure 3- 10 WTD666C Module Type A Relay Output Connections

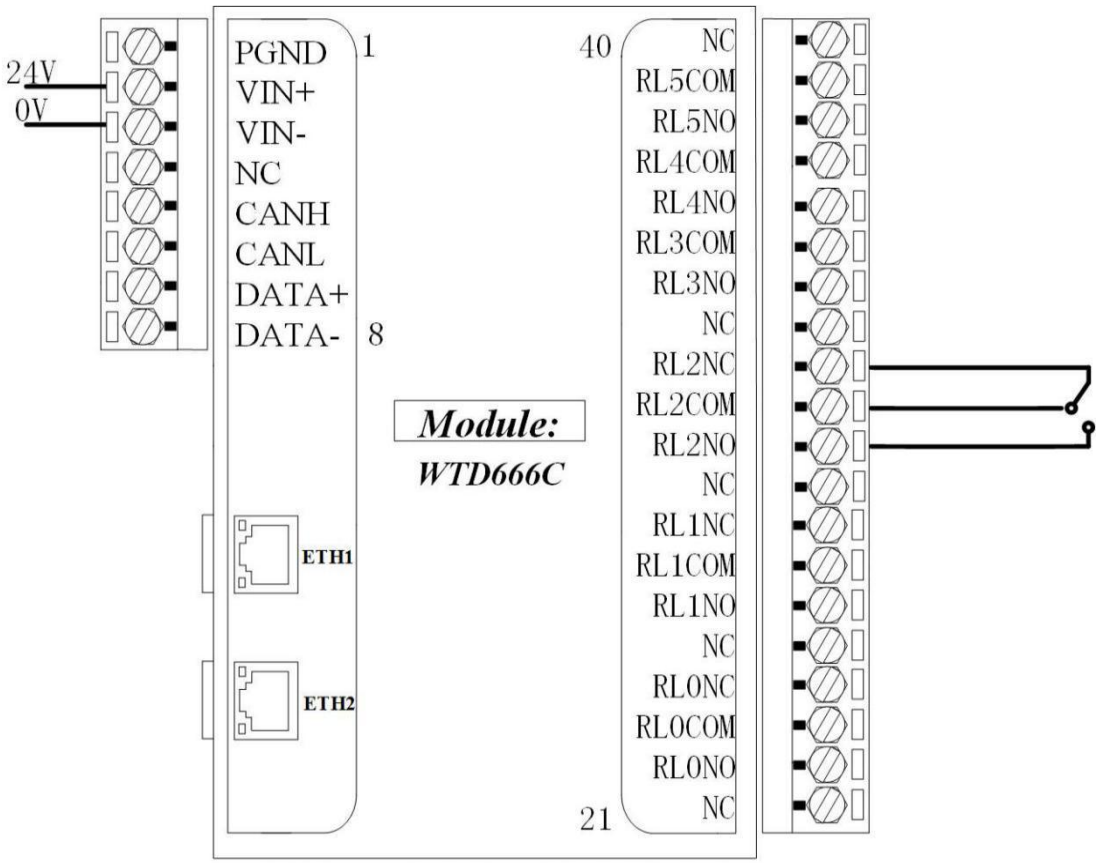

Figure 3- 11 WTD666C Module Type C Relay Output Connections

3.4 WTD678C

3.4.1 Brief Introduction of WTD678C Function

WTD678C is a digital input and output module with isolation. The module has 8-channel isolated digital quantity input, which can support switch contact signal or level signal, and is suitable for collecting the digital signal from industrial scenes. The module has 8-channel isolated digital outputs and the digital output uses open-drain output, with the maximum load of up to 50V and 200mA. The module is suitable for gathering industry field control power relays, etc.

3.4.1.1 Main Technical Parameters

3.4.1.1.1 Relay Output

♦Input Channels: 8 channels

♦Input Type: Switch contact signal or level signal

♦Isolation Voltage: 3000 VDC

♦Switch Contact Input: Disconnection: Digit 0

Close: Digit 1

♦ Level Input Range: High Level (Figure 1): +10 v to +50V

Low Level (Digital0）：≤+3V

3.4.1.1.2 Isolated Digital Output

♦ Output Channels: 8 Channels

♦ Output Type: Open Drain Output

♦ Maximum Load Voltage: 50VDC

♦ Maximum Load Current: 200mA

3.4.1.1.3 System Parameters

♦ CPU: 32-bit ARM Processor

♦ Operating system: Real-time Operating system

♦ Supply Voltage：+10VDC to +48VDC

♦ Working Temperature Range：-40℃ to +85℃

♦ Plastic Casing,Standard DIN Guide Rail Installation

♦ Communication Interface: ESD Protection

3.4.1.2 Functional Block Diagram

The functional block diagram of WTD678C module is shown in the following figure. The module consists of power supply, digital output circuit, 2xRJ45 communication interface, MCU and other components. The module`s micro-controller uses 32-bit ARM chips and has extremely fast data processing capability. Inside the chip, there`s watch-dog circuit, which makes the system to restart in case of accident, allowing the system to be more stable and reliable. WTD678C is designed for industrial applications, uses 2xRJ45 interface, can connect daisy chain network, supports Bypass function, and has ESD protection.

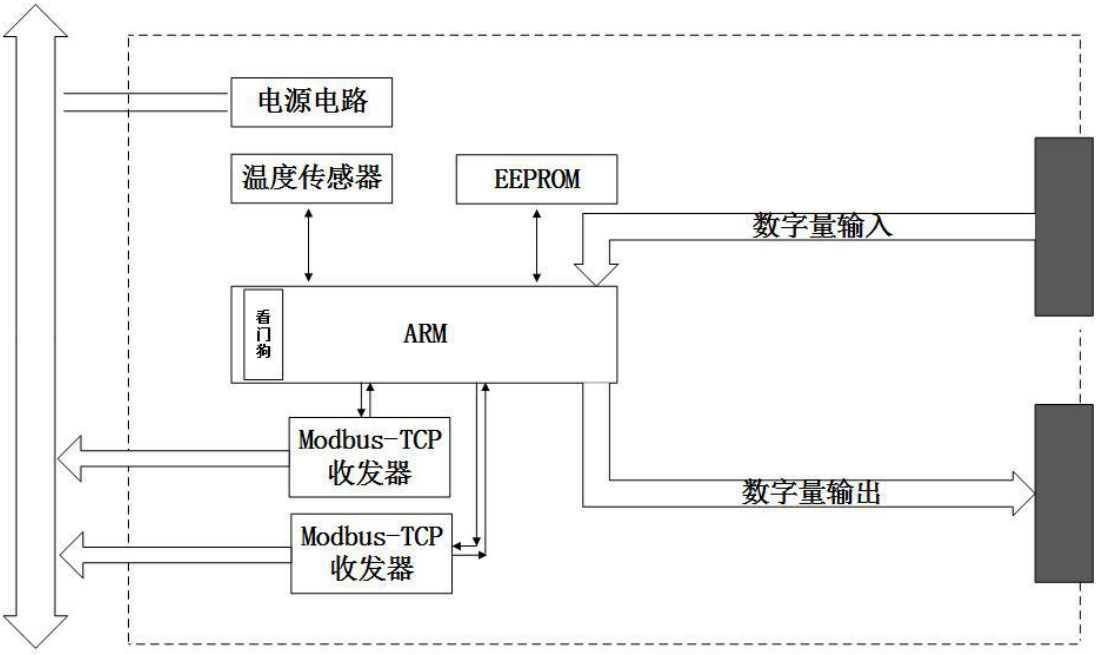

Figure 3- 12 WTD678C Module`s Functional Block Diagram

3.4.1.3 Terminal Function

3.4.1.3.1 Terminal Function Arrangement

WTD678C has a total of 28 terminals, with terminal function arranged as shown in the following figure.

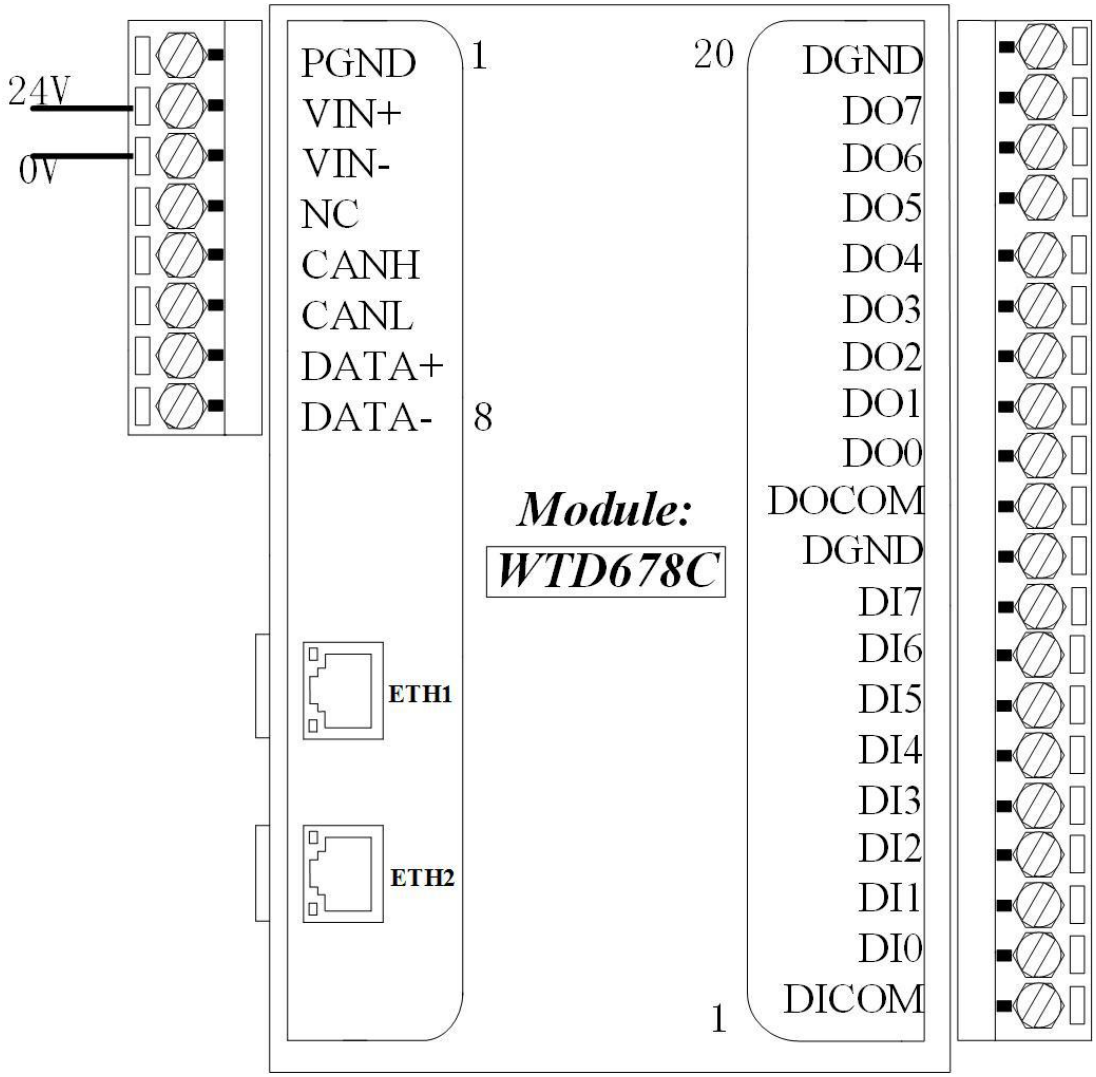

Figure 3- 13 WTD678C Terminal Function Arrangement

3.4.1.3.2 Terminal Function Description

The terminal function of WTD678C is defined as follows:

♦ PGND、VIN+ and VIN- is the input terminal of the module, PGND is the power ground, VIN+ connects to power positive terminal and VIN- connects to power negative terminal.

