



Modbus Communication



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1.What Is Modbus

Modbus is a data communications protocol originally published by Modicon (now Schneider Electric) in 1979 for use with its programmable logic controllers (PLCs).

It has become the most popular open standard communication protocol and is now a commonly available means of connecting industrial electronic devices.

2.Data Frame Format Of Modbus Message

The following example is standard Modbus RTU

Master Write Request:

0x01	06	00 01	00 17	98 04
Station No. of Slave	Function Code	Data Address	Data Value	CRC Check

Master Read Request:

0x01	03	00 01	00 01	D5 CA
Station No. of Slave	Function Code	Start Address	Read Length	CRC Check

Slave Response:

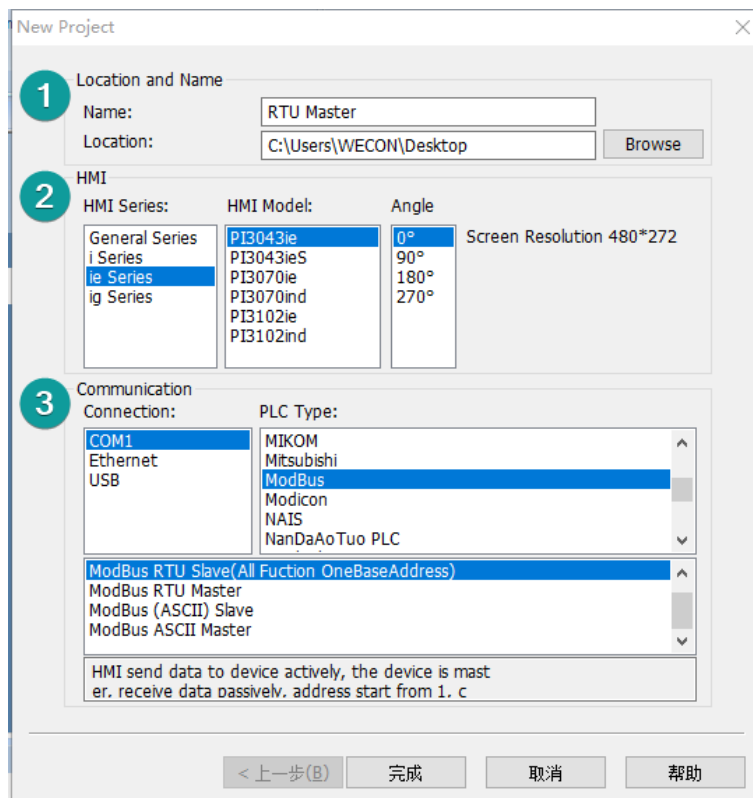
0x01	03	02	00 17	F8 4A
Station No. of Slave	Function Code	Data Address	Data Value	CRC Check

3. How To Set Modbus Protocol In PIStudio

3.1 HMI as RTU Master

3.1.1 Create a new project

Open PIStudio Software>>New Project, as shown in the figure below, set the touch screen project model and communication device type in sequence.

