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

PC320 Process Controller

02-107
Publication Number 39370712

Congratulations on your purchase of the Global Water PC320 Process Controller. This instrument has been quality tested and approved for providing accurate and reliable measurements. We are confident that you will find the monitor to be a valuable asset for your application. Should you require assistance, our technical staff will be happy to help.

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I. PC320 Process Controller Description

The PC320 Process Controller is reliable, accurate and suitable for measuring any type 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 12 different common sensor types and appropriate selectable engineering units. In addition, the PC320 can be programmed by the user to monitor any type of custom sensor in any user defined units. Custom user defined engineering units are also programmable for all standard sensor types. Both 2-point and 3-point calibration methods are supported and an additional 3rd order polynomial equation can be applied to the sensor data to correct for non-linearities in sensor output. The polynomial mode is useful for calculating other parameters based on a sensor reading such as calculating water flow rate from water level.

The PC320 controller is enclosed in a NEMA 4 enclosure and is easily programmed and calibrated in the field using the water resistant 8 button keypad and 2-line LCD display, by going through a series of simple menu options.

The LCD display shows what type of sensor is being monitored, the data reading averaged over a user programmable time period, and the engineering units selected. The display also shows the current On or Off state for each of the 4 relays. Two other display modes are available. One shows the maximum and minimum sensor readings since last reset. Another mode displays the current state of any of the 4 relays in real time, the sensor reading that caused the last triggering event, and the On or Off time remaining in the control cycle. The LCD display can be backlit for easy viewing at all times and offers a power saving mode for limiting current drain in battery powered applications.

Four relays are provided for controlling 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 threshold levels in one of five different control modes.

Relay operation is defined by setting upper and lower sensor threshold levels and turning relays on when sensor readings exceed a normally defined range.

Both normally open and normally closed relay contacts are provided. Relay modes include a One Time trigger that will engage a relay one time only for a programmed on time period when a sensor reading falls outside of a defined normal range. The Steady state mode will turn on a relay as long as the sensor reading is out of the normal range. The Cyclic mode will continually turn a relay on and off for user definable on and off times while the sensor reading is outside of normal range. Additionally, High Control and Low Control Modes are provided. These modes are used for maintaining a sensor reading within a specific range; for example keeping the water level in a tank between two predefined levels. A sixth mode allows a relay to be deactivated regardless of settings. There are also programmable Delay Times and Hysteresis. Setting a Delay Time will delay a relay from turning on for that amount of time when a sensor reading falls outside of normal range. This is used to limit the effect of rapidly changing sensor readings and keeping the relays from reacting quickly to very small changes near a threshold setting. The Hysteresis function allows the relay to remain on until the sensor reading falls into the normal range again, plus a defined hysteresis percentage. This also prevents the relays from overreacting to rapidly changing events near a threshold level. A test mode is provided for manually testing relay operation.

A fully scalable 4-20mA output is available for recording sensor data readings by devices like data loggers, PLC's, telemetry systems and chart recorders. There is a factory installed USB data logger option available that can record these data readings to memory at regular intervals, as well as the exact times of all changes in relay states and the current sensor reading at that time. Contact a Sales or Technical Support representative for more information. To easily interpret this sensor and relay data, a free software package is available. A separate manual titled "FC220-PC320 Data Logger Option" describes this in more detail and is available for free download at globalw.com/support.