♦ DATA+ and DATA- are RS-485 interface terminals, and DATA+ connects to Terminal A of RS-485 transceiver, and DATA- connects to Terminal B of RS-485 transceiver.

♦ DI0~DI17 are 8-channel isolated digital input channels of the module;

♦ DO0~DO7 are 8-channel isolated digital output channels of the module;

♦ DGND is the ground of isolated digital output and the common side of dry contact input (switch contact signal) of the module;

♦ DICOM is the common side of wet contact input(active level)of the module;

♦ DOCOM is the common port of the module output;

3.4.1.4 Digital Input and Output Connection Mode

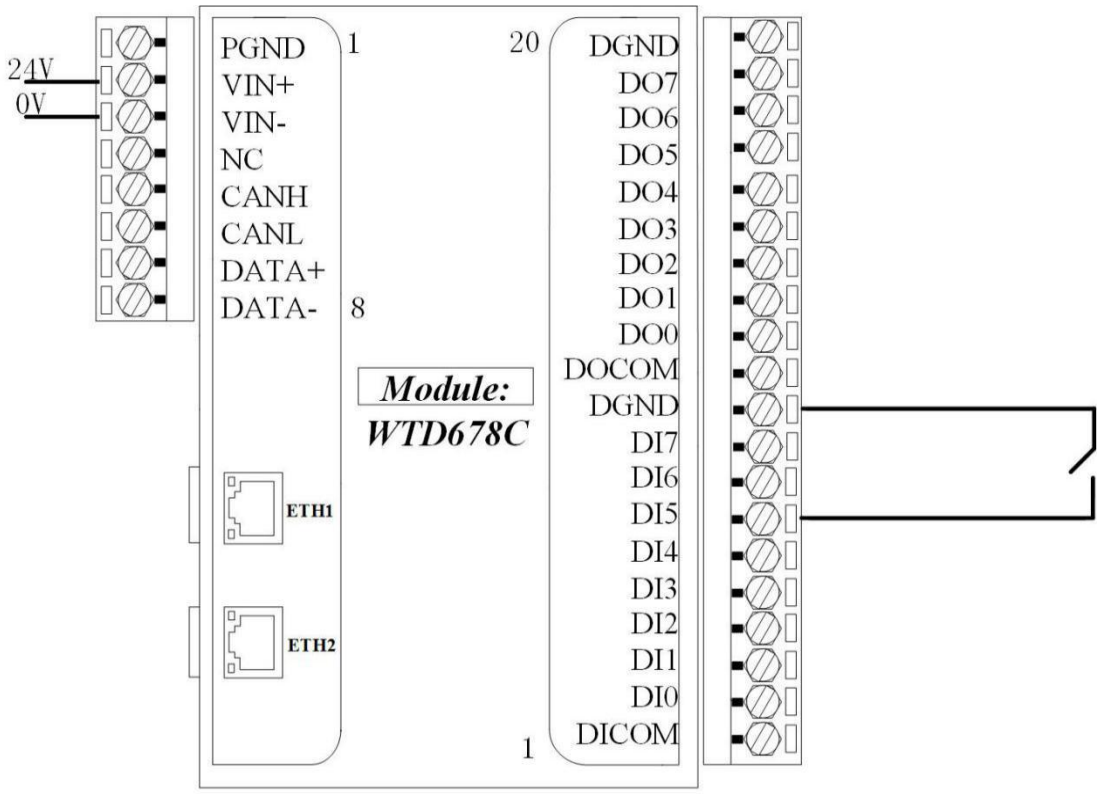

Figure 3- 14 WTD678C Digital Input Dry Node Wiring Diagram

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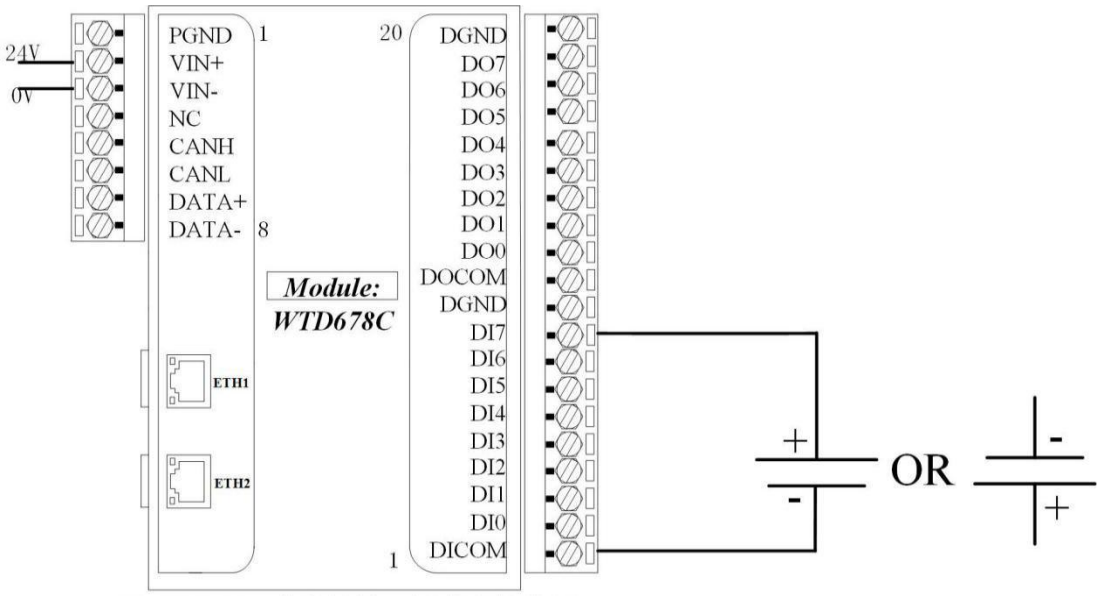

Figure 3- 15 WTD678C Digital Input Wet Node Wiring Diagram

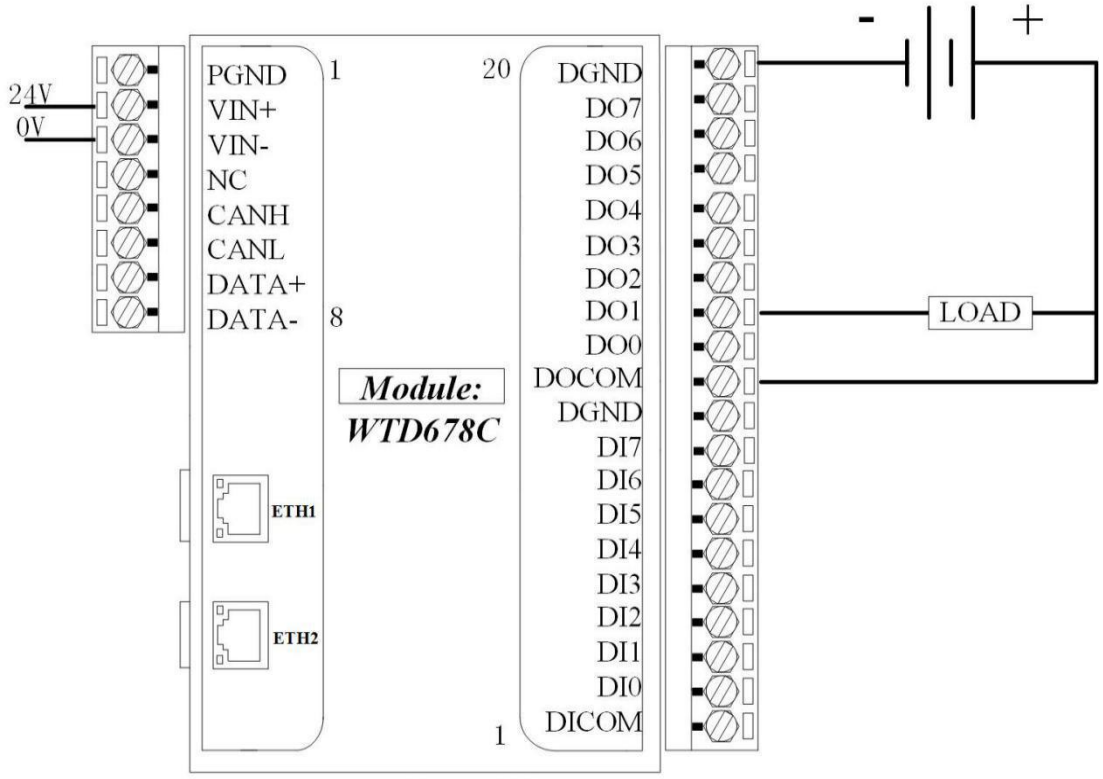

Figure 3- 16 WTD678C Digital Input Dry Node Wiring Diagram

3.5 WTD614P

WTD614P is RTD temperature acquisition module and can perform

4-channel RTD measurement simultaneously. It is suitable for collecting temperature value of industry scene. The module also has a 2-channel digital output function.

3.5.1 Main Technical Parameters

3.5.1.1 Analog Input

♦Input Channels: 4-channel Difference

♦Input Type: Pt Series RTD

♦Thermal Resistance Type and Temperature Range: Pt series Pt100 (IEC), Pt100 (JLS), Pt1000), -200 o c to 400 o c

♦ RTD Mode of Connection: 2-wire、3-wire or 4-wire modes

♦ Temperature resolution: 0.1℃

♦ Accuracy: ±0.05%

♦ Sample Rate: 50 sampling points/sec

♦ Input Impedance: 800kΩ

♦ Periodic Self-calibration Function

♦ Terminal Reverse connection protection

♦ Control of Each Channel Open/Closed

♦ Independent Control of Enabling Each Channel

♦ Span Drift: ± 25 ppm/°C

♦ Zero Point Drift: ± 6 μ V/°C

3.5.1.2 Digital Output

♦ Output Channels: 2 channels;

♦ Output Type: Open-collector Output;

♦ Maximum Load Voltage: +30V；

♦ Output Load Current: 30mA;

3.5.1.3 System Parameters

♦ CPU: 32-bit ARM Processor

♦ Operating system: Real-time Operating system

♦ Supply Voltage：+10VDC to +48VDC

♦ Working Temperature Range：-40℃ to +85℃

♦ Plastic Casing,Standard DIN Guide Rail Installation

♦ Communication Interface: ESD Protection

3.5.2 Functional Block Diagram

The functional block diagram of WTD614P module is shown in Figure 3-17. The module consists of power supply, isolating circuit, A/D switching circuit, digital output circuit, 2xRJ45 communication interface, MCU and other components. The module`s micro-controller uses 32-bit RISC ARM chips and has extremely fast data processing capability. Moreover, it uses watch-dog circuit, which makes the system to restart in case of accident, allowing the system to be stable and reliable.

WTD614P is designed for industrial applications, and has photoelectric isolation between internal input units, output units and control units. Moreover, it has filter processing for input signal, greatly reducing the interference of industrial site on the module`s normal running, makes the module more reliable. The 2xRJ45 communication interface can make daisy-chained group network, support bypass function and can respond to the disconnection of

network and power. The module has a very high anti-strike ability of ESD, over voltage and over current protection.