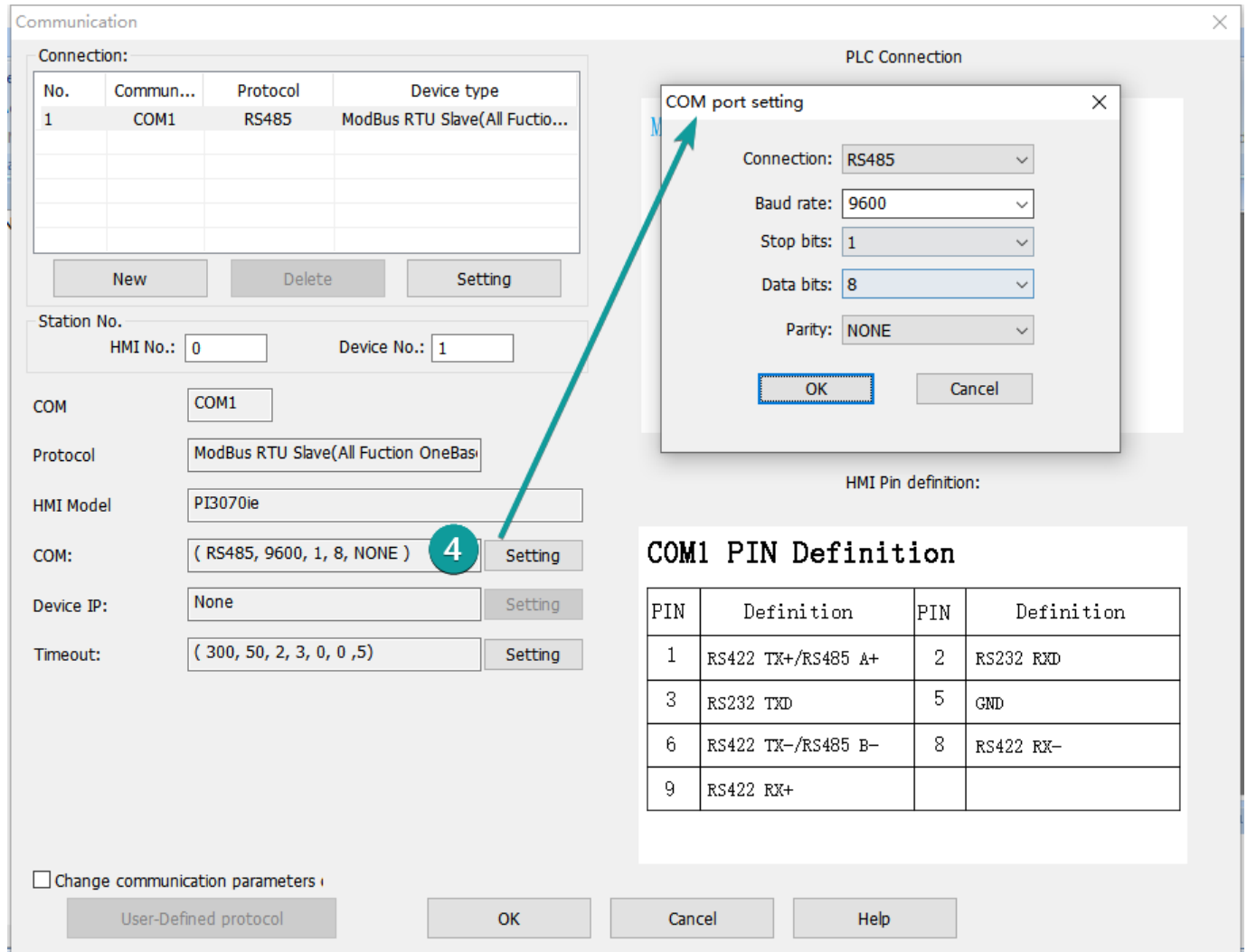


3.1.2 Communication Settings

Menu bar:project>>communication>>COM port settings, as shown below

Set the Connection, stop bits, data bits, parity and baud rate respectively to the default values of RS485, 1, 8 and NONE(None parity).

The specific parameters please be sure them consistent with device side.



Communication

Connection:

No.	Commun...	Protocol	Device type
1	COM1	RS485	ModBus RTU Slave(All Fuctio...

New Delete Setting

Station No.
HMI No.: 0 Device No.: 1

COM: COM1

Protocol: ModBus RTU Slave(All Fuction OneBas

HMI Model: PI3070ie

COM: (RS485, 9600, 1, 8, NONE) **4** Setting

Device IP: None Setting

Timeout: (300, 50, 2, 3, 0, 0, 5) Setting

☐ Change communication parameters

User-Defined protocol OK Cancel Help

PLC Connection

COM port setting

Connection: RS485

Baud rate: 9600

Stop bits: 1

Data bits: 8

Parity: NONE

OK Cancel

HMI Pin definition:

COM1 PIN Definition

PIN	Definition	PIN	Definition
1	RS422 TX+/RS485 A+	2	RS232 RXD
3	RS232 TXD	5	GND
6	RS422 TX-/RS485 B-	8	RS422 RX-
9	RS422 RX+		

3.1.3 Station Number Settings

There are two ways to set the slave station numbers,

1) One is set here:

Communication

Connection:

No.	Commun...	Protocol	Device type
1	COM1	RS485	ModBus RTU Slave(All Fuctio...

New Delete Setting

Station No.

HMI No.: 0 Device No.: 1

COM: COM1

Protocol: ModBus RTU Slave(All Fuction OneBas

HMI Model: PI3070le

COM: (RS485, 9600, 1, 8, NONE) Setting

Device IP: None Setting

Timeout: (300, 50, 2, 3, 0, 0 ,5) Setting

☐ Change communication parameters

User-Defined protocol


OK Cancel Help

PLC Connection

ModBus RS485

HMI com1
9 pin (female) RS485

1 RXD A+
6 TXD B-
5 GND GND



HMI Pin definition:

