OPERATION MANUAL

MODEL 9250M / 9251M
MICROCOMPUTER BASED
Dissolved Oxygen / Temperature
PORTABLE METER

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I. 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.

II. GENERAL INTRODUCTION

The Model 9250M/9251M Handheld Dissolved Oxygen, Temperature System is a rugged, microprocessor-based instrument designed for use in field laboratories and process control applications. This unit uses a polygraphic clark sensor for accurate and precise measurement of dissolved oxygen.

The model 9250M/9251M's microprocessor allows the user to easily recalibrate the parameters for the probe. The system requires only a single point calibration, regardless of which dissolved oxygen display you use.

The system simultaneously displays temperature in ° C along with dissolved oxygen in % air-saturation or dissolved oxygen ppm (parts per million). The user can switch to DO %, DO ppm, RECALL and ERASE display by just pressing the [MODE] key.

The model 9250M/9251M is also equipped with a non-volatile memory allowing the user to save all calibration data, parameter setting and store 50 different sets of readings. The model 9250M/9251M will also assign a site number for each set of readings for an easy review of the data.

The model 9250M comes with a RS232C interface which can easily let the user log all data simultaneously or download the stored 50 sites in a RS232 equipped personal computer.

A calibration bottle is included with the instrument. A small sponge in the bottle can be moistened to provide a water saturated air environment, which is ideal for air calibration procedures. This bottle is also designed for transporting and storing the probe. When the probe is stored in the bottle, the moist environment will prolong effective membrane performance and probe life.

This instrument is powered by six AAA-size alkaline batteries or with a UL approved AC adapter. The instrument also displays a "LO BAT" message when the batteries are in need of replacement.

III. USING THE MODEL 9250M/9251M

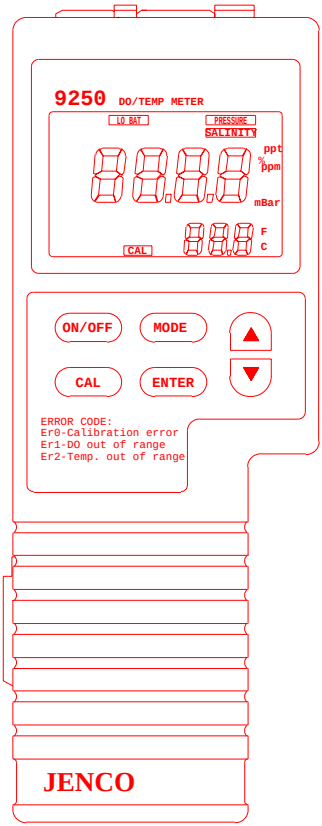


Figure 1

PRECAUTIONS and MAINTENANCE

A. THE CASE

The Model 9250M/9251M case is SPLASH PROOF in a watertight case. But the instrument should not be used under water since the instrument is not WATERPROOF. The SPLASH PROOF feature is to prevent permanent damage to the instrument when accidentally splashed with non-corrosive solution.

Take the following measures immediately in the event that the instrument is dampened in any kind of solution.

1. Place all the rubber caps tightly in all the instrument's connector holes then rinse the instrument thoroughly with distilled water. After rinsing and drying, the connectors should be inspected and cleaned to remove all contaminants that might affect the probe connections.
2. Wait for the instrument and probe to be completely dry before resuming operation.
3. If unsatisfactory results are gained after doing the above, notify your Jenco representative for possible repair or replacement (See XI. WARRANTY).

B. THE PROBE

1. Membranes will last long time if installed properly and maintained regularly. Erratic readings are a result of damaged or fouled membranes or from large bubbles in the electrolyte reservoir. If unstable readings or sign of membrane damage occurs, you should replace the membrane and KCl solution. The average replacement interval is two to four weeks.

2. Unstable readings may occur if the membrane cap is coated with oxygen consuming (e.g. bacteria) or oxygen evolving (e.g. algae) organisms.

3. Chlorine, sulfur dioxide, nitric oxide and nitrous oxide can affect readings by behaving like oxygen at the probe.

4. Avoid any environment, which contains substances that may damage the probe materials. Some of these substances are concentrated acid, caustics and strong solvents.

