

Operation Manual

MODEL 3931

Microcomputer Based DO Transmitter

JENCO ELECTRONICS, LTD.

MANUFACTURER OF PRECISION INSTRUMENTS

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GENERAL INTRODUCTION

Thank you for selecting the JENCO Model 3931. The 3931 DO Transmitter is a rugged microprocessor based instrument assembled in a watertight 1/8 DIN case, designed for use in laboratories and process control applications.

The system displays DO or Temperature status in one large LCD screen.

The model 3931 microprocessor performs a self-diagnostic routine every time you turn on the unit, it will provide you with basic information on the stability of the instrument.

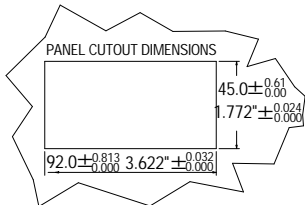
The model 3931 has an isolated 4-20mA analog output, offset and span configurable for the DO display.

INITIAL INSPECTION

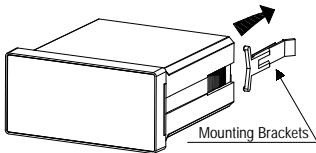
Carefully unpack the unit and accessories. Inspect for damages made in shipment. If any damage is found, notify your **Jenco** representative immediately. All packing materials should be saved until satisfactory operation is confirmed.

USING THE JENCO MODEL 3931

A. Mounting Procedure

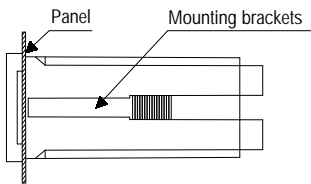


DRAWING 1



DRAWING 2

1. Make a cutout on any panel, with a thickness of 1/16 inch (1.5mm) to 3/8 inch (9.5mm). Refer to **DRAWING 1**.
2. Remove the mounting assembly from the controller and insert the controller into the cutout. Refer to **DRAWING 2**.



DRAWING 3

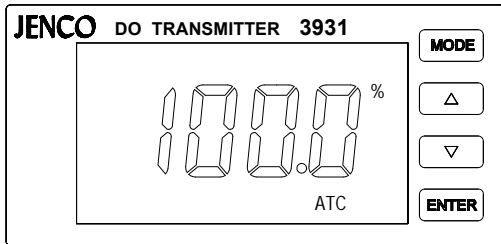
3. Replace the mounting bracket assembly onto the controller and secure the controller to the mounting panel. Refer to **DRAWING 3**.

[Note] :

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

B. Front Panel

The front panel consists of a 4-digit LCD display and 4 keys.



1. [**MODE**] key:

1a. In the **Measure mode**, pressing this key will switch the display in sequence from DO (%), DO (mg/L), Temperature and back to DO (%) again.

1b. In the **Calibration/Setting mode**, pressing this key for three seconds will move you back to the previous parameter in the case when recalibration / resetting is required.

2. **[UP]** key:

2a. In the **Calibration mode**, pressing this key will show the next possible option. In the **Setting mode**, pressing this key will show the next possible option and increases the numeral increment.

2b. In the **Measure mode**, pressing this key and **[ENTER]** key at the same time, the unit will enter the **Calibration mode**.

3. **[DOWN]** key:

3a. In the **Calibration mode**, pressing this key will show the next possible option. In the **Setting mode**, pressing this key will show the next possible option and decreases the numeral increment.

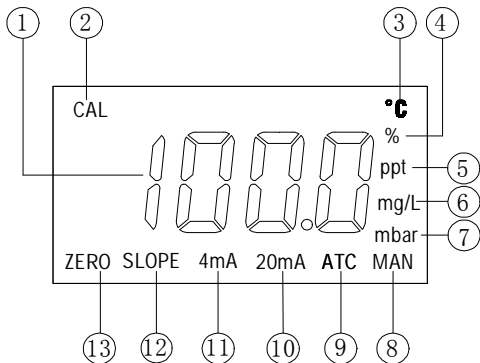
3b. In the **Measure mode**, pressing this key and **[ENTER]** key at the same time, the unit will enter the **Setting mode**.

4. **[ENTER]** key:

In any mode where the user can change the settings, pressing this key will save the new settings. If no change has been made then pressing this key will just move

the user to the next setting.