COM1 PIN Definition

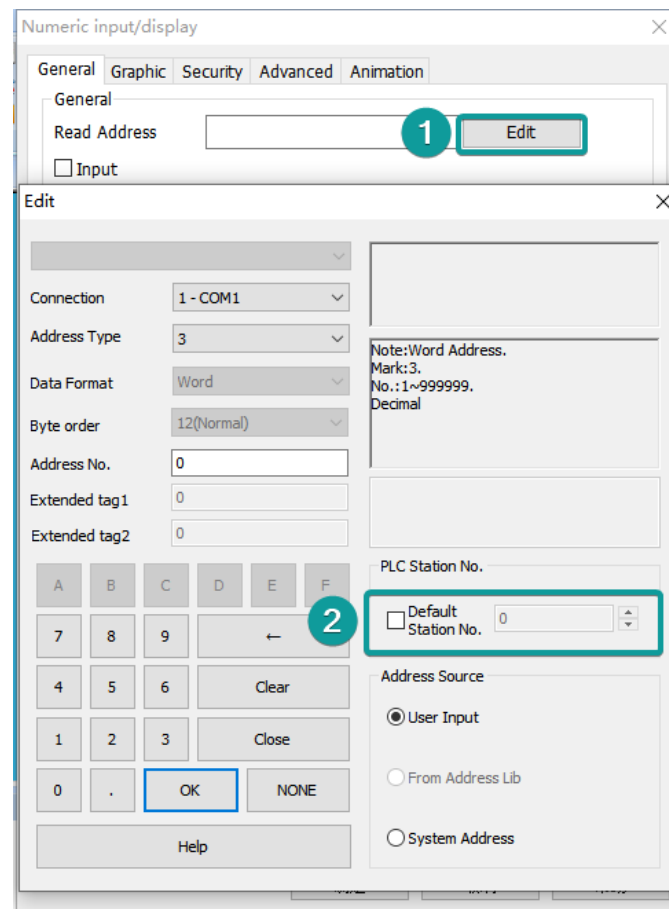
PIN	Definition	PIN	Definition
1	RS422 TX+/RS485 A+	2	RS232 RXD
3	RS232 TXD	5	GND
6	RS422 TX-/RS485 B-	8	RS422 RX-
9	RS422 RX+		

This method is just apply for HMI connect to one single slave device.

2) Two is set here:

When address modification, there is one option for changing the station No.

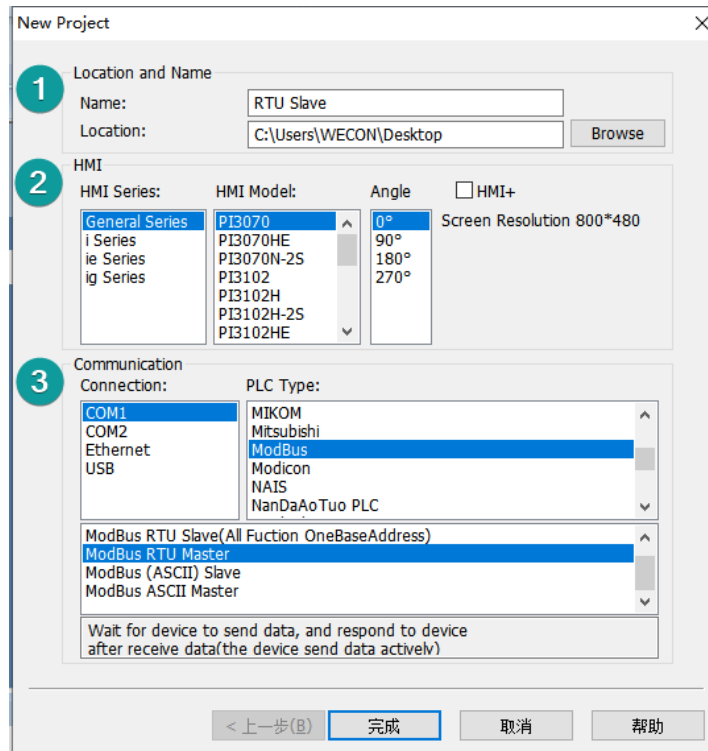
This method is able to let HMI connect to multi stations.



3.2 HMI as RTU Slave

3.2.1 Create a new project

Open PIStudio Software>>New Project, as shown in the figure below, set the touch screen project model and communication device type in sequence.



New Project

1 Location and Name
 Name: RTU Slave
 Location: C:\Users\WECON\Desktop Browse

2 HMI
 HMI Series: General Series
 HMI Model: PI3070
 Angle: 0°
 Screen Resolution 800*480

3 Communication
 Connection: COM1
 PLC Type: ModBus
 ModBus RTU Slave(All Fuction OneBaseAddress)
 ModBus RTU Master
 ModBus (ASCII) Slave
 ModBus ASCII Master
 Wait for device to send data, and respond to device after receive data(the device send data activelv)

