Global Water

Instrumentation, Inc.
151 Graham Road
P.O. Box 9010
College Station, TX 77842-9010
T: 800-876-1172
Int'l: (979) 690-5560, Fax: (979) 690-0440
E-mail : globalw@globalw.com

PC300: Process Controller

01-357
Publication Number 39300712

Congratulations on your purchase of the Global Water Process Controller. This instrument has been quality tested and approved for providing accurate and reliable measurements. We are confident that you will find the controller to be a valuable asset for your application. Should you require assistance, our technical staff will be happy to help.

Table of Contents

I.	Checklist	Page 3
II.	Inspection	3
III.	Warranty	3
IV.	Process Controller Operation	4
V.	Process Controller Installation	5
VI.	PC300 Specification	6
VII.	Maintenance	7
VIII.	Troubleshooting	7
IX.	Customer Support	7
X.	Programming Procedure	9
XI.	Appendix A: PC300 Terminal Strip Diagram	14
XII.	Appendix B: Power and Input Configurations	15
XIII.	Appendix C: PC300 Calibration Connections	16

I. Checklist

a. PC300 Process Controller

b. PC300 Process Controller Manual

II. Inspection

a. Your Process Controller was carefully inspected and certified by our Quality Assurance Team before shipping. If any damage has occurred during shipping, please notify Global Water Instrumentation, Inc. and file a claim with the carrier involved.

III. Warranty

a. Global Water Instrumentation, Inc. warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from date of shipment from factory. Global Water's obligations under this warranty are limited to, at Global Water's option: (I) replacing or (II) repairing; any products determined to be defective. In no case shall Global Water's liability exceed the products original purchase price. This warranty does not apply to any equipment that has been repaired or altered, except by Global Water Instrumentation, Inc., or which has been subject to misuse, negligence or accident. It is expressly agreed that this warranty will be in lieu of all warranties of fitness and in lieu of the warranty of merchantability.

b. The warranty begins on the date of your invoice.

IV. Process Controller Operation

The PC300 Process Controller is reliable, accurate and suitable for measuring all types of 2 and 3 wire sensors with 4-20 mA, 0-1 volt and 0-5 volt outputs. The controller comes pre-programmed for use with 10 different sensor types and 13 engineering units. In addition, the PC300 can be programmed at the factory to monitor any type of custom sensor in any units selected by the customer.

The controller is easily programmed and calibrated in the field using the 4-button keypad and 2-line LCD display by going through a series of simple menu options.

Two separate relays are provided for controlling all types of external devices including samplers, alarms, mixers, pumps, control valves, floodgates and telemetry systems. Each relay is independently programmable to trigger on maximum and/or minimum levels in one of three different modes. Each channel also has an NPN pulse output available for triggering external devices such as water samplers. Pressing any of the front panel keys for 1 second turns off all outputs.

In the “One-Time” mode, the relay will stay on for a period of time programmable by the user from 1 second to over 16 hours and then will not turn on again until the system is reset. In the “Continuous” mode, the relay will stay on as long as the sensor reading is outside the pre-defined limit and will turn off once the reading returns to a normal level. In the “Process” mode, the relay will turn on when the sensor reading exceeds the pre-defined limit. The relay will stay on for a programmable period of time from 1 second to over 16 hours and then will turn off for a separate programmable time period with the same range. This cycle will continue for as long as the sensor reading is outside the normal range.

The LCD display shows what type of sensor is being monitored, the data reading averaged over 10 seconds and the engineering units selected. The display also indicates if either of the relays has been triggered since last reset, which relays were triggered and whether the maximum or minimum limit was exceeded. Pressing any key for 1 second resets these relay indicators. The LCD display is backlit for easy viewing at all times.

A scalable 4-20mA output is also provided for connecting to an external monitoring device. This output can be scaled to correspond to the entire range of the sensor or any range within it. The analog output is typically connected to a data logger, SCADA system, PLC or telemetry system for historical recording of sensor data.