II. PC320 Specifications:

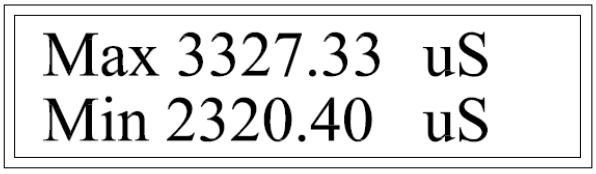
Power Requirements:	12VDC or 18-24VDC Input, +/-10%
Supply Current:	13mA + Sensor Current + Backlight + 4-20mA Output 150mA Maximum Total Current
Backlight Current:	23mA when on
Internal Fuse:	315mA
Power Adaptor:	18VDC Universal Power Supply, 90-220VAC Input AC Version only
Sensor Types/Units:	Level (Feet, Inches, Meters, Centimeters, Custom) Temperature (ºF, ºC, Custom) pH (ph, Custom) Conductivity (uS, mS, Custom) Dissolved Oxygen (%, mbar, ppm, mg/L, Custom) ORP (mV, Custom) Turbidity (NTU, Custom) Wind Speed (MPH, KPH, Ft/Sec, M/Sec, Custom) Wind Direction (º, Custom) Humidity (%, Custom) Solar Radiation (W/M², Custom) Pressure (mbar, hPa, inHg, PSI, Pa, Custom) Custom (Custom)
Output Relays:	4 Independent SPDT Relays Contact Rating: 8A @ 250VAC, 5A @ 30VDC Resistive
Level Sensor Input:	2-Wire or 3-wire, 4-20mA, 0-5VDC, 0-1VDC
Output:	4-20mA Scalable
Display/Keypad:	16 Character x 2 Line Backlit LCD, 8-Button Tactile Keypad
Sensor Resolution:	7 Digit Maximum, Auto-Floating point
Accuracy:	Sensor Accuracy + 0.1% + 1 Digit
Dimensions:	7.1”W x 5.1”H x 1.4D (180mm x 130mm x 35mm)
Weight:	1 lb

III. Display Modes

The PC320 has three display modes, pressing the DISPLAY button on the front panel cycles through them: Sensor Reading > Max/Min > Relay Status > Sensor Reading ...

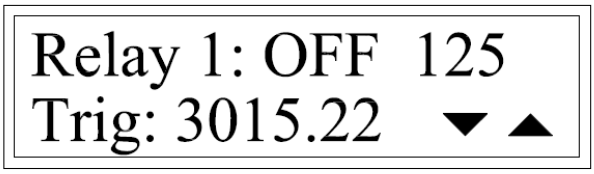
Sensor Reading

The top line shows the sensor type. The second line shows the current sensor reading and units updated once each second. The brackets to the right of the sensor reading indicate the current on or off status of each of the 4 relays, relay 1 to the left and relay 4 to the right. When the brackets are filled the relay is on. In the above example, relay 2 is on and the others are off.



Max/Min

This display mode shows the minimum and maximum readings since last reset. To reset the display, press SAVE for 2 seconds. Pressing SAVE also turns off all 4 relays. Once reset, the relays will not trigger again for 15 seconds.

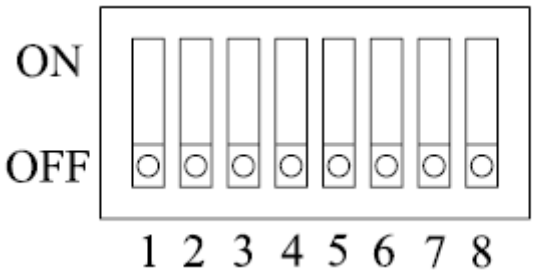


Relay Status

This display mode shows the current status for each of the relays. Use the UP and DOWN arrow buttons to scroll through relays 1-4. The top line shows the relay number, whether it is currently on or off, and how many seconds remain in the on or off cycle, if applicable. Depending on the relay mode selected, the on and off times may not apply and would not be displayed. The bottom line shows if that relay has been triggered since last reset. If the relay has been triggered, the sensor reading at the time of triggering is shown. If the relay has not been triggered, “None” will be displayed. The relays are turned off and the status reset when the SAVE button is pressed for 2 seconds. Once reset, the relays will not trigger for 15 seconds. In the above example, relay 1 is currently off with 125 seconds remaining before it is turned on again. The relay was last triggered by a sensor reading of 3015.22 uS.

IV. Switch Settings

Inside the PC320 is a bank of 8 switches which are used to select the sensor type and power input. Select the switches as follows:



Select only one of SW1 and SW2, leave the other switch off
SW1: ON, Sensor power is 12 volts
SW2: ON, Sensor power is 18-24 volts depending on the voltage input to the
Note this feature is not available when running from a 12 volt battery

SW3: ON, Sensor power is continuous
SW3: OFF, Sensor power is switched on and off by the microprocessor in power saving mode. If not using power saving mode, set SW3 to ON.