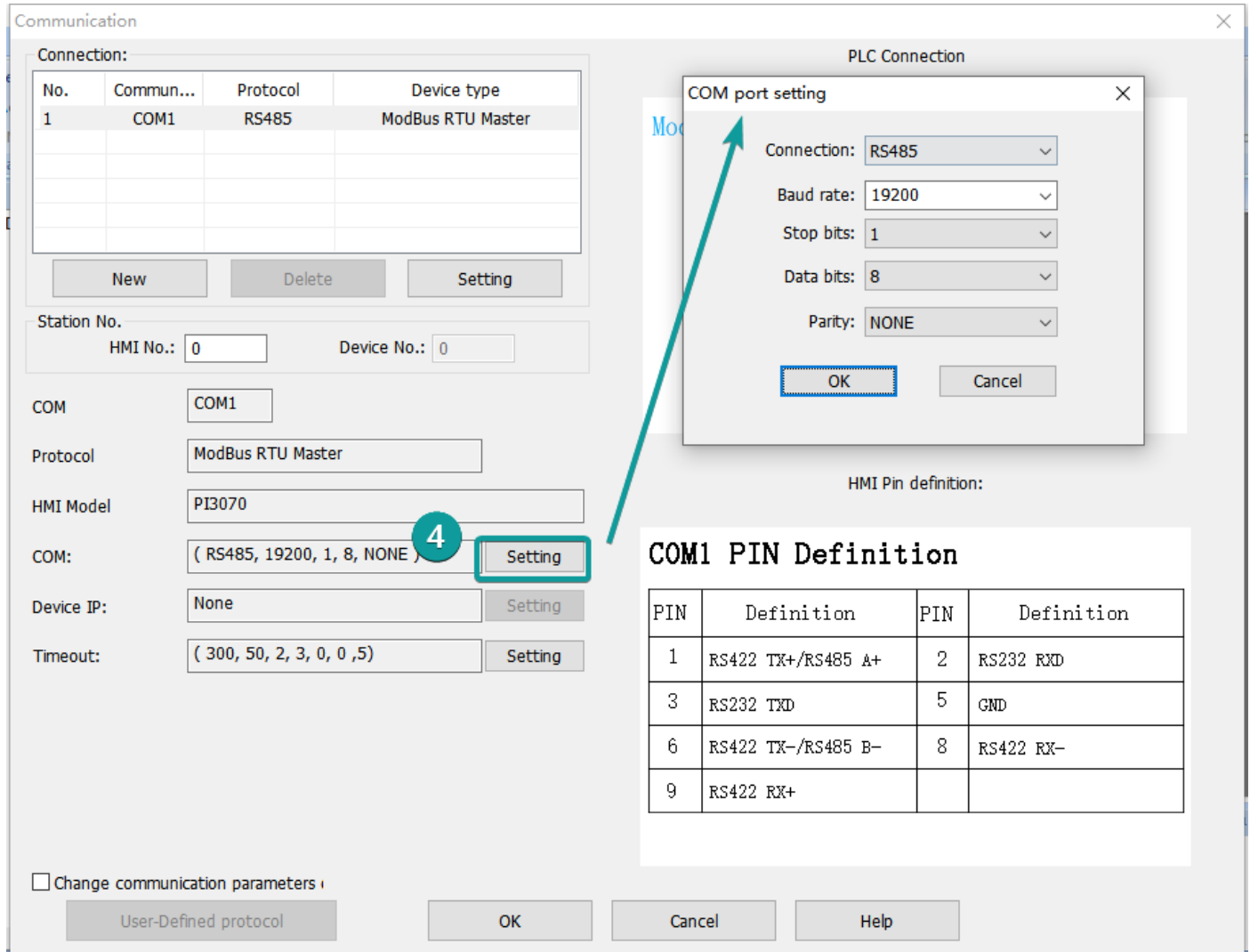
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3.2.2 Communication Settings

Menu bar:project>>communication>>COM port settings, as shown below

Set the Connection, stop bits, data bits, parity and baud rate respectively to the default values of RS485, 1, 8 and NONE(None parity).

The specific parameters please be sure them consistent with device side.



Communication

No.	Commun...	Protocol	Device type
1	COM1	RS485	ModBus RTU Master

New Delete Setting

Station No.
HMI No.: 0 Device No.: 0

COM: COM1

Protocol: ModBus RTU Master

HMI Model: PI3070

COM: (RS485, 19200, 1, 8, NONE) **4** Setting

Device IP: None Setting

Timeout: (300, 50, 2, 3, 0, 0, 5) Setting

☐ Change communication parameters

User-Defined protocol OK Cancel Help

PLC Connection

COM port setting

Connection: RS485

Baud rate: 19200

Stop bits: 1

Data bits: 8

Parity: NONE

OK Cancel

HMI Pin definition:

COM1 PIN Definition

PIN	Definition	PIN	Definition
1	RS422 TX+/RS485 A+	2	RS232 RXD
3	RS232 TXD	5	GND
6	RS422 TX-/RS485 B-	8	RS422 RX-
9	RS422 RX+		

3.2.3 Station Number Settings

Communication

Connection:

No.	Commun...	Protocol	Device type
1	COM1	RS485	ModBus RTU Master

New

Delete

Setting

Station No.