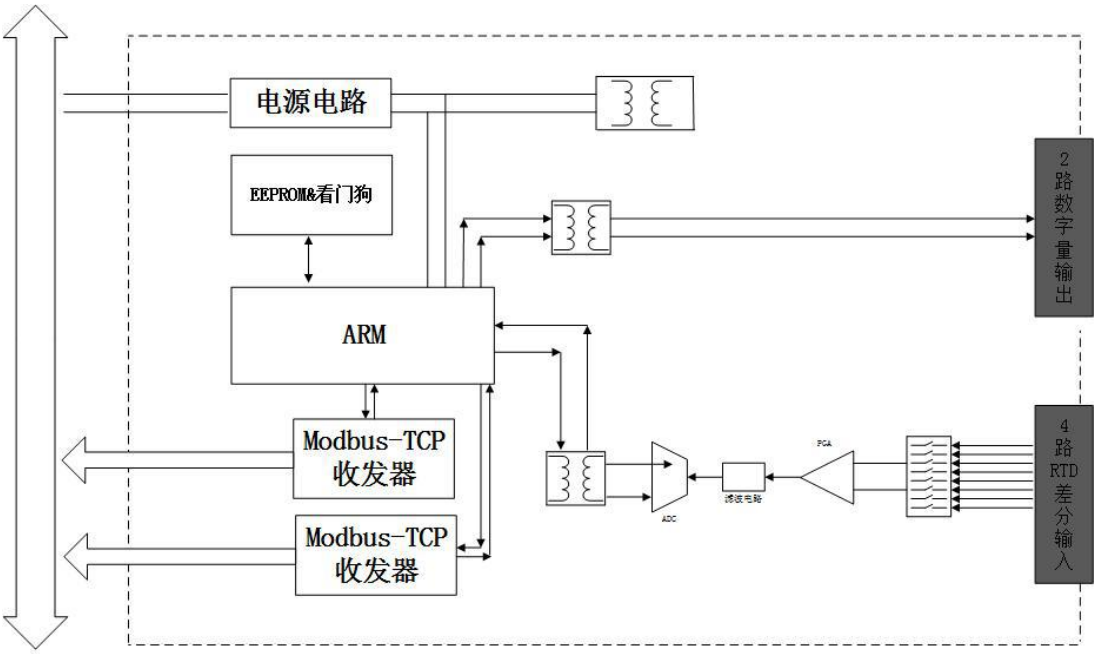

Figure 3- 17 WTD614P Functional Block Diagram

3.5.3 Terminal Function

3.5.3.1 Terminal Function Arrangement

WTD678C has a total of 28 terminals, with terminal function arranged as shown in the following figure.

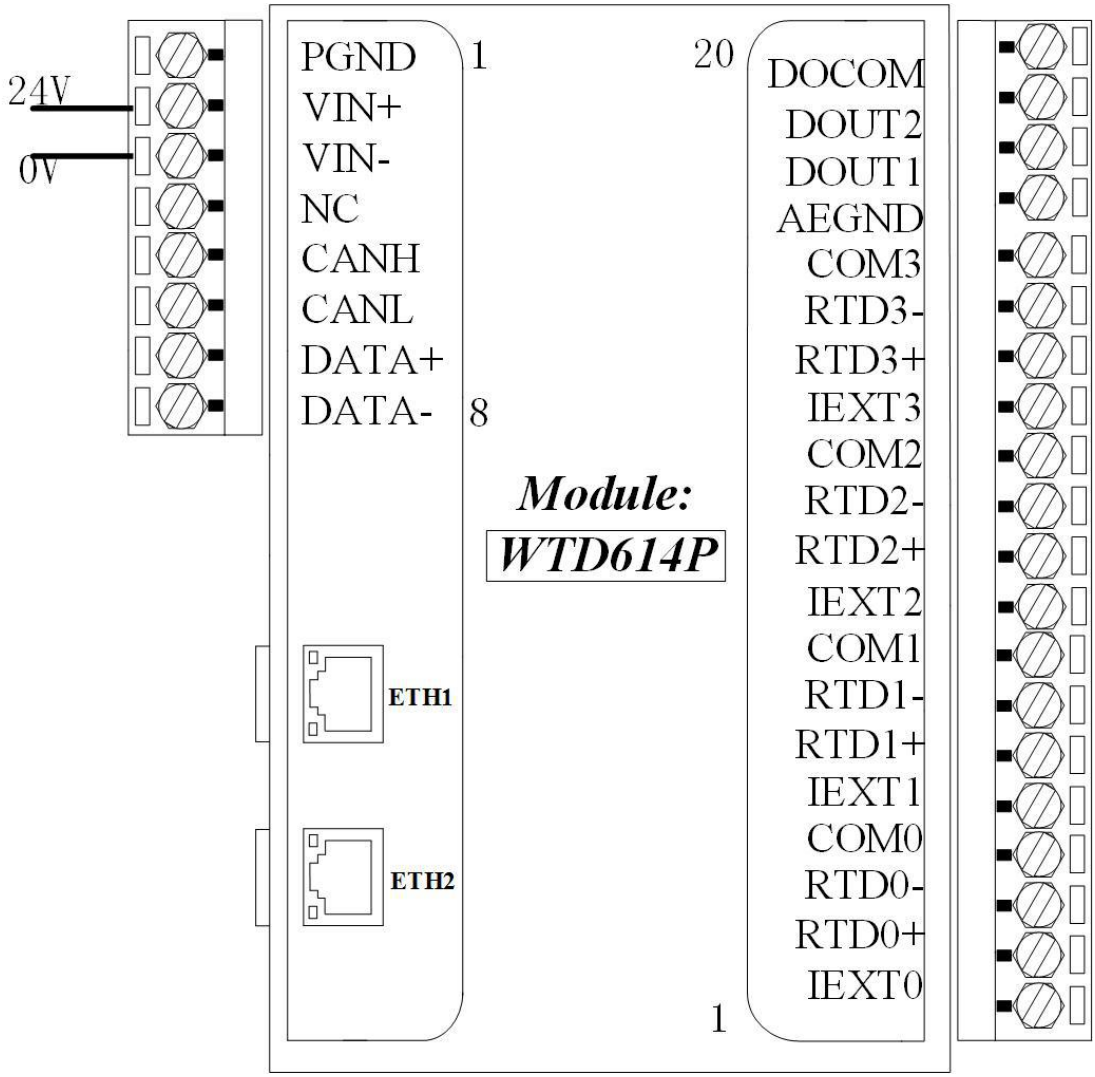

Figure 3- 18 WTD614P Terminal Function Arrangement

3.5.3.2 Terminal Function Description

The terminal function of WTD614P is defined as follows:

♦ PGND、VIN+ and VIN- is the input terminal of the module, PGND is the power ground, VIN+ connects to power positive terminal and VIN- connects to power negative terminal.

♦ DATA+ and DATA- are RS-485 interface terminals, and DATA+ connects to Terminal A of RS-485 transceiver, and DATA- connects to Terminal B of RS-485 transceiver.

♦ RTD0 ± to RTD3 ± and COM0 to COM3 and IEXT0 to IEXT3 are 4 channel

RTD channel interfaces. Wiring Method: Refer to Section 3.5.4.

♦ DOCOM、DOUT1、DOUT2 and AEGND are 2 channel digital output channel interfaces. Wiring Method: Refer to Section 3.5.5.

3.5.4 RTD Connection Mode

WTD614P has 4-channel RTD input channel. Each channel supports 2-wire, 3-wire and 4-wire thermal resistance measurement. 2-wire thermal resistance has the connection mode as shown in Figure 3-19, it connects two wires of RTD to RTD0+ and RTD0-, then short connect internal RTD0- and COM0; 3 wires of 3-wire thermal resistance has 2 connectors with the same color (usually blue), and 1 with a different color (usually red). The connection mode is shown in Figure 3-20. Connect RTD's red wire to RTD0+, and two blue wires respectively to RTD0- and IEXT0 ends.

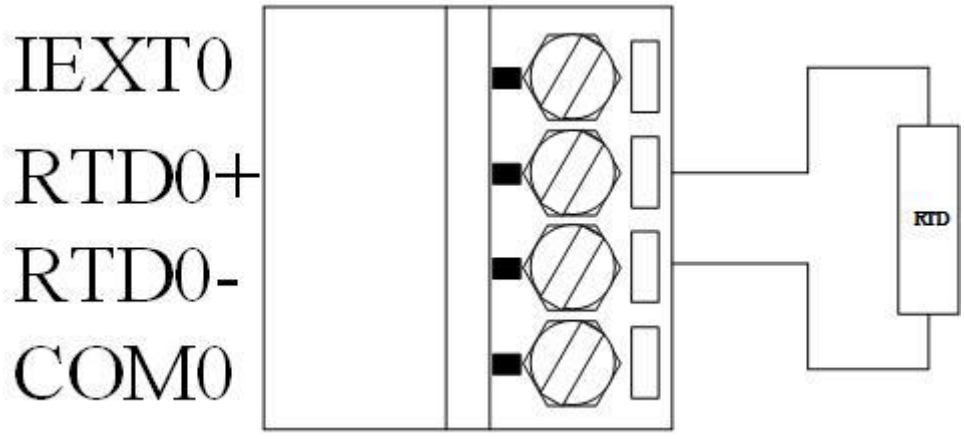

Figure 3- 19 2-wire RTD Connection Mode

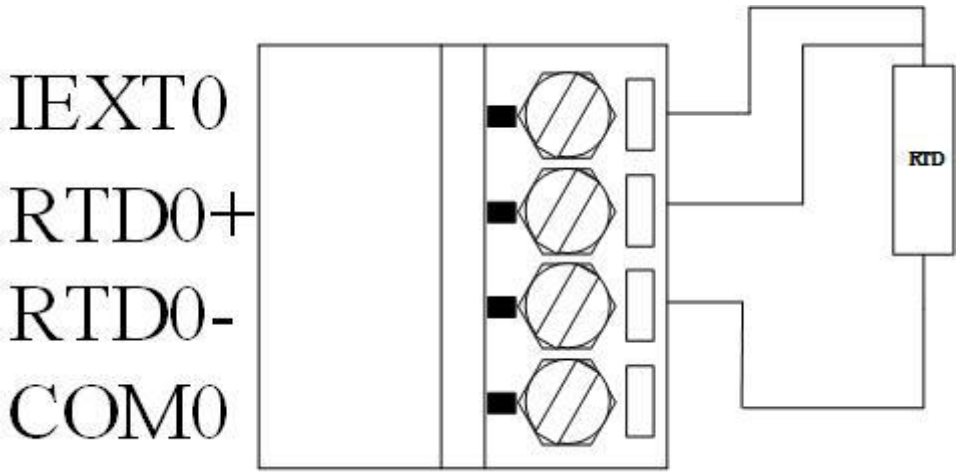

Figure 3- 20 3-wire RTD Connection Mode

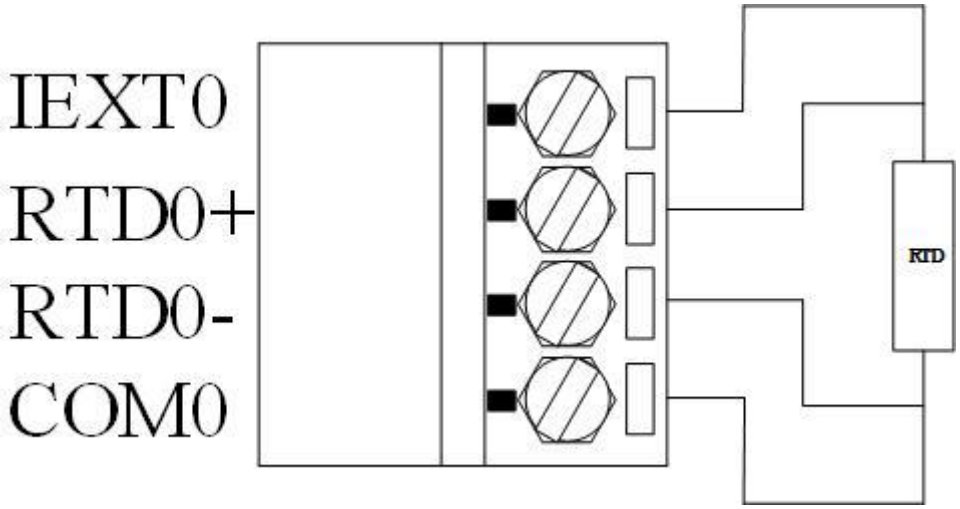

Figure 3- 21 4-wire RTD Connection Mode

3.5.5 Digital Output Connection Mode

The digital output port of the module must connect to the pull-up resistor when in use. DOUT terminal of the module is connected to the pull-up resistor provided by users, with AEGND terminal to the ground signal provided by users, as shown in the following figure.

