OPERATION MANUAL

JENCO MODEL 6303
pH CONTROLLER

JENCO ELECTRONICS, LTD.
MANUFACTURER OF PRECISON INSTRUMENTS

INTENDED USE AND GENERAL INTRODUCTION FOR THE MODEL 6303

The model 6303 is a precise instrument for the measurement and control of pH. It can also be used to measure but not control temperature and mV. A built-in micro- controller stores, calculates and compensates for all the parameters relating to pH determinations, such as the temperature characteristics of the pH electrode, pH electrode offset voltage and pH electrode slope deviations, etc.

Internal EPROM allows the model 6303 to retain its calibration and set point values after AC power is turned off or due to line failures. A WATCHDOG TIMER allows the 6303 to withstand power line transients without software latch up.

A special feature of the model 6303 is that it can be calibrated with the controller on line. Removing the electrode from the process for calibration will not disturb the process under control (BUMPLESS TRANSFER).

A LOCK feature is provided for the user to program into the memory of the built-in micro-controller a special code after the control parameters are set. The set parameters cannot be changed without recalling the pre-programmed code. This LOCK feature makes the 6303 "TAMPER PROOF" against accidental or intentional tampering of the set parameters.

Additional features such as REVERSABLE isolated 4-20 mA output current (6303C), "Progressive Proportional Gain Adjusted" pulse output (6303P) for direct drive of metering pump (proportioned to H+ concentration rather than pH values), front panel programmable relay hysteresis, operational error indications, easy to read LCD displays, simplicity of operations, etc., make the 6303 an ideal instrument for the industrial measurement and control of pH.

The 6303 front panel is custom designed to NEMA 4 specification. This unique design also prevents leakage of water through the cutout on the mounting panel.

TOUCH KEYS FOR THE MODEL 6303

(REFER TO FIGURE 1)

1. MODE key
   The MODE keys select the type of parameters for the instrument to display. Select pH, mV, TEMP display by pressing the MODE key. The pH calibration values and controller outputs will not be affected by changing of display modes.
2. Command keys
   STAND, SLOPE, LOCK, HIGH, LOW, SET, RELAY, ENTER and RESET are command keys. These command keys give a direct instruction to the micro-controller to perform a specific task.
3. DIGIT and COUNT keys

Whenever the instrument is in the "SET" condition, the LSD of the display will flash, pressing the COUNT key scrolls the flashing digit from 0 to 9. Pressing the DIGIT key shifts the flashing digit to the left, allowing the next digit to be set by the COUNT key.

4. LOCK key
   The LOCK key is used to program into the memory of the micro-controller, using the DIGIT and COUNT keys, a special numeric code after the calibrate and control parameters are set. These parameters are then "locked", in that they can not be changed without recalling the pre-programmed code.
5. RESET key
   When the RESET key is pressed, the internal memory of the micro-controller is cleared. The instrument must be re-calibrated with pH buffers and the set points re-entered. The LOCK function is also cleared by the RESET key. The RESET key can only be activated when an error condition is displayed.

MEASUREMENT ERROR INDICATIONS

E--1 pH electrode offset voltage greater than +/-90mV
E--2 pH electrode slope off by +/-30%
E--3 Temperature measurement over 115℃
E--4 pH buffer temperature out of range

All error indications will disappear if the error condition is corrected.

WIRING DIAGRAM
(REFER TO FIGURE 2)

1. Connect the AC line to the rear of the instrument. The model 6303 can be used with 115 or 230 VAC 50/60 Hz. Power consumption is 6VA. Make sure that the Earth connector is connected to the earth lead of the AC power line.
2. Connect the proper load to the output relays. **Make sure that the load does not exceed the relay rating, 5 Amp at 115 VAC and 2.5 Amp at 230VAC.**
3. Set the proper load to the 4-20 mA output connector. Make sure that the load impedance is less than **550** Ohms.
4. Connect the electrode lead to the BNC connector. **A combination pH electrode is to be used**.