HMI No.: 0

Device No.: 0

COM

COM1

Protocol

ModBus RTU Master

HMI Model

PI3070

COM:

(RS485, 19200, 1, 8, NONE)

Setting

Device IP:

None

Setting

Timeout:

(300, 50, 2, 3, 0, 0 ,5)

Setting

☐ Change communication parameters

User-Defined protocol

OK

Cancel

Help

PLC Connection

ModBus RS485

HMI com1

9 pin (female)

1 RXD

6 TXD


5 GND

RS485

A+

B-

GND



HMI Pin definition:

COM1 PIN Definition

PIN	Definition	PIN	Definition
1	RS422 TX+/RS485 A+	2	RS232 RXD
3	RS232 TXD	5	GND
6	RS422 TX-/RS485 B-	8	RS422 RX-
9	RS422 RX+		

3.3 HMI as TCP Master

3.3.1 Create a new project

Open PIStudio Software>>New Project, as shown in the figure below, set the touch screen project model and communication device type in sequence.

New Project

1 Location and Name
 Name: TCP Master
 Location: C:\Users\WECON\Desktop Browse

2 HMI
 HMI Series: General Series
 HMI Model: PI3070
 Angle: 0°
☐ HMI+
 Screen Resolution 800*480

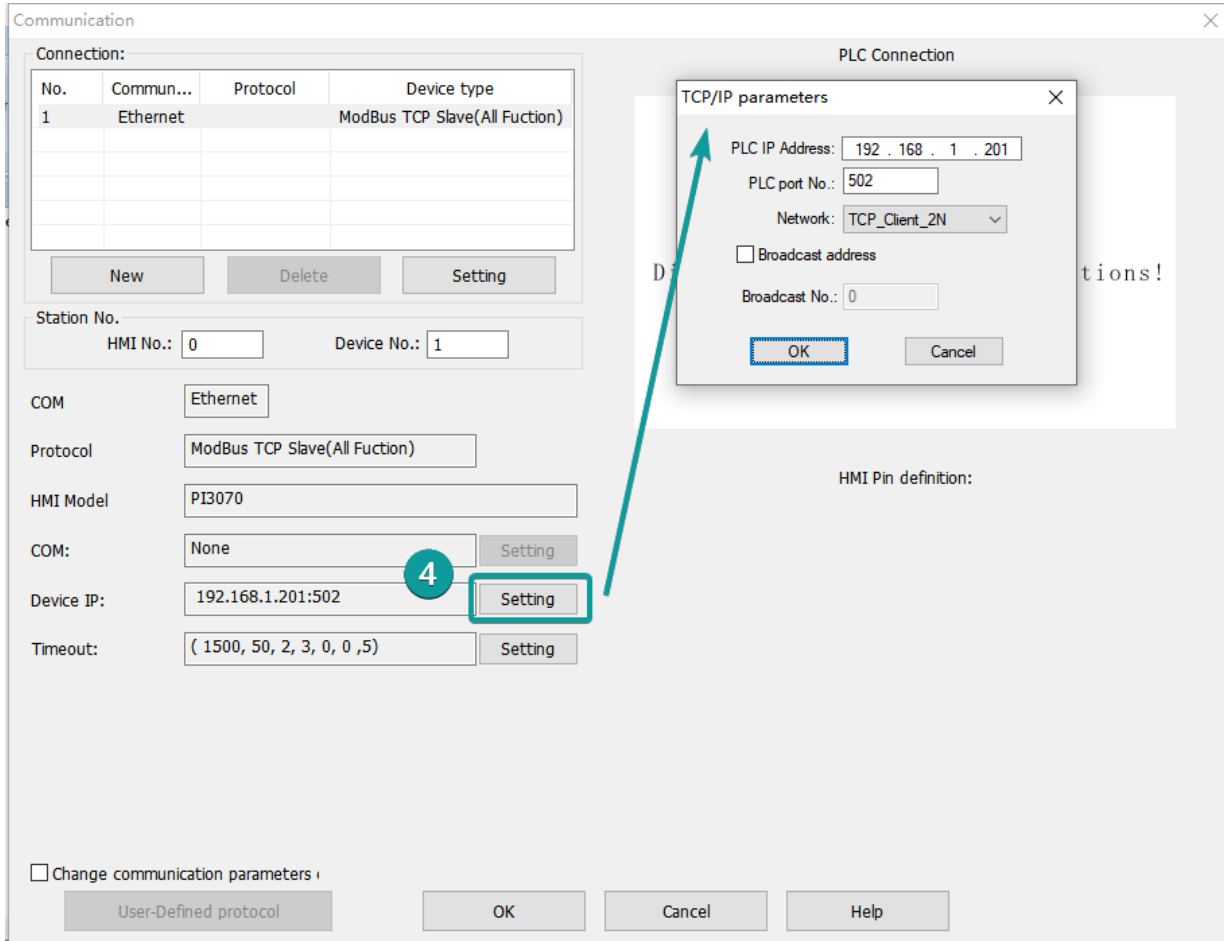
3 Communication
 Connection: Ethernet
 PLC Type: ModBus
 ModBus TCP Slave(All Fuction)
 ModBus TCP Master
 ModBus ASCII TCP Slave
 ModBus ASCII TCP Master
 ModBus RTU Slave(ETH)
 HMI send data to device actively, the device is master. receive data passively. address start from 0. u