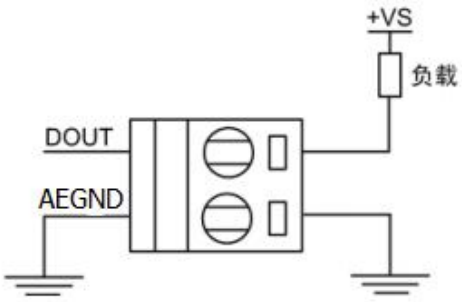

图　　DO 接线方式示意图

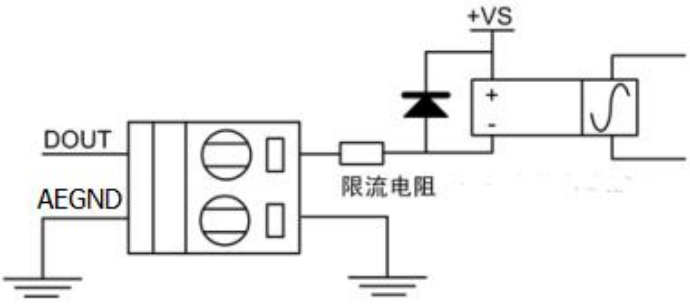

图　　DO 驱动继电器接线示意图

Figure 3- 22 DO Connection Mode

3.6 WTD618X

WTD618X is an analog input gathering module and can sample 8-channel differential signal simultaneously, with 16-bit of sampling resolution. It is suitable for collecting various voltage and current signal in industrial site and can be used to collect those from sensor or transmitter. The module also supports collection of thermocouple temperature, has 8-channel measurement channels, and is suitable for collecting temperature value on industrial site.

3.6.1 Main Technical Parameters

3.6.1.1 Analog Input

♦ Input Channels: 8-channel Differential Input

♦ Supports Type and Measurement Range: It can independently configure each channel's input signal measurement range and voltage input range: ±10V、±5V、±2.5V、±1V、±500mV、±100mV、±20mV； Current input range: ±20mA、+4～20mA，when choosing current input, a jump cap needs to be placed in the module, and choose a 100Ω precision resistance.

♦ ADC Resolution: 16-bit

♦ Sample Accuracy: ± 0.05%

♦ Sample Rate: 50 sampling points/sec

♦ Input Low-pass Filtering, Over-voltage Protection

♦ Upper and Lower Over-limit Alarm Output, Independent Enabling

♦ High Common-mode Voltage: 200 VDC

♦ Span Drift: ± 25 ppm/°C

♦ Zero Point Drift: ± 6 μ V/°C

♦ Input Impedance: 20MΩ

3.6.1.2 Thermocouple Input

♦ Channel Number: 8

♦ Input Type: Thermocouple

♦Thermocouple Type and Measurement Range: J 0~760℃

K 0~1370℃

T -100~400℃

E 0~1000℃

R 500~1750℃

S 500~1750℃

B 500~1800℃

♦ Voltage range: ±1V

♦ Sample Rate: 50 Sampling points/sec

♦ Temperature Measurement Accuracy: 0.2%

♦Voltage Accuracy: 0.02%

♦ Channel Operation: Independent Control of Channel Open/Closed

3.6.1.3 System Parameters

♦ CPU: 32-bit ARM Processor

♦ Operating system: Real-time Operating system

♦ Supply Voltage：+10VDC to +48VDC

♦ Working Temperature Range：-40℃ to +85℃

♦ Plastic Casing,Standard DIN Guide Rail Installation

♦ Communication Interface: ESD Protection

3.6.2 Functional Block Diagram

The functional block diagram of WTD618X module is shown in the following figure. The module consists of power supply, isolating circuit, A/D switching circuit, 2xRJ45 communication interface, MCU and other components. The module`s micro-controller uses 32-bit RISC ARM chips and has extremely fast data processing capability. Moreover, it uses watch-dog circuit, which makes the system to restart in case of accident, allowing the system to be stable and reliable, and can be applied to application environment of high performance and high speed. WTD618X is designed for industrial applications, and has photoelectric isolation between internal input units, output units and control

units. Moreover, it has filter processing for input signal, greatly reducing the interference of industrial site on the module`s normal running, makes the module highly reliable. The 2xRJ45 communication interface can make daisy-chained group network, support bypass function and is not affected by the disconnection of network and power, etc.. Moreover, it has ESD, over-voltage and over-current protection.

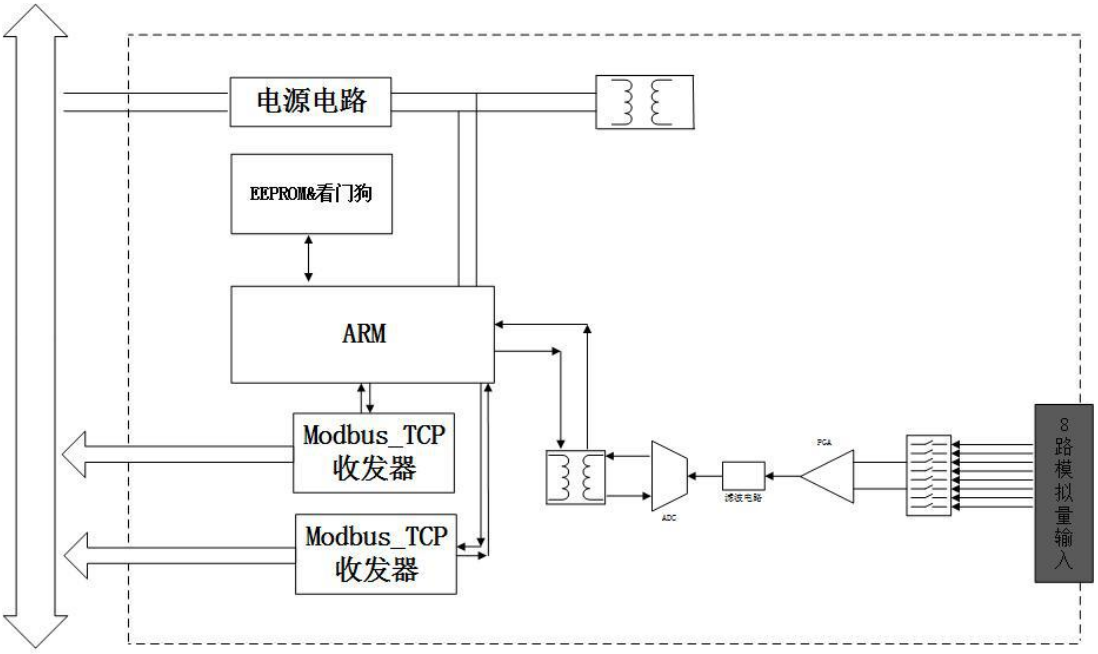

Figure 3-23 WTD618X Functional Block Diagram

3.6.3 Terminal Function

3.6.3.1 Terminal Function Arrangement

WTD618X has a total of 28 terminals, with terminal function arranged as shown in the following figure.

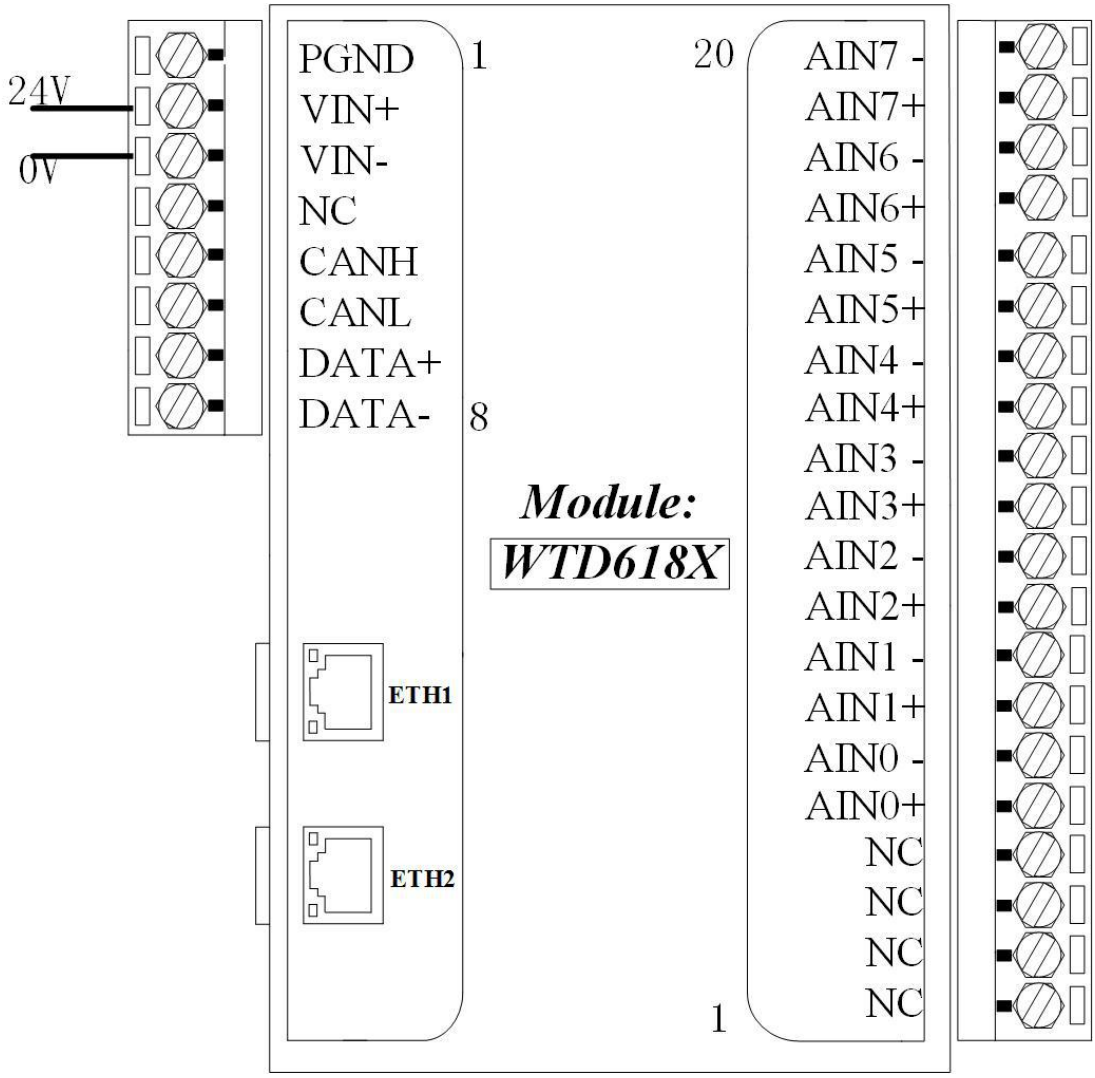

Figure 3- 24 WTD618X Terminal Function Arrangement

3.6.3.2 Terminal Function Description

The terminal function of WTD614P is defined as follows:

♦ PGND、 VIN+ and VIN- is the input terminal of the module, PGND is the power ground, VIN+ connects to power positive terminal and VIN- connects to power negative terminal.

♦ DATA+ and DATA- are RS-485 interface terminals, and DATA+ connects to Terminal A of RS-485 transceiver, and DATA- connects to Terminal B of RS-485 transceiver.