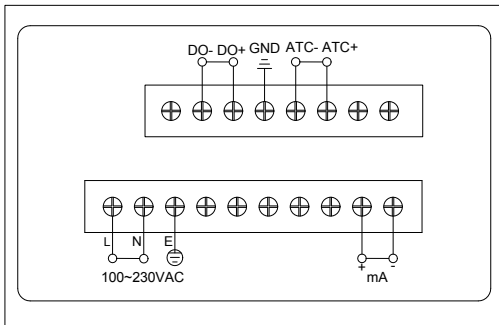
C. LCD screen



1. Major LCD display.
2. **CAL** – This icon will be displayed if the meter is in the **Calibration/Setting mode**.
3. **°C** – Temperature and unit display.

4. **%** – DO unit indicator.
5. **ppt** – Display during calibration when user is prompted for the approximate salinity of the sample in parts per thousand (ppt).
6. **mg/L** – DO unit indicator.
7. **mbar** – Display during calibration to prompt user for barometric pressure.
8. **MAN** – This icon will be displayed without temperature probe.
9. **ATC** – This icon will be displayed when a temperature probe is connected.
10. **20mA** – This icon, when displayed, indicates the meter is in the **20mA Setting mode**.
11. **4mA** – This icon, when displayed, indicates the meter is in the **4mA Setting mode**.
12. **SLOPE** – This icon will be displayed which is the value of 100.0% saturation in air.
13. **ZERO** – This icon will be displayed which is the value of 0.0% saturation in anaerobic water.

D. Rear connectors



1. Connect the AC line to the rear of the instrument. The model 3931 can be used with 100~240V AC at 50/60 HZ. Make sure the **EARTH** connector is connected to the earth lead of the AC power line.

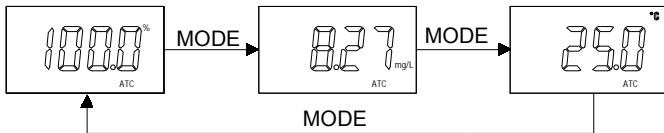
2. Set the proper load to the 4-20mA-output connector. Make sure that the load impedance is less than 500 Ohms.
3. The shielded line of dissolved oxygen electrode must be connected to the "GND", otherwise the readings would be unstable.

[Note] :

- (1) Make sure that the power is unplugged before wiring your probes etc.
- (2) Make sure you connect the AC power cord to the correct AC terminals. Incorrect connection may damage the unit permanently.

E. Measure mode

Turning on the unit will always display the **Measure mode**. This instrument is designed to provide 3 distinct measurements:

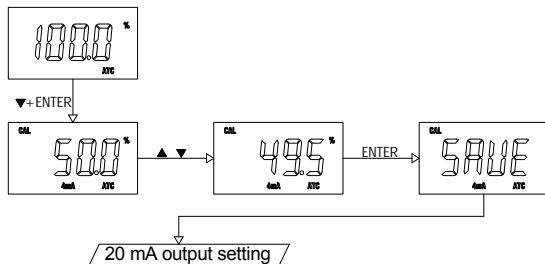


1. **DO(%)** –A measurement of oxygen in percent saturation.
2. **DO(mg/L)** –A measurement of oxygen in mg/L.
3. **Temperature** –Current temperature of the solution.

F. 4-20 mA setting mode

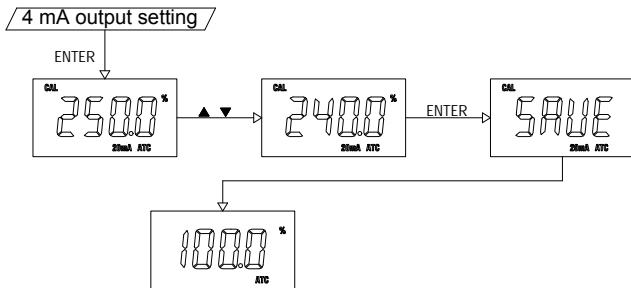
Pressing **[DOWN]** key and **[ENTER]** key at the same time, the meter will enter into the **4-20mA** setting mode.

1. **4mA** output setting:



Pressing **[UP]** key or **[DOWN]** key in this screen to adjust the 4 mA value, this value is used for scaling the 4-20mA analog output. Pressing **[ENTER]** key to save, and enter the next setting screen.