A low power sleep mode is also provided. In this mode, the Process Controller will remain inactive for a programmable period of time from 1 minute to 4 hours, wake up for 30 seconds and read the sensors, then return to low power mode. If, while awake, the sensor reading is determined to be outside either of the pre-defined limits, the controller will trigger the corresponding relays and remain active. The controller will not return to low power mode until the relays have turned off or, in Process or Continuous modes, the sensor reading has returned to normal limits. Setting the sleep time to zero turns the sleep mode off. You can exit sleep mode at any time by holding any of the front panel keys down for up to 15 seconds. This will activate the display for 30 seconds, then return to sleep mode. To defeat sleep mode, enter the setup menu before the 30 seconds has elapsed as described in the setup procedure and set the sleep time to zero.

To prevent the relays from being triggered prematurely; a 15 second delay is added after initial power-up, emerging from sleep mode, resetting the relays and display indicators or exiting the setup menu. This allows a short period of time to bring the sensor into a normal range or enter the setup menu. The relays are inactive while in the setup menu. The relays will operate normally once the 15 second delay time has elapsed.

V. Process Controller Installation

The Process Controller has many applications and therefore many installation solutions. The case is rugged and can be easily installed in a variety of conditions. Four screw holes are provided at the corners for securing the case to a wall, panel or various types of mounting hardware. While the case is watertight and will resist moisture, Global Water does not recommended that the PC300 be mounted outdoors without providing protection from continuous exposure to water.

VI. PC300 Specifications

Process Controller:	
Power Input:	120/240 VAC or 12VDC 60mA DC normal, 350mA maximum 120uA average during sleep mode
Sensor Power:	12 VDC Switched, 100mA Maximum 24 VDC Continuous, 100mA Maximum (24 volts available in AC operation only)
Sensor Input:	4-20mA, 0-1VDC or 0-5VDC; Selectable
Enclosure:	12cm W x 20cm H x 7.5cm D, NEMA 4X
Sensor Reading:	5 digits + decimal point
Input Resolution:	.005mA or 1.2mV
Relay Contacts:	SPDT 30VDC, 5A Max Capacity: 150W
Relay 1, Digital Output:	NPN to Ground, 1.0Kohm pull-up resistor
Relay 2, Digital Output:	NPN to Ground, Open-collector
Analog Current Output:	4mA minimum, 20mA maximum Resolution: .005mA
Total System Accuracy:	0.1% of full-scale + .005mA
Sensor Types/units:	Water Level (Feet/Meters) Temperature (ºF/ºC) pH (no units) Dissolved Oxygen (%) Turbidity (NTU/ppm) Conductivity (µS) Wind Speed (MPH/KPH) Wind Direction (º) Soil Moisture (%) Custom Sensor (any of the above units, mA, mV or custom programmed units) Any of the sensors can be re-programmed as a custom sensor with custom units.
Sensor Data Range:	0.000 to 60,000 (60000 max in the display with 4 different decimal point positions)
Relay Times Range:	1-60,000 seconds (16.67 hours) Resolution: 1 second increments
Sleep Time Range:	1-240 minutes (4 hours) Resolution: 1 minute increments

VII. Maintenance

a. Global Water recommends verifying the sensor calibration at regular intervals.

b. Except for the fuse, sensor input and relay outputs, there are no user-serviceable parts inside the Process Controller.

VIII. Troubleshooting

Issue: Sensor reading incorrectly

a. Verify the power source is supplying correct voltage.
b. Check the Process Controllers calibration.
c. Check the sensor connection
d. Check the sensor's calibration.
e. Clean the sensor following the maintenance instructions.

Issue: Display is blank

a. Verify that the power is applied and wired correctly
b. Check that sleep mode is not on by holding down any of the front panel keys for 15 seconds.
c. Disconnect the power then check the fuse inside the controller.

IX. Customer Support:

Call Global Water for tech support: 800-876-1172 or 979-690-5560 (many problems can be solved over the phone). Fax: 979-690-0440 or E-mail: globalw@globalw.com.

