Integrated Display Pirani Vacuum Gauge

宜准 INSTRUE

- 5-digit LED digital display vacuum pressure
- Unit display optional: Pa, Torr, mBar
- Smart button multi-function operation
- Dual control relays with setpoint
- Analog voltage output
- RS485 communication Modbus-RTU

WPI200 Digital Pirani Vacuum Gauge

操作手册

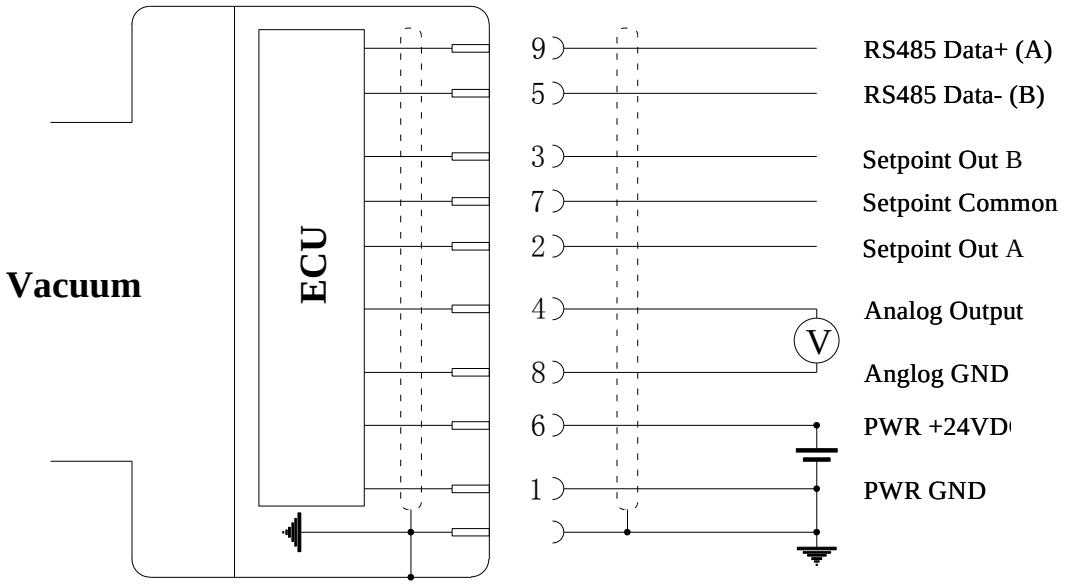
INSTRUE, Makes Vacuum Measurement ***Easier.***

1. Specifications

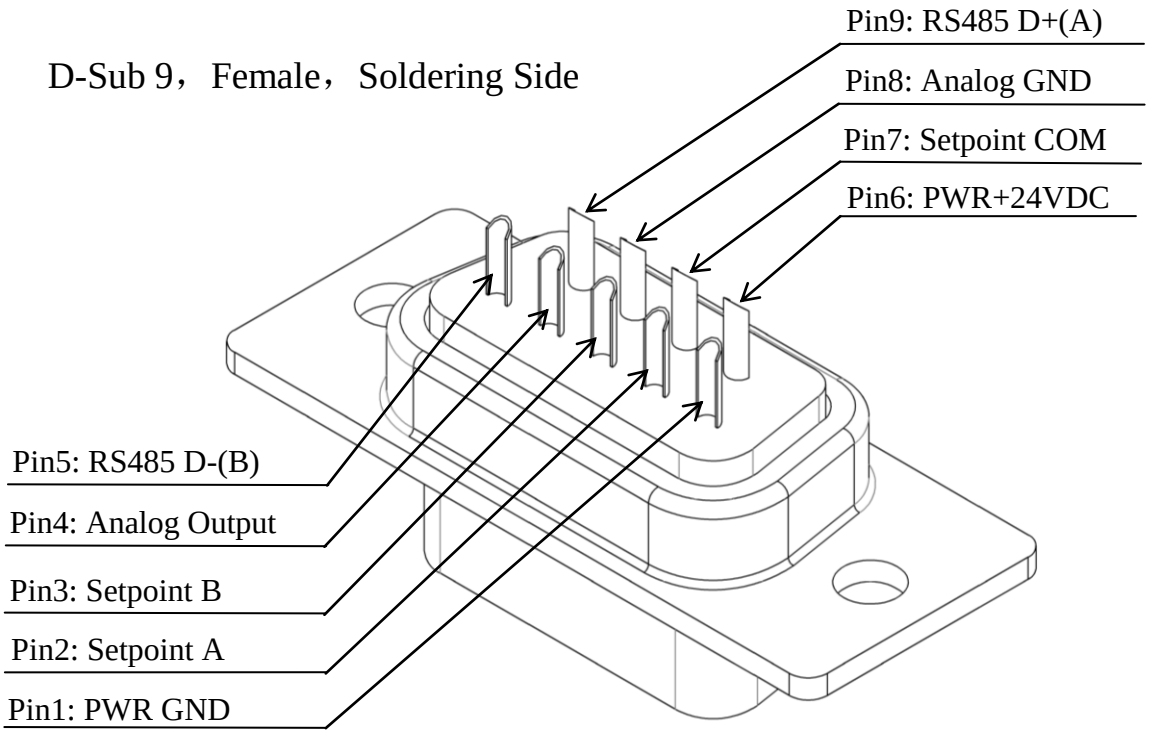
Parameters	Technical Data
Measuring Range (Air,N2)	1.0×10^{-1} ~$1.0\times10^{+5}$ Pa
Accuracy	1.0×10^{-1} ~ $1.0\times10^{+0}$ Pa : ±30% $1.0\times10^{+0}$ ~ $1.0\times10^{+4}$ Pa : ±20% $1.0\times10^{+4}$ ~ $1.0\times10^{+5}$ Pa : ±50%
Repeatability	1.0×10^{-1} ~ $1.0\times10^{+4}$ Pa : ±2% $1.0\times10^{+4}$ ~ $1.0\times10^{+5}$ Pa : ±5%
Max. Withstand Pressure	$1.5\times10^{+5}$ Pa
Response Time	100 ms, Display update: 1sec.
Bake Temp. for Probe	Max.150 ºC
Working Temperature	0 ºC ~ +45 ºC
Storage Temperature	-40 ºC ~ +75 ºC
Environment Humidity	5 ... 85 %, No condensation
Key Operation	3 Buttons: calibration, control point settings, unit selection, 485 address, scientific or floating display mode, analog voltage formula, restore factory settings, etc.
Output Signal	5-LED Display, 3-LED indication for unit selection
	Dual Setpoint Control Relay Output, 60VDC 0.5A
	RS485，Baud Rate 9600 bps
	Analog Voltage Output +2.286V~+10.0V, or +2.5V~+8.5V (selectable), Min. Impedance 10KΩ
	Analog Voltage +2.0V~ +10V, Min. Impedance 10KΩ
Power Supply	+16 ~ +32VDC/100mA
Power Consumption	Max. 2.5W
Protection Degree	IP40，IEC529
Vacuum Connection	Standard: DN 16 ISO-KF, Others optional
Electric Connection	DSub9 Male Connector, Cable Length < 100m(8*0.14mm^2)
Weight and Dimensions	300g g (KF16 Flange), 105H X 50W X 32D (KF16)
Materials on Vacuum	SS304, SS316L, Kovar, W, Glass