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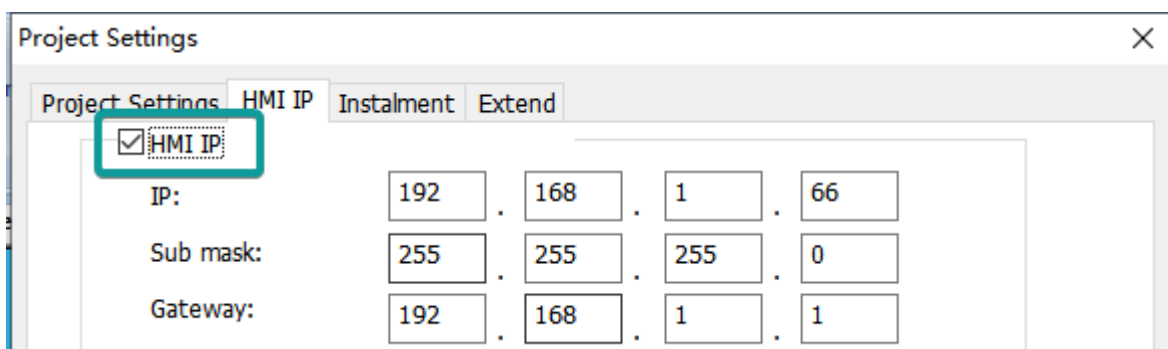
3.3.2 Communication settings

Menu bar: project>>communication>>TCP/IP parameters, as shown below

Set the Device IP address to 192.168.1.201 (need to be consistent with the real device's IP), and other default values.



Enable HMI IP(This IP is for HMI itself):



3.4 HMI as TCP Slave

3.4.1 Create a new project

Open PIStudio Software>>New Project, as shown in the figure below, set the touch screen project model and communication device type in sequence.

New Project

Location and Name

Name: TCP Slave

Location: C:\Users\WECON\Desktop Browse

HMI

HMI Series: General Series
i Series
ie Series
ig Series

HMI Model: PI3070
PI3070HE
PI3070N-2S
PI3102
PI3102H
PI3102H-2S
PI3102HE

Angle: 0°
90°
180°
270°

☐ HMI+ Screen Resolution 800*480

Communication

Connection: COM1
COM2
Ethernet
USB

PLC Type: LG
Mitsubishi
ModBus
NAIS
NanDaAoTuo PLC
Nardi Elettronica

ModBus TCP Slave(All Fuction)
ModBus TCP Master
ModBus ASCII TCP Slave
ModBus ASCII TCP Master
ModBus RTU Slave(ETH)