When calling for tech support, please have the following information ready;

1. Model #.
2. Unit serial number.
3. P.O.# the equipment was purchased on.
4. Our sales number or the invoice number.
5. Repair instructions and/or specific problems relating to the product.

Be prepared to describe the problem you are experiencing including specific details of the application, installation, and any additional pertinent information.

In some cases, it may be necessary to return the sensor being used along with the Process Controller. If this is not possible, be prepared to describe the test and calibration procedures used to determine that the sensor is functioning correctly.

In the event that the equipment needs to be returned to the factory for any reason, please call to obtain an RMA# (Return Material Authorization). Do not return items without an RMA# displayed on the outside of the package.

Clean and decontaminate the Controller if necessary.

Include a written statement describing the problems.

Send the package with shipping prepaid to our factory address. Insure your shipment, Global Water's warranty does not cover damage incurred during transit.

X. Programming Procedure

1. Turn on the power and wait 10 seconds for the system to initialize
2. Press the MENU button for 3-4 seconds to enter the first setup menu.
3. Sensor Type: This screen stores the Sensor Type connected to the Process Controller. Press the UP/DOWN arrow keys to select the type of sensor to be used. Press SAVE to store the sensor type. Press MENU to move on to the next screen. Available menu selections, sensor types and default units are:
    a. Level: Water Level (Feet)
    b. Temp: Temperature (ºF)
    c. pH: pH (units blank)
    d. DO: Dissolved Oxygen (%)
    e. Turb.: Turbidity (NTU)
    f. Cond.: Conductivity (µS)
    g. WindSp: Wind Speed (MPH)
    h. WindDr: Wind Direction (º)
    i. SoilM: Soil Moisture (%)
    j. Custom: Custom Sensor (%) (All units selectable for any sensor)
4. Units: The Units menu sets the engineering units shown in the display. Saving the sensor type in the previous step automatically selects an appropriate default unit for that sensor type. If a different unit is needed than the one in the display, select the desired measurement units by using the UP/DOWN arrow keys to scroll through the available options. Press the SAVE button to store the new unit type. Press the MENU button to go to the next menu screen. Available engineering units are:
    a. Feet
    b. Meters
    c. ºF
    d. ºC
    e. None (blank)
    f. NTU
    g. ppm
    h. µS
    i. MPH
    j. KPH
    k. º (Degrees)
    l. %
    m. mA
    n. mV

5. High Signal: The High Signal number is the raw data value that corresponds to the maximum reading the sensor will put out. Put the sensor in a condition that causes an output as close to its full-scale value as possible such as placing a 3 foot water lever sensor in a 3 foot column of water, a 10,000µS conductivity sensor in a 10,000µS calibration solution, etc. If this method is not practical, use a current loop meter to source the maximum sensor current into the input. If a meter is not available, a potentiometer in series with an ammeter or voltage source can be used as shown in Appendix C but may provide results with less accuracy. Press SAVE to store the High Signal value. Press MENU to go to the next step.
6. Low Signal: The Low Signal number is the raw data value that corresponds to the minimum reading the sensor will put out. Put the sensor in a condition that causes an output closest to its minimum value. This could be removing a water level sensor from water, a wind speed sensor that is not spinning, etc. Again, if this method is not practical; a current meter, potentiometer with ammeter or a voltage source can be used. Press SAVE to store the Low Signal value. Press MENU to go to the next step.
7. High Level: The High Level is the sensor reading that corresponds to the High Signal number from step 5 such as 15.000 (Feet) for a 15 foot water level sensor, 100.00 (%) for a dissolved oxygen sensor, etc. For example, if the High Signal from step 5 was set with a 15 foot level sensor in 14.750 feet of water, set the display to read 14.750. The display will still read values above 14.750 feet. Adjust the High Level value by using the UP/DOWN arrow keys until the display shows the reading that corresponds the current used to set the High Signal number saved in step 5, then press SAVE to store the value. Note that as you scroll up past 60.000, the decimal point will shift to the right and the display will change to 60.00, scrolling past 600.00 changes the display to 600.0 and scrolling past 6000.0 changes the display to 6000. with the display stopping at 60,000. Scrolling down shifts the decimal place to the left in a similar manner as the digits in the display reach approximately 6400 with the display stopping at 0.000. Select the number that shows the decimal point in the position that gives that maximum resolution and still allows the maximum sensor reading to be displayed. For example: It is possible for a dissolved oxygen sensor to be displayed as 100.0% or 100.00% but the later gives better resolution. Pressing SAVE in this menu automatically stores the decimal point position and maximum levels for upcoming options. Press MENU to go to the next step.