♦ AIN0± to AIN7± is the module`s8-channel analog differential input channel, AIN+ is positive input terminal and AIN- negative input terminal.

♦ AIN0± to AIN7± is the module`s 8-channelthermocouple connection port.For connection mode, refer to Section 3.6.4；

3.6.4 Analog Input Connection Mode

WTD618X has 8 analog differential input channels, and can capture output voltage or current signal from sensors or transducers. Voltage input signals can be directly connected to the input terminals. For current input signal, it needs a external connection of 125Ω and 0.1% precision resistance. The connection mode is shown in Figure 3-25.

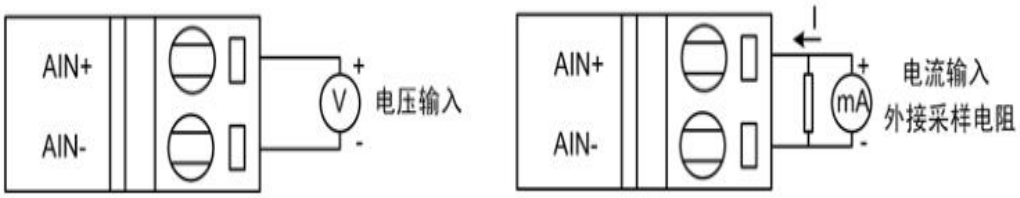

Figure 3-25 WTD618X Analog Input Connection Mode

WTD618X has 8 thermocouple input channels and the connection mode is simple, which only needs to simply connect thermocouple positive and negative terminals respectively to the TCi+ and the TCi- of a certain input channel of the module. The connection method of Channel 0 is shown in Figure 3-26.

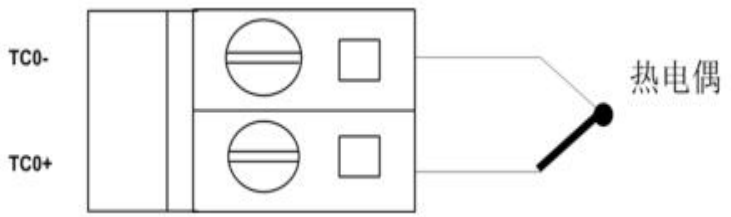

Figure 3-26 Thermo couple Connection Method

Chapter 4
Modbus Communication Protocol

4.1 Protocol Description

MODBUS protocol defines a simple data unit (PDU) independent of the underlying communication layer. MODBUS protocol mapping on a particular bus or network can introduce some additional fields on application data unit (AUD).

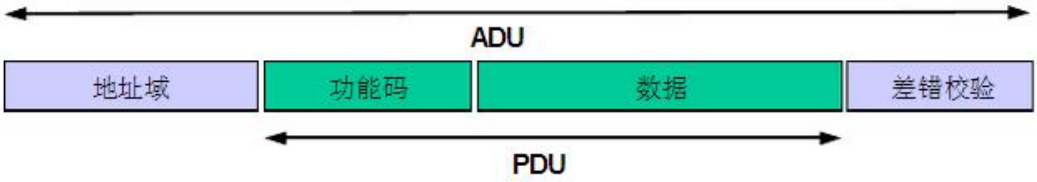

Figure 4-1 Generic

Start the client for MODBUS transaction processing to create the MODBUS application data unit. The address code indicates which server needs to respond, and the function code indicates which operation to be executed to the server. The data domain is used for providing relevant parameters required by the server, and the final check code is used to verify the protocol`s validity.

4.1.1 Address Code

Use a byte to encode the address code domain of MODBUS protocol. The effective size range is decimal 0-255 (0 as broadcast address). When the message is sent from the client to the server, the server will compare the address code received and its own address code to identify whether it needs to implement responses.

4.1.2 Function Code

Use a byte to encode the function code domain of MODBUS data unit. The range of valid code is the decimal 1-255 (1-127 for the corresponding codes of normal function and 128-255 reserved for exception responses). When sending a message from the client device to the server, a function code domain notifies

the server to perform which operations. Function code can also be added with a function code to define multiple operations.

4.1.3 Data Bits

The message data field sent from the client device to the server device includes additional information, and the server uses this information to perform the operations defined by the function code. The field also includes discrete items and register address, the number of items processed, and the actual number of data byte in the field.

In some request, the data field does not exist (that is, the length can be 0), in which case the server does not require any additional information. The function code is only for instructions.

4.1.4 Check Code

Under MODBUS RTU mode, the message sent from the client device to the server finally include two bytes of error checking field, which are implemented based on the cyclic redundancy check (CRC) method for all message content.

Under MODBUS ASCII mode, the error checking field is based on the implementation for all message content based on longitudinal redundancy check (LRC) method.

Modbus TCP mode has no additional stipulated check, because TCP is a connection-oriented reliable protocol. TCP is a protocol that MODBUS RTU/ASCII protocol is encapsulated into a TCP packet, there is not much difference in essence, but one is running on 232 or 485 serial communication platforms, the other is running on Ethernet platforms.

4.1.5 Response

If in a correctly received MODBUS ADU, errors related with MODBUS function request does not appear, the response data field from the server to the client includes the requested data. If there are errors related with MODBUS function request, the field includes an exception code, which a server application can use to identify the next operations. For example, a client can read the on/off status of a set of discrete output or input, or read/write the data content of a set of registers.

When the server responds to the client, it uses the function code field to indicate the normal (no error) response or some kind of error (referred to as exception response). For a normal response, the server only respond to the original function code.

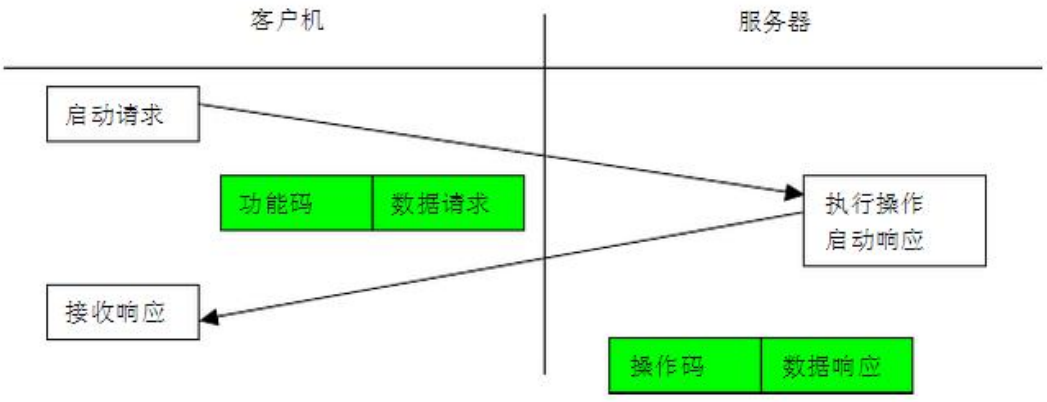

Figure4-2 MODBUS Transaction Processing (no error)

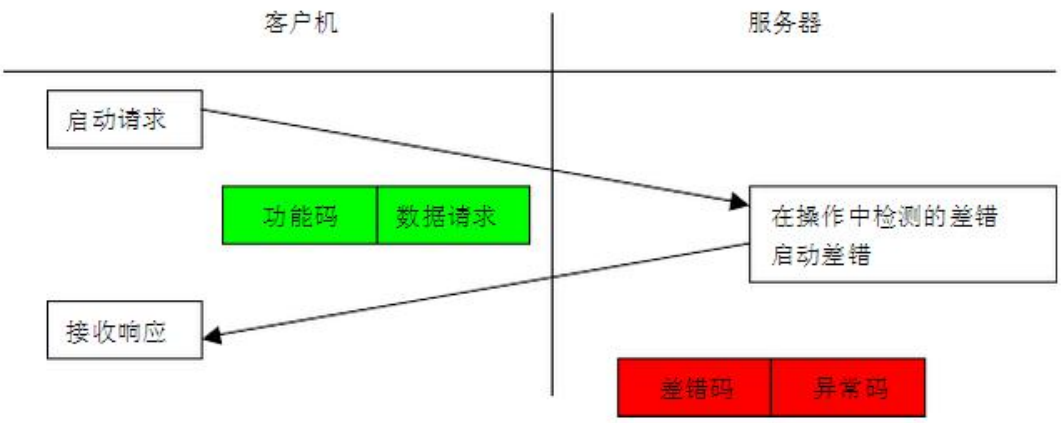

Figure4-3 MODBUS Transaction Processing（abnormal response）

For abnormal response, the server returns a code equal to the original function one, while setting the most significant bit of the original function code as logic 1. In addition, the client needs to have time out management so as not to wait indefinitely for a response that may not appear.

For serial link communication, the Modbus ADU is up to 256 bytes in length, thus Modbus PDU = 256-device address (1 byte)-CRC validation (2 byte) = 253 bytes.

Modbus transaction, shown in the figure, describes the general procedure of Modbus device in transaction process. Once the device processes the request, it will use the Modbus transaction to generate Modbus response. According to the results, two types of responses can be created:

A normal Modbus response:

Response function code = Request function code.

An abnormal Modbus response:

1) is used to provide the related information with the error identified in the process for the host computer;

2) Abnormal function code = Request function code +0x80;

3) provides an exception code to indicate the reason of errors.

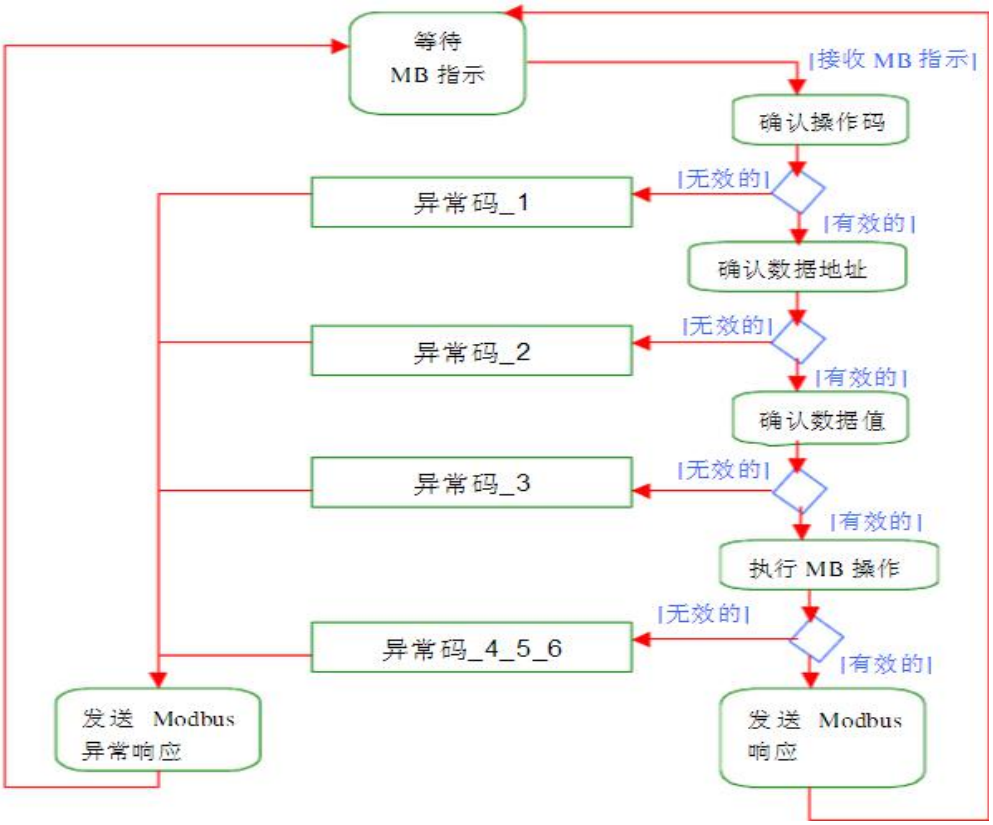

Figure 4-4 MODBUS Transaction

4.2 Data Encoding

MODBUS uses a 'big-Endian' to represent address and data item. This means that while launching multiple bytes, the most significant bit is sent first. For example: The register size is 16 bit and the register value is 0x1234, then it sends the first byte 0x12, and the second byte 0x34.