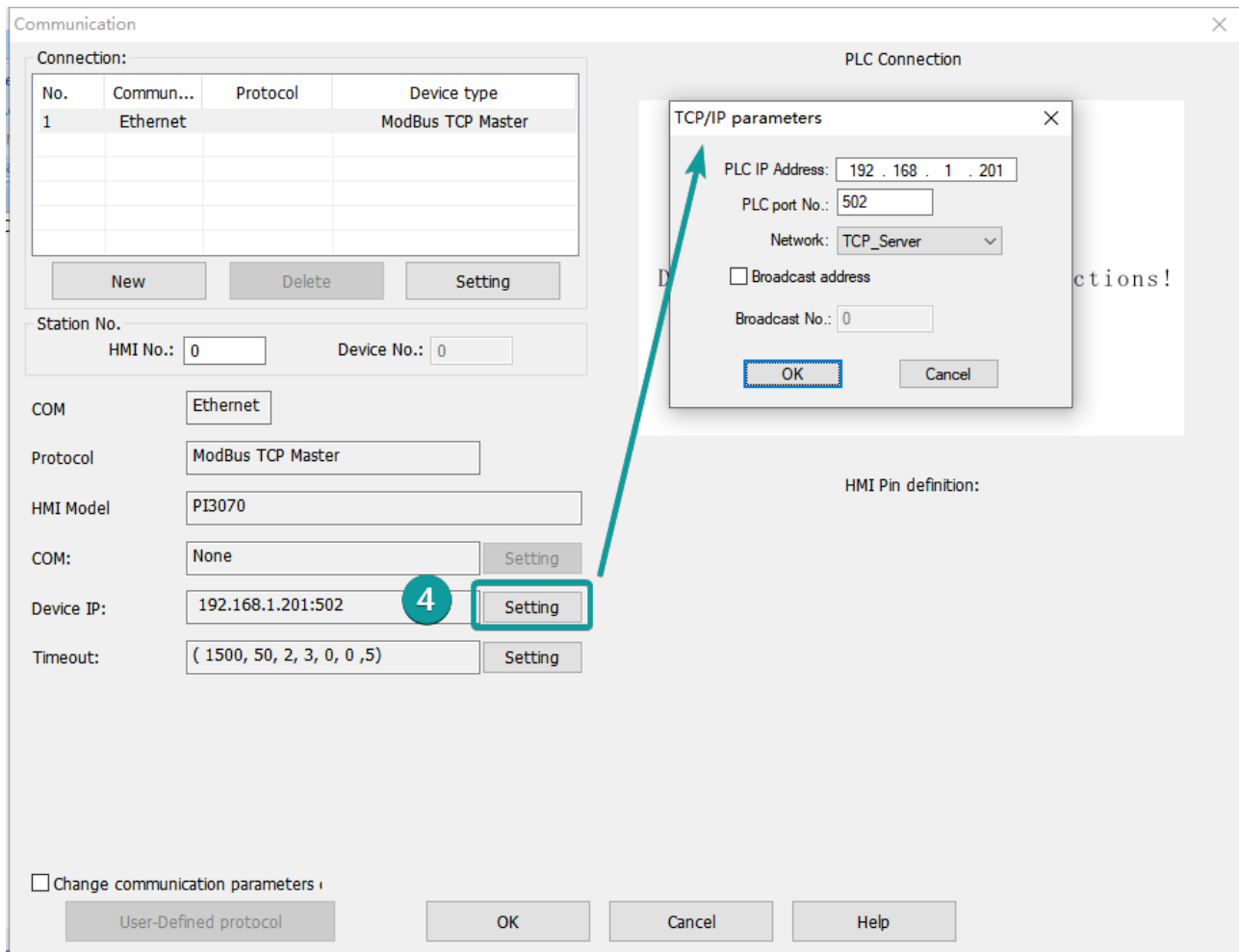
The device send data actively, and HMI respond to de vice after receive data correctlv.

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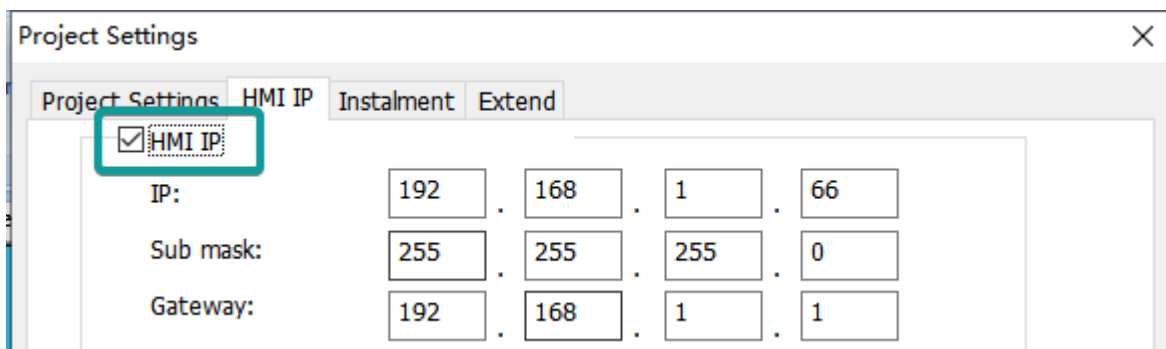
3.4.2 Communication settings

Menu bar: project>>communication>>TCP/IP parameters, as shown below

Set the Device IP address to 192.168.1.201 (need to be consistent with the real device's IP), and other default values.