8. Low Level: The Low Level number is the sensor reading corresponding to the Low Signal number stored in step 6 such as 0.000 (Feet) for a 15 foot water level sensor, 0.000 MPH for a wind speed sensor, etc. For example, if the Low Signal number in step 6 was set using a pH sensor in a calibration solution with a pH of 1.050, set the display to read 1.050. The display will read values below this number down to zero. Negative numbers are not supported by the PC300. Adjust the Low Level value by using the UP/DOWN arrow keys until the display shows the reading corresponding to the Low Signal number, then pressing SAVE to store the value.
9. Relay 1 Maximum: This is the upper threshold number which causes relay 1 to trip when exceeded. Use the UP/DOWN arrow keys to select the desired limit, then press SAVE to store the number. Press MENU to go to the next screen.
10. Relay 1 Minimum: This is the lower threshold number which causes relay 1 to trip when crossed. Use the UP/DOWN arrow keys to select the desired limit, then press SAVE to store the number. Press MENU to go to the next screen.
11. Relay 1 On Time: This is the amount of time that relay 1 will stay on in One-Shot and Process modes. This setting does not apply to Continuous mode. Use the UP/DOWN arrow keys to select the amount of time in seconds the relay will stay on from 1 to 60,000 seconds. Press SAVE to store the On Time. Press MENU to go to next screen. Note: A setting of 1 second will produce a relay On Time of at least 1 second but the overall accuracy of the relay times is approximately +/- 1 second.
12. Relay 1 Off Time: This is the amount of time that relay 1 will stay off in Process mode after being triggered and the relay On Time has elapsed. This setting does not apply to One-Shot and Continuous modes. Use the UP/DOWN arrow keys to select the amount of time in seconds the relay will stay off from 1 to 60,000 seconds. Press SAVE to store the Off Time. Press MENU to go to next screen.
13. Relay 1 Mode: The Relay Mode determines how relay 1 turns on and off after a preset limit has been exceeded. Use the UP/DOWN arrow keys to select the operating mode for relay 1. Press SAVE to store the selection. Press MENU to go to the next screen. The options are:

    One-Time Mode: In this mode, the relay will trigger once only when the sensor reading falls outside the predefined limits and stay on for the On Time set in step 11, *even if the sensor reading returns to a normal value*. The On Time must be set to a value other than zero. The LCD display will

indicate 1L in the bottom left-hand corner if the relay was triggered by crossing the low limit set in step 10 and 1H if the upper limit set in step 9 was passed. Once the relay turns off, it will not trigger again until the unit is reset. Pressing any key on the keypad for one second clears the display and resets the system allowing the relay to be re-trigger.

Continuous Mode: In this mode, the relay will stay on as long as the sensor reading is outside the limits defined in steps 9 and 10. The relay On and Off times do not apply. To prevent relay chatter when the sensor reading is near the upper or lower limits, a 5% deadband must be passed to turn the relay off again. Thus, the sensor reading must rise 5% above the lower limit or fall 5% below the upper limit to turn off the relay. Once off, the relay will trigger again if the sensor drifts outside the normal range. The display indicators will display the last condition (1L or 1H) that caused a relay closure. Press any key for one second to clear the relay and the display indicators.