4.3 Data Model

MODBUS is based on the data model on a series of tables with different characteristics. Four basic forms are:

Basic Table	Object Type	Access Type	Content
Discrete Input	Single Bit	Read-only	I/O systems to provide this

			type of data
Coil	Single Bit	Read and Write	Change this type of data through the application
Input Register	16-bit Words	Read-only	I/O systems to provide this type of data
Holding Register	16-bit Words	Read and Write	Change this type of data through the application

The difference between input and output as well as bit addressing and word addressing does not imply any application operation. If it is the most natural explanation of the core part of suspicious objects, this difference is completely acceptable, and very common, in order to consider all four tables covering another table.

For any item in the basic table, the agreement allows a single choice of65,536 data items, and the read and write operations designing those items can go across multiple consecutive data items until limited by data size, which is associated with the transaction processing function code.

It is clear that all data through MODBUS process must be placed in the device application storage. However, the physical address of the memory should not be confused with reference data. The only requirement is the link between data reference and physical address.

The MODBUS logic reference number used in MODBUS function code is the index of the unsigned integers starting with 0.

4.4 Introduction of Modbus Function and Register

Function Code	**Description**
01 (0x01)	Read Coil State
02 (0x02)	Read Discrete Input State
03 (0x03)	Read Holding Register State

04 (0x04)	Read Input Register State
05 (0x05)	Control Single Coil Output State
06 (0x06)	Preset Single Register State
15 (0x0F)	Control Output State of Multiple Coils
16 (0x10)	Preset Multiple-Register State

4.4.1 01 (0x01) Read Coil State

This function code is used to read the coil state of WTD6XXX module equipment, ranging 1~2000. Request PDU details the start address, i.e. the first coil address and coil number specified. The coil address in request PDU makes addressing of the coil from zero, thus the address of the addressing coil 1-16 corresponds to 0-15.

The coil status of responded message indicates that each bit in the data field corresponds to a coil state. It indicates the state of1= ON and 0 = OFF. The first data byte`s LSB (least significant bit) represents the output of initial coil state in the query. Other coils repeat until the high-order end of this byte, and follow an order from low- to high-order end in the subsequent bytes.

If the returned output quantity is not a multiple of eight, a zero is used to fill in the remaining bits of the data byte (until the high-order end of the byte). The number domain of bit illustrates the number of full bytes of data.

Request PDU		**Response PDU**		**Errors**	
Function Code	0x01	Function Code	0x01	Function Code	0x81
Start Address High Bytes	0x00	Number of Bytes	0x01	Error Code	0x01或0x02或0x03或0x04
Starting Address Lower	0x00	Coil State	0x01		

Bytes					
Coil Number High Byte	0x00				
Coil Number Low Byte	0x02				

The above example indicates it requires to acquire the coil state with register address 0x0000 and register number of 0x0002. Seen from the normal response returned, the coil state is 0b00000001, i.e. the DO0 (Coil 1) is expressed in LSB, with the state ON, DO1 (Coil 2) is expressed in the left bit of LSB, with the state OFF, and the remaining 6 bits are zero-filled. For error returns, the returned function code is the normal function code plus 0x80, and the error code is the actual error state value.

4.4.2 02 (0x02) Read Discrete Input

This function code is used to read the discrete input state of WTD6XXX module equipment, ranging 1~2000. Request PDU details the start address, i.e. the first discrete input address and discrete input number specified. The coil address in request PDU makes addressing of the discrete input address from zero, thus the address of the addressing coil 1-16 corresponds to 0-15.

The discrete input state in the responded message indicates that each bit in the data field corresponds to an input state. It indicates the state of1= ON and 0 = OFF. The first data byte`s LSB (least significant bit) represents the output of initial discrete input state in the query. Other discrete inputs repeat until the high-order end of this byte, and follow an order from low- to high-order end in the subsequent bytes.

If the returned output quantity is not a multiple of eight, a zero is used to fill in the remaining bits of the data byte (until the high-order end of the byte). The

number domain of bit illustrates the number of full bytes of data.

Request PDU		Response PDU		Errors	
Function Code	0x02	Function Code	0x02	Function Code	0x82
Start Address High Bytes	0x00	Number of Bytes	0x01	Error Code	0x01 or 0x02or 0x03or 0x04
Starting Address Lower Bytes	0x00	Input State	0x02		
Output Number High Bytes	0x00				
Output Number Low Bytes	0x02				

The above example indicates it requires to acquire the input state with discrete input address of 0x0000 and discrete input number of 0x0002. Seen from the normal response returned, the input state is 0b00000010, i.e. the DI0 (discrete input 1) is expressed in LSB, with the state OFF, DI1 (discrete input 2) is expressed in the left bit of LSB, with the state ON, and the remaining 6 bits are zero-filled. For error returns, the returned function code is the normal function code plus 0x80, and the error code is the actual error state value.

4.4.3 03 (0x03) Read Holding Registers

The function code is used to read the content of holding register`s continuous block in WTD6XX module device. Request PDU describes the starting register address and register number. Because the register address is addressing from zero, the address of address register 1-16 corresponds to 0-15.

In the response message, the register data are packed into two bytes in each register. For each register, the first byte represents high bit and the second byte represents low bit.

Request PDU		Response PDU		Errors	
Function Code	0x03	Function Code	0x03	Function Code	0x83

Start Address High Bytes	0x00	Number of Bytes	0x04	Error Code	0x01 or 0x02 or 0x03 or 0x04
Starting Address Lower Bytes	0x00	Register Data High Byte	0x01		
Register Number High Byte	0x00	Register Data Low Byte	0x02		
Register Count Low Byte	0x02	Register Data High Byte	0x01		
		Register Data Low Byte	0x03		

The above example indicates it requires to acquire input register data with register address 0x0000 and register number of 0x0002. Seen from the normal responses returned, the REGO (i.e. Holding Register 1) data is 0x0102, that is, the data of the first two bytes, and the data of REG1 (i.e. Holding Register 2) is 0x0103, i.e. the data of the second two bytes. For error returns, the returned function code is the normal function code plus 0x80, and the error code is the actual error state value.

4.4.4 04 (0x04) Read Input Registers

The function code is used to read the content of WTD6XXX module device continuous input registers (1~125). Request PDU describes the starting register address and register number. Because the register address is addressing from zero, the address of address register 1-16 corresponds to 0-15.

In the response message, the register data are packed into two bytes in each register. For each register, the first byte represents high bit and the second byte represents low bit.

Request PDU		**Response PDU**		**Errors**	
Function Code	0x04	Function	0x04	Function	0x84

		Code		Code	
Start Address High Bytes	0x00	Number of Bytes	0x04	Error Code	0x01 or 0x02 or 0x03 or 0x04
Starting Address Lower Bytes	0x00	Register Data High Byte	0x01		
Input Register Number High Byte	0x00	Register Data Low Byte	0x01		
Input Register Number Low Byte	0x02	Register Data High Byte	0x01		
		Register Data Low Byte	0x04		

The above example indicates it requires to acquire input register data with register address 0x0000 and register number of 0x0002. Seen from the normal responses returned, the REGO (i.e. Input Register 1) data is 0x0101, that is, the data of the first two bytes, and the data of REG1 (i.e. Input Register 2) is 0x0104, i.e. the data of the second two bytes. For error returns, the returned function code is the normal function code plus 0x80, and the error code is the actual error state value.

4.4.5 05 (0x05) Control Single Coil Output

The function code is used to control the state ON or OFF of single coil of WTD6XXX module.

In the request PDU address field, the address of controlled coil is described. Since the coil address starts the addressing from zero, the address of addressing coil 1 corresponds to 0. The constants in the request data field also describes the ON/OFF state of the requested coil. The request output of hexadecimal value of FF 00 is ON. The request output of hexadecimal value 00 00 is OFF. All other values are illegal, and have no effect on output. Normally the appropriate PDU should be identical to the request one, and

return after the end of the coil control.

Request PDU		Response PDU		Errors	
Function Code	0x05	Function Code	0x05	Function Code	0x85
Coil Address High Bytes	0x00	Coil Address High Bytes	0x00	Error Code	0x01 or 0x02 or 0x03 or 0x04
Low Coil Address Bytes	0x00	Low Coil Address Bytes	0x00		
High Coil State Bytes	0xFF	High Coil State Bytes	0xFF		
Low Coil State Bytes	0x00	Low Coil State Bytes	0x00		

The above example indicates it requires to acquire the coil state ON of register address 0x0000. For error returns, the returned function code is the normal function code plus 0x80, and the error code is the actual error state value.

4.4.6 06 (0x06) Preset Single Register

The function code is used to preset the content of single holding register in WTD6XXX module device.

The requested PDU describes the register address, because the register address is addressing from zero, the address of address register 1 corresponds to 0. The constants in the request data field also describes the data value of the requested preset register, with high data bit in the former, and low data bit in the post.

Normally the appropriate PDU should be identical to the request one, and return after the completion of the register data preset.

Request PDU		Response PDU		Errors	
Function Code	0x06	Function Code	0x06	Function Code	0x86
Register address high byte	0x00	Register address high byte	0x00	Error Code	0x01 or 0x02 or 0x03 or 0x04

Register address low byte	0x00	Register address low byte	0x00		
Register Data High Byte	0x01	Register Data High Byte	0x01		
Register Data Low Byte	0x23	Register Data Low Byte	0x23		

The above example indicates it requires to acquire register data 0x0123 with preset register address 0x0000. For error returns, the returned function code is the normal function code plus 0x80, and the error code is the actual error state value.

4.4.7 15 (0x0F) Control Multiple Coils Output

The function code is used to force the state ON or OFF of multiple continuous coils of WTD6XXX module.

Request PDU details the start address of the coil, i.e. the first coil address and coil number specified. The coil address in request PDU makes addressing of the coil from zero, thus the address of the addressing coil 1-16 corresponds to 0-15.

The constant in the request data field also describes the ON/OFF state of the requested coil. In the field bit logic position, "1" requests the appropriate output ON. In the field bit logic position, "0" requests the appropriate output OFF. The first data byte`s LSB (least significant bit) represents the state of the initial coil controlled. Other coils repeat until the high-order end of this byte, and follow an order from low- to high-order end in the subsequent bytes.
Normally it responses to PDU return function code, the starting address and the mandatory number of coils.

Request PDU		Response PDU		Errors	
Function Code	0x0F	Function Code	0x0F	Function Code	0x8F
Start Address High Bytes	0x00	Start Address High Bytes	0x00	Error Code	0x01 or 0x02 or 0x03 or 0x04
Starting Address Lower Bytes	0x00	Starting Address Lower Bytes	0x00		
Output Number High Bytes	0x00	Output Number High Bytes	0x00		
Output Number Low Bytes	0x09	Output Number Low Bytes	0x09		
Number of Bytes	0x02				
High Coil Output Bytes	0x01				
Low Coil Output Bytes	0x23				

The above example indicates it requires to control the coil state with the starting address of 0x0000 and coil number of 0x0009. And 9 coils` output state is 0x0123, representing the ON state of DO0 (Coil 1), DO1 (Coil 2), DO5 (Coil 6), DO8 (Coil 9) status and the OFF state of the remaining 5 coils (DO2~DO4 and DO6~DO7) . For error returns, the returned function code is the normal function code plus 0x80, and the error code is the actual error state value.