Note：Due to R & D and new product launch, INSTRUE reserves the right to modify this document. Please keep in touch with the original factory!

2. WPI 200：DBSub9 Pin Assignment



D-Sub 9，Female，Soldering Side



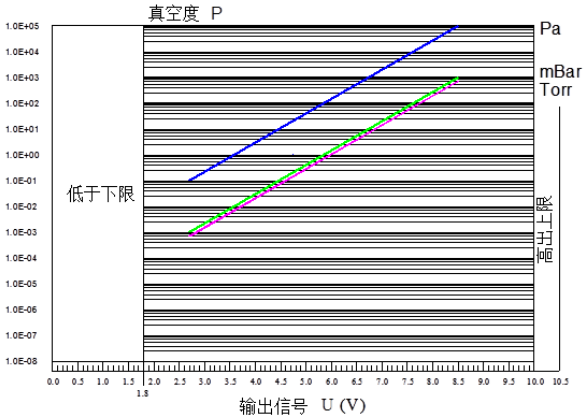
Caution

Pay Attention on D-Sub 9：Male, Female, Socket, Soldering Side.

3. Analog Signal Output

Pin 4 / Pin 8 of D-sub 9 connector provides analog voltage output of real-time vacuum pressure. In order to be compatible with applications of different external brands, the analog voltage output range and formula can be selected in two modes, which can be selected through key operation on front panel.

