

User's Guide



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***DOTX441
Dissolved Oxygen Analyzer***



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WARNING: These products are not designed for use in, and should not be used for, human applications.

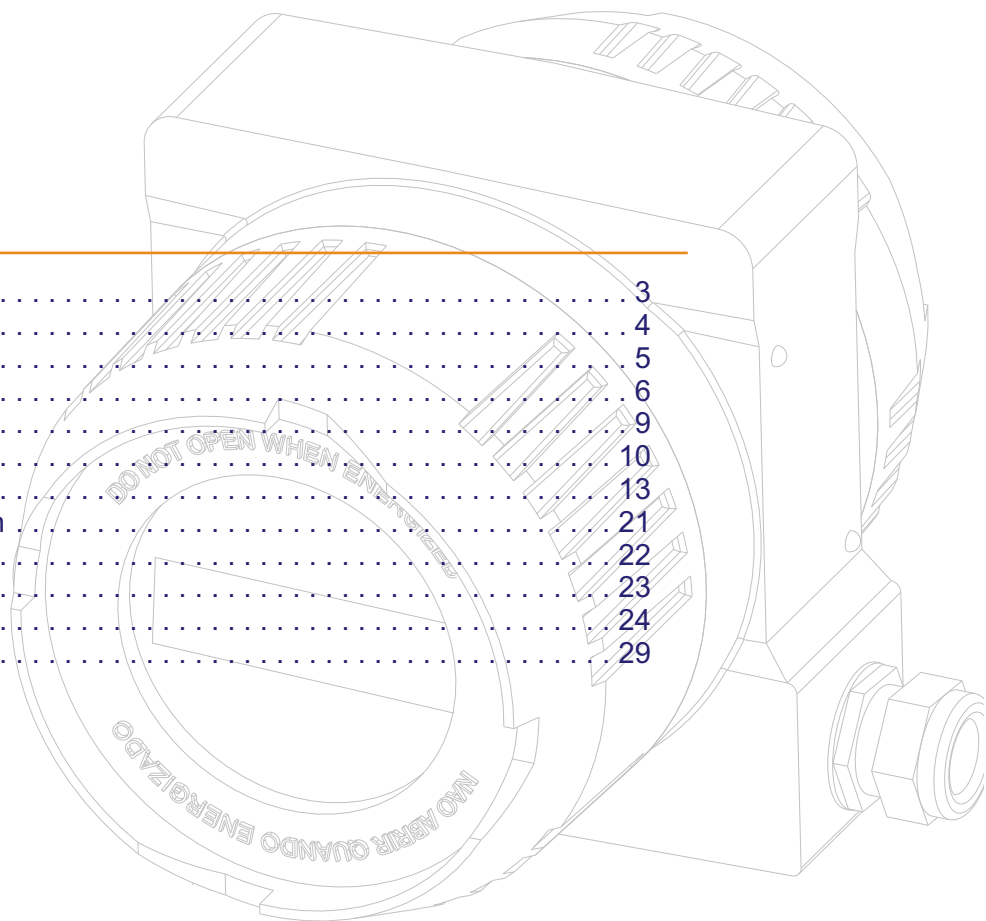
Instruction Manual

Dissolved Oxygen Analyzer

DOTX441

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2. Specifications

Application	Analyzer/Transmitter/Dissolved Oxygen Controller Micro processed
GENERAL	
Case	Cast Aluminum SAE 323
Finishing	Electrostatic Epoxy Paint
Electrical Connection	Connector Barr – Conexell Type
Cable Inlet	Cable Knockout 1/2" (2 x)
Assembly	2" Tube or Flat Surface
Identification (TAG)	SS Tag
Enclosure	IP-68
Power Consumption	3.5 VA
Weight	1.9 Kg
Electrical Power	90 to 240 VAC (50 / 60 Hz)
Working Temperature	5 to 40°C
Relative Humidity	20 to 80 %
Analyzer / Transmitter	
Display	Alphanumeric 2 lines x 16 characters
Range	0 to 60 mgO ₂ /L
Resolution	0.1 or 0.01
Relative Precision	0.02 % (full scale)
Working Temperature	50 °C
Auto Temperature Compensation	50 °C
Measuring Principle	Clark Polarographic Cell
Response Time	20 s (Programmable)
Barometric Pressure Compensation	Up to 10.000 m
Signal Output	Analogic 4 to 20 mA w/ programmable output range for all Reading range
Galvanic Isolation	2000 VAC (by opto coupler)