4.4.8 16 (0x10) Preset Multiple Registers

The function code is used to preset the content of holding register`s continuous block in WTD6XXX module device.

Request PDU describes the starting register address and register number. Because the register address is addressing from zero, the address of address register 1-16 corresponds to 0-15. In the requesting data field, it also illustrates

the value of write requests. The data in each register is divided into two bytes, with high bit in the former, low bit in the post.

Normal response returns the function code, starting address and the number written to the registers.

Request PDU		**Response PDU**		**Errors**	
Function Code	0x10	Function Code	0x10	Function Code	0x90
Start Address High Bytes	0x00	Start Address High Bytes	0x00	Error Code	0x01 or 0x02 or 0x03 or 0x04
Starting Address Lower Bytes	0x00	Starting Address Lower Bytes	0x00		
Register Number High Byte	0x00	Register Number High Byte	0x00		
Register Count Low Byte	0x02	Register Count Low Byte	0x02		
Number of Bytes	0x04				
Register value high byte	0x12				
Register value low byte	0x34				
Register value high byte	0x56				
Register value low byte	0x78				

The above example indicates it presets the register data with register address 0x0000 and register number of 0x0002. Moreover, the value of REG0 (register 1) is 0x1234 and that of REG1 (register 2) is 0x5678. For error returns, the returned function code is the normal function code plus 0x80, and the error code is the actual error state value.

Chapter 5

I/O Modbus Address Mapping Table

5.1 WTD-6XXX I/O Modbus Address Mapping Table

WTD-6XXX IO series module supports the Modbus Tcp protocol

	Module Name	Module Brief
1	WTD614P	4-channel Pt input
2	WTD618X	8-channel analog quantity/thermocouple input
3	WTD624X	4-channel analog quantity output
4	WTD640X	16-channel isolated digital input module
5	WTD650C	16-channel isolated digital output module
6	WTD666C	6-channel power relay output module
7	WTD678C	16-channel isolated digital input and output module

5.1.1 WTD614P 4-channel Platinum Resistance Input Module

Address 0XXXX	Channel Number	Corresponding Content	Property	Notes
00201	0	Abnormal Channel Signal	Read-only	
00202	1	Abnormal Channel Signal	Read-only	
00203	2	Abnormal Channel Signal	Read-only	
00204	3	Abnormal Channel Signal	Read-only	

Address 4XXXX	Channel Number	Corresponding Content	Property	Notes
40001		Reading in Current Range	Read and Write	
40002		Reading in Current Range	Read and Write	
40003		Reading in Current Range	Read and Write	
40004		Reading in Current Range	Read and Write	
40011		♦ Input Type:	Read and Write	
40012		♦ Input Type:	Read and Write	
40013		♦ Input Type:	Read and Write	
40014		♦ Input Type:	Read and Write	
40021		Platinum Resistance	Read and Write	

		Wiring System Number		
40022		Platinum Resistance Wiring System Number	Read and Write	
40023		Platinum Resistance Wiring System Number	Read and Write	
40024		Platinum Resistance Wiring System Number	Read and Write	

5.1.2 WTD618X 8-channel Analog Input Module

Address 0XXXX	Channel Number	Corresponding Content	Property	Notes
00201	0	Abnormal Channel Signal	Read-only	
00202	1	Abnormal Channel Signal	Read-only	
00203	2	Abnormal Channel Signal	Read-only	
00204	3	Abnormal Channel Signal	Read-only	
00205	4	Abnormal Channel Signal	Read-only	
00206	5	Abnormal Channel Signal	Read-only	
00207	6	Abnormal Channel Signal	Read-only	
00208	7	Abnormal Channel Signal	Read-only	

Address 4XXXX	Channel Number	Corresponding Content	Property	Notes
40001		Reading in Current Range	Read and Write	
40002		Reading in Current Range	Read and Write	
40003		Reading in Current Range	Read and Write	
40004		Reading in Current Range	Read and Write	
40005		Reading in Current Range	Read and Write	
40006		Reading in Current Range	Read and Write	
40007		Reading in Current Range	Read and Write	
40008		Reading in Current Range	Read and Write	
40011		♦ Input Type:	Read and Write	
40012		♦ Input Type:	Read and Write	
40013		♦ Input Type:	Read and Write	
40014		♦ Input Type:	Read and Write	

40015		♦ Input Type:	Read and Write	
40016		♦ Input Type:	Read and Write	
40017		♦ Input Type:	Read and Write	
40018		♦ Input Type:	Read and Write	

5.1.3 WTD624X 4-channel Analog Output Module

Address 0XXXX	Channel Number	Corresponding Content	Property	Notes
00001	0	DI Signal	Read-only	
00002	1	DI Signal	Read-only	
00003	2	DI Signal	Read-only	
00004	3	DI Signal	Read-only	

Address 4XXXX	Channel Number	Corresponding Content	Property	Notes
40001		Output Value in Current Range	Read and Write	
40002		Output Value in Current Range	Read and Write	
40003		Output Value in Current Range	Read and Write	
40004		Output Value in Current Range	Read and Write	
40011		♦ Output Type:	Read and Write	
40012		♦ Output Type:	Read and Write	
40013		♦ Output Type:	Read and Write	
40014		♦ Output Type:	Read and Write	
40215		Communication Failure Enabling	Read and Write	
40216		Communication Failure Signs	Read-only	

5.1.4 WTD640X 16-channel Isolated Digital Input Module

Address 0XXXX	Channel Number	Corresponding Content	Property	Notes
00001	0	DI Signal	Read-only	
00002	1	DI Signal	Read-only	
00003	2	DI Signal	Read-only	
00004	3	DI Signal	Read-only	
00005	4	DI Signal	Read-only	
00006	5	DI Signal	Read-only	
00007	6	DI Signal	Read-only	
00008	7	DI Signal	Read-only	
00009	8	DI Signal	Read-only	
00010	9	DI Signal	Read-only	
00011	10	DI Signal	Read-only	
00012	11	DI Signal	Read-only	
00013	12	DI Signal	Read-only	
00014	13	DI Signal	Read-only	
00015	14	DI Signal	Read-only	
00016	15	DI Signal	Read-only	
00033	0	Input Counting Mode: On (1)/Off (0)	Read and Write	
00034	0	Input Counting Mode: Count Reset (0)	Read and Write	
00035	0	Input Counting Mode: Overflow Reset (0)	Read and Write	
00036	0	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00037	1	Input Counting Mode: On (1)/Off (0)	Read and Write	
00038	1	Input Counting Mode: Count Reset (0)	Read and Write	
00039	1	Input Counting Mode: Overflow Reset (0)	Read and Write	
00040	1	Input Counting Mode: Locking State (read)/Reset State	Read and Write	

		(written)		
00041`	2	Input Counting Mode: On (1)/Off (0)	Read and Write	
00042	2	Input Counting Mode: Count Reset (0)	Read and Write	
00043	2	Input Counting Mode: Overflow Reset (0)	Read and Write	
00044	2	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00045	3	Input Counting Mode: On (1)/Off (0)	Read and Write	
00046	3	Input Counting Mode: Count Reset (0)	Read and Write	
00047	3	Input Counting Mode: Overflow Reset (0)	Read and Write	
00048	3	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00049	4	Input Counting Mode: On (1)/Off (0)	Read and Write	
00050	4	Input Counting Mode: Count Reset (0)	Read and Write	
00051	4	Input Counting Mode: Overflow Reset (0)	Read and Write	
00052	4	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00053	5	Input Counting Mode: On (1)/Off (0)	Read and Write	
00054	5	Input Counting Mode: Count Reset (0)	Read and Write	
00055	5	Input Counting Mode: Overflow Reset (0)	Read and Write	
00056	5	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00057	6	Input Counting Mode: On (1)/Off (0)	Read and Write	
00058	6	Input Counting Mode:	Read and Write	

		Count Reset (0)		
00059	6	Input Counting Mode: Overflow Reset (0)	Read and Write	
00060	6	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00061	7	Input Counting Mode: On (1)/Off (0)	Read and Write	
00062	7	Input Counting Mode: Count Reset (0)	Read and Write	
00063	7	Input Counting Mode: Overflow Reset (0)	Read and Write	
00064	7	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00065	8	Input Counting Mode: On (1)/Off (0)	Read and Write	
00066	8	Input Counting Mode: Count Reset (0)	Read and Write	
00067	8	Input Counting Mode: Overflow Reset (0)	Read and Write	
00068	8	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00069	9	Input Counting Mode: On (1)/Off (0)	Read and Write	
00070	9	Input Counting Mode: Count Reset (0)	Read and Write	
00071	9	Input Counting Mode: Overflow Reset (0)	Read and Write	
00072	9	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00073	10	Input Counting Mode: On (1)/Off (0)	Read and Write	
00074	10	Input Counting Mode: Count Reset (0)	Read and Write	
00075	10	Input Counting Mode: Overflow Reset (0)	Read and Write	
00076	10	Input Counting Mode:	Read and Write	

		Locking State (read)/Reset State (written)		
00077	11	Input Counting Mode: On (1)/Off (0)	Read and Write	
00078	11	Input Counting Mode: Count Reset (0)	Read and Write	
00079	11	Input Counting Mode: Overflow Reset (0)	Read and Write	
00080	11	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00081	12	Input Counting Mode: On (1)/Off (0)	Read and Write	
00082	12	Input Counting Mode: Count Reset (0)	Read and Write	
00083	12	Input Counting Mode: Overflow Reset (0)	Read and Write	
00084	12	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00085	13	Input Counting Mode: On (1)/Off (0)	Read and Write	
00086	13	Input Counting Mode: Count Reset (0)	Read and Write	
00087	13	Input Counting Mode: Overflow Reset (0)	Read and Write	
00088	13	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00089	14	Input Counting Mode: On (1)/Off (0)	Read and Write	
00090	14	Input Counting Mode: Count Reset (0)	Read and Write	
00091	14	Input Counting Mode: Overflow Reset (0)	Read and Write	
00092	14	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00093	15	Input Counting Mode:	Read and Write	

		On (1)/Off (0)		
00094	15	Input Counting Mode: Count Reset (0)	Read and Write	
00095	15	Input Counting Mode: Overflow Reset (0)	Read and Write	
00096	15	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	

Address 4XXXX	Channel Number	Corresponding Content	Property	Notes
40001～40032	0 ～ 15	Use for Counting (16-channel) [32Bits]	Read-only	
40081～40096	0 ～ 15	Input Mode Settings	Read and Write	
40097～40128	0 ～ 15	Input Filter Low Level Width	Read and Write	
40129～40160	0 ～ 15	Enter Filter High Level Width	Read and Write	

5.1.5 WTD650C 16-channel Isolated Digital Output Module

Address 0XXXX	Channel Number	Corresponding Content	Property	Notes
00017	0	DO Signal	Read and Write	
00018	1	DO Signal	Read and Write	
00019	2	DO Signal	Read and Write	
00020	3	DO Signal	Read and Write	
00021	4	DO Signal	Read and Write	
00022	5	DO Signal	Read and Write	
00023	6	DO Signal	Read and Write	
00024	7	DO Signal	Read and Write	
00025	8	DO Signal	Read and Write	
00026	9	DO Signal	Read and Write	
00027	10	DO Signal	Read and Write	
00028	11	DO Signal	Read and Write	
00029	12	DO Signal	Read and Write	
00030	13	DO Signal	Read and Write	
00031	14	DO Signal	Read and Write	
00032	15	DO Signal	Read and Write	