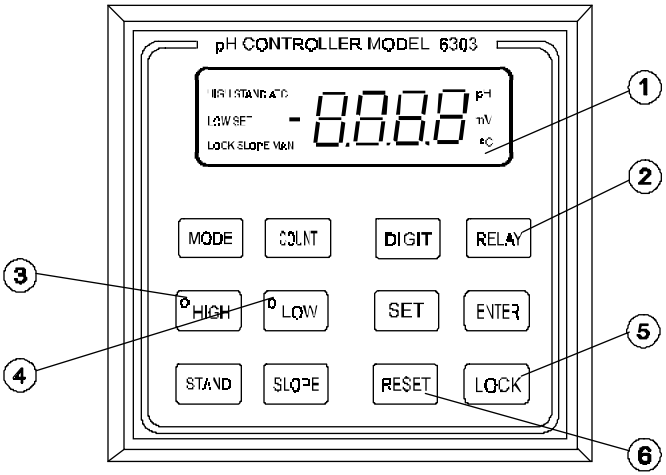


FIGURE 1 FRONT VIEW

1. LCD display
2. Splash proof keyboard
3. HIGH set point indicator
4. LOW set point indicator
5. NEMA 4 sleaving (optional)
6. RESET switch

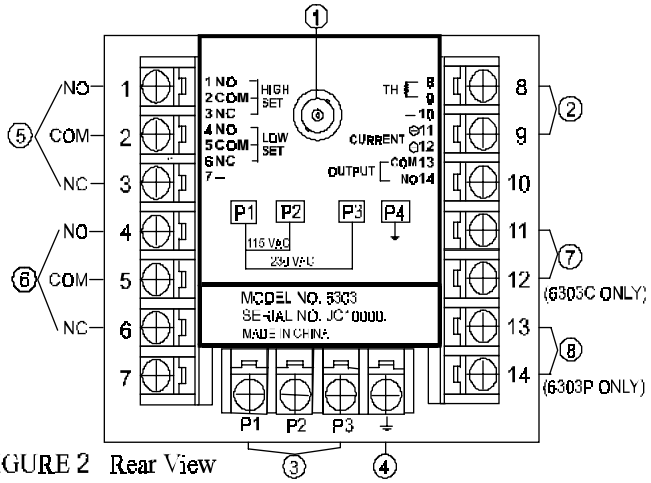
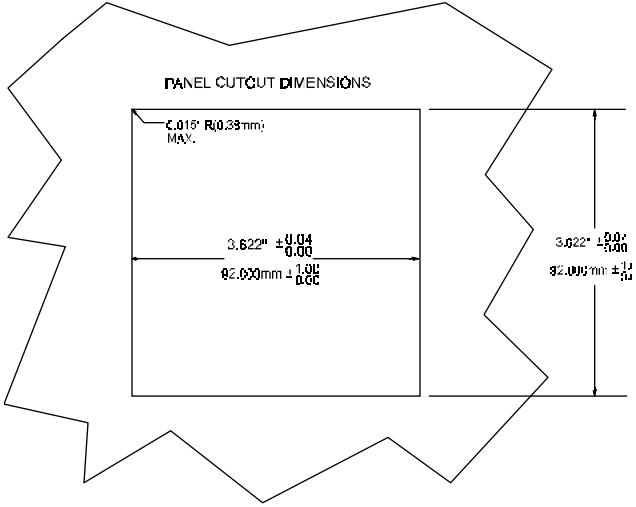


FIGURE 2 Rear View

1.pH electrode BNC connector
2.ATC/TEMP input terminals
3.AC input terminals
4.Earth terminal
5.HIGH set point relay terminals
6.LOW set point relay terminals
7.4-20 mA output terminals.**(6303C ONLY)**
8.Pulse output **(6303P ONLY)**

Mounting Procedure



Panel Cutout

Figure 4

1. Make a cutout on any panel, with a thickness of $^{1}/_{16}$" (1.5mm) to $^{3}/_{8}$" (9.5mm). (REFER TO FIGURE 4).
2. Remove the mounting brackets assembly from the panel meter and insert the panel meter into the cutout. (REFER TO FIGURE 5).
3. Replace the mounting brackets assembly onto the panel meter and fasten the mounting screws to secure the panel meter to the mounting panel. (REFER TO FIGURE 6).