SW4: ON, Sensor type is 4-20mA
SW4: OFF, Sensor type is 0-5 VDC or 0-1 VDC

SW5: ON, Sensor type is 4-20mA or 0-5 VDC
SW5: OFF, Sensor type is 0-1 VDC

SW6: This switch is unused

Select only one of SW7 and SW8, leave the other switch off
SW7: ON, Power input to the PC320 is 18-24 VDC
SW8: ON, Power input to the PC320 is 12 VDC

V. Sensor Input

The PC320 accepts any analog sensor with a 4-20mA, 0-5VDC or 0-1VDC output. Available power for the sensor depends on the power input to the PC320. When powering the PC320 from 12 volts, the sensor power is also 12 volts. If you are running from a power supply of 18-24 volts, the sensor power can be selected from either a regulated 12 volt supply, or directly from the 18-24 volt input. The power can also be connected continuously or it can be set to be turned on and off by the PC320 when using a power saving mode. In this mode the sensor is turned on at user defined intervals for a programmable warm-up time, then turned off again to conserve power.

VI. 4-20mA Output

A 4-20mA output is provided that is proportional to any defined sensor range. This allows the data history to be recorded by an external data logger or PLC, or by the internal data logger option, or both. The output is fully scalable and allows the user to select the sensor ranges that are proportional to the 4mA and 20mA output currents.

VII. Relay Operation

Several settings independently control the operation of the 4 relays. These settings are Upper Threshold, Lower Threshold, Hysteresis, Delay Time, Relay Mode, On Time and Off Time. Not all of these settings may apply depending on which relay mode is selected.

The **Upper and Lower Threshold** settings establish a normal band which the sensor reading should remain in. If a sensor reading rises above the Upper Threshold, the relay will trigger. Likewise; if the sensor reading falls below the Lower Threshold, the relay will also trigger. If either the Upper or Lower Thresholds are not needed, they should be set to a value outside of the sensor output.

Example: A water level sensor has a range of zero to 15 feet and is installed in a water tank to control a pump. Relay 1 has an Upper Threshold of 10 feet and a Lower Threshold of 5 feet. The relay may trigger (depending on mode) when the water level rises above 10 feet or falls below 5 feet. If it is desired for the relay to turn on only when the level is above 10 feet, but not below 5 feet; change the Lower Threshold to a value outside of the normal range of the sensor, like a negative number (-10 feet).

Since in normal use the water level will never fall below zero, the Lower Threshold will have no effect and not trigger the relay.

Hysteresis is a percentage change of the full span of the sensor required to turn a relay off again once it has been triggered. This is used to keep the relays from turning on and off too often when a sensor reading is very near a threshold level. Note that the percentage is of the span the sensor is calibrated for, not necessarily the full range of the sensor. If there is a pH sensor capable of measuring from 0-14, but is calibrated at a pH of 4 and 10, the span is considered 10-4 or 6 pH units. If the Hysteresis is set to 10%, that is equivalent to 10% of 6 or 0.6 pH units. The maximum hysteresis is 25%.

Example: A water level sensor monitors the level in a tank and the PC320 is connected to a pump; which will pump water out of the tank. The Upper Threshold is set to 10 feet and the Hysteresis is set to zero. When the level rises above 10 feet, the pump will turn on. When the level falls to 9.999 feet, the pump will turn off. Thus; the pump will turn on and off repeatedly trying to maintain the level at exactly 10 feet. The level sensor has a total calibrated span of 15 feet and 10% of that is 1.5 feet. If the Hysteresis is set to 10%; the relay will trigger when the level rises to 10 feet, pumping water from the tank. The pump will not turn off again until the level falls to 10 feet minus 10% or 8.5 feet. The level in the tank will be maintained between 8.5 and 10 feet, saving the pump from turning on and off so often and wearing it out.

Example: A temperature sensor has a span of -50ºC to +50ºC, or 100 degrees centigrade. The controller is set to turn on a heater when the temperature falls below 25ºC (Lower Threshold). The Hysteresis is set to 5% or 5ºC (5% of 100º span). The heater will turn on just below 25ºC but not turn off until the temperature rises to 25C + 5% or 30C. The normal temperature range in the tank will be 25ºC to 30ºC.

The **Delay Time** is the amount of time required for a sensor reading to be above or below a threshold level before a relay is turned on. This can be used to prevent a relay from triggering when a sensor reading briefly falls outside of a normal range. Maximum delay time is 99 seconds.