Output Voltage: +2.5V ~ +8.5VDC



$$P=10^{(U-C)}$$

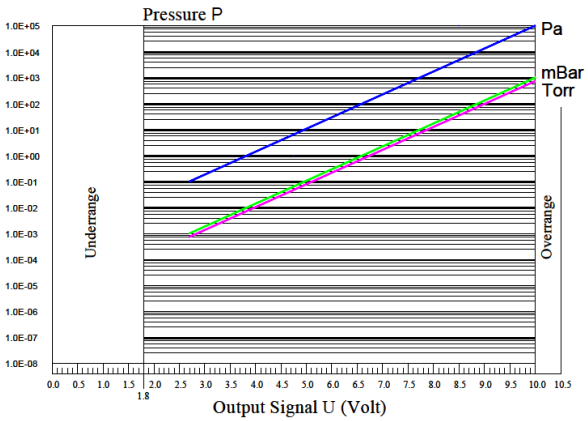
$$U=C+\lg P$$

其中：

P : Pressure
U : Voltage (V)
C : Constant

U	P	C
(V)	Pa	3.5
(V)	mBar	5.5
(V)	Torr	5.625

Output Voltage: +2.286V ~ +10.0VDC



$$P=10^{((U-c)/1.286)}$$

$$U=c+1.286\times\lg P$$

P : Pressure
U : Voltage (V)
C : Constant

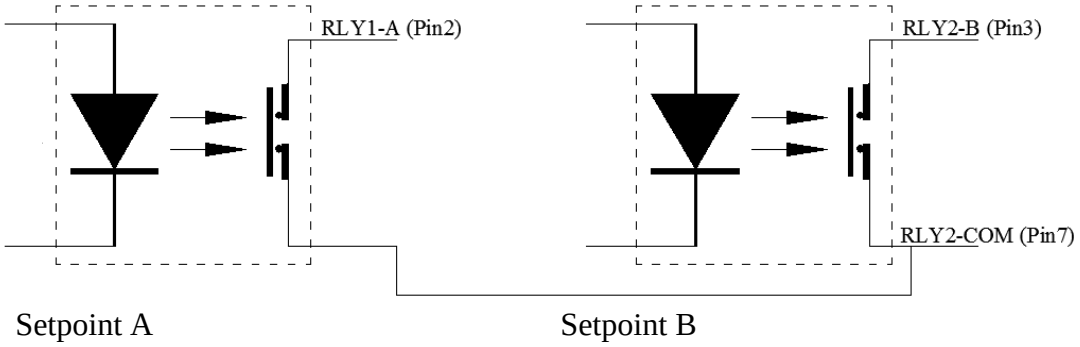
U	P	C
(V)	Pa	3.572
(V)	mBar	6.143
(V)	Torr	6.304

4. Setpoint Switch Setting

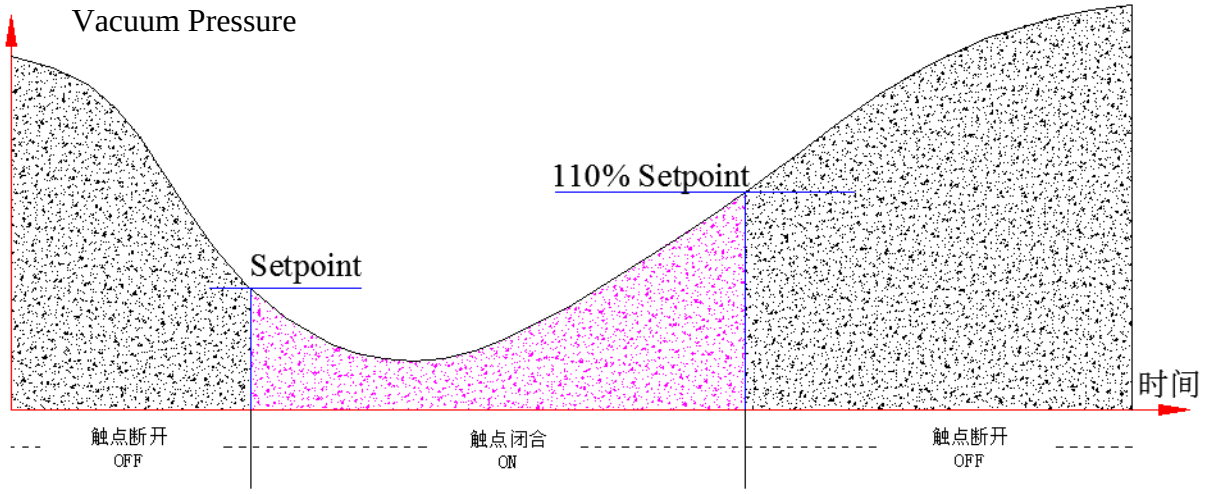
WPC400 has two setpoint switches that can be set independently, and the vacuum pressure at the switching point can be set through the top keys

The set value range of the change-over switch is 5.0e-5 PA ~ 9.9e + 4 PA.

The contact capacity of the relay is 60VDC 0.5A, which is normally open. The setting value is defined as that the relay switches to the on state. When the vacuum pressure is lower than this setting value, the output is "on". When the vacuum pressure rises to 110% of the setting value, the signal output is "off".



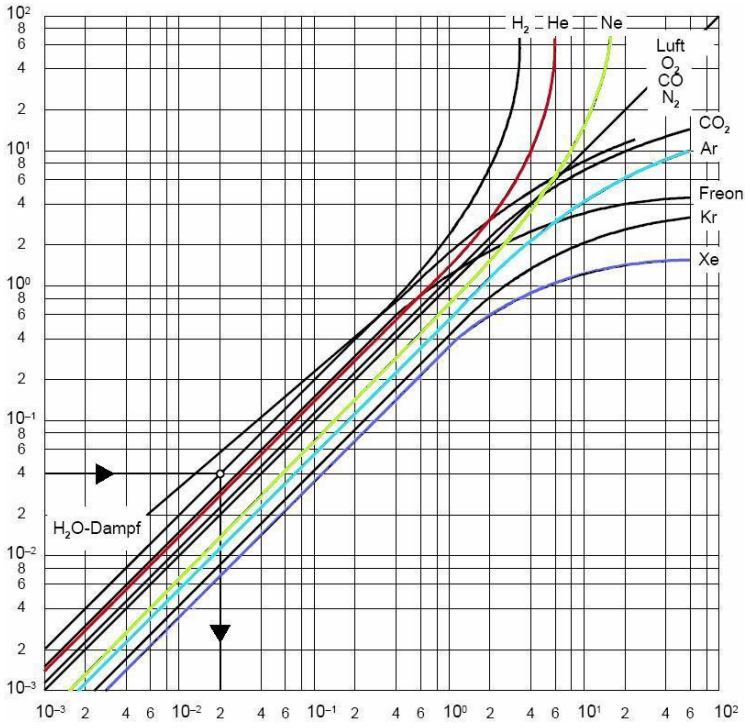
Setpoint Relay Diagram (60VDC/600mA)