2. 20mA output setting:



Pressing **[UP]** key or **[DOWN]** key in this screen to adjust the 20mA value, this value is used for scaling the 4-20mA analog output. Pressing **[ENTER]** key to save, and goes to the **Measure mode**.

[Note] : See "[H. 4-20mA OUTPUT](#)" page.

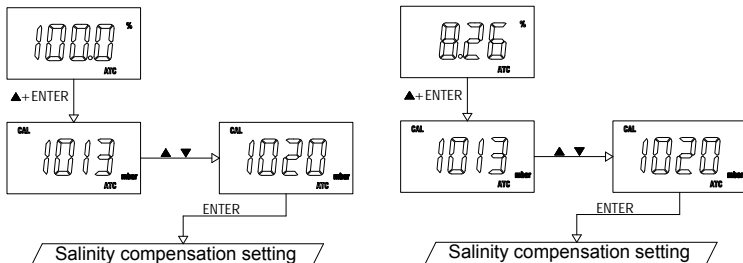
G. DO Calibration mode

Connect the DO probe to the unit and turn the unit on.

If you are calibrating in % then press the **[MODE]** key to DO (%) measure mode.

If you are calibrating in mg/L then press the **[MODE]** key to DO (mg/L) measure mode.

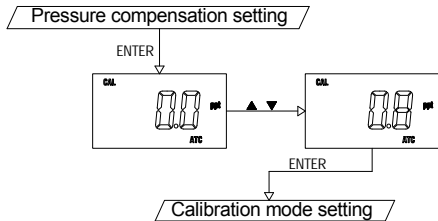
1. Pressure compensation setting:



In the **DO measure mode**, pressing **[UP]** key and **[ENTER]** key at the same time to allow the meter to go to the **pressure compensation setting**. The main screen will display “1013mbar” (factory default value). To change the pressure factor, press the **[UP]** or **[DOWN]** key to adjust the value between 600 and 4000mbar. Press **[ENTER]** to save the new value and the unit will automatically go into the next calibration parameter.

2. Salinity compensation setting:

In this interface, the salinity default factor value is 0.0ppt. To change the salinity



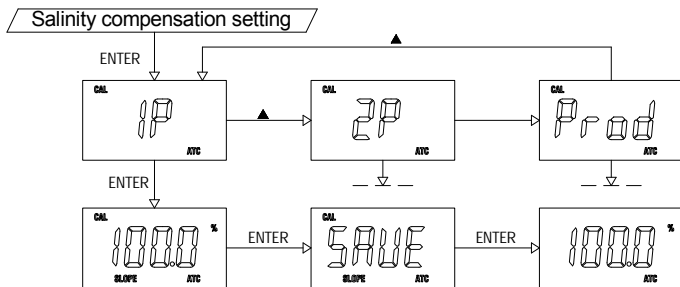
compensation factor, use the **[UP]** key or **[DOWN]** key to adjust the value between 0.0 and 49.9ppt. Press **[ENTER]** to save the new value and the unit will automatically go into the next calibration parameter.

3. Calibration mode setting:

The model 3931 has “1-point” or “2-point” or “Product” calibration mode for DO calibration.

Rinse the DO probe with distilled water, hold the probe in the air gently with the sensor facing down and wait 60 to 120 minutes for the dissolved oxygen and temperature reading to stabilize.

(1) 1-point calibration



Press the **[UP]** or **[DOWN]** key to select “**1P**” then press the **[ENTER]** key to save the selection and the unit will automatically move to the “**SLOPE calibration**”.

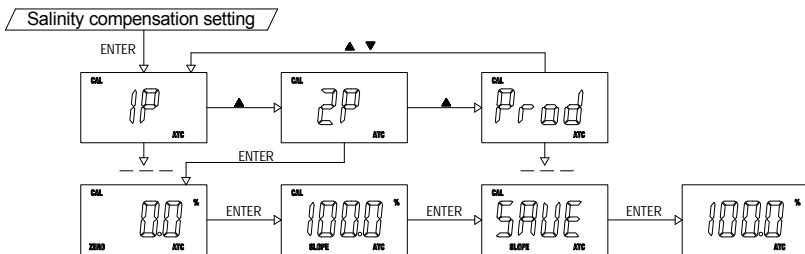
“SLOPE calibration”:

a. If you are calibrating in “%” then the 100.0% calibration will be displayed. An error will be displayed if the input is not within the DO calibration limit. (In this case, refer to the “**ERROR DISPLAY AND TROUBLESHOOTING**”). If all is well, press the **[ENTER]** key to save the new calibration and the unit will automatically move to the “**Measure mode**”.