Relay Modes:

Off: In Off mode, relays will not turn on regardless of settings

One Time: In One Time mode, a relay will turn on one time only when a sensor reading is above or below a threshold level. The relay will turn on for the programmed On Time, then turn off regardless of sensor reading. If during the On Time the sensor reading returns to a normal range, the relay will turn off even if the On Time has not elapsed. Once the On Time has elapsed, the relay will remain off until the sensor reading returns to a normal level (between thresholds), and then crosses past a threshold level again. The Off Time does not apply in this mode and has no effect on relay operation, the Delay Time and Hysteresis settings do apply.

Steady: In Steady (Steady State) mode the relay will turn on when a sensor reading is outside of the normal range, and stay on. The relay will remain on as long until the sensor reading is outside of the threshold points. The Delay Time and Hysteresis settings are used in this mode. Programmed ON and Off times do not apply.

Cyclic: In cyclic mode the relay will trigger when a sensor reading falls outside of the threshold settings. The relay will turn on for the On Time, then off for the Off Time. The cycle of on and off will continue until the sensor reading falls within a normal range again. The Delay Time and Hysteresis setting apply in this mode.

High Control: In High Control mode, the relay will turn on when the sensor reading rises above the Upper Threshold. The relay will remain on until the sensor reading falls below the Lower Threshold. This mode could be used to turn on a pump when a water level rises above 10 feet and continue to pump until the level falls below 5 feet. Delay Time does apply. On Time, Off Time and Hysteresis do not apply and have no effect on relay operation.

Low Control: This mode is the opposite of High Control mode. The relay will turn on when a sensor reading falls below the Lower Threshold and remain on until the sensor reading rises above the Upper Threshold. This might be used to pump water into a tank when the level falls below 5 feet and continue to pump until the level rises above 10 feet. Delay Time does apply. On Time, Off Time and Hysteresis do not apply and have no effect on relay operation.

VIII. Power Saving Mode

A power saving mode is provided that allows the operating current to be reduced in remote monitoring applications. One way this is accomplished is to turn off the LCD display backlight, this saves about 20mA of current. Three modes allow the user to turn the backlight on all the time, off all the time, or turn it on for one minute only. In this last mode, the backlight will come on for one minute when any of the buttons on the keypad are pressed, then turn off again after one minute of inactivity. The sensor can also be turned on and off periodically to reduce power consumption. The user can program a sample rate of 0-60 minutes, and can set the sensor warm-up time of 0-60 seconds. Example: The sample rate is 30 minutes and the warm-up time is 3 seconds. The sensor will be turned on for 3 seconds every 30 minutes then shut off again. During the time the sensor is off the LCD display and 4-20mA output will indicate the last sensor reading. The relays will continue to operate, based on that last reading. After 30 minutes more, a new reading will be taken and the display and 4-20mA output updated again. Note that using the 4-20mA output will increase the current draw by an amount equal to the output current. It is also possible to fail to react to rapidly changing events.

IX. Scientific Notation

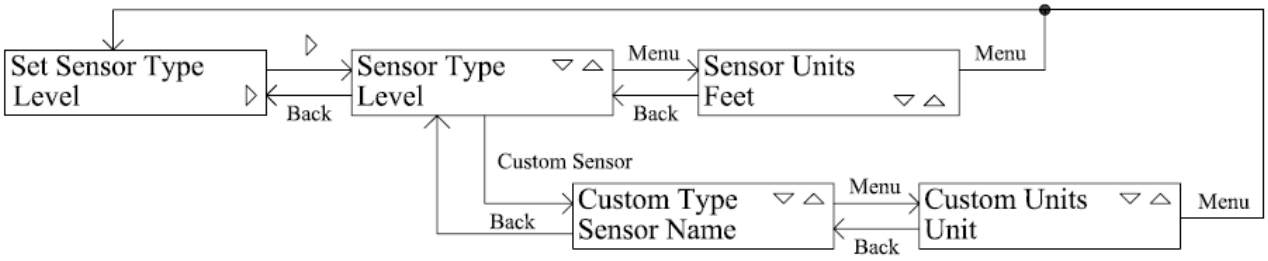
Scientific notation is used in the PC320 for entering parameters for the Polynomial mode and is generally used for displaying very large or very small numbers. It represents a number as being multiplied by 10 raised to a power, such as 5.67*10^2 being equal to 567 since 10^2 equals 100 ($10^2 = 10^2$). The notation E2 is also equivalent to “shift the decimal point to the right two times”. This makes the display of large and small numbers easier to read; 5.67E3 is 5.67 thousand or 5670, 5.67E6 is 5.67 million, etc. In the same way, small numbers less that one can be shown as 10 raised to a negative power, or “shift the decimal point that many times to the left”; such as 5.67E-3 = 0.00567 or 5.67 thousandths, 5.67E-6 = .00000567 or 5.67 millionths.