Address 4XXXX	Channel Number	Corresponding Content	Property	Notes
40001～40032	0 ～ 15	Output Low Level Pulse Time Time Unit: 0.1ms (16-channel) [32Bits]	Read and Write	
40033～40064	0 ～ 15	Output High Level Pulse Time Time Unit: 0.1ms (16-channel) [32Bits]	Read and Write	
40064～40096	0 ～ 15	Set single pulse count (Set to 0=Continue mode) (16-channel) [32Bits]	Read and Write	
40097～40112	0 ～ 15	Output Mode Settings	Read and Write	

5.1.6 WTD666C 6-channel Power Relay Output Module

Address 0XXXX	Channel Number	Corresponding Content	Property	Notes
00001	0	DO Signal	Read and Write	
00002	1	DO Signal	Read and Write	
00003	2	DO Signal	Read and Write	
00004	3	DO Signal	Read and Write	
00005	4	DO Signal	Read and Write	
00006	5	DO Signal	Read and Write	

Address 4XXXX	Channel Number	Corresponding Content	Property	Notes
40211		Module Name 1	Read-only	
40212		Module Name 2	Read-only	
40213		Software Version 1	Read-only	
40214		Software Version 2	Read-only	
40215		Communication Failure Enabling	Read and Write	
40216		Communication Failure Signs	Read-only	

5.1.7 WTD678C 16-channel Isolated Digital Input and Output Module

Address 0XXXX	Channel Number	Corresponding Content	Property	Notes
00001	0	DI Signal	Read and Write	
00002	1	DI Signal	Read and Write	
00003	2	DI Signal	Read and Write	
00004	3	DI Signal	Read and Write	
00005	4	DI Signal	Read and Write	
00006	5	DI Signal	Read and Write	
00007	6	DI Signal	Read and Write	
00008	7	DI Signal	Read and Write	
00017	0	DO Signal	Read and Write	
00018	1	DO Signal	Read and Write	
00019	2	DO Signal	Read and Write	
00020	3	DO Signal	Read and Write	
00021	4	DO Signal	Read and Write	
00022	5	DO Signal	Read and Write	
00023	6	DO Signal	Read and Write	
00024	7	DO Signal	Read and Write	
00033	0	Input Counting Mode: On (1)/Off (0)	Read and Write	
00034	0	Input Counting Mode: Count Reset (0)	Read and Write	
00035	0	Input Counting Mode: Overflow Reset (0)	Read and Write	
00036	0	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00037	1	Input Counting Mode: On (1)/Off (0)	Read and Write	
00038	1	Input Counting Mode: Counting Reset (0)	Read and Write	
00039	1	Input Counting Mode: Overflow Reset (0)	Read and Write	
00040	1	Input Counting Mode: Locking State	Read and Write	

		(read)/Reset State (written)		
00041`	2	Input Counting Mode: On (1)/Off (0)	Read and Write	
00042	2	Input Counting Mode: Count Reset (0)	Read and Write	
00043	2	Input Counting Mode: Overflow Reset (0)	Read and Write	
00044	2	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00045	3	Input Counting Mode: On (1)/Off (0)	Read and Write	
00046	3	Input Counting Mode: Count Reset (0)	Read and Write	
00047	3	Input Counting Mode: Overflow Reset (0)	Read and Write	
00048	3	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00049	4	Input Counting Mode: On (1)/Off (0)	Read and Write	
00050	4	Input Counting Mode: Count Reset (0)	Read and Write	
00051	4	Input Counting Mode: Overflow Reset (0)	Read and Write	
00052	4	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00053	5	Input Counting Mode: On (1)/Off (0)	Read and Write	
00054	5	Input Counting Mode: Count Reset (0)	Read and Write	
00055	5	Input Counting Mode: Overflow Reset (0)	Read and Write	
00056	5	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00057	6	Input Counting Mode: On (1)/Off (0)	Read and Write	

00058	6	Input Counting Mode: Count Reset (0)	Read and Write	
00059	6	Input Counting Mode: Overflow Reset (0)	Read and Write	
00060	6	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	
00061	7	Input Counting Mode: On (1)/Off (0)	Read and Write	
00062	7	Input Counting Mode: Count Reset (0)	Read and Write	
00063	7	Input Counting Mode: Overflow Reset (0)	Read and Write	
00064	7	Input Counting Mode: Locking State (read)/Reset State (written)	Read and Write	

Address 4XXXX	**Channel Number**	**Corresponding Content**	**Property**	**Notes**
40001～40016	0 ～ 15	Use for Counting (8-channel) [32Bits]	Read-only	
40017～40032	0 ～ 15	Output Low Level Pulse Time Time Unit: 0.1ms (8-channel) [32Bits]	Read and write	
40033～40048	0 ～ 15	Output High Level Pulse Time Time Unit: 0.1ms (8-channel) [32Bits]	Read and Write	
40049～40064	0 ～ 15	Set single pulse count (Set to 0=Continue mode) (8-channel) [32Bits]	Read and Write	
40081～40088	0 ～ 15	Input Mode Settings	Read and Write	
40089～40096	0 ～ 15	Output Mode Settings	Read and Write	
40097～40112	0 ～ 15	Input Filter Low Level Width	Read and Write	
40113～40128		Enter Filter High Level Width	Read and Write	

Annex 1: Data Formats and I/O Ranges

WTD618X Analog Input Ranges

Threshold Code (hex)	Input Range Description	Data Format	+F.S.	0	-F.S.	Display Resolution
00	± 10 V	Engineering Units	+10.000	±00.000	-10.000	1 mV
		% of FSR	+100.00	±00.000	-100.00	0.01%
		Twos Complement	7FFF	0000	8000	1 LSB*
01	± 5 V	Engineering Units	+5.0000	±0.0000	-5.0000	100 µV
		%of FSR	+100.00	±000.00	-100.00	0.01%
		Twos Complement	7FFF	0000	8000	1 LSB*
02	±2.5 V	Engineering Units	+2.5000	±0.0000	-2.5000	100 µV
		%of FSR	+100.00	±000.00	-100.00	0.01%
		Twos Complement	7FFF	0000	8000	1 LSB*
03	±1 V	Engineering Units	+1.0000	±0.0000	-1.0000	100 µV
		%of FSR	+100.00	±000.00	-100.00	0.01%
		Twos Complement	7FFF	0000	8000	1 LSB*
04	± 500mV	Engineering Units	+500.00	±000.00	-500.00	10 µV
		%of FSR	+100.00	±000.00	-100.00	0.01%
		Twos Complement	7FFF	0000	8000	1 LSB*
05	± 100mV	Engineering Units	+100.00	±00.000	-100.00	10 µV
		%of FSR	+100.00	±000.00	-100.00	0.01%
		Twos Complement	7FFF	0000	8000	1 LSB*
06	± 20 mV	Engineering Units	+20.000	±00.000	-20.00	1 µV
		%of FSR	+100.00	±000.00	-100.00	0.01%
		Twos Complement	7FFF	0000	8000	1 LSB*

0F	± 20 mA	Engineering Units	+20.000	±00.000	-20.000	1 µA
		%of FSR	+100.00	±000.00	-100.00	0.01%
		Twos Complement	7FFF	0000	8000	1 LSB*
10	±4~20mA	Engineering Units	+20.000	±00.000	-20.000	1 µA
		%of FSR	+100.00	±000.00	-100.00	0.01%
		Twos Complement	7FFF	0000	8000	1 LSB*

Threshold Code (hex)	Input Range Description	Data Format	Signal Maximum Value	Signal Minimum Value	Display Resolution
07	Type K Thermocouple 0°C to 1370°C	Engineering Units	+1370.0	+0000.0	0.1 °C
		%of FSR	+100.00	+000.00	0.01%
		Twos Complement	7FFF	0000	1 LSB*
08	Type J Thermocouple 0°C to 760°C	Engineering Units	+760.000	+00.000	0.01 °C
		%of FSR	+100.00	+000.00	0.01%
		Twos Complement	7FFF	0000	1 LSB*
09	Type R Thermocouple 500°C to 1750°C	Engineering Units	+1750.000	+500	0.1 °C
		%of FSR	+100.00	+028.57	0.01%
		Twos Complement	7FFF	2492	1 LSB*
0A	Type S Thermocouple 500°C to 1750°C	Engineering Units	+1750.000	+500	0.1 °C
		%of FSR	+100.00	+028.57	0.01%
		Twos Complement	7FFF	2492	1 LSB*
0B	Type B Thermocouple 500°C to 1800°C	Engineering Units	+1800.0	+500.00	0.1 °C
		%of FSR	+100.00	+027.77	0.01%
		Twos	7FFF	2381	1 LSB*

		Complement			
0C	Type E Thermocouple 0°C to 1000°C	Engineering Units	+1000.0	+0000.00	0.1 °C
		%of FSR	+100.00	+000.00	0.01%
		Twos Complement	7FFF	0000	1 LSB*
0D	Type T Thermocouple -100°C to 400°C	Engineering Units	+400.000	-100.00	0.01 °C
		%of FSR	+100.00	-0.25.00	0.01%
		Twos Complement	7FFF	E000	1 LSB*

WTD614P Analog Input Ranges

Threshold Code (hex)	Input Range Description	Data Format	Signal Maximum Value	Signal Minimum Value	Display Resolution
00	100.00Ω Platinum RTD α=.00385 -50°C to 150°C	Engineering Units	+150.00	-50.00	0.01 °C
		%of FSR	+100.00	+000.00	0.01%
		Twos Complement	7FFF	D556	1 LSB*
01	100.00Ω Platinum RTD α=.00385 0°C to 100°C	Engineering Units	+100.00	+000.00	0.01 °C
		%of FSR	+100.00	+000.00	0.01%
		Twos Complement	7FFF	0000	1 LSB*
02	100.00Ω Platinum RTD α=.00385 0°C to 200°C	Engineering Units	+200.00	+000.00	0.01 °C
		%of FSR	+100.00	+000.00	0.01%
		Twos Complement	7FFF	0000	1 LSB*
03	100.00Ω Platinum RTD α=.00385 0°C to 400°C	Engineering Units	+400.00	+000.00	0.01 °C
		%of FSR	+100.00	+028.57	0.01%
		Twos Complement	7FFF	2492	1 LSB*
	100.00Ω	Engineering Units	+200.0	-200.00	0.01 °C

04	Platinum RTD α=.00385 -200°C to 200°C	%of FSR	+100.00	+000.00	0.01%
		Twos Complement	7FFF	8000	1 LSB*
05	100.00Ω Platinum RTD α=.00392 -50°C to 150°C	Engineering Units	+150.0	-50.00	0.01 °C
		%of FSR	+100.00	+000 .00	0.01%
		Twos Complement	7FFF	D556	1 LSB*
06	100.00Ω Platinum RTD α=.00392 0°C to 100°C	Engineering Units	+100.0	+000.00	0.01 °C
		%of FSR	+100.00	+027.77	0.01%
		Twos Complement	7FFF	0000	1 LSB*
07	100.00Ω Platinum RTD α=.00392 0°C to 200°C	Engineering Units	+200.0	+000.00	0.01 °C
		%of FSR	+100.00	+000.00	0.01%
		Twos Complement	7FFF	0000	1 LSB*
08	100.00Ω Platinum RTD α=.00392 0°C to 400°C	Engineering Units	+400.0	+000.00	0.01 °C
		%of FSR	+100.00	+027.77	0.01%
		Twos Complement	7FFF	0000	1 LSB*
09	100.00Ω Platinum RTD α=.00392 -200°C to 200°C	Engineering Units	+200.0	-200.00	0.01 °C
		%of FSR	+100.00	+000.00	0.01%
		Twos Complement	7FFF	8000	1 LSB*
0A	1000.00Ω Platinum RTD α=.00385 -40°C to 160°C	Engineering Units	+160.0	-40.00	0.01 °C
		%of FSR	+100.00	000.00	0.01%
		Twos Complement	7FFF	E000	1 LSB*

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