Setpoint Diagram

5. Gas Type Dependence

For Pirani portion of WPC400, the measurement is sensitive to the type of gas in the system. The different gases have different masses and hence will take different amounts of heat out of the wire. However, this does mean that if the gauge is calibrated using air or N_2 and is then used to measure a process gas such as Argon, there will be an error in the pressure measurement. The error is reproducible and so in most cases the pressure is accepted as being a relative, but reproducible, measure of pressure.



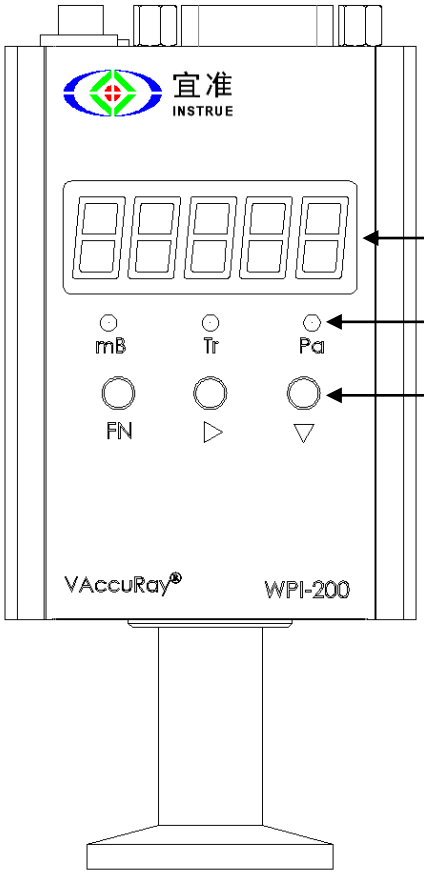
Therefore, when the measured gas is other gases than air/N_2 and the pressure is below 100Pa, a calibration factor is need to calculate the effective pressure:

$$P_{effective}=C*PressureReading$$

Gases	C		Gases	系数 C
Air, O_2, CO, N_2	1.0		CO_2	0.9
H_2	0.5		Kr	2.4
He	0.8		Xe	3.0
Ne	1.4		H_2O Vapor	0.5
Ar	1.7		Freon	0.7

6. WPI 200 Panel Demonstration and Operation

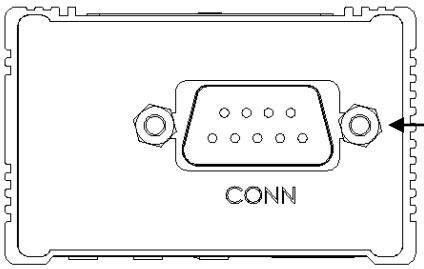
6.1 Panel Descriptions



5-Digit LED Display

3 Unit Indication

3 Tactile Keys



Dsub9 Male Connector：

- Power Input
- Setpoint Relays
- Analog Voltage Output
- RS485-Modbus Communication

6.2 Key Operation

MENU Key	Display	▶ Key	▼ Key
Press 1 & Hold	ATP	Press to calibrate atmospheric pressure	NA
Press 2 & Hold	HUC	Press to implement zero calibration	NA
Press 3 & Hold	—	Press to show SP1 value, then press again to flash one digit which can be changed	Press repeatedly to change the flashing number and set the vacuum pressure of the setpoint
Press 4 & Hold	— —	Press to show SP2 value, then press again to flash one digit which can be changed	Press repeatedly to change the flashing number and set the vacuum pressure of the setpoint
Press 5 & Hold	U	Press the display unit repeatedly to select: Pa, Torr, mbar	NA
Press 6 & Hold	d	Press to select the display format. S is the scientific counting format and N is the floating format	NA
Press 7 & Hold	Ad	Press to show the RS485 address on last two digital LED, and then press repeatedly to flash the digit which can be changed.	Press repeatedly to change the current flashing digit setting (0-9). Address 01 ~ 99 can be set.
Press 8 & Hold	DFL	Restore the factory settings	NA
Press 9 & Hold	AO	Select the analog voltage output mode， 0 for 0.0~+10.0VDC output， 1 for 0.0~+8.50VDC output.	NA

