

OPERATION MANUAL

The Jenco models 693pH/695pH

JENCO ELECTRONICS, LTD.
MANUFACTURER OF PRECISION INSTRUMENTS

GENERAL INTRODUCTION

The Jenco models 693pH/605pH are 2-wire pH transmitters with input/output isolation, wide power supply range, high input impedance, LCD display(695pH only), DIP switch programmable SPAN/ZERO range(695 pH only), manual/automatic temperature compensation, modular design and housed in a NEMA 4X enclosure.

The models 693pH/695 pH can used with any pH electrode with BNC coaxial connector. The input pH signal is converted to a 4 to 20 mA DC current output for transmission over the power supply leads to any desired location for indication, control, etc. The power supply range required to operate the transmitter is 11 to 80 VDC.

Input/output signal isolation eliminates ground loops and ground voltage differentials. In many applications, the signal ground can vary as much as a few hundred volts from the output ground

For the model 695 pH , the pH value is displayed by a LCD display. A push button switch allows the LCD display to indicate the output current in milliamps.

Internal DIP switches and trimmers are provided to allow the SPAN to be programmable from 1 pH to 14 pH over the entire measurement range of 0 to 14 pH (Model 695 only)

INITIAL INSPECTION

Carefully unpack the instrument and accessories. Inspect for damage in shipment. If any damage is found, notify your JENCO REPRESENTATIVE IMMEDIATELY. All packing material should be saved until satisfactory operation is confirmed

INPUT/OUTPUT WIRING

(REFER TO FIGURE 1 AND FIGURE 2)

1. Loosen the 4 plastic screws and lift the case top to access to the internal connectors.
Loosen the 4 philips head screws to lift out the PC board module.
2. Drill the proper size hole in the case to mount the desired watertight cable fitting connectors.
3. Connect the BNC connector of the pH electrode through the cable fittings to the PC board.
4. Connect the power supply leads to the terminal block. NOT THE POLARITY OF THE SUPPLY LEADS. The lead length is limited only by the resistance of the leads and the supply voltage. The maximum lead resistance R is defined by-
$$R = (\text{Supply Voltage} - 11) / 20 \text{ mA}$$
4. Connect the leads of the ATC probe to the terminal block. A fixed resistor can be used in place of the ATC probe, if the temperature of the solution is constant. Refer to Table 1 for the resistance to temperature values.
5. Secure the PC board module to the case with the 4 philips head screws.

ATC PROBE RESISTANCE TO TEMPERATURE DATA

Use the following table to select the resistor to simulate the process temperature when the ATC probe is not used and only if the process temperature is relatively constant.

pH measurement error due to temperature is approximately 0.0033 pH/pH/C from pH 7.00

Temperature °C	Resistance Kohm
0	2.685
25	3.000
40	3.185
50	3.315
70	3.570
90	3.825
100	3.950

Table 1

The Resistance can be calculated by the following to within 1 °C

$$R=3.00+(T-25) \times 0.01265$$

MODE SWITCH

(FOR THE MODEL 695 ONLY REFER TO FIGURE 1)

1. The MODE SWITCH is a watertight momentary switch located on the front cover of the case. “Press for mA” is marked on the top cover.
2. When the MODE SWITCH is pressed and held, the instrument will display the output current value in milliampere.
3. The instrument will display the pH value when the MODE SWITCH is released.

SLOPE AND STANDARDIZE CONTROLS

(REFER TO FIGURE 2)

1. The STAND (standardize) control(P2) located on the PC board module, is used to adjust the electrode offset voltage.
2. The SLOPE control (P1) located on the PC board module, is used to adjust the sensitivity of the electrode input signal
3. The measurement system, instrument with pH electrode, must be calibrated, using the STAND and SLOPE controls, against pH buffer solutions to compensate for the deviation of the pH electrode from theoretical values.
4. For accurate pH measurements, the measurement system must be calibrated periodically and when a new pH electrode is installed.

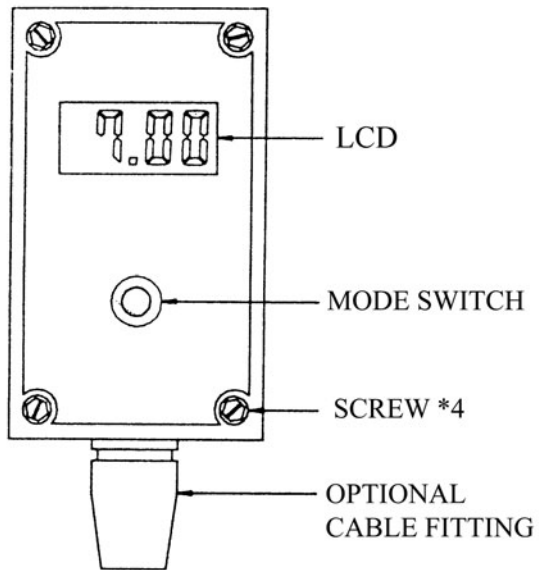


FIGURE 1:GASE PANEL

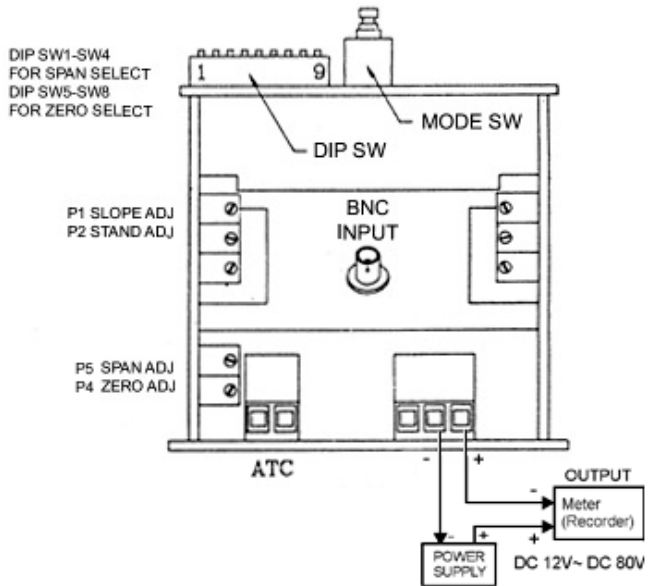


FIGURE 2:PC BOARD MODULE

DIP SWITCH SELECTION FOR THE 4-20 mA OUTPUT RANGE

(FOR THE MODEL 695 ONLY THE 4-20 mA OUTPUT FOR THE MODEL 693 IS FIXED INOUT RANGE OF 0 TO 14 pH)

The 4 to 20 mA output can be selected to cover input SPAN of 1 to 14 pH over the entire measurement range of 0 to 14 pH

1. INPUT SPAN-

The SPAN can be calculated from the input range corresponding to an output of 4 to 20 mA

Example Input range of pH 3 to pH 8

pH 3=4 mA

pH 8=20mA

SPAN =8-3=5pH

The pH value at the 4 mA output must be smaller than the pH value at the 20 mA output .

2. OFFSET VOLTAGE-

The example shown above indicates that an OFFSET voltage must be introduced as the input range is not symmetrical around the isopotential point of 7.00

The offset voltage is calculated by the following

$$\text{OFFSET voltage} = [70 \times (\text{pH at 4mA})] / \text{SPAN}$$

3. Use the following rule to set the DIP switch for the desired input range corresponding to 4 to 20 mA

3.1 Select the desired SPAN with DIP switches SW1 to SW4 as shown below

SPAN	SW1	SW2	SW3	SW4
14	ON	OFF	OFF	OFF
13	OFF	ON	OFF	OFF
12	ON	ON	OFF	OFF
11	OFF	OFF	ON	OFF
10	ON	OFF	ON	OFF
9	OFF	ON	ON	OFF
8	ON	ON	ON	OFF
7	OFF	OFF	OFF	ON
6	ON	OFF	OFF	ON
5	OFF	ON	OFF	ON
4	ON	ON	OFF	ON
3	OFF	OFF	ON	ON
2	ON	OFF	ON	ON
1	OFF	ON	ON	ON

3.2 Calculate the offset voltage and set the DIP switches SW5 to SW8 to the mV value closest to that shown below

OFFSET mV	SW5	SW6	SW7	SW8
0	OFF	OFF	OFF	OFF
70	ON	OFF	OFF	OFF
140	OFF	ON	OFF	OFF
210	ON	ON	OFF	OFF
280	OFF	OFF	ON	OFF
350	ON	OFF	ON	OFF
420	OFF	ON	ON	OFF
490	ON	ON	ON	OFF
560	OFF	OFF	OFF	ON
630	ON	OFF	OFF	ON
700	OFF	ON	OFF	ON
770	ON	ON	OFF	ON
840	OFF	OFF	ON	ON
910	ON	OFF	ON	ON

3.3 Example-

pH 4=4.00mA pH 10 =20mA

SPAN =10-4=6

SW1-ON SW2-OFF SW3-OFF SW4-ON

OFFSET voltage =(70 X 4)/6=36.67

SW5-ON SW6-OFF SW7-OFF SW8-ON

FINE ADJUSTMENT OF THE 4 TO 20mA Output

(FOR MODEL 695 ONLY REFER TO FIGURE 2)

1. Connect a 3 Kohm resistor to the ATC input and apply power to the instrument.
2. Input a DC signal voltage for the display to indicate the pH value at 3mA
3. Press/hold the MODE switch and set the 4mA ADJ control(P5) for the display to indicate 4.0mA.
4. Input a DC signal voltage for the display to indicate the pH Value at 20mA
5. Press/hold the MODE switch and set the 20mA ADJ control (p4) for the display to indicate 20.0 mA.
6. Repeat 2 through 3 till both values are correct.

The Following table shows the approximate input voltage to the displayed pH value at 25 °C. It is important for the display to indicate the correct pH value as the output current is referred to the displayed pH value and not to the input mV Value.

PH	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0
MV	0.0	-59	-118	-178	-237	-296	-355	-414
PH	7.0	6.0	5.0	4.0	3.0	2.0	1.0	0.0
MV	0.0	59	118	178	237	296	355	414

pH CALIBRATION

1. Rinse the pH electrode and ATC probe with distilled water or buffer 7.00 and immerse in buffer 7.00. Allow sufficient time for the pH electrode and ATC probe to reach temperature equilibrium with the buffer solution.
2. Set the STAND control for the display to indicate the buffer value corresponding to the temperature of the buffer.
3. Rinse the electrode and ATC probe with distilled water or the next buffer used and immerse in buffer 4.01 or buffer 10.01. Allow sufficient time for the pH electrode and ATC probe to reach temperature equilibrium with the buffer solution.
4. Set the SLOPE control for the display to indicate the buffer value corresponding to the temperature of the buffer solution.
5. The instrument is dual point calibrated and ready for use.
6. Secure the case top to the instrument .

The following shows the temperature/buffer values-

Temp(°C)	0	10	20	25	30	40	50	60
Buffer 4.00	4.00	4.00	4.00	4.01	4.01	4.00	4.06	4.10
Buffer 7.00	7.11	7.06	7.01	7.00	6.98	6.97	6.97	6.98
Buffer 10.01	10.32	10.18	10.06	10.01	9.97	9.89	9.83	9.78

Buffers other than 4.01 and 10.01 may be used.

4-20 mA OUTPUT AND POWER SUPPLY

1. The output of the transmitter is set to 4 mA to 20 mA. The pH value can be obtained by measuring the transmitter output current (A) based on the following equation.

$$PH = [(A - 4) / 16] \times [pH \text{ at } 20\text{mA} - pH \text{ at } 4\text{mA}] + pH \text{ at } 4\text{mA}$$

Example: A=12mA

PH value at 4mA is 1, pH value at 20mA is 7

$$PH = [(12 - 4) / 16] \times [7 - 1] + 1 = 4$$

2. The minimum load (R) is determined by the following equation

$$R = [\text{Supply Voltage} - 11] / 20$$

The maximum load (R) includes the total loop resistance of the lead wires from the power supply.

OUTPUT ISOLATION

The power supply ground is isolated from the pH electrode. If the pH electrode is in contact with the process ground, the voltage difference between the two grounds can differ greatly causing measurement error and /or damage to the instrument. Input/Output isolation eliminates this problem.

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.

JENCO INSTRUMENTS, INC.

7968 Arjons Drive, Suite C
San Diego, CA 92126 USA
TEL: 858-578-2828 FAX: 858-578-2886
E-MAIL: jencoi@ix.netcom.com

JENCO ELECTRONICS, LTD.

PO. BOX LINKOU 117
TAIPEI, TAIWAN
TEL: 02 601-6191 FAX: 02 601-7206
E-MAIL: jencoe@ms2.hinet.net

SHANGHAI JENCO ELECTRONICS, LTD.

18 Wang Dong Zhong Road Sijing Town, Songjiang
SHANGHAI, CHINA
TEL: (86-021)5761-9599 FAX: (86-021)5761-9598
E-MAIL: jenco@public.sta.net.cn
Homepage: <http://www.jenco.com.cn>