5. The probe's gold cathode must always be bright. If it is tarnished (which can result from contact with certain gases), or plated with silver (which can result from extended use with a loose or wrinkled membrane), the gold surface must be restored. To restore the cathode you may either return the instrument to your nearest Jenco representative, or clean it using the Jenco Probe Reconditioning kit. Never use chemicals or abrasives not supplied with this kit.

6. It is also possible for the silver anode to become contaminated, which will prevent successful calibration. To clean the anode, remove the O-ring and membrane and soak the probe overnight in 3% ammonium hydroxide. Rinse the sensor tip and KCl reservoir with deionized water, add a new KCl solution, and

install a new membrane and O-ring. Turn the instrument on and allow to stabilize for 30 minutes. If, after several hours you are still unable to calibrate, return the instrument to your authorized Jenco representative.

7. If the O-ring is wrinkled or loose, replace it with the appropriate O-ring provided in the Jenco O-ring pack.
8. To keep the electrolyte from drying out, store the probe in the calibration bottle with the moistened sponge.

PROBE PREPARATION

The model 9250M/9251M' probe is shipped dry. The protective cap on the probe must be removed and replaced the KCl solution before using the probe.

To prepare for installation of a membrane cap on your model 9250M/9251M probe:

1. Unscrew the probe membrane cap.
2. Thoroughly rinse the sensor tip and KCl reservoir with distilled water.
3. Prepare the electrolyte according to the directions on the KCl solution bottle.

C. THE KEYPAD

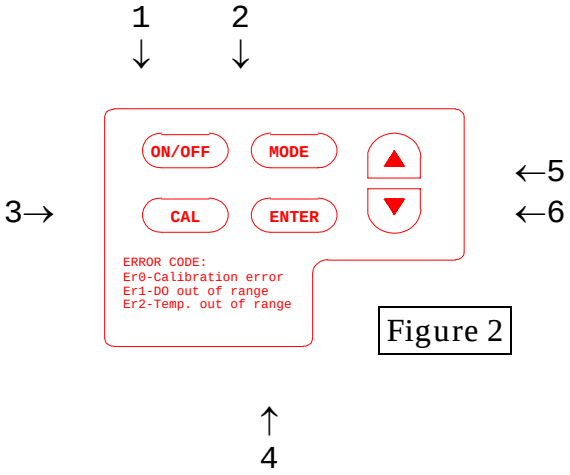


Figure 2

1. The [**ON/OFF**] key.
   This key will turn on or turn off the instrument. The last display mode will be saved, except during calibration, recall and erase modes where it will default to DO % mode. Calibration data, user settings and the 50 different site readings are saved in non-volatile memory, and will be intact even if the user turned off the instrument.
2. The [**MODE**] key.
   a. In normal operation this key will rotate the display starting from Dissolved Oxygen in % air saturation, Dissolved Oxygen in ppm, RECALL or ERASE mode.
   b. In Calibration mode this key will exit the current calibration and go to the next calibration parameter.
3. The [**CAL**] key.
   During normal operation this key will change the mode from normal to Calibration mode. See CALIBRATION SET-UP.

4. The [**ENTER**] key.
   4a. During normal operation pressing this key for about 2 seconds will save all the readings in the next available site number.
   4b. During RECALL mode this key will toggle the display between saved DO % and DO ppm including temperature and site number.
   4c. During calibration mode this key will save the current value of the displayed parameter in non-volatile memory.
5. The [Δ] key.
   5a. During calibration mode this key is used to increment / change the pressure and salinity setting.
   5b. In Recall mode this will move to a higher (latest) site number.
6. The [∇] key.
   6a.During calibration mode this key is used to decrement / change the pressure and salinity setting.
   6b. In Recall mode this will move to a lower (older) site number.
7. [∇] and [**ENTER**] keys.
   Pressing this combination during ERASE mode for about 5 seconds will erase **ALL** data in the non-volatile memory. Data in all 50 sites will be erased completely. Do not use the erase function until all recorded data has been reviewed or transcribed / downloaded outside the model 9250M / 9251M. (SEE SAVING AND RECALLING DATA.)

D. THE DISPLAY

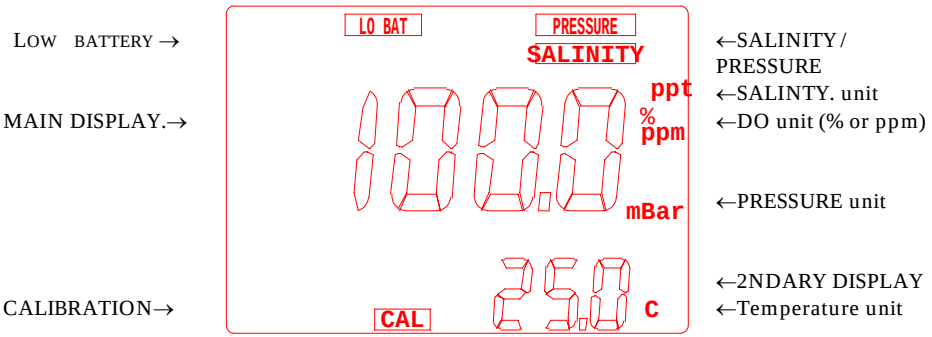
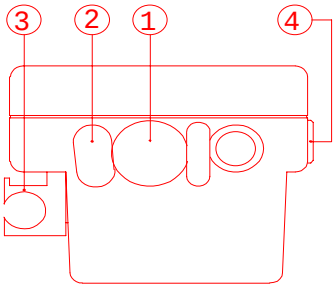


Figure 3

E. CONNECTORS



1. DO / TEMP PROBE connector
2. AC ADAPTER
3. PROBE holder
4. RS232 connector

Figure 4

F. REPLACING THE BATTERIES

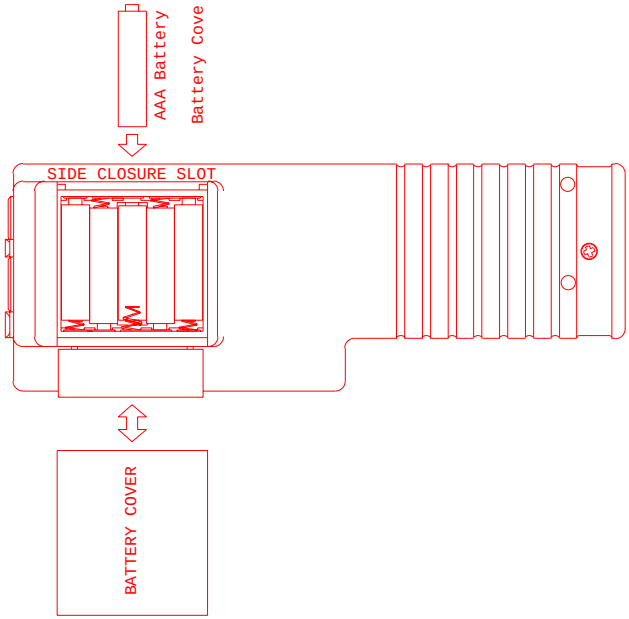


Figure 5

1. Position the meter so that the bottom part of the meter is facing up. (Refer to figure 5.) Insert a coin in the side closure slot. Tilt the coin and thrust it upward to open the battery compartment and lift the closure up.
2. Remove all of the old batteries and insert a new set of batteries ensuring the polarities are correct.

G. TURNING ON/OFF THE INSTRUMENT

Once the batteries are installed correctly and/or an AC adapter is installed, you can press the [ON/OFF] key to turn on or turn off the instrument. When the unit is not in use the user should turn off the instrument to save battery life. By just unplugging the AC adapter will not turn off the instrument if batteries are present. It would automatically switch to battery power and will continue to operate.

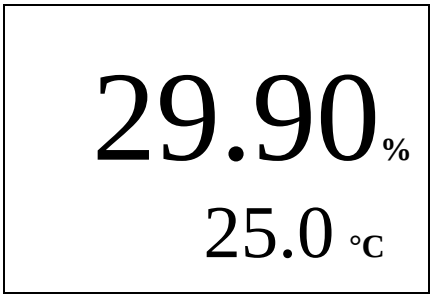
After the self-diagnostic (RAM, EEPROM & ROM) is complete the temperature will be displayed in the lower right of the display and the instrument is ready to make a measurement. If you received any "**bAd**" messages turn OFF the unit and turn it ON again. (See **VIII. ERROR DISPLAYS AND TROUBLESHOOTING**). Just immerse the probe halfway to the liquid. If possible do not allow the probe to touch any solid object in the solution. There should be no air bubbles around the probe either. Shaking or moving the probe vigorously before recording any measurement will dislodge any bubbles formed in the probe.

H. MODEL 9250M/9251M MODES

This instrument is designed to provide 3 distinct measurements:

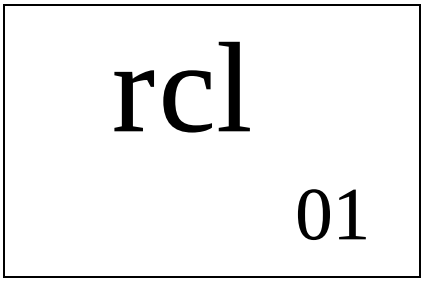
1. Temperature - current temperature of the solution, which is always displayed.
2. Dissolved Oxygen % - a measurement of oxygen in percent saturation.
3. Dissolved Oxygen ppm - a measurement of oxygen in ppm.

To choose any measurement mode (temperature is always included) simply press and release the [MODE] key. Carefully observe the annunciators units at the far side of the LCD.



For Dissolved Oxygen in % air saturation mode the unit is **%**.
If in Dissolved Oxygen ppm mode the unit will be **ppm**.

This is **recall** mode.



← This is the site number.

This is **Erase** mode.

Note : Every time the unit is turned OFF the last mode is saved so that when you turn the instrument ON again it will return to this mode. Turning OFF at Recall or Erase mode will set the mode back to DO % mode.

IV. CALIBRATION SET-UP

A. CALIBRATION REQUIREMENTS

To accurately calibrate the Model 9250M/9251M you will need the following information:

1. The approximate pressure (in mbar) of the region in which you plan to take your dissolved oxygen measurements (See VII. DO CALIBRATION VALUES).

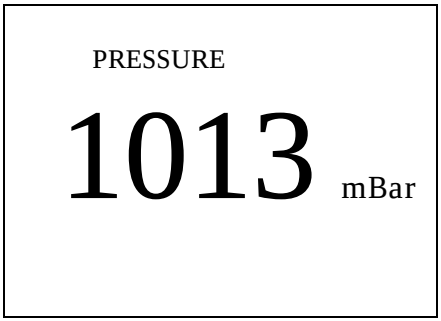
2. The approximate salinity of the water you will be analyzing. Fresh water has a salinity of approximately zero. Sea water has a salinity of approximately 35 parts per thousand (ppt).

B. CALIBRATION PROCEDURES

1. Place 5-6 drops of distilled water into the sponge inside the calibration bottle. Turn the bottle over and allow any excess water to drain out of the bottle. The wet sponge creates a 100% water saturated-air environment for the probe, which is ideal for calibration, transport and storage of the Model 9250M/9251M probe.

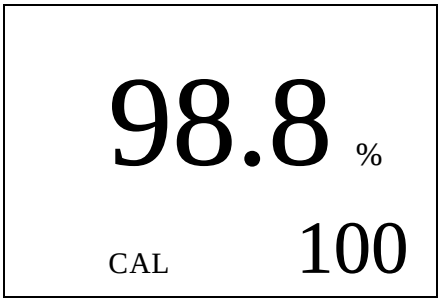
2. Screw in the bottle into probe allowing at least 5 mm space between the probe and the sponge.

3. Turn on the instrument by pressing the [ON/OFF] key. Wait around 10~20 minutes for the dissolved oxygen and temperature readings to stabilize.

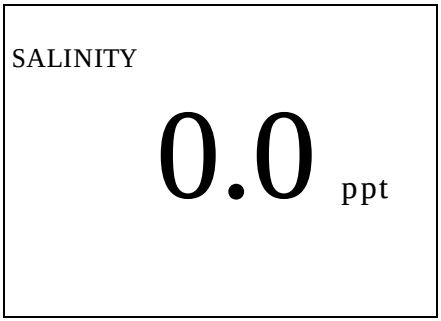


4. Press the [CAL] key.

5. The LCD will prompt you to enter the local pressure in mbar. Use the [Δ] or [∇] keys to increase or decrease the pressure respectively.



6. When the proper pressure appears on the LCD, press the [ENTER] key once to view the calibration value in the lower right of the LCD and a second time to move to the salinity compensation procedure.



7. The LCD will prompt you to enter the approximate salinity of the water you about to analyze. You can enter any number from 0.0 to 70.0 parts per thousand (ppt) of salinity. Use the [Δ] or [∇] keys to increase or decrease the salinity compensation respectively. When the correct salinity appears on the LCD, press the [ENTER] key.

8. Each time the Model 9250M/9251M has been turned off, it may be necessary to re-calibrate before taking measurements again. All calibrations should be completed at a temperature, which is close as possible to the sample temperature. Dissolved oxygen readings are only as good as the calibration.

V. SAVING AND RECALLING DATA

The Model 9250M/9251M is equipped with a non-volatile memory than can store up to 50 different sets of readings. Non-volatile memory will be retained even if power is lost.

A. SAVING READINGS TO MEMORY

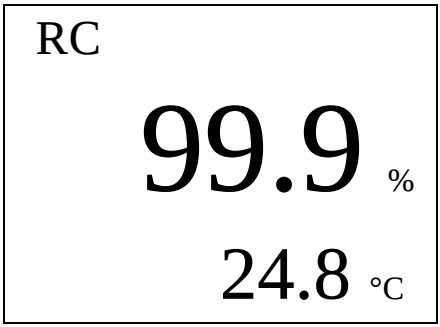
1. While in DO % or DO ppm mode press the [**ENTER**] key for about 2 seconds. The unit will display "**SAVE**" and the site number for a brief moment to indicate a successful save.

2. When all 50 sites are used up, the LCD will display "**FULL**". This message will remain on the LCD (even after power down) until a key (except for the [**ON/OFF**] key) is pressed.

3. Once you have acknowledged that the memory is full, any subsequent saving of data will begin ***OVERWRITING*** the existing data starting at ***site #1***.

B. RECALLING READINGS FROM MEMORY

1. Press the [**MODE**] key repeatedly until RECALL mode ("**rcl**" see MODEL 9250M/9251M modes) is displayed on the screen along with the site number on lower right corner.



2. Press the [**ENTER**] key to display the last set of data that was saved. The model 9250M /9251Mwill display DO % and temperature and the letters "**RC**" on the upper left corner to indicate you are in Recall mode. Press the [**ENTER**] key again to display the DO ppm and temperature. Press the

[**ENTER**] key again to toggle between these two stored values.

3. Press the [Δ] key to move to a higher (newer) site number.
4. Press the [∇] key to move to a lower (older) site number.

Here is an example of the model 9250M /9251M memory.
Site #1 (oldest data)
Site #2
Site #3 ← for example if you are displaying site #3, then if you press the [Δ] key the model 9250M/9251M will display site #4.
Site #4
Site #5 (newest data)

C. ERASING DATA

1 To erase **ALL** the data stored in memory , press the [**MODE**] key repeatedly until the unit displays Erase mode ("**ErAS**" see MODEL 9250M/9251M modes).
2. Press the [∇] and [**ENTER**] keys simultaneously and wait for the secondary display to count down to zero. The LCD will display "**dOnE**" to indicate successful erasure and return to DO % mode.

CAUTION: All data will be erased, so be sure you have reviewed them thoroughly or transcribed/downloaded to an archive before using this function.

VI. RS232C INTERFACE OPERATION(ONLY 9250M)

A. INTRODUCTION

This section assumes you are familiar with the basics of data communication, the RS232 interface, a rudimentary knowledge and a copy of the more popular Windows® 98+ computer languages capable of using a an RS232 port.

A simple program must be written in order to send your command and receive data from the meter.

B. PREPARING THE METER

This meter comes equipped with an RS232C interface. This meter communicates with a PC computer (100% IBM PC / AT compatibles) through a DB-9 interface connector. A standard RS232C cable used for interconnecting two IBM PC / ATs can also be used for this operation.

After you have connected the cable and turned on both the meter and the computer, you are now ready for the software preparation.

C. SOFTWARE

A demo program written in Visual Basic® 6.0 and source are included in the accompanying disk. Read the “Model 9250M RS232 protocol.doc” to understand the procedure used inside the demo program.

VII. DO CALIBRATION VALUES

TABLE 1

Calibration values for a range of pressures and altitudes.

Pressure mBar	Pressure mm-Hg	Altitude feet	Altitude meters	Calibration Value in %
1023	768	-276	-84	101
1013	**760**	**0**	**0**	**100**
1003	752	278	85	99
993	745	558	170	98
983	737	841	256	97
973	730	1126	343	96
963	722	1413	431	95
952	714	1703	519	94
942	707	1995	608	93
932	699	2290	698	92
922	692	2587	789	91
912	684	2887	880	90
902	676	3190	972	89
892	669	3469	1066	88
882	661	3804	1160	87
871	654	4115	1254	86
861	646	4430	1350	85
851	638	4747	1447	84
841	631	5067	1544	83
831	623	5391	1643	81
821	616	5717	1743	80
811	608	6047	1843	79
800	600	6381	1945	78
790	593	6717	2047	77
780	585	7058	2151	76
770	578	7401	2256	75
760	570	7749	2362	74
750	562	8100	2469	73
740	555	8455	2577	72
730	547	8815	2687	71
719	540	9178	2797	70
709	532	9545	2909	69
699	524	9917	3023	68
689	517	10293	3137	67

VIII. ERROR DISPLAYS

MAIN DISPLAY	2NDARY DISPLAY	POSSIBLE CAUSE
"ovEr" or “undr” during calibration		Instrument detects improper probe input during calibration.
	“udr”	Temperature is less than -6.0 °C.
	“ovr”	Temperature is greater than 46.0 °C.
“ovEr” in DO ppm mode		Sample O_2 concentration is greater than50.00 ppm.
“undr” in DO ppm mode		Sample O_2 concentration is less than -3.0 % ppm.
"ovEr" in DO % mode		Sample % air-saturation is greater than 500. 0 %.
“undr” in DO ppm mode		Sample % air-saturation is less than -3.0 %.
“bAd”	“rA_”	Failed RAM check
“FAIL”	“EEP”	Failed to write or read the external eeprom
“bAd”	“EEP”	Failed EEPROM check
“bAd”	“rO_”	Failed ROM check

IX. SPECIFICATIONS

Display	Range	Accuracy	Resolution
Dissolved O_2 (ppm)	0 to 50.00 ppm	±0.2 % of span	0.01 ppm
Dissolved O_2 % air-sat	0 to 500.0 %	±0.2 % of span	0.1 %
Temperature (°C)	-6.0 to 46.0°C	±0.1 °C ± 1 LSD	0.1 °C

DO

Salinity compensation range : 0.0 to 70.0ppt (User programmable)
Pressure compensation range: 600 to 1100 mBar (User programmable)

Temperature

Temperature compensation : -6.0 to 46.0°C
Sensor type : Thermistor ,10KΩ
Ambient temperature
operating range : 0 to 50 °C

POWER

Power supply : 6 AAA batteries / 9V AC adapter

Battery Life (Alkaline) : ~ 25 Hours

DIMENSIONS

Main display(DO%/DO ppm) : 15mm high
2ndary display(Temp) : 8.7mm high
Case length : 222 mm
Case height : 71 mm
Width : 83 mm
Weight : 410g (batteries included)

X. ACCESSORIES AND REPLACEMENTS

LD-900-7	Model 9250M/9251M DO Lab Probe
LD-900-8	Model 9250M /9251M DO probe
LD-900-3A	Membrane Cap kit

XI. 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 free of 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, 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 authorized returns.

NOTE: Jenco reserves the right to make improvements in design, construction and appearance of our products without notice.