7. INSTRUE reading software Gauge Reader 3.0

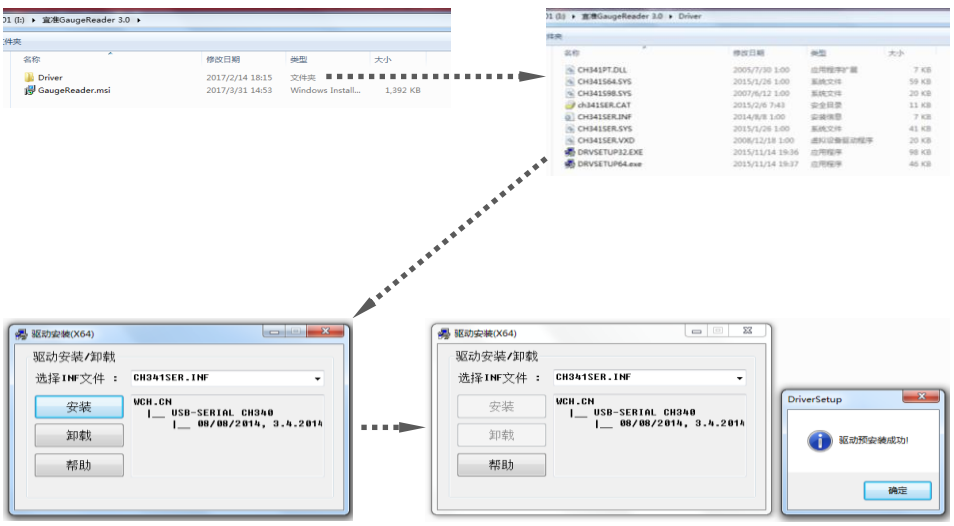
This Section 6 and 7 are only applicable to WPI 200 model with RS485 function.

Install Gauge Reader 3.0 application software on ordinary Win XP, Win7, Win8 or Win10, and the computer can communicate with pon100 in real time through a USB/RS485 converter. (the vacuum gauge needs to be powered by separate + 24VDC)

WPI 200

7.1 USB / RS485 Converter Driver Installation

Open the folder supplied by INSTRUE, find the software packages that should be installed on the computer and click the appropriate driver file to install.