Warning

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Cleaning the instrument

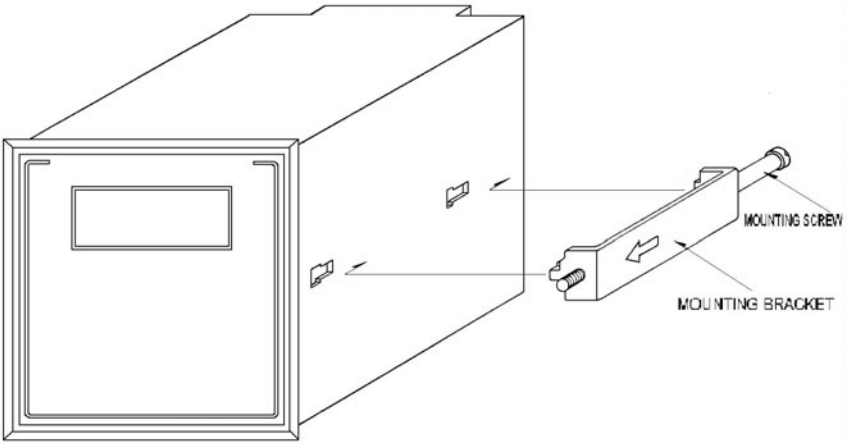
1. Be sure to remove the power before attempting to clean the meter.
2. Use a lint free cloth and clean water or neutral detergent.
3. Wipe the outer surface of the instrument only.
4. Wipe dry the instrument before plugging the power.

Power

Use 115 VAC or 230 VAC 50/60 Hz AC power source only.

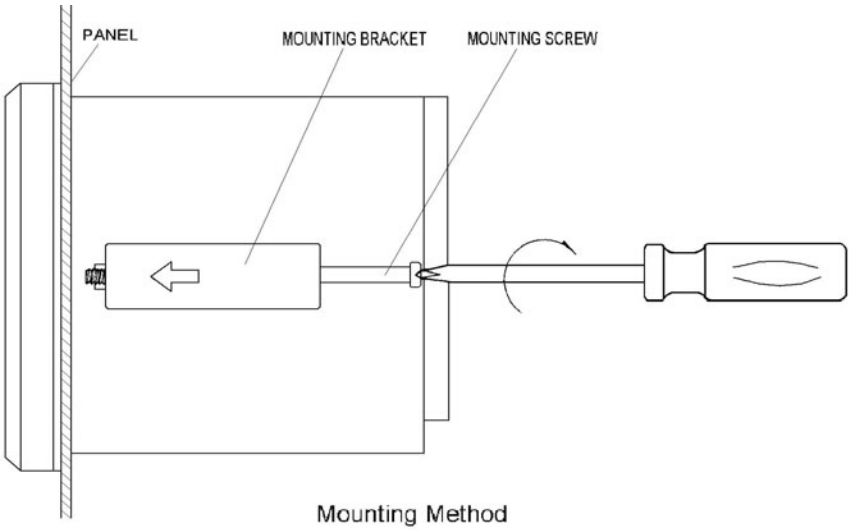
Fuse

Use 315 mA/250V fast acting glass tube fuse only.



Panel Meter With Mounting Brachet And Screw

Figure 5



Mounting Method

Figure 6

pH CALIBRATION

Connect the power cord to the AC line. The instrument will enter into the state when the instrument was last turned off, as the internal EPROM retains all previous values. **It is not necessary to press the RESET key before calibration.**

TEMPERATURE COMPENSATION and MANUAL SETTING

1. The unit will be in the ATC mode when the thermistor sensing probe is connected. The "ATC" announciator will be displayed.
2. The unit can be used in the manual temperature compensation mode. The "MAN" announciator will be displayed when the temperature probe is not connected to the unit
   A. Press the MODE key for the meter to display temperature
   B. Press the SET key, the LSD will flash
   C. Press the DIGIT and COUNT keys for the desired temperature reading
   D. Press ENTER key

CALIBRATION WITH BUFFER SOLUTIONS

Once the STAND key is pressed all outputs are frozen, ie, it will no longer track the input from the pH electrode. This allows the instrument to be calibrated without disrupting the control loop.

SINGLE POINT CALIBRATION

1. Press the MODE key to enter the pH mode
2. Press the STAND key
   A. The "SET" announciator will be displayed, indicating that all outputs from the instrument are frozen to the status when the "STAND" key is pressed. **E--1 MAY APPEAR. DO NOT PRESS THE RESET KEY.**
   B. The display 06.86 pH start to flash ,you can press "DIGIT" "COUNT" to enter desired buffer value corresponding to the buffer temperature. Example 6.86 or 7.00 pH at 25℃
3. Immerse the electrode in the first buffer, 6.86 pH or 7.00pH
   E--1 should disappear.
4. Press the "ENTER" key ,the instrument displays a flashing buffer value corresponding to the buffer temperature you set at 2.B.(refer to TABLE 1or 2).
5. When the electrode is stable to within +/- 0.02 pH, the display will stop flashing, the STAND annunciator will appear and display the buffer value you set at 2.B

6. If the display still drift, press the STAND key to repeat standardization.
7. **If E--1 does not disappear, check to make sure**
   A. The electrode offset is less than +/- 90 mV
   B. The correct buffer is used.
8. Press the MODE key(Don't press MODE key if you want do two point calibration)
   A. The "SET" annunciator will disappear and the output will again track the input pH values
   B. The instrument is single point calibrated to the theoretical slope and is ready for measurements .(Refer to DUAL POINT CALIBRATION if two point calibration is required).

DUAL POINT CALIBRATION

1. Immerse the pH electrode in buffer 4.01 ,9.18 or 10.01pH.
2. Press the SLOPE key
   A. The "SET" annunciator will be display ,Indicating that all output from the instrument are frozen to the status when the "SLOPE" key is pressed .
   B. The display 04.01 or 09.18 pH start to flash ,you can press "DIGIT" and "COUNT" to enter desired buffer value corresponding to the buffer temperature Example 4.01,9.18 or 10.01 pH at 25 ℃
3. Press the "ENTER" key, the instrument displays a flashing buffer value corresponding to the buffer temperature you set at 2.B (refer to TABLE 1 or 2).
4. When the pH electrode is stable to within +/- 0.02 pH, the display will stop flashing, the slope annunciator will appear and display the buffer value you set at 2.B.
5. If **E—2** is displayed, check to make sure that :
   A. The electrode slope is within +/- 30% of theoretical value.
   B. The correct buffer is used.
6. If the display still drifts, press the "SLOPE" key to repeat the calibration in the second buffer.
7. Press the "MODE" key :
   A. The "SET" annunciator will disappear and the output will again track the input pH values.
   B. The instrument is dual point calibrated and is ready for measurements.

RELAY HYSTERESIS AND SET POINTS

RELAY HYSTERESIS SET

1. Enter the pH mode by pressing the MODE key
2. Press the RELAY key, the instrument will display HL10, indicating that the hysteresis of the HIGH set point and LOW set point relay is +/-0.10 pH

3. Press the SET key, DIGIT and COUNT keys to enter the desired hysteresis value
4. Press the ENTER key

RELAY HIGH SET POINT

1. Press the RELAY,HIGH and the SET keys
2. Enter the desired set point value via the DIGIT and COUNT keys
3. Press the ENTER key
4. The relay will be energized if the display is greater than the HIGH set point value, the LED lamp on the HIGH keypad will be ON

RELAY LOW SET POINT

1. Press the RELAY, LOW and the SET keys
2. Enter the desired set point value via the DIGIT and COUNT keys
3. Press the ENTER key
4. The relay will be energized if the display is less than the LOW set point value, the LED lamp on the LOW keypad will be ON

ISOLATED CURRENT OUTPUT (MODEL 6303C ONLY)

The 4-20 mA current output is proportional to the pH value between the HIGH and the LOW set points. The load impedance should be less than **550** ohms.

20 mA SET POINT

1. Press the HIGH, SET keys
2. Press the DIGIT and COUNT keys for the desired 20 mA output pH value
3. The 20 mA value can be any value between 0.00 and 14.00 pH
4. Press the ENTER key

4 mA SET POINT

1. Press the LOW, SET key
2. Press the DIGIT and COUNT keys for the desired 4 mA output pH value
3. The 4 mA value can be any value between 0.00 and 14.00 pH
4. Press the ENTER key

EXAMPLE
(REFER TO FIGURE 3)

1. 20 mA set point at 14.00 pH, 4 mA set point at 0.00 pH

Current output is 12 mA at pH 7.00, output increase for increasing pH inputs

2. 20 mA set point at 8.00 pH, 4 mA set point at 10.00 pH
   Current output is 12 mA at 9.00 pH, output decrease for increasing pH inputs

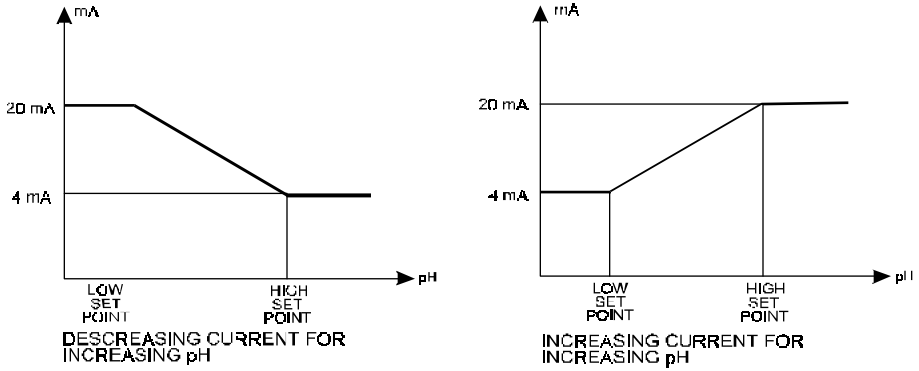


FIGURE 3 CURRENT OUTPUT

PULSE FREQUENCY OUTPUT (MODEL 6303P ONLY)

The "Progressive Proportional Gain Adjusted" pulse output is used to directly drive a pulse driven dosing pump. The output volume of the dosing pump is directly proportional to the output pulse rate of the 6303 controller. **The 6303 is calibrated for the pulse rate to be proportional to the concentration of the OH- or H+ ions, instead of the pH value, for a set point differential of 2 pH units.**

100 PPM(PULSE PER MINUTE) SET POINT

1. Press the HIGH, SET keys
2. Press the DIGIT and COUNT keys for the desired 100 PPM output pH value
3. The 100 PPM value can be any value between 0.00 and 14.00 pH
4. Press the ENTER key

1 PPM(PULSE PER MINUTE) SET POINT

1. Press the LOW, SET keys
2. Press the DIGIT and COUNT keys for the desired 1 PPM output pH value

3. The 1 PPM value can be any value between 0.00 and 14.00 pH
4. Press the ENTER key

EXAMPLE

1. 100 PPM set point at 14.00 pH, 1 PPM set point at 0.00 pH
Pulse frequency is 10 PPM at 7.00 pH, output rate increase for increasing pH inputs
2. 100 PPM set point at 8.00 pH, 1 PPM set point at 10.00 pH
   A. Pulse frequency is 10 PPM at 9.00 pH, output rate decrease for increasing pH inputs
   B. Since the set point differential is exactly 2 pH units, the pulse rate conforms to the H+ ion concentration.

SET POINT LOCK

The calibration and set point values can be "locked" to prevent tampering of the instrument.

LOCK

1. Press the LOCK, SET keys, 0000 will display and flashing last digit.
2. Press the DIGIT and COUNT keys for the desired numeric code
3. Press the ENTER key, the "LOCK" announciator will be displayed
4. The instrument is "locked", all calibration and set values cannot be changed via the keyboard

UNLOCK

1. Press the LOCK, SET keys
2. Press the DIGIT and COUNT keys to the same numeric code to “lock”the instrument
3. Press the ENTER key, the "LOCK" announciator will disappear
4. The instrument is "unlocked", new parameters can be entered

pH BUFFER TABLE 1

Temp(℃)	6.86	4.01	9.18
0	6.98	4.00	9.46
5	6.95	4.00	9.39
10	6.92	4.00	9.33
15	6.90	4.00	9.28
20	6.88	4.00	9.22
25	6.86	4.01	9.18
30	6.85	4.02	9.18
35	6.84	4.02	9.10
40	6.84	4.04	9.07
45	6.83	4.05	9.04
50	6.83	4.06	9.01
55	6.83	4.08	8.98
60	6.84	4.09	8.96

TEMPERATURE COEFFICIENT OF THE pH BUFFERS

	BUFFERS		
Temp(℃)	10.01	7.00	4.01
0	10.32	7.11	4.00
5	10.25	7.08	4.00
10	10.18	7.06	4.00
15	10.12	7.03	4.00
20	10.06	7.01	4.00
25	10.01	7.00	4.01
30	9.97	6.98	4.02
35	9.93	6.98	4.02
40	9.98	6.97	4.03
45	9.86	6.97	4.04
50	9.83	6.97	4.06
55	9.80	6.97	4.07
60	9.78	6.98	4.10

SPECIFICATIONS FOR THE MODEL 6303 pH CONTROLLER

Table 2

RANGE	
pH	-2.00 to 16.00
mV	-1999 to +1999
Temp	-3.0 to 115.0℃
RESOLUTION	
pH	0.01
mV	1
Temp	0.1
ACCURACY (+/-1 DIGIT)	
pH	+/-0.01
mV	+/-0.1
Temp(-3 to 115℃)	+/-0.2
ATC (-3 to 115℃)	+/-0.2
INPUT IMPEDANCE	Greater than 10^{12} Ohms
TEMPERATURE COMPENSATION	-3 to +115.0℃
AUTO	-3 to +115.0℃
MANual	
ELECTRODE BUFFER RECOGNITION	
SINGLE POINT STANDARDIZATION	
DUAL POINT STANDARDIZATION	
BUMPLESS CALIBRATION	
DISPLAY LOCK	

RELAY SET POINT HYSTERESIS	**ISOLATION VOLTAGE**
RELAY OUTPUT	**POWER SOURCE**
	POWER FAILURE BACKUP
CE CERTIFICATION	**DIMENSIONS**
NEMA 4	
Current OUTPUT (6303C-pH)	**WEIGHT**
	FUSE
4-20 mA OUTPUT	**STORAGE TEMPERATURE**
	AMBIENT TEMPERATURE
Yes	
Eliminates electrode offset	
Calculates and compensates for electrode slope deviation	1000 VDC
	0.1% of span
Output do not change during calibration	0.4mA typical
0.5 inch high LCD display	550 Ohms min
Set values cannot be changed without entering the user programmable LOCK code	
User programmable	Reversible 1 to 100 ppm output
5 Amp at 115 VAC , 2.5 Amp at 230 VAC	Between any two set points
To be approved	1000VDC max
In front of the MOUNTING panel	115,230VAC +/- 15% 50/60Hz
	yes
	1/4 DIN case, 4.25 inch deep behind mounting panel (BNC
Reversible 4 to 20 mA output	connector included)
Between any two points	1.65 lbs
4-20 mA OUTPUT ISOLATION	315 mA 250V
4-20 mA OUTPUT LINEARITY	0 to 65 ℃
4-20 mA OUTPUT NOISE	0 to 50 ℃
4-20 mA LOAD	

PULSE OUTPUT (6303P-pH)

PULSE FREQUENCY

WARRANTY

Jenco Instruments, Ltd. Warrants this product to be free from significant deviations in material and workmanship for a period of 1 year from date of purchase. If repair or adjustment is necessary and has not been the result of abuse or misuse, within the year period, please return-freight-prepaid and the correction of the defect will be made without

charge. If you purchased the item from our Jenco distributors and it is under warranty, please contact them to notify us of the situation. Jenco Service Department alone will determine if the product problem is due to deviations or customer misuse.

Out-of –warranty products will be repaired on a charge basis.

RETURN OF ITEMS

Authorization must be obtained from one of our representatives before returning items for any reason. When applying for authorization, please have the model and serial number handy, including data regarding the reason for return. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Jenco will not be responsible for damage resulting from careless or insufficient packing. A fee will be charged on all unauthorized returns.
NOTE: Jenco Instruments, Inc reserves the right to make improvements in design, construction, and appearance of our products without notice.

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