Enable HMI IP(This IP is for HMI itself):



4.Function Code Corresponding Table

Type	Register	Function code & Description
Word	3	04 (read input register: read current binary value in one or more input registers)
		06 (write single register: write a binary value to a holding register)
		10 (write values to multiple addresses)
	4	03 (read holding register: read current binary value in one or more holding registers)
		06 (write single register: write a binary value to a holding register)
		10 (write values to multiple addresses)
	W6	03 (read holding register: read current binary value in one or more holding registers)
		06 (write single register: write a binary value to a holding register)
		10 (write values to multiple addresses)
	W16	03 (read holding register: read current binary value in one or more holding registers)
		10 (write values to multiple addresses)
Bit	0	01 (Read coil state)
		05 (Force a single coil to force the on/off state of a logic coil)
		0F (Write multiple bits, ie write continuously)
	1	02 (Read the input state)
		05 (Force a single coil to force the on/off state of a logic coil)
		0F (Write multiple bits)
	W5	01 (Read coil state to obtain the current state of a set of logic coils)
		05 (Force a single coil to force the on/off state of a logic coil)
		0F (Write multiple bits)
	W15	01 (Read coil state to obtain the current state of a set of logic coils)
		0F (Write multiple bits)

5.Common Used Function Codes

Code	Hex	Address Type	Data Type	Function	Write/Read
02	02	1	Single Bit Address	Discrete Inputs	Read
01	01	0/W5/W15	Single Bit Address	Coils	Read
05	05	0/W5	Single Bit Address	Single Coil	Write
15	0F	0/W15	Single Bit Address	Multiple Coils	Write
04	04	3	16 Bit Address	Input Register	Read
03	03	4	16 Bit Address	Holding Register	Read
06	06	4/W6	16 Bit Address	Single Register	Write
16	10	4/W16	16 Bit Address	Multiple Registers	Write

6.Tool

6.1 Monitoring Tool Modscan

Download link:

<https://www.win-tech.com/html/demos.htm>

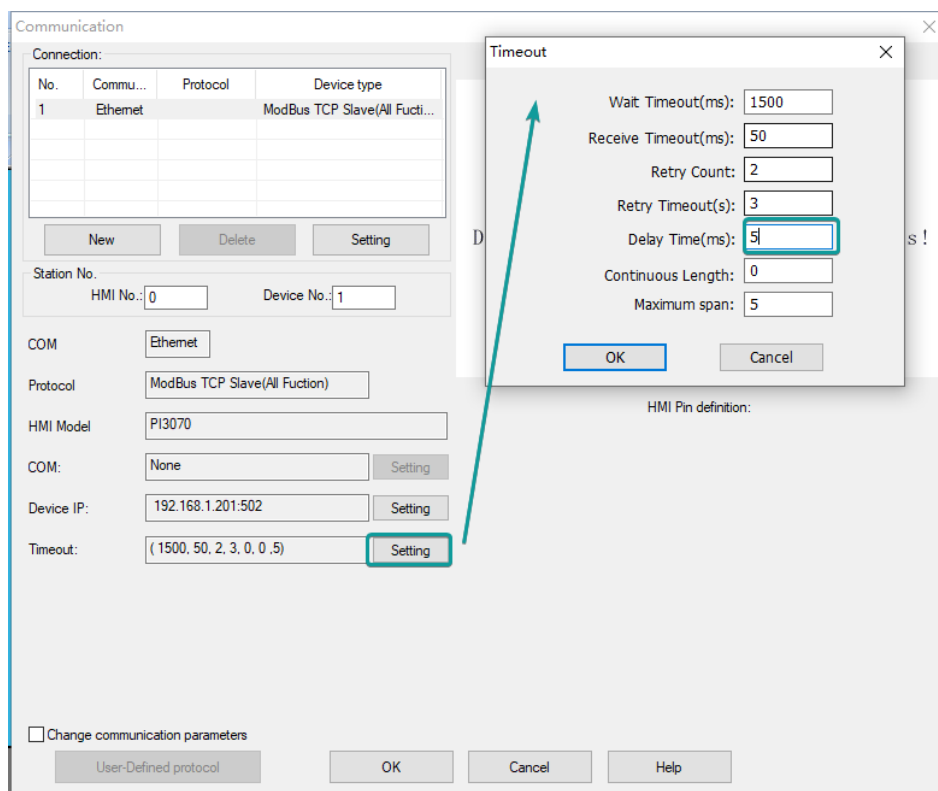
If your device is able to be monitored the address by this tool, it means your device is standard protocol. Please check about it first if you are not sure about your protocol whether standard one or not.

7.FAQ

7.1 Why read data is right, but HMI still shows pop-ups for timeout?

A: If this phenomenon just happen in ie model, but same communication condition and environment, other models are normal. Please increase the Delay Time to 5.

(Release Build VER:R05R998_V7.1.117_D20210320)



7.2 Why two addresses cannot display on same screen?

Question Description:

If I just put single one address in one screen, the communication is normal. But when I put another address into same one, it would pop up the timeout message.

For example, the first one address is 41, and the second one is 42.

A: Most probably it is caused by the address conflict. When your first address's data is enough long, it would affect to the communication of the address next to it. So please check your device manual first. Probably it has indicated the recommended read length. Or you can try to directly change it in the communication settings as 1.

If it is still not solved by above method, please use the Modbus monitoring tool to check the frame format. See whether there are some differences between two situation(Single one and two addresses) or not.