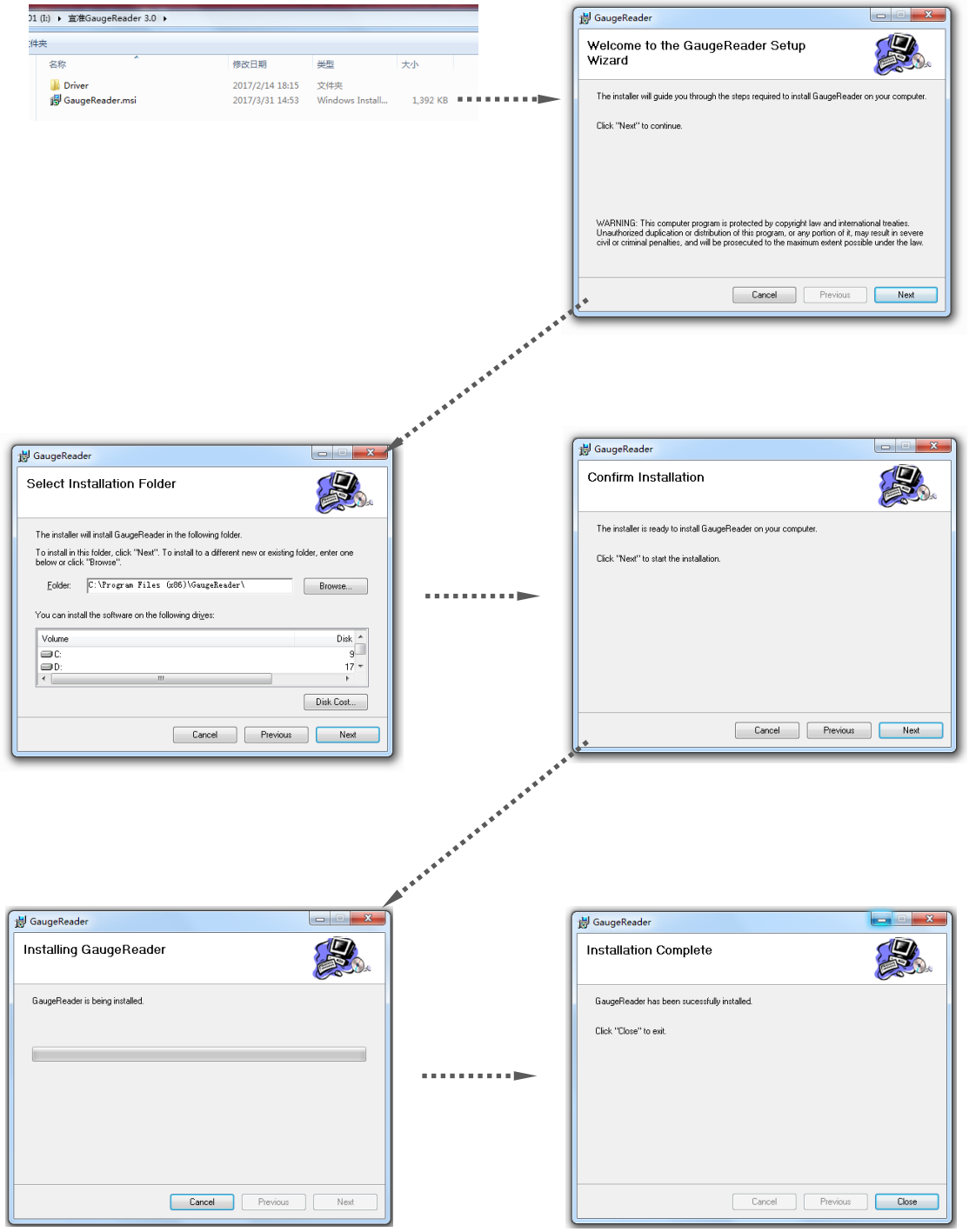


After installation, click OK.

Set the serial port in the computer device manager:

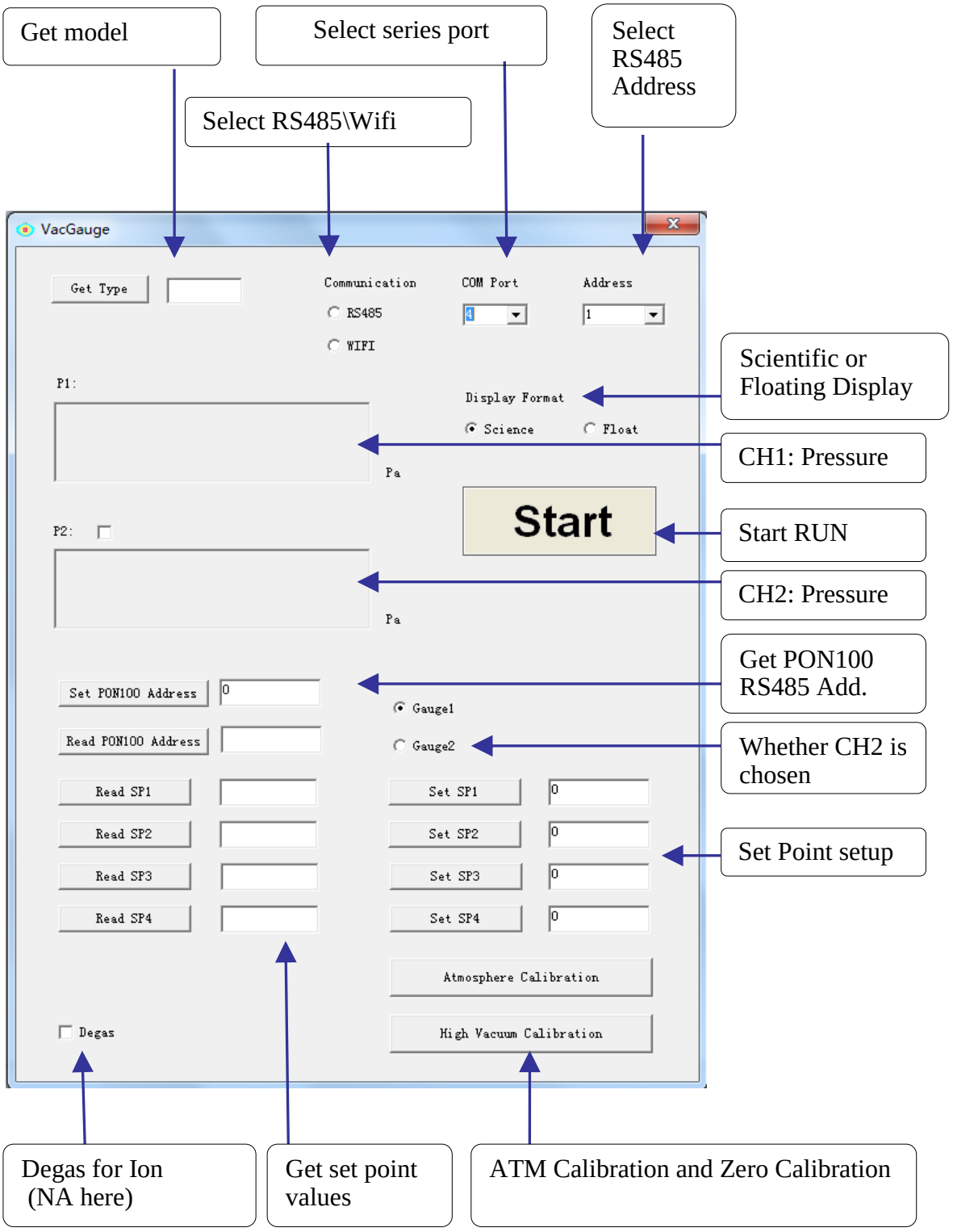
Baud rate: 9600; Start bit: 1; Data bit: 8; Stop bit: 1; Check bit: None

7.2 Application software GaugeReader3 0 installation



After installation, an executable file is generated in the selected folder: VacGauge. exe