X. Programming Setup Parameters

Press the MENU button for 2 seconds to enter the setup menu. Pressing the MENU button again cycles through the different setup options. Pressing the BACK button moves backward to the previous display. Pressing the DISPLAY button from any menu exits setup and returns to the normal display mode. Press the RIGHT arrow

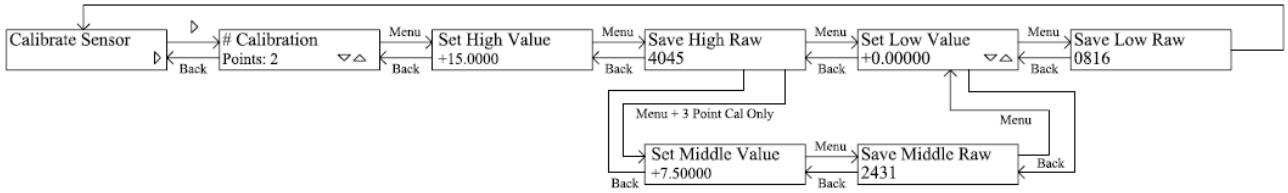
button to enter any of the setup sub-menus. These sub-menus are Set Sensor Type, Calibrate Sensor, Polynomial Mode, 4-20mA Output Calibration, Decimal Places, Averaging Time, Power Saving, Relay Settings, and Relay Test Mode. Note that while in the setup menus, all normal operations will stop. **After one minute of inactivity, the PC320 will automatically return to the main display and operation mode.**

Set Sensor Type:



Press the RIGHT arrow button to enter this or any other sub-menu. To change the sensor type, use the UP and DOWN arrow buttons to scroll through the different pre-programmed sensor types, or to select the "Custom" sensor option. Select the sensor type and press SAVE. Press MENU to move forward to the units menu. Each sensor type has pre-defined engineering units to choose from, as well as a "Custom" setting that allows the units to be set to any 4 character symbol. Select the desired units and press SAVE. For the case of custom sensor or custom units, press the LEFT and RIGHT arrows to select a character to change, then use the UP and DOWN arrow buttons to scroll through upper and lower case letters, numbers, and a list of special characters. When all characters in the custom sensor name or units menus have been changed, press SAVE to store them to memory. A list of standard sensors and units is shown in the Specifications Section of this manual. Custom Sensor names are limited to 16 characters and Custom Units are limited to 4.

Calibrate Sensor:

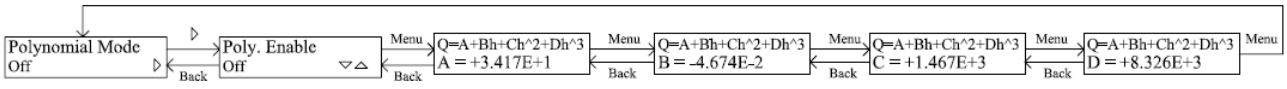


To change or check the sensor calibration press the RIGHT arrow button. To skip the calibration option press the MENU key to move to the next programming option.

First select whether the sensor will be calibrated using a 2 or 3 point method. Generally; sensors are calibrated at 2 points as close to the ends of the sensor's measurement range as possible. For example: A 15 foot water level sensor would be calibrated using a 2-point method and be set at zero feet and as close to 15 feet as practically possible. However; a pH sensor with a range of 0-14 may be typically calibrated at a pH of 4 and 10 due to the hazards of using very strong acids and bases. Calibrating a sensor at points other than the full range of the sensor will not stop the PC320 from measuring the full sensor range, but may slightly decrease the overall accuracy. A ph sensor might also be calibrated using a 3-point method at pH values of 4, 7 and 10. Using a 3-point calibration will increase the accuracy of sensors that have small amounts of nonlinearity.