b. If you are calibrating in “mg/L” then the current reading in mg/L will be displayed. If you press the **[ENTER]** key, the unit will capture the current value and then you can change the value by using the **[UP]** and **[DOWN]** keys. If you are satisfied with the mg/L value, press the **[ENTER]** key to save the new calibration. If the DO input is within calibration range then the new calibration will be saved and the unit will automatically move to the “**Measure mode**”, otherwise an error

message will be displayed. (In this case, refer to the “**ERROR DISPLAY AND TROUBLESHOOTING**”).

(2) 2-point calibration



Press the [UP] or [DOWN] key to select “2P” then press the [ENTER] key to save the selection, the unit will automatically move the “ZERO calibration”.

“ZERO calibration”:

Immerse the probe in the saturated sodium sulfite solution, after the reading is stabilized.

a. If you are calibrating in “%” then the 0.0% calibration will be displayed. An error will be displayed if the input is not within the DO calibration limit. (In this case, refer to the “**ERROR DISPLAY AND TROUBLESHOOTING**”). If all is well, press the **[ENTER]** key to save the new calibration and the unit will automatically move to the “**SLOPE calibration**”.

b. If you are calibrating in “mg/L then the 0.00mg/L calibration will be displayed. An error will be displayed if the input is not within the DO calibration limit. (In this case, refer to the “**ERROR DISPLAY AND TROUBLESHOOTING**”). If all is well, press the **[ENTER]** key to save the new calibration and the unit will automatically move to the “**SLOPE calibration**”.

“SLOPE calibration”:

Rinse the DO probe with distilled water, hold the probe in the air gently with the sensor facing down, after the reading is stabilized.

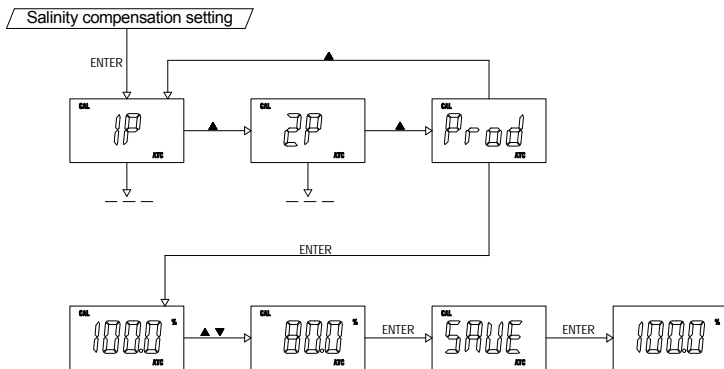
a. If you are calibrating in “%” then the 100.0% calibration will be displayed. An error will be displayed if the input is not within the DO calibration limit then an error

message will be displayed. (In this case, refer to the “**ERROR DISPLAY AND TROUBLESHOOTING**”). If all is well, press the **[ENTER]** key to save the new calibration and the unit will automatically move to the “**Measure mode**”.

b. If you are calibrating in “mg/L” then the current reading in mg/L will be displayed. If you press the **[ENTER]** key, the unit will capture the current value and then you can change the value by using the **[UP]** and **[DOWN]** keys. If you are satisfied with the mg/L value, press the **[ENTER]** key to save the new calibration. If the DO input is within calibration range then the new calibration will be saved and the unit will automatically move to the “**Measure mode**”, otherwise an error message will be displayed. (In this case, refer to the “**ERROR DISPLAY AND TROUBLESHOOTING**”).

(3) Product calibration

Press the **[UP]** or **[DOWN]** key to select “**Prod**” then press the **[ENTER]** key to save the selection.



Immerse the probe in the process system, after the reading is stabilized.
 Press the **[UP]** or **[DOWN]** key to change the value to your specified value. Then press the **[ENTER]** key to save and the unit will automatically move to the **“Measure mode”**.

H. 4-20 mA output

1. Isolation voltage:

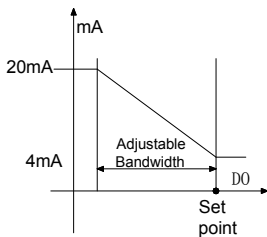
The maximum isolation voltage of the 4-20mA output contacts is 500 VDC. The voltage differential between the 4-20mA output contacts and the load should not exceed 500 VDC.

2. Output load:

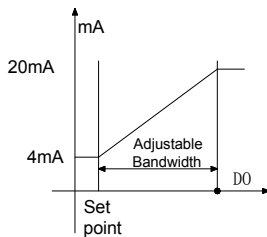
The maximum load is 500 ohm. Output current inaccuracies may occur for load impedance in excess 500 ohm.

3. The analog output will produce a linear analog output. The user can only bind the **ANALOG OUTPUT** to one reading at a time. The user can change this anytime by changing option at the **Calibration/Setting mode** screen.

The analog output will be restricted on the 4mA setting, 20mA setting and the current bound display.



Decreasing current for increasing DO



Increasing current for increasing DO

The above figure shows the relationship between Reading, U_{4mA} & U_{20mA} .

The analog output is based on the following equation:

$$\text{mA (output)} = 4\text{mA} + (16\text{mA}) * (D - U_{4\text{mA}}) / (U_{20\text{mA}} - U_{4\text{mA}})$$

Where: mA (output) = analog output

D = current bound display

$U_{4\text{mA}}$ = user setting for 4mA for current bound display

$U_{20\text{mA}}$ = user setting for 20mA for current bound display

ERROR DISPLAY AND TROUBLESHOOTING

DO Display	Temperature Display	Display Mode	Possible cause(s) [Action(s)]
"OvEr"	-10.0~80.0°C	DO measure mode	DO reading > 400.0% or 40.00mg/L
"Undr"	-10.0~80.0°C	DO measure mode	DO reading < 0.0% or 0.00mg/L
"Undr"	"OvEr"	DO measure mode	Temperature > 80.0°C. [Bring solution to a lower temperature.]
"OvEr"	"Undr"	DO measure mode	Temperature < -10.0°C. [Bring solution to a higher temperature.]

SPECIFICATIONS

Mode	Range	Resolution	Accuracy
DO(%)	0.0 to 400.0%	0.1%	±0.2%FS
DO(mg/L)	0.00 to 40.00mg/L	0.01mg/L	±0.2%FS
Temperature	-10.0 to 80.0 °C	0.1 °C	±0.3 °C

DO:

Salinity compensation	0.0 to 49.9ppt (manual)
Pressure compensation	600 to 4000mbar (manual)
Temperature compensation	-10.0°C to 80.0 °C (manual or automatic)

Temperature:

Temperature sensor Thermistor, 22k ohm at 25 °C,

4-20mA output:

Current output range	4 to 20mA (isolated)
Current output scale	user programmable

Maximum load 500 ohm

Accuracy $\pm 0.03\text{mA}$

Isolation voltage 500VDC

General:

Keys Audio feedback in all keys

Power: 100VAC to 240VAC, 50/60Hz

Ambient Temperature range 0.0 to 50.0 °C

Case IP65, 1/8DIN case, depth 90mm

Weight 290 g

WARRANTY

Jenco 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.

Jenco Instruments, Inc.

7968 Arjons Drive, Suite C San Diego, CA 92126, USA

TEL: 858-578-2828 FAX: 858-578-2886

E-Mail: jencoinfo@jencoi.com; sales@jencoi.com

Website: www.jencoi.com

Jenco Electronics, Ltd.

4F., NO. 80, Songde Rd., Xinyi Dist., Taipei City 110, Taiwan

TEL: 886-2-2345-6188 FAX: 886-2-2345-6791

E-Mail: sales@jenco.com.tw

Website: www.jenco.com.tw

Shanghai Jenco Instruments, Ltd.

18 Wang Dong Zhong Road

Sijing Town, Songjiang

Shanghai, China

TEL: 86-021-5761-9599 FAX: 86-021-5761-9598

E-Mail: jencos@jenco.com.cn

Website: www.jenco.com.cn