7.3 Use application software GaugeReader3 0



8. WPI 200 Applications

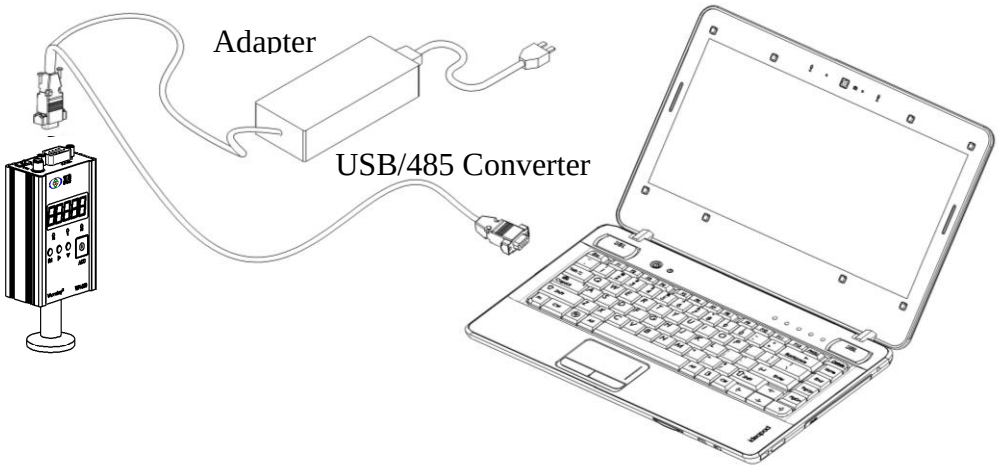
8.1 Use with RS485 Communication

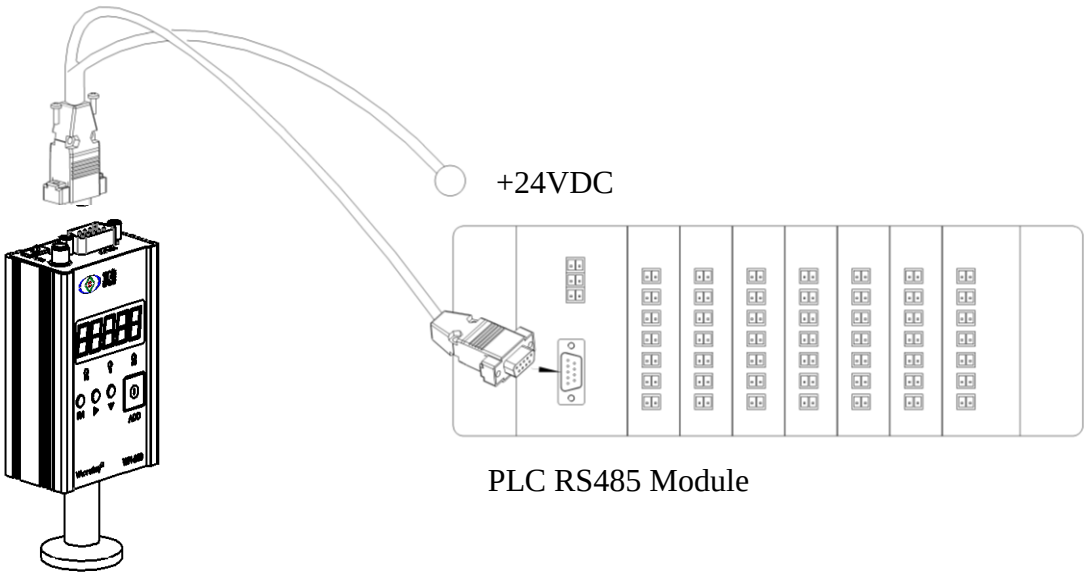
Before starting to communicate with the WPI 200 via RS485, please be sure the address is set correctly as your system topology design.

The WPI 200 can be used with any kind of PLC which has a standard RS485 interface.

The WPI 200 can also be used with a regular Win XP\Win7_32\Win7_64 based computer, a USB\RS485 converter is normally needed in this case. INSTRUE provides PC software Gauge Reader for this application.

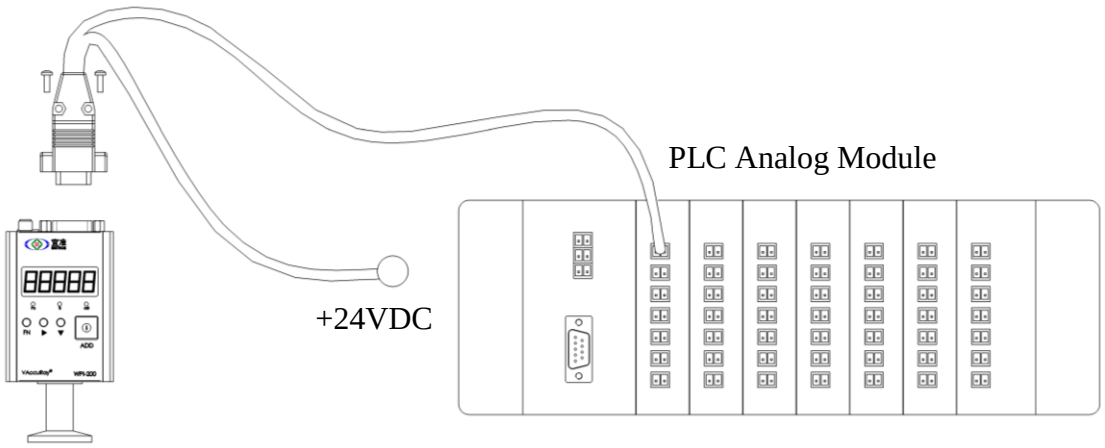
The controlling host sends its commands to the individually addressed devices connected to the RS485 Modbus. In replay the device returns the data requested via bus to the host.