After selecting the number of calibration points, press SAVE and MENU. Using the arrow buttons, set the High Value to the upper calibration point, first setting the +/- sign, then separately each digit. If you are calibrating a 15 foot water level sensor but only have an 8.5 foot column of water, set the High Value to +8.50000. If you are using a pH 10 buffer solution to calibrate a 0-14 pH sensor, set it to +10.0000. Use the UP and Down buttons to change the sign to + or -. Use LEFT and RIGHT to select each digit, then UP and Down to change it in the range of 0-9 or decimal point. Press SAVE when done and then MENU to move forward. Next place the sensor in a condition that corresponds to the High Value previously set, or use a loop or process calibrator. Press SAVE to store the High Raw data number, then MENU. For 3-point calibration, the next menu will allow you to set the middle calibration point; then the Low point. A 2-point calibration will skip the middle point and jump to the Low point. Set each of these Middle and Low calibration points in the same way as the High.

Polynomial Mode:



The calibration process previously discussed can be further modified. This is best described with an example that will use a water level sensor and from this level data, calculate the water flow rate in a flume.

Calibrate a water level sensor as previously described. When selecting the sensor type, you can use the Custom Sensor and Units selection; the sensor name and units displayed don't actually have anything to do with calculations, they are just used as

identifiers for the user on the LCD display. Calibrate the sensor normally. You can set the sensor type to Water Flow and the units to CFS (Cubic Feet per Second).

A flume or weir equation usually has the form of Q = A * B ^ C; where Q is flow in CFS, A is a multiplier, B is water level in feet and C is an exponent applied to B. However; in many cases a 3rd order polynomial can give a close approximation of flow. Example: The flow equation for a 3" Parshall Flume is:

Water Flow (CFS) = 0.994 * [(Water Level in Feet) ^ 1.55]

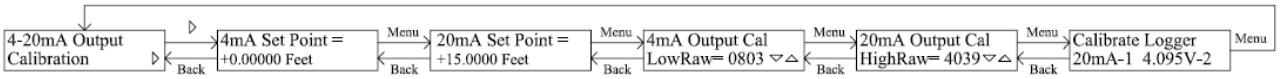
A 3rd order polynomial can approximate this with:

CFS = -1.499E-2 + [3.746E-1 * Level] + [7.164E-1 * Level^2] – [8.771E-2 * Level^3]

The accuracy of the equation will vary depending on the application but the polynomial function can usually calculate non-linear parameters accurately and can correct for some sensor non-linearities. This mode will only calculate positive numbers from positive data, any negative results or data will be considered zero.

Press the RIGHT Arrow, then use UP or DOWN to select the polynomial mode to On, press SAVE. Press MENU and program the numbers for each coefficient A - D. Unused parameters should be set to zero.

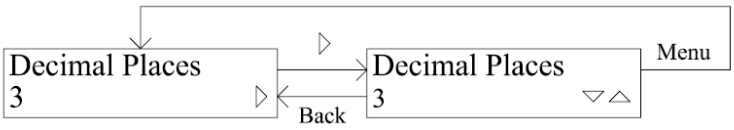
4-20mA Output Calibration:



To scale and calibrate the 4-20mA output press the RIGHT arrow key. The 4mA Set Point defines the sensor reading that results in an output current of 4mA. Use the arrow buttons to change the sign to + or - and set the value, then press SAVE. The 20mA Set Point is the sensor value that results in a 20mA output current. As before, use the arrows to change the 20mA Set Point. Press SAVE to store this setting. Any sensor reading between these two points will be scaled to the corresponding output current. The next three menus are set at the factory and should not normally need to be changed. The 4mA Output Cal menu allows the 4-20mA output to be set to exactly 4.000mA, or very close. Connect a DC current meter between the 4-20mA output and ground. Use the UP and DOWN arrows to raise and lower the raw data number (and output current) until the current meter reads as close to 4.000mA as possible. Press

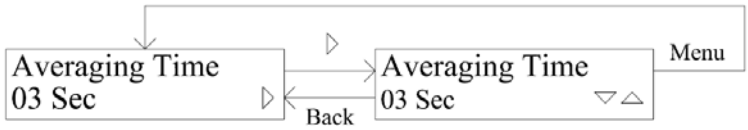
SAVE and MENU. A sensor does not need to be connected during this process. The 20mA Output Cal menu sets the 20mA output in the same way. Use UP and DOWN to adjust the output until the current meter reads exactly 20.000mA. The Calibrate Logger menu is used to recalibrate the PC320 data logger option only and will be discussed in the section titled Data Logger Option and in the Data Logger Option software manual.