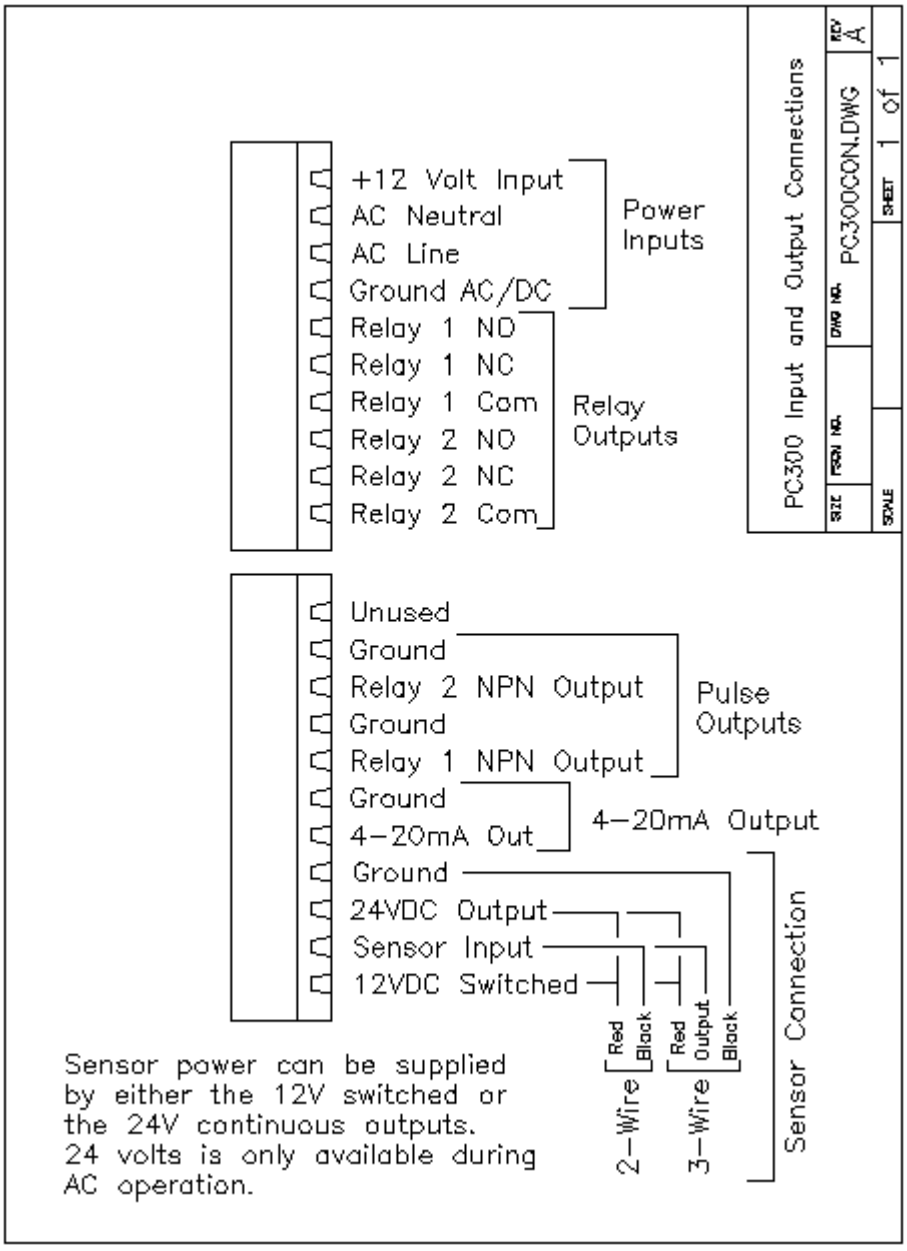
Process mode: In Process mode, the relay will first close for the On Time then open for the Off Time. This cycle will repeat as long as the sensor reading is outside the normal range. The On and Off times must both be non-zero. As in the Continuous mode, the display indicators will indicate the last condition (1L or 1H) that caused the relay trigger and a 5% deadband must be crossed to stop the relay's on-off cycle. Press any key to clear the relay and display.