RS485 Setting： 9600 baut rate，8 data bits, 1 stop bit, No parity

8.2 Use with Analog/Digital Converter



8.3 Use with Wireless Communication (Optional)

Before starting to communicate with the WPI 200 via wireless, please be sure the tip switch on the top is on WL side, and the ADD is set correctly as your system topology design.

The WPI 200 can be used with INSTRUE WGC 150 via wireless communication. In this case, WPI 200 and WGC 150 must be set at same address, and the WGC 150 should be set at Wireless mode through the front key operation.

The WPI 200 can also be used with a regular Win XP\Win7_32\Win7_64 based computer, an INSTRUE USB Wireless Transceiver (refer to 3.2.6) is required. INSTRUE provides PC software Gauge Reader (refer to 3.2.6) for this application.

Procedure

Step 1. A two-wire cable is required to supply the WPI 200 with +24VDC\GND power. An antenna needs to be installed.

Step 2. Install the software driver for USB Wireless Transceiver, and also install the INSTRUE Gauge Reader application software.

Step 3. Open the Gauge Reader, click the function selections, then Start

For those who want to design their own software interface, you need to know the Instrue RS485\Wireless communication protocols, and dynamic link libraries, and embed them to your own software.

9. RS485 Modbus-RTU Communication Protocol

1) Communication Setup：

Baud rate：9600 Start Bit：1 Data Bit：8 Stop Bit：1
Checkout bit：No

2) Instruction format：

a. Read instruction：

- Upper computer sends instructions to vacuum gauge：

Add	Command	Register Hi	Register Low	Data Word（Hi 8bit）	Data Word（Low 8bit）	CRC Check（Low8bit）	CRC Check（Hi 8bit）
1-99	03	00	XX	00	XX	XX	XX

- Return Instruction：

Add	Command	Data Byte	Data	CRC Check（Low 8bit）	CRC Check（Hi 8bit）
1-99	03	XX	XX Byte	XX	XX

b. Write Instruction:

- Upper computer sends instructions to vacuum gauge：

Add	Command	Register Hi	Register Low	Data Length（Hi 8bit）	Data Length（Low 8bit）	Data Byte	Highest Data Byte
1-99	16	00	XX	00	02	4	Bit31-24

Data Mid Byte	Data Mid Byte	Data Mid Byte	CRC Check（Low 8bit）	CRC Check（Hi 8bit）
Bit23-16	Bit15-8	Bit7-0	XX	XX

- Return Instruction：

Add	Command	Register Hi	Register Low	Data Length（Hi 8bit）	Data Length（Low 8bit）	CRC Check（Low 8bit）	CRC Check（Hi 8bit）
1-99	16	00	XX	00	02	XX	XX

3) Register address table：

Register address（16hexadecimal）	Data byte length	Storage content
01	2	Gauge Ch1: Vacuum data of scientific counting format
03	2	Gauge CH2: Vacuum data of scientific counting format
11	2	Gauge Ch1: Vacuum data of floating point format
13	2	Gauge CH2: Vacuum data of floating point format
21	2	Set Point 01: Floating Format
23	2	Set Point 02: Floating Format
25	2	Set Point 03: Floating Format
27	2	Set Point 04: Floating Format
29	2	Set Point 05: Floating Format
2B	2	Set Point 06: Floating Format
31	1	Set Point 01 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
32	1	Set Point 02 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
33	1	Set Point 03 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
34	1	Set Point 04 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
35	1	Set Point 05 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
36	1	Set Point 06 correspond Gauge 1：Gauge Ch1；2：Gauge Ch2
40	1	Implement Calibration: 1：Gauge Ch1 atmosphere 2：Gauge Ch1 Zero 4：Gauge Ch2 atmosphere 8：Gauge Ch2 Zero

Data display format：

Scientific count format

For example, the vacuum gauge display data is 1.2E+3, and the ASCII code stored in the register is the corresponding data, that is, 0x31, 0x32, 0x2b, 0x33.

For example, the vacuum gauge displays the data 1.0E-1, and the data stored in the register are 0x31, 0x30, 0x2d and 0x31.

Floating format

The 32 bit floating number is stored in the register.

Vacuum gauge address setting：

Through Gauge Reader 3.0 application software interface, you can set the vacuum meter local address, factory address set to 01.

10. Dimensions （mm）