Decimal Places:



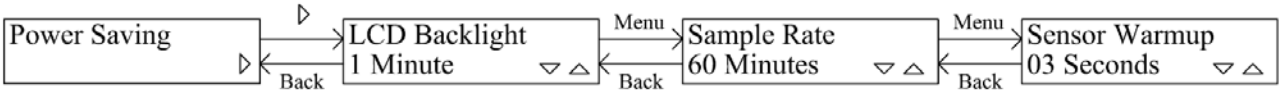
Use this menu option to set the maximum number of decimal places for the sensor readings in the display. Press RIGHT arrow to select, then UP and DOWN to change the display resolution, Then SAVE to store. If the display overflows, the decimal point will automatically be shifted to the right to provide the most accurate data. The maximum number of decimal places is 5.

Averaging Time:



The PC320 Process Controller can average the sensor reading over a programmable period of time. A one second time setting defeats the averaging feature, since the display is normally updated every second anyway. Press the RIGHT arrow button to change the setting. use the UP and DOWN arrows to set the averaging time and then press SAVE. The maximum averaging time is 30 seconds.

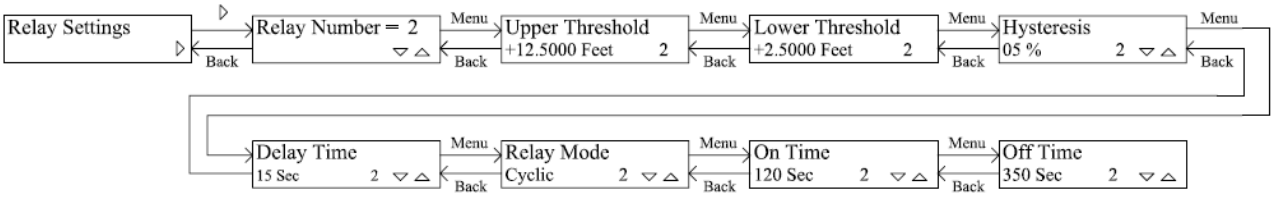
Power Saving Mode:



The power saving mode allows the average power consumption to be reduced by controlling the time the sensor and LCD backlight are turned on. To set the power saving parameters, press the RIGHT arrow button. The LCD Backlight has 3 settings, ON turns the backlight on all the time, OFF forces the backlight to be off, and 1 Minute mode will turn the backlight on when any button on the keypad is pressed, then it will turn off again after one minute of inactivity. Use the UP and DOWN arrows and SAVE to change and save the setting. The Sample Rate is the interval between sensor readings (and how often the display and 4-20mA output will be updated). Use LEFT and RIGHT to select a digit and use UP and DOWN to scroll through 0-9, press

SAVE to store the setting. The Sensor Warmup time is how long the sensor will be powered on before a reading is taken, consult the sensor manual. Set this parameter in the same manner as the sample rate. In this example the backlight is in 1 minute mode. The sensor will be turned on for 3 seconds every 60 minutes. The display and 4-20mA output will remain on but will continue to indicate the flow that corresponds to the last sensor measurement. During the time the sensor is off, the display will show the last reading and the relays will continue to operate based that.

Relay Settings:

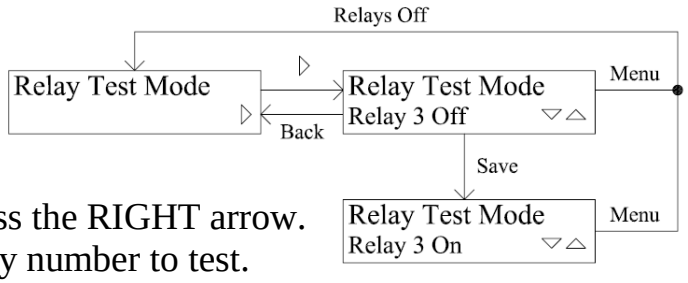


To change Relay Settings, press the RIGHT arrow button. **For more information on relay modes please consult the section of this manual titled Relay Operation.** Each relay is independent of the others and can be programmed separately. Use the UP and DOWN arrows to select which relay is to be changed, press MENU to move to the next sub-menu.

