

OPERATION MANUAL

JENCO MODEL 6173 MICROCOMPUTER BASED pH/mV/Temperature BENCH METER

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INITIAL INSPECTION

Carefully unpack the instrument and accessories. Inspect for damages made in shipment. If any damage is found, notify your Jenco representative immediately. All packing materials should be saved until satisfactory operation is confirmed.

GENERAL INTRODUCTION

The model 6173 is a precise instrument for the measurement of pH, mV and temperature. A built-in microcomputer is used to store, calculate and compensate for all the relevant parameters relating to pH determinations. These include temperature characteristics of the pH electrode, buffer solutions and electrode slope deviations.

The mechanical touch keys are highly reliable with tactile and audio feedback. This meter can be operated with six 1.5V batteries. Re-calibration is not required when power is turned on again.

The meter has a large LCD that displays the pH (mV) and temperature simultaneously along with the user-prompting mode indication annunciators. The instrument prompts the user through the calibration and measurement procedures.

An AUTOLOCK feature is provided for both pH and mV measurements. This enables the instrument to automatically sense the end point and "lock" the reading to indicate the end point value of a measurement. The 6173 can also be used in the non-AUTOLOCK mode.

The AUTOLOCK and the user prompting features help eliminate most of the errors in the determination of pH and mV values.

The model 6173 uses pH and ORP electrodes with BNC connectors and interchangeable ATC (Automatic Temperature Compensation) / Temperature probes.

Other features include electrode offset recognition, electrode slope recognition, electrode efficiency display, built in buffer coefficients, automatic or manual temperature compensation.

BATTERIES REPLACEMENT

Follow the procedures to replace the internal batteries.

1. Replace batteries when the BAT indicator appears on the LCD . The instrument can operate within specifications for approximately one hour after BAT starts to appear.
2. The battery compartment is located at the bottom side of the meter (Refer to Figure 1). Flip the meter over so that the bottom side is facing up. Lift the battery cover to expose the battery compartment.
3. Replace all six type AA batteries.
4. Replace battery cover.

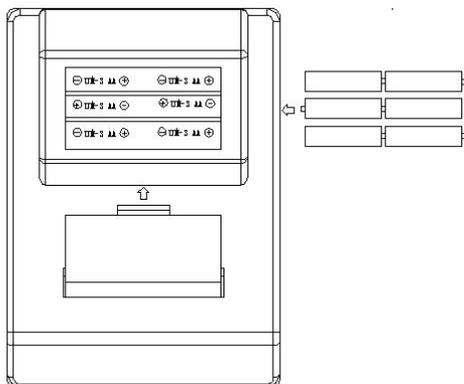


Figure 1

TURNING ON/OFF THE INSTRUMENT

When the instrument is not in use, press the **ON/OFF** key to turn off the instrument. Unplugging the AC adaptor from the instrument or from the AC line does not turn off the instrument. It would automatically switch to the internal batteries. The instrument will continue to operate on the internal batteries.

ABOUT LCD DISPLAY

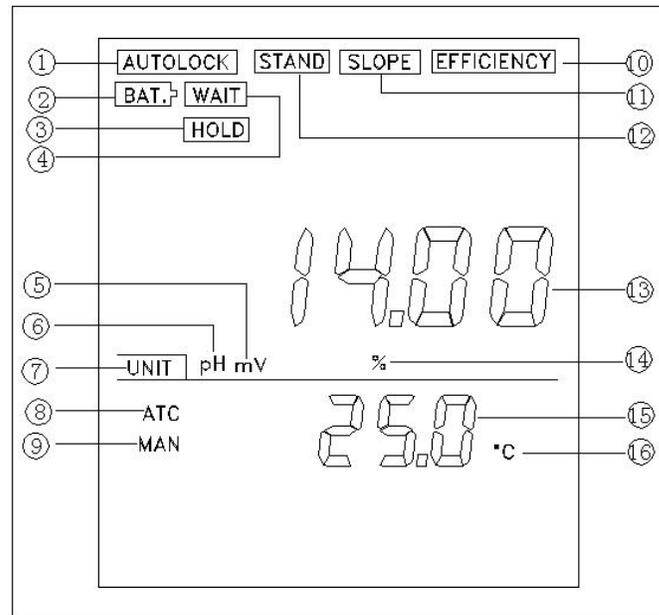


Figure2

1. AUTOLOCK : In the autolock mode.
2. BAT. : Low battery indicator.
3. HOLD : Input is locked
4. WAIT : Waiting to lock.

- 5. mV : mV unit.
- 6. pH : pH unit.
- 7. UNIT : Unit indicator.
- 8. ATC : ATC mode indicator.
- 9. MAN : MANUAL mode indicator.
- 10. EFFICIENCY: Efficiency of electrode.
- 11. SLOPE : Calibration indicator
- 12. STAND : Calibration indicator
- 13. 14. 00 : Main LCD display
- 14. % : Efficiency unit
- 15. 25. 0 : Second LCD display
- 16. °C : Temperature unit

KEY FUNCTIONS OF THE MODEL 6173

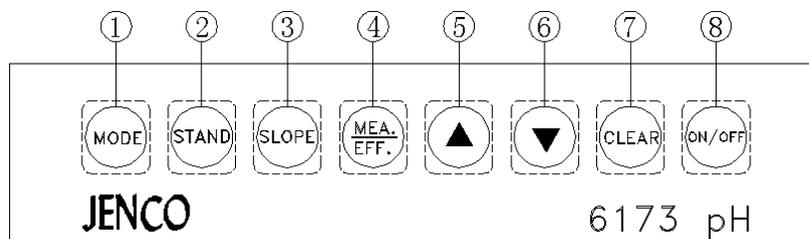


Figure3

1. [MODE] key : The [MODE] key selects the parameters to be displayed. Pressing the [MODE] key changes the display sequentially to display : pH-AUTOLOCK , mV-AUTOLOCK , pH and mV. The calibration values will not be affected by changing the display modes.

- 2.&3. [STAND] and [SLOPE] keys: The [STAND] and [SLOPE] keys are used for dual point pH calibration of the instrument.
Pressing and holding the [STAND] key while turning on the power ,will chang the buffer set to the other available buffer set.
4. [MEA./EFF.] key : a. The [MEA./EFF.] key is used to bring the instrument out of the AUTOLOCK condition when operating in the pH-AUTOLOCK or mV-AUTOLOCK mode.
b. Press and hold this key for 5 seconds, the large LCD will display the efficiency of the electrode.
- 5.&6. The [Δ] and [∇] keys : The [Δ] and [∇] keys are used to manually enter the temperature values. They have no effect on the instrument when operating in ATC mode.
7. [CLEAR] key : The [CLEAR] key is used to clear all calibration values stored in the internal memory. Under normal use the key will not be activated unless pressed and held for 2 seconds.
8. [ON/OFF] key : The [ON/OFF] key turns the instrument on or off. The pH calibration values will not be erased when the instrument is turned off.

CONNECTOR

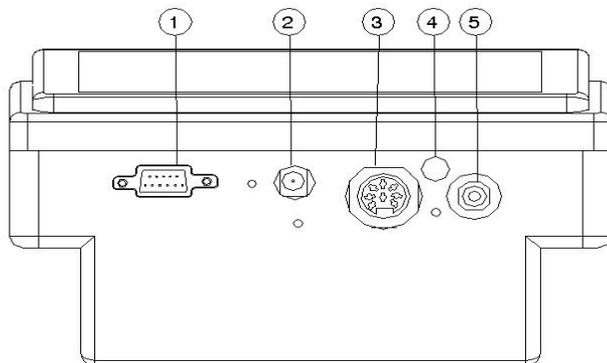


Figure 4

- | | |
|---------------------|-------------------------------|
| 1. RS-232 connector | 2. AC adaptor input connector |
| 3. ATC connector | 4. Ref. Input connector |
| 5. pH/ORP connector | |

OPERATIONAL PROCEDURES

BUFFER TABLE SELECT

There are two sets of buffer available for this unit :
4.01, 7.00, 10.01pH and 4.00, 6.86, 9.18pH.

You can change the buffer set by turning off the unit then press and hold the [STAND] key as you turn on the unit again.

pH CALIBRATION

Turn on the instrument by pressing the [ON/OFF] key. When turn on, the display maintains at the same mode before shut down.

1. Calibration with an ATC/Temp probe in the pH-AUTOLOCK mode.
 - 1.1 Connect the pH electrode to the BNC connector and the ATC/Temp probe to the ATC/Temp connector of the instrument. The ATC annunciator on the LCD will be on. Press the [MODE] key if necessary to go to pH-AUTOLOCK mode.
 - 1.2 Rinse the pH electrode and ATC/Temp probe in distilled water and immerse them in pH buffer 7.00(6.86). The instrument will display the buffer temperature.
 - 1.3 Press the [STAND] key. The STAND annunciator will be on and the WAIT annunciator will flash. At this time the instrument is waiting for a stable reading. The display will be locked to the buffer value corresponding to the temperature of buffer 7.00 (6.86) as set in 1.2. When a stable reading is reached, the WAIT annunciator will stop flashing and stay off. The SLOPE annunciator will start to flash. This means that the standardization at buffer 7.00(6.86) has been completed and the instrument is now ready to be sloped at a second buffer.
Allow sufficient time for the electrode and ATC/Temp probe to stabilize before taking any action.
 - 1.4 Remove the pH electrode and ATC/Temp probe from buffer 7.00 (or 6.86) and rinse both in distilled water. After rinsing, immerse both in buffer 4.00(4.01) or 9.18(10.01) pH.
 - 1.5 Press the [SLOPE] key. The SLOPE annunciator will stop flashing and stay on. The WAIT annunciator will start to flash, indicating that the instrument is waiting for a stable reading. The display will be

locked to the second buffer value corresponding to the temperature of the second buffer. When a stable reading is reached, the WAIT annunciator will stop flashing and stay off. The instrument will calculate and compensate for the pH electrode slope deviation corresponding to the values of the two calibration buffers. The instrument is now dual point calibrated and ready for measurements.

After two point calibration, pressing and holding the [MEA./EFF.] key for about 5 seconds will display the new electrode efficiency.

2. Calibration with manual temperature compensation in the pH-AUTOLOCK mode.
 - 2.1 Connect the pH electrode to the BNC connector of the instrument. The MAN annunciator will be on. Press the [MODE] key if necessary to go to pH-AUTOLOCK mode.
 - 2.2 Rinse the pH electrode in distilled water and immerse it in buffer 7.00(6.86). Set the instrument to display the temperature of the buffer by pressing the [Δ] and [∇] keys. The displayed temperature must be less than 60. °C
 - 2.3 Press the [STAND] key. The STAND annunciator will be on and the WAIT annunciator will flash. This means that the instrument is waiting for a stable reading. The display will be locked to the buffer value corresponding to the temperature of buffer 7.00 (or 6.86) as set in 2.2. When a stable reading is reached, the WAIT annunciator will stop flashing and stay off. The SLOPE annunciator will start to flash, indicating that the standardization at buffer 7.00(6.86) is

completed and the instrument is ready to be sloped at a second buffer.

Allow sufficient time for the electrode and ATC/Temp probe to stabilize before taking any action.

- 2.4 Remove the pH electrode from buffer 7.00 (or 6.86), rinse with distilled water and immerse it in buffer 4.00(4.01) or 9.18(10.01). Set the instrument to the temperature of the 2nd buffer as in 2.2. The displayed temperature must be less than 60. °C
- 2.5 Press the [SLOPE] key. the SLOPE annunciator will stop flashing and stay on. The WAIT annunciator will start to flash, indicating that the instrument is waiting for a stable reading. The display will be locked to the value of the second buffer corresponding to the temperature of the second buffer as set in 2.3 . When a stable reading is reached, the WAIT annunciator will stop flashing and stay off. The instrument will calculate and compensate for the pH electrode slope deviation corresponding to the values of the two calibration buffers. The instrument is now dual point calibrated and ready for measurements.

3. Calibration with ATC/Temp probe in pH mode.

- 3.1 Connect the pH electrode to the BNC connector and the ATC/Temp probe to the ATC/Temp connector of the instrument. The ATC annunciator on the LCD will be on. Press the [MODE] key for the LCD to display pH and the AUTOLOCK annunciator to be off.
- 3.2 Rinse the pH electrode and ATC/Temp probe in distilled water and immerse them in pH buffer 7.00(6.86).the instrument will display the buffer temperature.
- 3.3 Allow sufficient time for the electrode and ATC/Temp

probe to stabilize. Press the [STAND] key. The STAND annunciator will be on and the SLOPE annunciator will flash, indicating that standardization at buffer 7.00 (6.86) is completed and the instrument is ready to be sloped at a second buffer. The instrument will display the buffer value corresponding to the temperature of the buffer 7.00(6.86) as measured in 3.2. If the reading still drifts, repeat 3.3 until a stable reading is obtained.

3.4 Remove the pH electrode and ATC/Temp probe from buffer 7.00(6.86). Rinse them in distilled water and immerse them in buffer 4.00(4.01) or 9.18(10.01). The instrument will display the temperature of the second buffer.

3.5 Allow sufficient time for the pH electrode and ATC/Temp probe to stabilize. Press the [SLOPE] key. The SLOPE annunciator will stop flashing and stay on. The instrument will display the second buffer value corresponding to the temperature of the second buffer, as measured in 3.4. If the reading still drifts, repeat 3.5, until a stable reading is obtained. The instrument will calculate and compensate for the pH electrode slope deviation corresponding to the values of the two calibration buffers. The instrument is now dual point calibrated and ready for measurements.

After two point calibration, pressing and holding the [MEA./EFF.] key for about 5 seconds will display the new electrode efficiency.

4. Calibration with manual temperature compensation in the pH mode.

4.1 Connect the pH electrode to the BNC connector of the

instrument. The MAN annunciator will be on. Press the [MODE] key for the LCD to indicate pH and for the AUTO annunciator to be off.

- 4.2 Rinse the pH electrode in distilled water and immerse in buffer 7.00(6.86). Set the instrument to display the temperature of the buffer by pressing the [Δ] and [∇] keys. The displayed temperature must be less than 60°C.
- 4.3 Allow sufficient time for the electrode to stabilize. Press the [STAND] key. the STAND annunciator will be on and the SLOPE annunciator will start to flash, indicating that the standardization at buffer 7.00 (6.86) is completed and the instrument is ready to be sloped at a second buffer. The instrument will display the buffer value corresponding to the temperature of the buffer 7.00(6.86) set in 4.2. If the reading still drifts, repeat 4.3 until a stable reading is obtained.
- 4.4 Remove the pH electrode from buffer 7.00(6.86), rinse with distilled water and immerse it in buffer 4.00(4.01) or 9.18(10.01). Set the instrument to the temperature of the 2nd buffer as in 4.2. The displayed temperature must be less than 60. °C
- 4.5 Allow sufficient time for the pH electrode to stabilize. Press the [SLOPE] key. the SLOPE annunciator will stop flashing and stay on. The instrument will display the value of the second buffer corresponding to the temperature of the second buffer as set in 4.4. If the reading still drifts, repeat 4.5, until a stable reading is obtained. The instrument will calculate and compensate for the pH electrode slope deviation corresponding to the values

of the two calibration buffers. The instrument is now dual point calibrated and ready for measurements.

After two point calibration, pressing and holding the [MEA./EFF.] key for about 5 seconds will display the new electrode efficiency.

pH MEASUREMENTS

The STAND and SLOPE annunciators must be on. This means that the instrument is dual point calibrated and is ready for measurements.

1. Measurement with ATC/Temp probe in the pH-AUTOLOCK mode.
 - 1.1 Connect the pH electrode and ATC/Temp probe to the connector of the instrument. The ATC annunciator will be on.
 - 1.2 Press the [MODE] key until the LCD indicates pH mode and the AUTO annunciator is on.
 - 1.3 Rinse the pH electrode and the ATC/Temp probe with distilled water and immerse them in the sample to be measured.
 - 1.4 Press the [MEA./EFF.] key. The WAIT annunciator will start flashing. This means the instrument is waiting for a stable reading. The display will track the pH value as sensed by the pH electrode and the ATC/Temp probe. When the display changes less than 0.01 pH in about 10 seconds the autolock function will be activated. The WAIT annunciator will stop flashing and stay off. The reading is then locked and will not respond to further changes from the pH electrode and ATC/Temp probe.

- 1.5 For samples that are inherently unstable, the instrument will not AUTOLOCK. In this case, use the pH NON-AUTOLOCK mode for measurements.
2. Measurement with ATC/Temp probe in the pH NON-AUTOLOCK mode.
 - 2.1 Connect the pH electrode and the ATC/Temp probe to the connector of the instrument. The ATC annunciator will be on .
 - 2.2 Press the [MODE] key for the LCD to indicate pH and for the AUTO annunciator to be off.
 - 2.3 Rinse the pH electrode and the ATC/Temp probe with distilled water and immerse them in the sample to measured.
 - 2.4 Allow sufficient time for the display to stabilize. The instrument will display the pH value of the sample at the displayed sample temperature.
3. Measurement with manual temperature compensation in the pH-AUTOLOCK mode.
 - 3.1 Connect the pH electrode to the connector of the instrument The MAN annunciator will be on.
 - 3.2 Press the [MODE] key for the LCD to indicate pH and for the AUTO annunciator to be on.
 - 3.3 Rinse the pH electrode with distilled water and immerse it in the sample to be measured. Set the instrument to the temperature of the sample as in 2.2 of pH CALIBRATION section.
 - 3.4 Press the [MEA/EFF.] key. The WAIT annunciator will start to flash. This means that the instrument is waiting for a stable reading. The display will track the pH value as sensed by the pH electrode. When the

display changes less than 0.01 pH within approximately 10 seconds, the autolock function will be activated. The WAIT annunciator will stop flashing and stay off. The reading is then locked and will not respond to further changes from the pH electrode.

3.5 For samples that are inherently unstable, the instrument will not autolock. Use the pH NON-AUTOLOCK mode for measurements.

4. Measurement with manual temperature compensation in the pH NON-AUTOLOCK mode.

4.1 Connect the pH electrode to the connector of the instrument.

4.2 Press the [MODE] key for the LCD to display pH and for the AUTO annunciator to be off.

4.3 Rinse the pH electrode with distilled water and immerse it in the sample to be measured.

4.4 Allow sufficient time for the display to stabilize. The instrument will display the pH value of the sample at the set sample temperature.

TEMPERATURE MEASUREMENTS

The model 6173 can be used to measure temperature independently with the ATC/Temp probe without using the pH electrode.

1. Place the ATC/Temp probe in the media to be measured. The measured temperature is displayed.

2. If "Undr/OvEr" is displayed on, the temperature is out of the temperature range of -10.0 to 120. °C . Once the temperature is brought within range, then "Undr/OvEr" will

disappear and the correct temperature reading will be displayed. It is not necessary to press the [CLEAR] key.

mV MEASUREMENTS

1. Measurement in the mV-AUTOLOCK mode.
 - 1.1 Connect the optional combination ORP electrode to the BNC connector of instrument.
 - 1.2 Press the [MODE] key for the LCD to indicate mV and for the AUTO annunciator to be on.
 - 1.3 Rinse the electrode with distilled water and immerse it in the sample to be measured.
 - 1.4 Press the [MEA./EFF.] key. The WAIT annunciator will start to flash. This means the instrument is waiting for a stable reading. The display will track the mV value as sensed by the electrode,. When the display changes less than 1 mV within 10 seconds, the AUTOLOCK function will be activated. The WAIT annunciator will stop flashing and stay off. The reading is then locked and will not respond to further changes from the electrode. The “lock” display is the mV value of the sample.

If “OvEr/Undr” is displayed, the mV value measured is out of the “-2000/+2000 mV” range. The instrument will display the correct value once the input mV is brought within range. It is not necessary to press the [CLEAR].
 - 1.5 The ATC/Temp probe can be used to measure the sample temperature as required.

- 1.6 For samples that are inherently unstable, the instrument will not autolock. In this case, use the mV NON-AUTOLOCK mode for measurements.
2. Measurement in the mV NON-AUTOLOCK mode.
 - 2.1 Connect an ORP electrode to the BNC connector of instrument.
 - 2.2 Press the [MODE] key for the LCD to indicate mV and for the AUTO annunciator to be off.
 - 2.3 Rinse the electrode with distilled water and immerse it in sample to be measured.
 - 2.4 Allow sufficient time for the display to stabilize. The instrument will display the mV value of the sample.

If "OvEr/Undr" " is displayed, the mV value measured is out of the "-2000/+2000 mV" range. The instrument will display the correct value once the input mV is brought within range. It is not necessary to press the [CLEAR].
 - 2.5 The ATC/Temp probe can be used to measure the sample temperature as required.

pH BUFFERS

The temperature coefficient of pH calibration buffers 4.00 , 4.01, 6.86, 7.00, 9.18 and 10.01 are stored inside the instrument. The buffers used to calibrate the instrument must exhibit the same temperature characteristics as the stored values.

Temperature coefficient of the pH buffers

| | | | | | | |
|----|------|------|------|------|------|-------|
| °C | 4.00 | 6.86 | 9.18 | 4.01 | 7.00 | 10.01 |
| 0 | 4.01 | 6.98 | 9.46 | 4.01 | 7.11 | 10.32 |
| 5 | 4.00 | 6.95 | 9.39 | 4.01 | 7.08 | 10.25 |
| 10 | 4.00 | 6.92 | 9.33 | 4.00 | 7.06 | 10.18 |
| 15 | 4.00 | 6.90 | 9.28 | 4.00 | 7.03 | 10.12 |
| 20 | 4.00 | 6.88 | 9.23 | 4.00 | 7.01 | 10.06 |
| 25 | 4.00 | 6.86 | 9.18 | 4.01 | 7.00 | 10.01 |
| 30 | 4.01 | 6.85 | 9.14 | 4.01 | 6.98 | 9.97 |
| 35 | 4.02 | 6.84 | 9.10 | 4.02 | 6.98 | 9.93 |
| 40 | 4.03 | 6.84 | 9.07 | 4.03 | 6.97 | 9.89 |
| 45 | 4.04 | 6.83 | 9.04 | 4.04 | 6.97 | 9.86 |
| 50 | 4.06 | 6.83 | 9.02 | 4.06 | 6.97 | 9.83 |
| 55 | 4.07 | 6.83 | 8.99 | 4.08 | 6.97 | 9.80 |
| 60 | 4.09 | 6.84 | 8.97 | 4.10 | 6.98 | 9.78 |

Note : The actual reading of the instrument can differ from the values shown by ± 0.01 pH.

SPECIFICATIONS

| Display | Range | Accuracy | Resolution |
|---------------|-------------------|--------------------------------|------------|
| pH | -6.00 to 20.00 pH | ± 0.01 pH, ± 1 digit | 0.01 pH |
| mV | -2000 to 2000 mV | $\pm 0.05\%$ FS, ± 1 digit | 1mV |
| Temperature°C | -10.0 to 120°C | ± 0.5 °C | 0.1 °C |

| | |
|----------------------------------|--|
| pH Temp compensation | AUTO/MANual -10.0 to 120.0°C |
| pH Buffer recognition | (4.01, 7.00&10.01) or (4.00, 6.86, 9.18) |
| pH Buffer Temp. range | 0 to 60°C |
| PH Electrode Offset recognition | ± 90 mV at pH 7.00 or 6.86 |
| pH Electrode Slope recognition | $\pm 30\%$ at pH 4.01, 9.18 or 10.01 |
| Input Impedance | $>10^{13}$ Ω |
| Power Supply : Batteries/Adapter | Six 1.5V batteries/AC adaptor |

| | |
|--------------------------|------------------------------------|
| Battery Life | About 500 hours |
| Calibration Back-up | EEPROM |
| Audio Feedback | All Touch Keys |
| End Point Sensing & Hold | Yes |
| LCD Size (pH/mV : Temp) | 16mm : 21 mm high LCD |
| Ambient Temp. Range | 0 to 50 °C |
| Relative Humidity | up to 95% |
| ATC Probe | Thermistor, 10k Ω |
| RS-232 communication | Bate Rate 9600 |
| Dimensions (W x D x H) | 230mm L x 165 mm W x 80 mm H |
| Weight | 650 grams (Batteries not included) |

WARRANTY

Jenco Instruments, Inc. warranties the model 6173 for a period of one year, from date of purchase, against all defects in material and workmanship. This warranty does not apply to the abuse and misuse of the instrument. If repair or adjustment is required, please return the defective instrument, freight prepaid. Instrument within warranty period will be repaired at no charge. Please make sure that the instrument is properly packaged and insured against possible damage in shipment.

Authorization must be obtained from a Jenco representative before returning items for any reason.