14. Relay 2 Maximum: This is the upper threshold number which causes relay 2 to trip when exceeded. Use the UP/DOWN arrow keys to select the desired limit, then press SAVE to store the number. Press MENU to go to the next screen.
15. Relay 2 Minimum: This is the lower threshold number which causes relay 2 to trip when crossed. Use the UP/DOWN arrow keys to select the desired limit, then press SAVE to store the number. Press MENU to go to the next screen.
16. Relay 2 On Time: This is the amount of time that relay 2 will stay on in One-Shot and Process modes. This setting does not apply to Continuous mode. Use the UP/DOWN arrow keys to select the amount of time in seconds the relay will stay on from 1 to 60,000 seconds. Press SAVE to store the On Time. Press MENU to go to next screen.
17. Relay 2 Off Time: This is the amount of time that relay 2 will stay off in Process mode after being triggered and the relay On Time has elapsed. This setting does not apply to One-Shot and Continuous modes. Use the

UP/DOWN arrow keys to select the amount of time in seconds the relay will stay off from 1 to 60,000 seconds. Press SAVE to store the Off Time. Press MENU to go to next screen.

18. Relay 2 Mode: This relay mode determines how relay 2 turns on and off after a preset limit has been exceeded. The Relay 2 modes operate the same as the Relay 1 Modes described in step 13 except that limits and time are set in steps 14-17 and the indicators in the lower left of the display read 2L or 2H when the relay has been triggered. Use the UP/DOWN arrow keys to find the proper operating mode for relay 2. Press SAVE to store the Relay Mode selection. Press MENU to go to the next screen.
19. 4mA Set Point: This is the sensor reading corresponding to 4mA in the 4-20mA output. Use the UP/DOWN arrow keys to scroll to the desired limit. Press SAVE to save the lower limit for the analog output. Press MENU to go to the next screen.
20. 20mA Set Point: This is the sensor reading corresponding to 20mA in the 4-20mA output. Use the UP/DOWN arrow keys to scroll to the desired limit. Press SAVE to save the upper limit for the analog output. For example: If the process meter is monitoring a pH sensor over the full 0-14 range but you wish the analog output to correspond to a range of 6-8, set the 4mA Set Point to 6.000 and the 20mA Set Point to 8.000. This will expand the analog output to show better resolution in the 6-8 range. Press MENU to go to the next screen
21. Sleep Time: This is the time in minutes that the process meter will stay inactive between sensor readings. Use the UP/DOWN arrow keys to select the Sleep Time from 1 to 240 minutes. Press SAVE to store the Sleep Time. Setting the Sleep Time to zero disables sleep mode and allows the process controller to remain active all the time. Press MENU to complete the programming procedure and return to normal operation. Note that no power is applied to the sensor in Sleep Mode and therefore, no monitoring occurs.

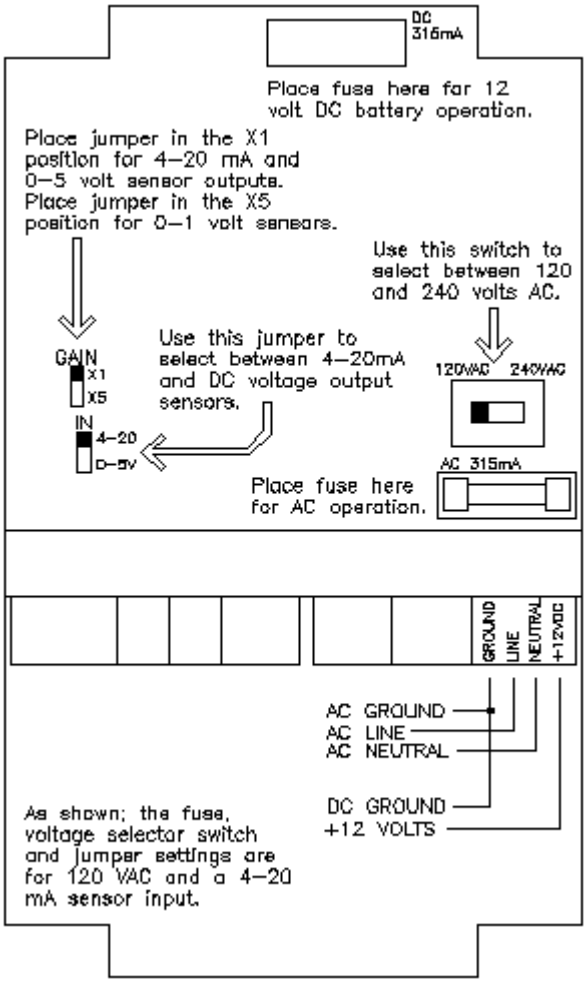
XI. Appendix A: PC300 Terminal Strip Diagram



XII. Appendix B: Power and Input Configurations

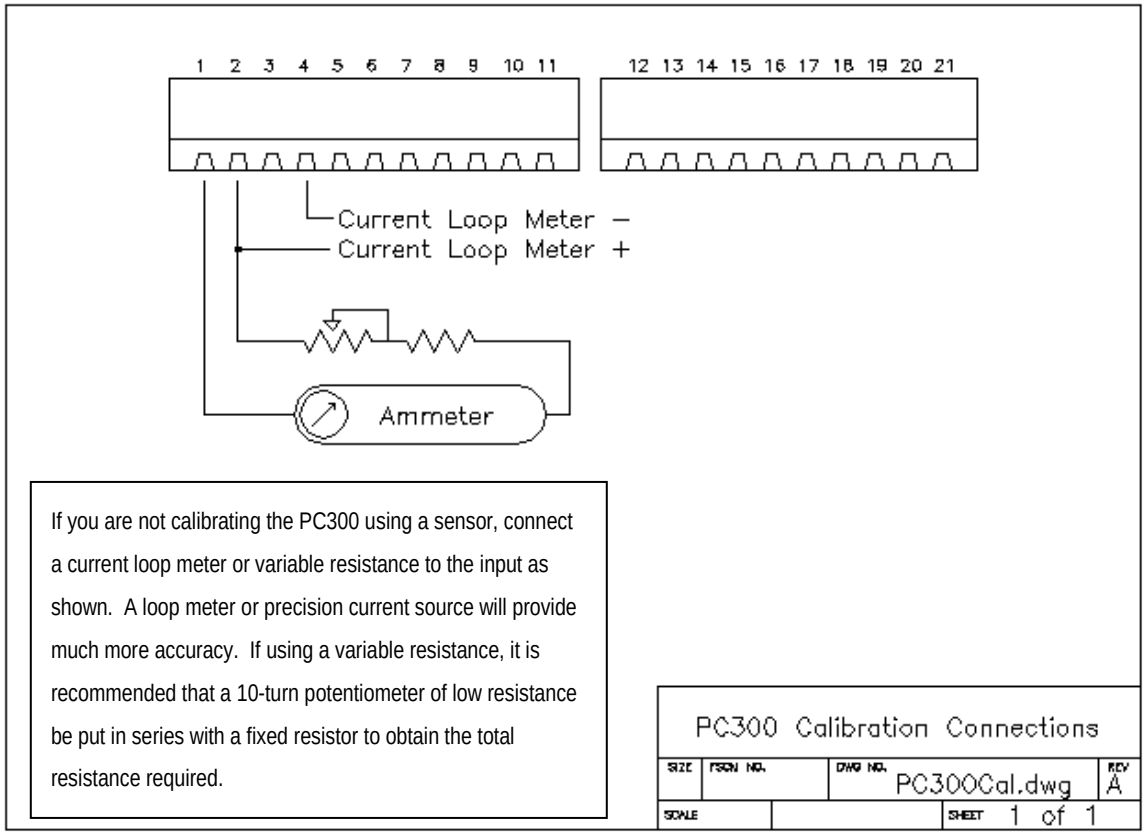
Disconnect power before attempting to change the power or input configurations.

This page describes how to change the sensor input type from current to voltage; and switch between 120 volts AC, 220 volts AC or 12 volts DC.



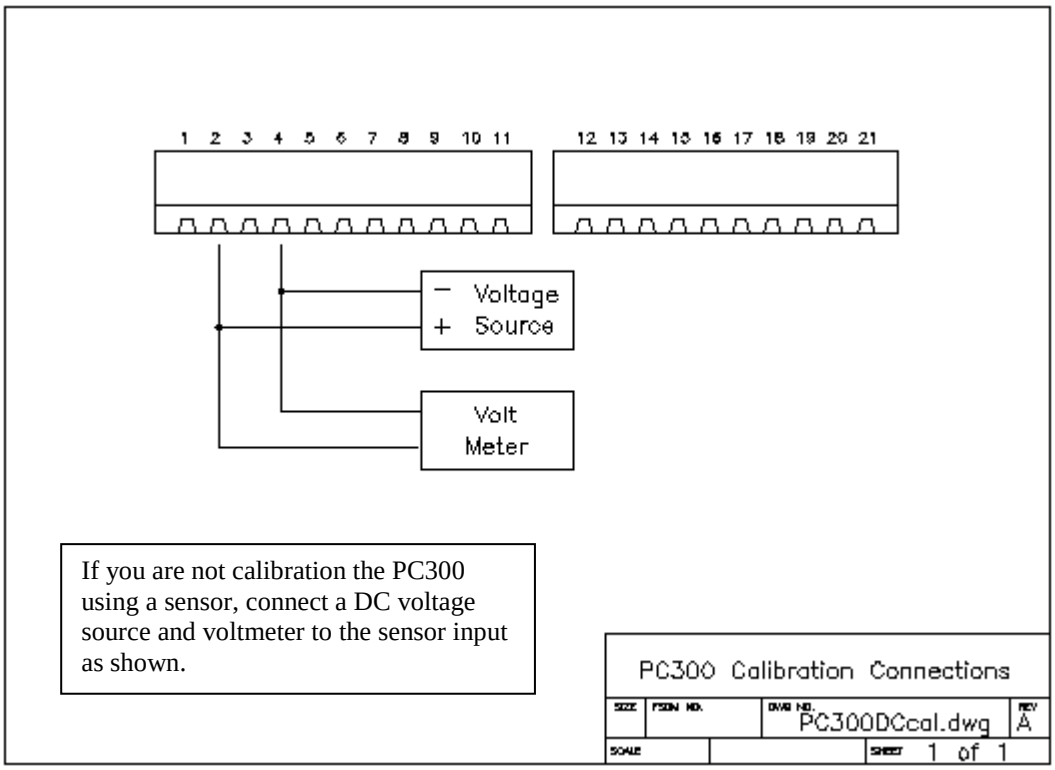
XIII. Appendix C: PC300 Calibration Connections

Calibrating the PC300 for a 4-20mA Output Sensor:



Set the Input Configuration jumpers as described in Appendix B for a 4-20mA sensor with a gain of one. When using a resistance to calibrate the PC300, it is recommended that two separate resistor networks be used, one for the low level current and one for the high level. The total resistance required to produce a 4.0mA input is about 2680ohms while the total resistance to produce 20.0mA is about 340ohms. If a single potentiometer were used, there would not be enough resolution to accurately dial in a specific input current, even with a 10-turn pot. Far more accuracy is achieved with a 100ohm 10-turn pot (Digi-Key part number GU1011S26-ND) in series with a 300ohm fixed resistor for generating the 20mA input. To produce an accurate 4mA calibrator, use a 2.4K resistor in series with a 500ohm 10-turn pot (Digi-Key part number GU5011S26-ND).

Calibrating the PC300 for a Voltage Output Sensor:



Set the input configuration jumpers as described in Appendix B for the sensor type to be used. If a 0-5 volt sensor will be connected to the PC300, set the Gain jumper to X1 (gain of one) and adjust the voltage source to a point near 5 volts that corresponds to the maximum output level of the sensor. Use this voltage level when saving the High Signal value in the setup menu and set the High Level setting to the sensor reading corresponding to that voltage. If a 0-1 volt sensor will be used, set the Gain jumper to X5 (gain of five) and adjust the voltage source to a point near 1 volt corresponding to the maximum sensor reading. Disconnect the voltage source when saving the Low Signal setting and set the Low Level value to zero.