Each relay must have upper and lower threshold defined. Depending on the relay mode, the relays will trigger when the sensor reading rises above the upper threshold or below the lower threshold. If only one threshold is needed, set the other threshold outside of any normal sensor reading. By default these settings are stored as +/- 9000000 so false triggering should be prevented.

Once a relay number is selected, press Menu. Use the arrow buttons to set the +/- sign, each digit, and decimal point for each threshold number. Press SAVE. Do this for both the upper and lower thresholds as needed. The next menu defines a hysteresis percentage. Use the arrow buttons to set hysteresis and SAVE, then press MENU. Set a delay time as needed and SAVE. The last two sections set the On and Off times for the relays. Use the arrows and SAVE to change these. Note that not all of these settings make any changes to relay operation, what effect they have depends on the relay mode selected for each relay and the sensor reading.

Relay Test Mode:



To manually test relay operation, press the RIGHT arrow. Use UP and DOWN to select the relay number to test. When a relay is selected, press SAVE to toggle the relay between On and Off. Press Display or Back to exit test mode, the relays will turn off upon exit.

XI. Data Logger Option

A factory option for the PC320 is an internal data logger which records a historical record of water flow, and records the exact time of each relay pulse. Channel one of the data logger records flow and channel two records relay events. A special software package allows the programming of the logger and the download of recorded flow and relay data. This software differs from other Global Water data logger software in the way it processes the relay data. Software such as Global Logger II will work with the PC320 data logger option but some relay information will not be seen. The data logger is factory calibrated and should not need to be recalibrated again. Should you need to recalibrate the logger, consult the Data Logger Option manual.

XII. Technical Support

a. 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.

b. 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 PC320 if necessary.
Include a written statement describing the problems.

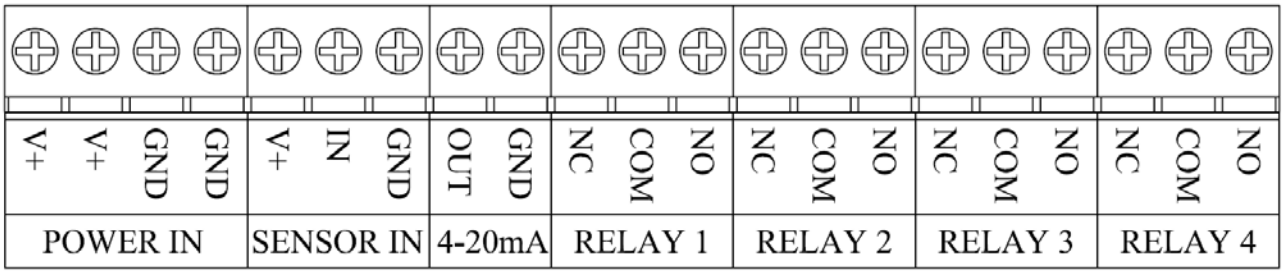
Send the package with shipping prepaid to our factory address. Insure your shipment, Global Water's warranty does not cover damage incurred during transit.

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.

XIII. Appendix A: Terminal Strip Diagram



POWER IN:

V+ 12VDC or 18-24VDC Input

V+ 12VDC or 18-24VDC Input

12VDC Input: SW7 OFF, SW8 ON

18-24VDC Input: SW7 ON, SW8 OFF

GND Power Supply and System Ground

GND Power Supply and System Ground

SENSOR IN:

V+ Sensor Power

12VDC Sensor Power: SW1 ON, SW2 OFF

18-24VDC Sensor Power: SW1 OFF, SW2 ON

(18VDC Power Input Only)

IN Sensor Input

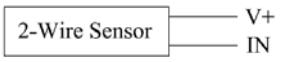
Sensor Power Continuous: SW3 ON

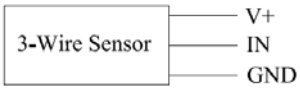
Sensor Power Switched: SW3 OFF (Power Saving Mode)

4-20mA Sensors: SW4 ON, SW5 ON

0-5VDC Sensors: SW4 OFF, SW5 ON

0-1VDC Sensors: SW4 OFF, SW5 OFF





4-20mA:

OUT 4-20mA Output

GND Power Supply and System Ground, 4-20mA return Path

RELAY 1-4: