OPERATION MANUAL

THE JENCO MODEL 1671
DUAL DISPLAY BENCHTOP
INSTRUMENT
pH - ORP (REDOX) - CONDUCTIVITY

JENCO ELECTRONICS, LTD.
MANUFACTURER OF PRECISON INS

GENERAL DESCRIPTION

Model 1671 is two instruments in one enclosure with separate inputs, separate displays, and separate millivolt recorder outputs for pH and conductivity. The pH section can also display mV reading for Oxidation Reduction Potential (ORP Redox) and Ion Specific Electrodes (ISE).

FOUR MODES OF OPEARTION

1. pH, continuous update of pH value
2. mV, continuous update of basic mV signal
3. pH-autolock, automatically holds pH display when stabilized
4. mV-autolock, automatically holds mV display when stabilized

AUTOMATIC ELECTRODE SENSING

When using pH or ORP electrodes with built in temperature compensation such as Jenco's 6000E series, internal software recognizes the temperature signal and selects the "ATC" (AUTOMATIC TEMPERATURE COMPENSTAION) mode. Likewise, attachment of Jenco's model 6000A / temperature probe automatically places the instrument in the ATC mode, whenever such a signal is not present, the instrument immediately switches to its MAN (MANUAL TEMPERATURE COMPENSTAION) mode. The front panel display continuously indicates the current status of temperature compensation (ATC or MAN) as well as the temperature being used to calculate pH.

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 materials should be saved until satisfactory

operation is confirmed.

FRONT PANEL CONTROLS AND INDICATORS

(REFER TO FIGURE 1)

1. The left half of the front panel contains the display and the range/ Selector switches for the Conductivity metering function. The ON/OFF toggle switch for the conductivity function located on the rear panel, lower left hand side.(REFER TO FIGURE 2) Must be on in order to utilize the conductivity function. Conductivity measurements can be made only with AC power applied.
   1) The LCD display window indicates the present conductivity value.
   2) Two LED annunciators located to the right of the display indicate whether the reading is us or ms.
   3) The labeling and meaning of the Conductivity range selection switches is as following:

A	0 to 19.99 uS/cm
B	0 to 199.9 uS/cm
C	0 to 1999 uS/cm
D	0 to 19.99 mS/cm
E	0 to 199.9 mS/cm

(Note: 1000 us=1ms; S=Siemens=mhos/cm^2)

2. The right half of the front panel is dedicated to pH, mV and temperature. The ON/OFF membrane switch for these functions is located on the front panel, top row. pH, mV. and temperature measurements can be made either with AC power applied or with the internal batteries. Access to the battery compartment is provided on the bottom panel of the instrument. The labeling and function of the membrane switches is as follows. Right half of the front panel consists of the following.(REFER TO FIGURE 1)
   4) pH/Temp/mV LCD display
   5) pH touch keys. There are 8 membrane switches and their labeling and

function are as following:

A) ON/OFF Alternate presses of this membrane switch turn the pH/mV/Temp section on and off. Setup and calibration information will be retained in memory when the instrument is turned off provided that batteries are installed.(REFER TO FIGURE 4)

B) CLEAR Resets the microprocessor, clears memory, and momentarily tests all LCD segments. This is the first step in the recalibration process.

C) DIGIT Selects tens, units, or tenths digit of temperature display. Use this switch in conjunction with the COUNT switch to set the sample temperature manually. DIGIT and COUNT are disabled when “ATC” is illuminated.

D) COUNT Increments the flashing digit after the DIGIT switch has been pressed. DIGIT and COUNT are disabled when “ATC” is illuminated.

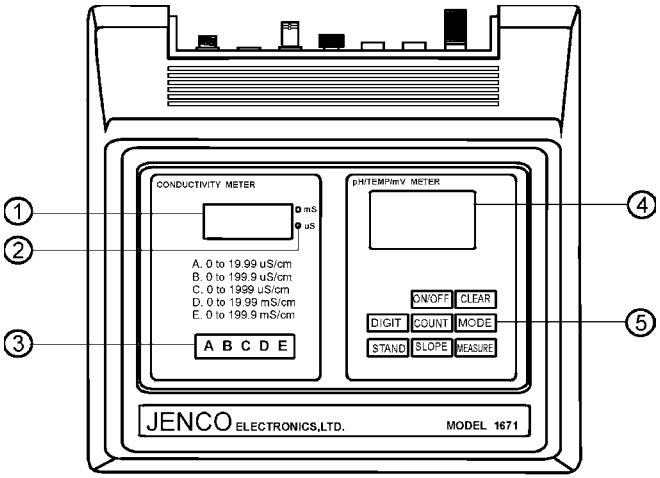
E) MODE Seguentially selects the four operating modes namely; pH, mV, pH-Autolock, and mV-Autolock.

F) STAND Used to compensate (calibrate) the instrument to the pH electrode to be used. Every pH electrode has its own characteristic offset and slope. STAND is used to compensate for offset. THE STAND switch is active only when the “STAND” indicator is flashing. Refer to the calibration section of this manual for further explanation.

G) SLOPE Used to compensate (calibrate) the instrument for the pH electrode to be used, The SLOPE switch compensates for electrode slope characteristics and is active only when the “SLOPE” indicator is flashing. Refer to the calibration section of this manual for more information.

H) MEASURE Used to begin making measurements after the calibration process is completed and/or to make the next

measurement when the display is held in the “Autolock” mode



① COND. LCD DISPLAY
② UNIT INDICATOR
③ COND. RANGE SELECTOR
④ pH/TEMP/mV LCD DISPLAY
⑤ pH TOUCH KEYS

FIGURE 1 FRONT PANEL

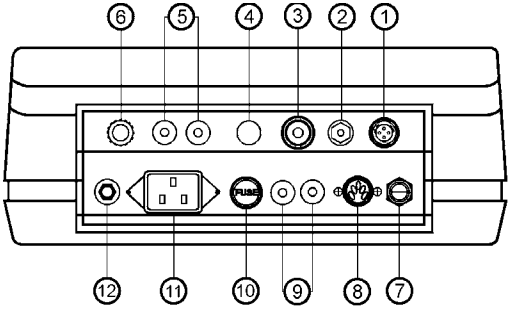
REAR PANEL CONNECTIONS AND CONTROIS
(REFER TO FIGURE 2)

The rear panel is logically divided into two rows. The upper row pertains to pH, mV, and temperature functions. The lower row is dedicated to conductivity. The functions and labelings of the connectors and controls are as following:

1. "3-1"ELECTRODE CONNECTOR Special four pin connector for Jenco 6000E series pH electrodes with built in ATC. When using this type of electrode, do not attach a separate temperature electrode.
2. REF CONNECTOR This function is seldom used. Modern pH electrodes are usually the "combination" type, meaning that the reference cell is built-in. Use the REF input only when using a "half-cell" type pH electrode where the sample junction and the reference junction are not included in one physical unit.
3. BNC ELECTRODE CONNECTOR Connect non temperature compensated pH or ORP/ISE electrode here.
4. ATC PROBE CONNECTOR Suitable for connecting Jenco model 6000A temperature probe when using non temperature compensated (BNC type) pH and ORP electrodes.
5. pH ANALOG OUTPUT CONNECTOR This is a millivolt signal which tracks the pH electrode output within ± 0.1%. It is suitable for driving chart recorders etc, when a permanent record of the process history is desired.

6. EARTH GROUND CONNECTOR Convenient connecting point for grounding the sample to the instrument. It is not necessary to use this connection unless the readings are unstable due to electrical noises caused by pumps and heaters etc.
7. CELL ADJUST 10-turn adjustment for conductivity cell variance. Use with conductivity solution standards in the calibration section of this manual.
8. CELL INPUT CONNECTOR Conductivity cell connector (5-pin DIN). Jenco accessory models 104 or CT200033 are attached here. (SEE LIST OF ACCESSORIES)
9. CONDUCTIVITY ANALOG OUTPUT CONNECTOR High impedance signal suitable for driving chart recorders etc. Voltage output corresponds with conductivity display as 1mV per count.
10. FUSE If instrument fails to operate, unscrew fuse cap and test fuse. If defective, replace with same type 0.5 Amp 250 volt fuse.
11. AC LINE CONNECTOR Line cord connection. This instrument is capable of operating on either 115VAC or 230VAC. Standard factory setup is for 115 and a cautionary lable is applied to the rear of the instrument indicating the voltage setting. To switch voltage, remove the 4 screws on the bottom cover (REFER TO FIGURE 3) and locate the slide switch on the printed circuit board near the transformer. The voltage settings are printed on the side of the switch. Confirm desired setting and replace bottom cover.
12. ON/OFF CONDUCTIVITY POWER SWITCH Toggle switch for the conductivity function. AC power source must be connected in order to use

this function.



① "3-1" ELELCTRODE CONNECTOR
② REF. CONNECTOR
③ BNC ELECTRODE CONNECTOR
④ ATC PROBE CONNECTOR
⑤ pH ANALOG OUTPUT CONNECTOR
⑥ EARTH GROUND CONNECTOR
⑦ CELL ADJUST
⑧ CELL INPUT CONNECTOR
⑨ COND. ANALOG OUTPUT CONNECTOR
⑩ FUSE
⑪ AC LINE CONNECTOR
⑫ COND. POWER SWITCH

FIGURE 2 REAR PANEL

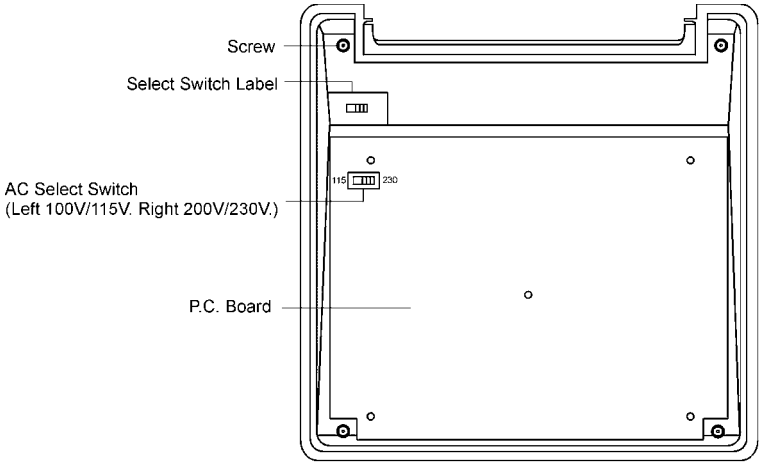


FIGURE 3 BOTTOM PANEL

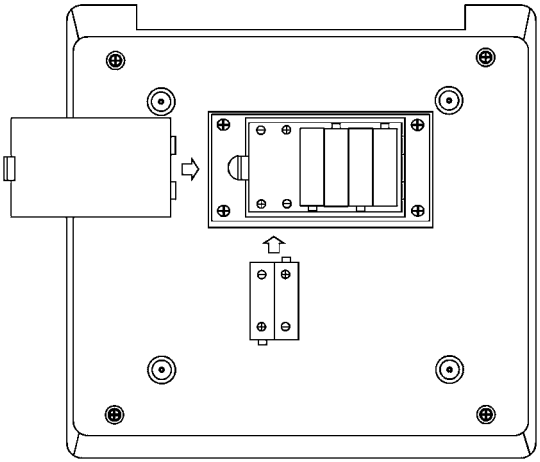


FIGURE 4 BATTERY COMPARTMENT

CALIBRATION / ELECTRODE COMPENSATION-pH

WHEN CALIBRATION IS REQUIRED

1. Upon first use of instrument
2. After changing batteries or AC power failure
3. When changing pH electrodes
4. When pH electrode fails to properly measure known buffer
5. Using an electrode that has not been used for a period of time

MATERIALS REQUIRED FOR CALIBRATION

1. Actual electrode to be calibrated
2. Buffer solutions 4, 7, and 10
3. Distilled water for rinsing electrode
4. Celsius thermometer or ATC electrode
5. Four clean beakers or other suitable containers

TECHNICAL THEORY REGARDING "CALIBRATION"

While the following adjustments are made upon the instrument itself, the actual process involves compensating the meter's sensitivity and software algorithm for the present status of the specific electrode to be used. Therefore, whenever you change electrodes, you must re-calibrate. pH electrodes deteriorate with use and with time, therefore they should be verified using known fresh buffer solutions before important sample measurements are made. The following process is a two point calibration which enters the electrode's offset and slope into memory. Setting of the offset is done at pH 7 (called STAND throughout this manual); while the slope is set at either pH 4.01 or 10.01 (called SLOPE in this manual). Choose the slope buffer according to whether your sample measurements are more likely to be acidic (4.01) or alkaline (10.01).

Buffer solutions, especially alkahne buffers, are subject to absorbtion of CO_2 from the air. They should be stored in tightly sealed glass containers when not in use and replaced frequently.

pH CALIBRATION PROCEDURE

1. Prepare the necessary buffers. If Automatic Temperature Compensating electrode is used, correct temperature will be automatically displayed. Otherwise (ATC light is OFF, MAN light is ON), ensure that temperature display matches buffer temperature.. Use DIGIT and COUNT switch to set correct temperature as necessary.
2. 1) Press CLEAR, wait for STAND to start flashing

2) Rinse electrode in distilled water

3) Immerse electrode in buffer 7

4) Press STAND; STAND will stop flashing WAIT will start flashing

5) Observe display for a few seconds; WAIT should stop flashing, SLOPE should start flashing. If ERR-n is displayed, refer to Error Codes section

3. 1) Rinse electrode in distilled water

2) Immerse electrode in buffer 4 or buffer 10 as desired

3) Press SLOPE; SLOPE will stop flashing, WAIT will start flashing.

4) Observe display for a few seconds; WAIT should stop flash; STAND, SLOPE, pH and AUTOLOCK should be on. The indicated pH will be the last buffer used adjusted for temperature

4. Instrument is now ready for use in pH-Autolock mode. Press MEASURE to make another pH-Autolock measurement; or press MODE to select continuous pH measurement. Additional presses of the MODE switch will cycle the instrument through all four of it's measurement modes, namely mV-Autolock , mV, pH-Autolock, pH.

mV CALIBRATION PROCEDURE

The mV and mV-Autolock functions of this instrument are not subject to user "calibration" in the same sense as pH. All pH, ORP, and ISE electrodes produce millivolt signals. In the pH mode, the instrument assumes that the attached electrode is intended for pH. It then interprets the mV signal, corrects it for temperature, and computes the results in terms of pH. In the mV mode, the instrument makes no assumptions and displays the electrode signal directly. Interpretation is left to the user. The mV mode is useful for comparative studies, trend analysis, and with the help of chemical handbooks, calculation of ionic concentration. The mV mode is also useful for evaluating the output of a pH electrode in case there is some doubt about it's performance. The mV reading accuracy of the instrument itself can be checked using an electronics laboratory type precision millivolt generator.

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CONDUCTIVITY CALIBRATION PROCEDURE

Conductivity calibration is accomplished by measuring a standard solution of known conductivity using the specific conductivity cell that will be used in practice. The CELL ADJ control on the rear panel of the instrument is rotated causing the display to indicate the proper value.(REFER TO FIGURE 2)

1. If possible, determine in advance the probable range of conductivity values to be measured. Consult the following section and carefully prepare the necessary standard KCL solutions for the measurement ranges of interest.
2. Rinse the conductivity cell with distilled water and immerse in the appropriate conductivity standard solution.
3. Select the appropriate display range from the front panel of the instrument , (A-B-C-D-E) and rotate the ten-turn CELL ADJ control on the rear panel of the instrument until the display reading matches the table value for that standard solution.
4. The instrument is now calibrated and ready to make sample measurements. Repeat the above procedure when changing conductivity cells or changing ranges.

PREPARATION OF KCL CONDUCTIVITY STANDARD SOLUTIONS

1. Carefully measure (in air) 74.55 grams Research Grade Potassium Chloride. Carefully dissolve KCL in sufficient distilled water to make 1.00 liters. Label this as 1.0 normal KCL.
2. Measure 100.0 ml of the 1 normal solution and add sufficient distilled water to make 1.00 liters. Label this as 0.1 normal KCL.
3. Measure 100.0 ml of the 0.1 normal solution and add sufficient distilled water to make 1.00 liters. Label this solution 0.01 normal KCL.
4. Measure 100.0 ml of the 0.01 normal solution and add sufficient distilled water to make 1.00 liters. Label this solution 0.001 normal KCL.
5. Measure 100.0 ml of the 0.001 normal solution and add sufficient distilled water to make 1.00 liters. Label this solution 0.0001 normal KCL.

SETTING OF CELL ADJ CONTROL

Select the appropriate measurement range (A-B-C-D-E) from the front panel and immerse the conductivity cell in the indicated standard solution at 25.0 . Adjust the CELL ADJ control on the rear panel of the instrument to display the reading indicated .Note that the solution temperature is critical. If it is not possible to maintain the setting at 25.0 , adjust the reading +2% for each 1 degree increase above 25.0 ; or -2% per degree below 25.0

Solution	Range	Reading
1.0 N	E 0-199.9 mS	111.8
0.1 N	D 0-19.99 mS	12.88
0.01 N	C 0-1999 uS	1413
0.001 N	B 0-199.9 uS	145.0
0.0001 N	A 0-19.99 uS	15.00

*NOTE: Measurements in this range should be interpreted with caution since the extremely low conductivity values are readily subject to distortions from external sources such as equipment contamination.

ERROR CODES

ERR-1 Cannot calibrate pH 7.00 with this setup, check buffer solution, electrode, cable, connectors.

ERR-2 Cannot calibrate pH 4.00 or pH 10.01 with this setup. Check buffer solution, electrode, cable, connectors.

ERR-3 Measurement temperature greater than 100.0 or less than 0.0 . Correct the error and measure pH again. Possible temperature sensor failure.

ERR-4 Buffer temperature less than 0.0 or greater than 60.4 . Correct the error and re-calibrate. Possible temperature sensor failure.

ERR-5 Apparent pH less than -2.00 or greater than +16.00. Instrument not capable of such measurements. Possible electrode failure.

ERR-6 Illegal procedure attempted. Re-read instruction and try again.

SPECIFICATIONS

pH/mV/temperature

RANGE	pH	-2.00 to 16.00
	Temp	0.0 to 100.0
	mV	- 999 to + 999
RESOLUTION	pH	0.01
	Temp	0.1
	mV	1
ACCURACY	pH	± 0.1%, ± 1 digit
	Temp	± 0.5 , ± 1 digit
	mV	± 0.1%, ± 1 digit
TEMPERATURE	Automatic	0.0 to 100.0
COMPENSATION	Manual	0.0 to 99.0

Buffer recognition	4.01, 7.01, 10.01, pH
Buffer temperature range	0.0 to 60.4
Buffer temp. comp. table	Internal, 0.5 steps
Electrode slope compensation	Nominal ± 30% at pH 4 and pH 10
Electrode offset compensation	Nominal ± 90mV at pH 7
Electrode calibration	Dual point
End point sensing	Automatic locking
Configuration memory	Battery backup
Error condition	Numerical prompt & audio alert
Recorder output	Electrode mV signal ± 0.1%
Display pH/mV	12.5 mm high LCD with pH/mV indicator
temperature	7.5 mm high LCD with indicator
Display update	$^1/_2$ second
Input impedance	$\pm 10^{13}$
Conductivity	
Scale, resolution	0 to 199.9 mS, 0.1 mS
	0 to 19.99 mS, 0.01 mS
	0 to 1999 uS, 1 uS
	0 to 199.9 uS, 0.1 uS
	0 to 19.99 uS, 0.01 uS
Accuracy	±1% f, s., ± 2% reading
Automatic temperature comp	0 to 50 , ± 2%
Cell constant	1.0, adjustable
Display	12.7 mm high, LCD

GENERAL

power requirements	115/230 V AC
	batteries, type AA (6)
battery life	20 hours, typical
dimensions	250⊙240⊙100 mm
	9.75⊙9.50⊙3.75 inches
weight	1.3kg, 2.87 lbs

RECOMMENDED ACCESSORIES:

The following probes are available from Jenco for use with this instrument. Standard cable length is 3 feet. Longer lengths are available on special order. Electrodes listed here are intended for hand-held laboratory applications. Jenco can also supply a complete line of industrial electrodes for permanent mounting in process control and on-line monitoring applications.

pH

600E	Basic combination pH electrode with 3 foot cable, BNC connector: no ATC. It is also available with longer cable up to 25 feet on special order. Ag/Agcl reference cell is built-in eliminating the need for a separate reference cell.
600ED	Similar to basic 600E, but features double junction internal construction. Preferred for longer electrode life, especially when measuring salt or sulfide contaminated samples.
600E-CJ	"Calomel junction" version of the basic 600E. Reference cell contains Hg_2cl_2. Recommended for use when test samples may contain heavy metals or proteins.
600E-ORP	Basic ORP (Redox) measurement electrode with 3 foot cable and BNC connector: no ATC.
6000E	Applications similar to basic 600E: ATC is built-in. Cable is sold separately. Requires 4 conductor shieded cable with 4-pin connector each end (model 6000C).
6000ED	Double junction version of 600E
6000E-CJ	Calomel Junction version of 6000E
6000E-ORP	ORP (Redox) version of 6000E

CONNECTING CABLE:

6000C	4 conductor cable with shield, 3 feet long. Includes appropriate 4-pin male and female connectors on each end. This item is required for use with 6000E series electrodes when used with model 1671.
6000A	External Automatic Temperature Compensation. (ATC) for pH/ORP. Use this separate ATC probe if using pH electrodes without internal ATC capability (e. g. Jenco's 600E series).Otherwise temperature compensation can be accomplished manually by entering the information via the Keyboard.

CONDUCTIVITY ELECTRODES:

104	Glass bodied cell with platinum elements, internal temperature compensation, 3 foot cable, 5-pin DIN connector, Cell constant K=1
CT200033	Epoxy bodied cell with Carbon graphite elements: otherwise same as Jenco model 104.

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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