Line Resistance	1K3 Ohms
Controller	
Actuation Type	Frequency Modulation, P+Di
Set-Points	2 independent from 0 to 100% of scale
Outputs	2 control ON-OFF, programmable for Alarm or Actuation P+Di
Control for Automatic Cleaning	Timer ON-OFF, for periods up to 99 seconds, and in intervals up to 99 hours
Cell	Model: DOE-441
Type	Immersion
Body Material	Polypropylene (PP) or SS 316(others upon request)
Maximum Temperature (@ Atm. Press.)	50 °C
Body Length	1500 mm (standard, others upon request)
Auto Cleaning System	Activated by a solenoid valve
Accessories	
Instruction Manual on a CD	
SS 304 clamps with nuts and bolts	

3. Mechanical Description

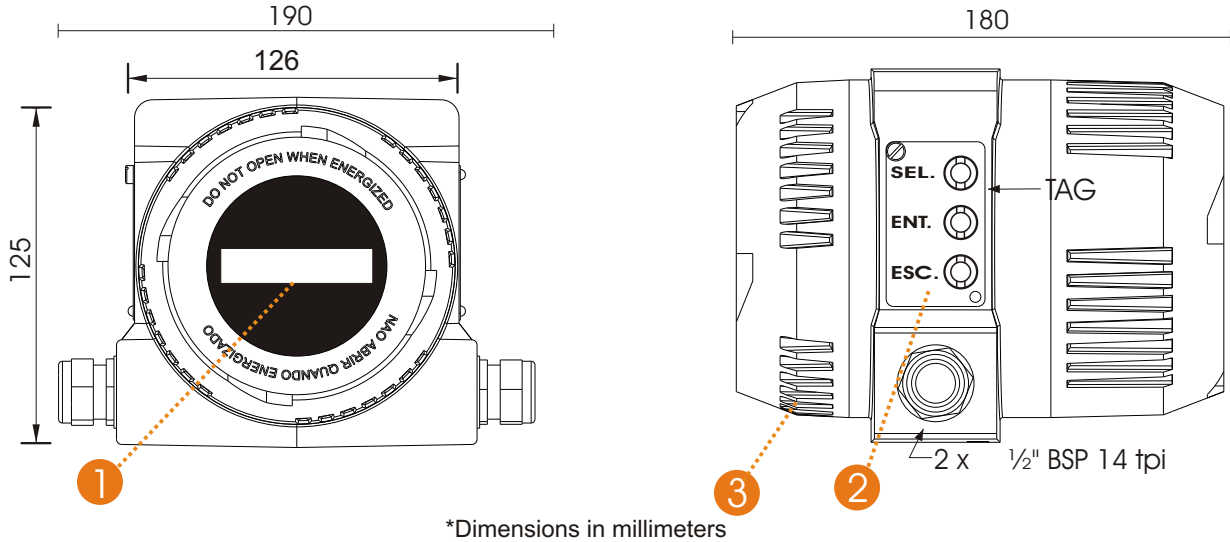
The equipment is offered in compact case in cast aluminum. **SAE 323, with low oxidation grade**, with anti corrosion treatment and finished with electrostatic epoxy paint. Reduced dimensions and very light weight, it is build under IP-68 protection.

User will find under the same case: the local indicator, Analyzer, Transmitter, Controller and the Register, making the equipment compact, rough and of ease operation.

The case installation can be done in 2" tube or Flat Surface.

Electrical connection is done by a terminal barr located in the case's back housing of the instrument, with cable Entrance thru 2 cable press of 1/2" BSP.

In one the instrument sides, user will find an identification tag in SS 316, which covers the external controls, sealed in Order to guarantee the case protection.



*Dimensions in millimeters

Items Description

1 - Display: Alphanumeric back lighted 2 Lines x 16 characters

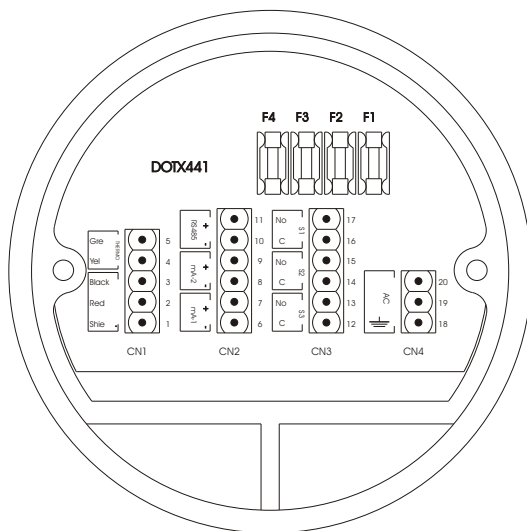
2 - Keyboard: 3 keys

key <SEL> Select the desired function, flashing option.

key <ENT> Confirms the selection chosen by Select key.

key <ESC> returns to prior menu.

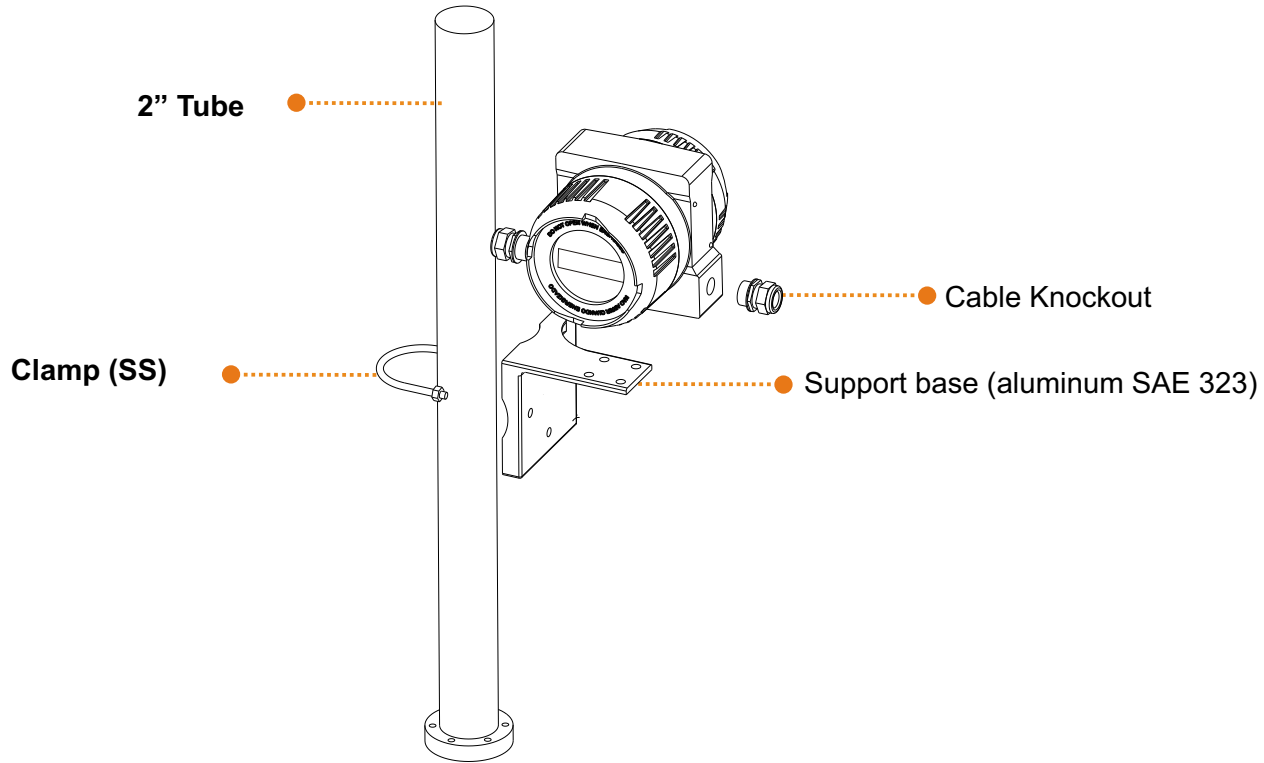
3 - Interconnection Board (located inside the back lid)



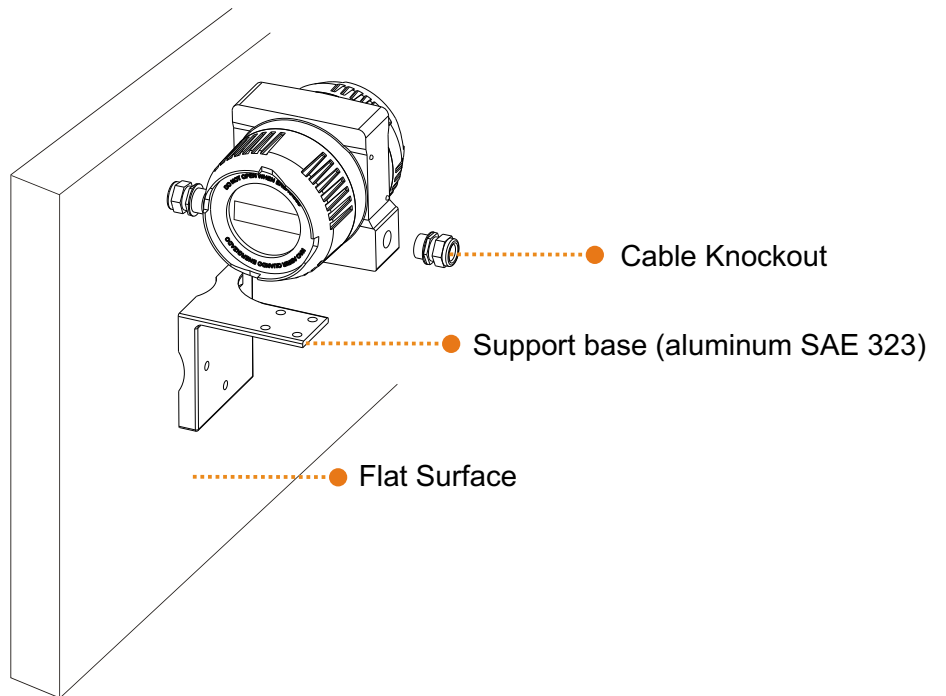
Slots	Connections
1	Dissolved Oxygen Cell Shield
2 & 3	Measuring Sensor
4 & 5	Thermocompensator
6 & 7	Transmission Output mA - 1
8 & 9	Transmission Output mA - 2
10 & 11	Digital Output Communication RS - 485
12 & 13	Set-Point 3 (S3) Contacts – Auto Cleaning
14 & 15	Set-Point 2 (S2) Contacts
16 & 17	Set-Point 1 (S1) Contacts
18	Grounding
19 & 20	Electrical Power from 90 thru 240 VAC 50 / 60 Hz
F1	General Fuse (3 A)
F2	Set-Point 1 Fuse (1 A)
F3	Set- Point 2 Fuse (1 A)
F4	Set- Point 3 Fuse (1 A)

4. Typical Installation

2" Tube Installation



Flat Surface Installation



Important: Install the equipment in a strategic location that allows ease access and maintenance and avoid exposing it direct to solar rays, besides equipment's overheating causing eventual damage, the Liquid Crystal Display will also loose it's sensibility, fading the display.

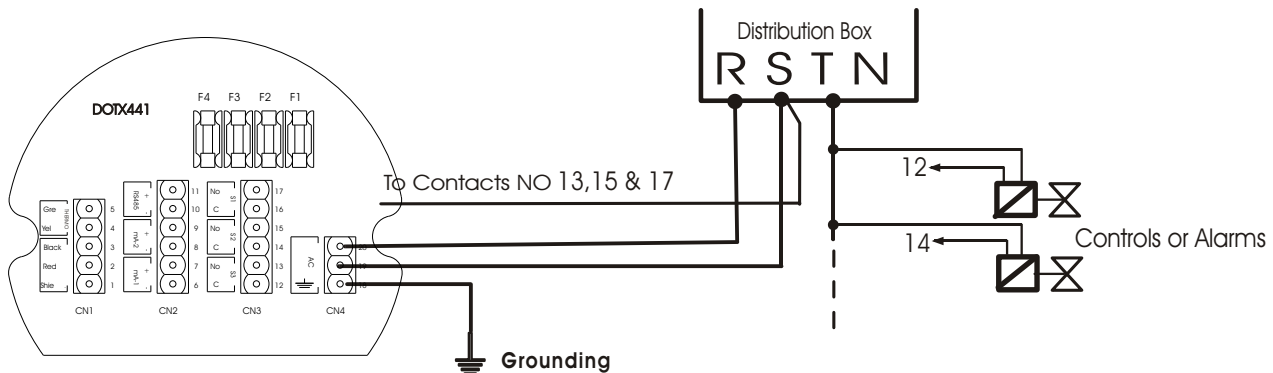
5. Equipment Installation

In order to achieve the best performance of OMEGA's Continuous Analyzer, it is crucial to perform it's correct installation. Follow instructions below:

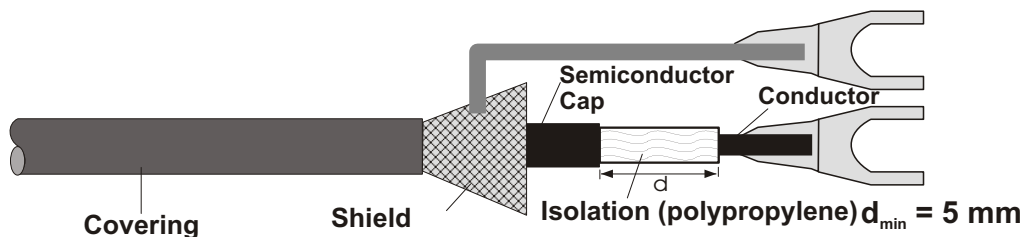
1. Remove the equipment from the box, verify if any damage was caused by it's transportation.
2. Install the case in a strategical location, for ease access and maintenance, exempt of vibrations and vapors.
3. Avoid exposing the equipment direct to solar rays. If necessary use some kind of protection.
4. After connecting the cable with it's respective terminals, proceed with terminal barr connection, located in the back panel of the case.
5. Inspect all electrical installation in order to certify that all connections are correct.
6. Verify power electrical source in order to make sure it's voltage value.
7. Turn on circuit breakers of the electrical box.

5.1 Important Recommendations

1 - The equipment electrical power must be independent from others system components. Being so, the cable that will power the Control Valves, Solenoids, Alarms, and others, **MUST BE CONNECTED DIRECT TO DISTRIBUTION BOX**, and "never" to the equipment slots.



- 2 - **Verify** if the cable knockouts of the equipment and probes are firmly attached to its respective interconnection cable. This proceeding is necessary in order to preserve IP-68 protection.
- 3 - **Be careful with humidity!** It will diminish the impedance generating measurement errors. Verify the cable knockouts and if necessary, dry them using a hair dryer.
- 4 - Replace periodically the sealing O-Rings in order to guarantee a good sealing of the enclosure.
- 5 - **Do not** cut or mend the interconnection cables. Under the cable shield there is a semiconductor coating material, used to eliminate electrostatic interference at the cable.



6 - ON-OFF outputs are thyristor type, offering innumerous advantages for the equipment, such as: no sparks presence, faster commutation, noise practically inexistent, no presence of RF interference and many more.

The outputs can commute any charge, since they are **powered by alternate tension (VAC)**.

5. Equipment Installation (cont.)

5.2 Dissolved Oxygen Industrial probe Characteristics - DOE-441

Dissolved Oxygen Immersion Probes for industrial application, consists typically in an adequate installation hardware, whose function is to hold and protect the Dissolved Oxygen industrial cell model: **DOE-441-R** and its respective connections.

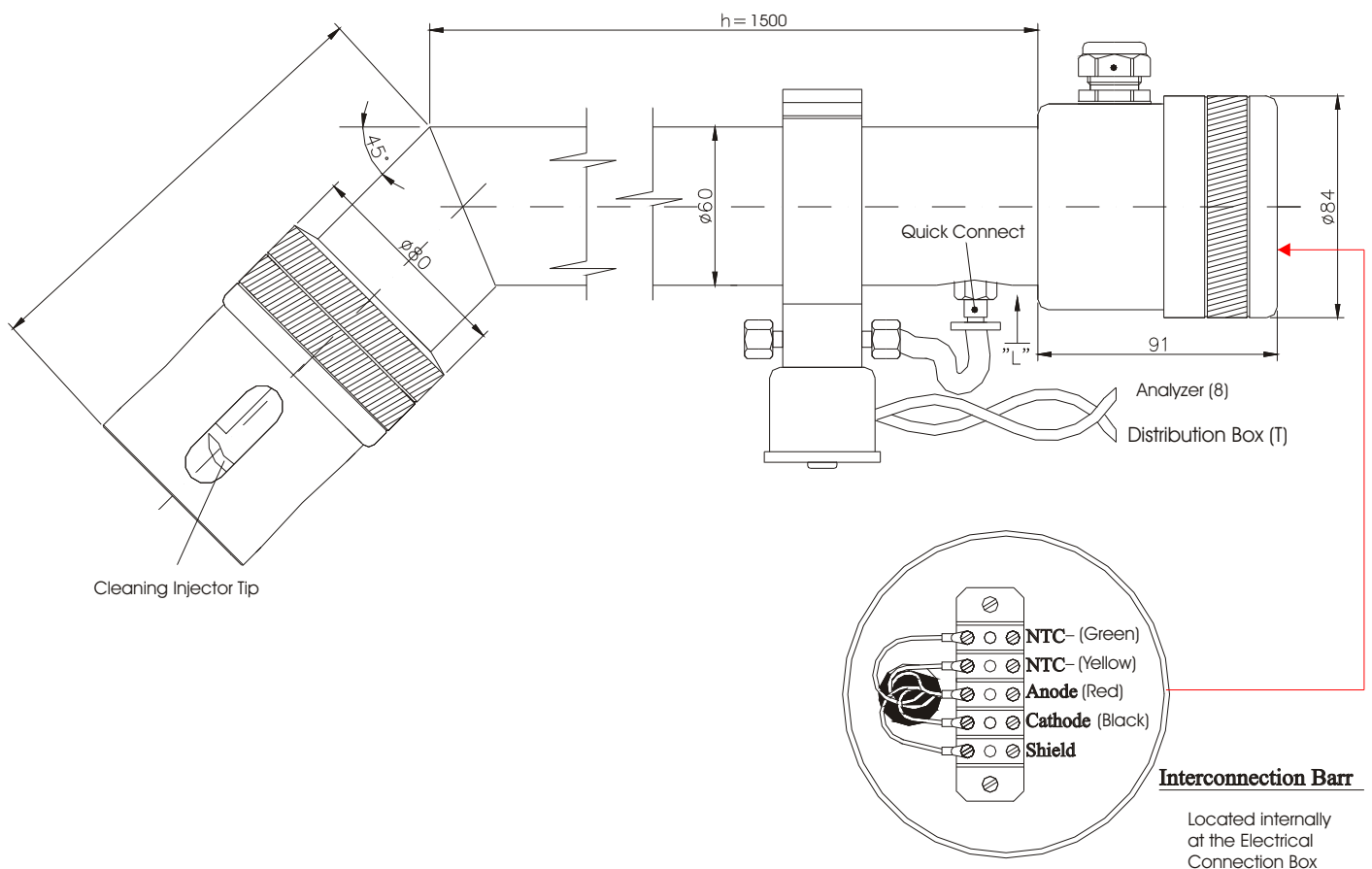
In order to choose the adequate material to its body construction will depend on work's chemical aggressiveness and temperature of the process. Find below some materials available:

a) PP (Polypropylene) - **Model DOE-441** (Standard)

b) Stainless Steel 316 - **Model DOE-441-S** (Special Order) and others upon request.

All connections offer guaranteed sealing by Nitrilic Rubber O-Rings, FKM or others. The electrical connection is done thru a terminal barr in an IP-68 case protection, with cables going thru a 1/2" NPT hole or 1/2" cable pres and the interconnection of the Probe's terminal barr to the cell being done by PA type connector. It is recommended that the connection cable from the probe to the equipment offers the shortest length possible, in order to avoid RF interference and noise problems.

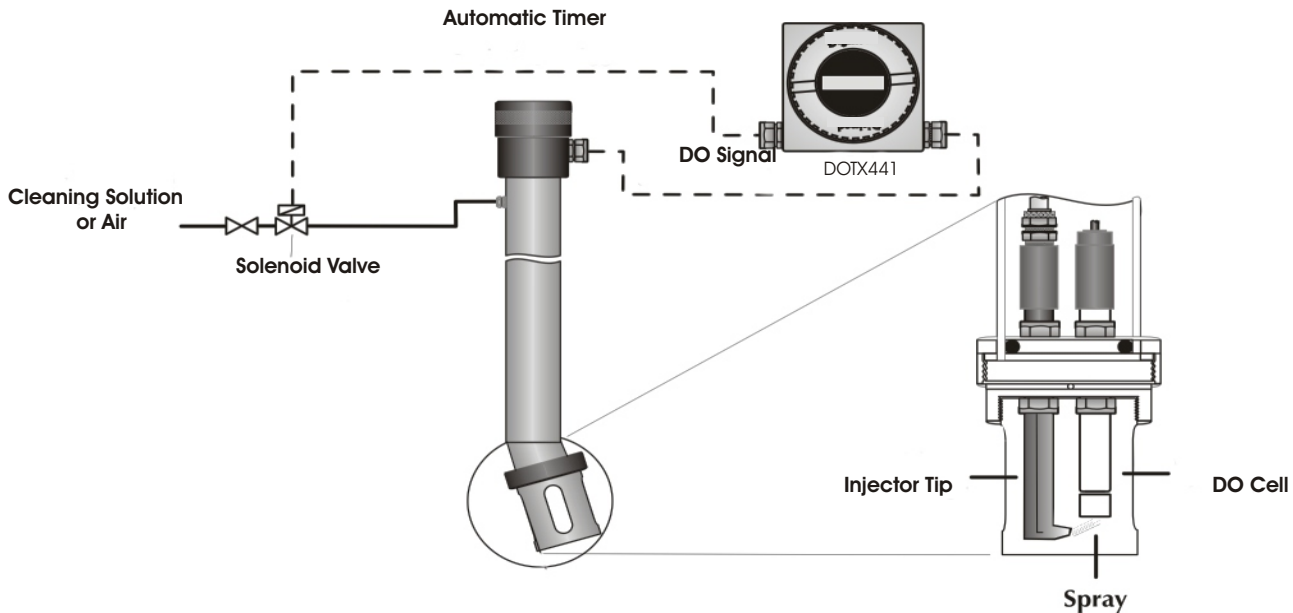
The installation of the Probe can be done by a pole or flange and the insertion length is defined based on the need of measure to be taken, being supplied with standard of $h=1500$ mm.



5. Equipment Installation (cont.)

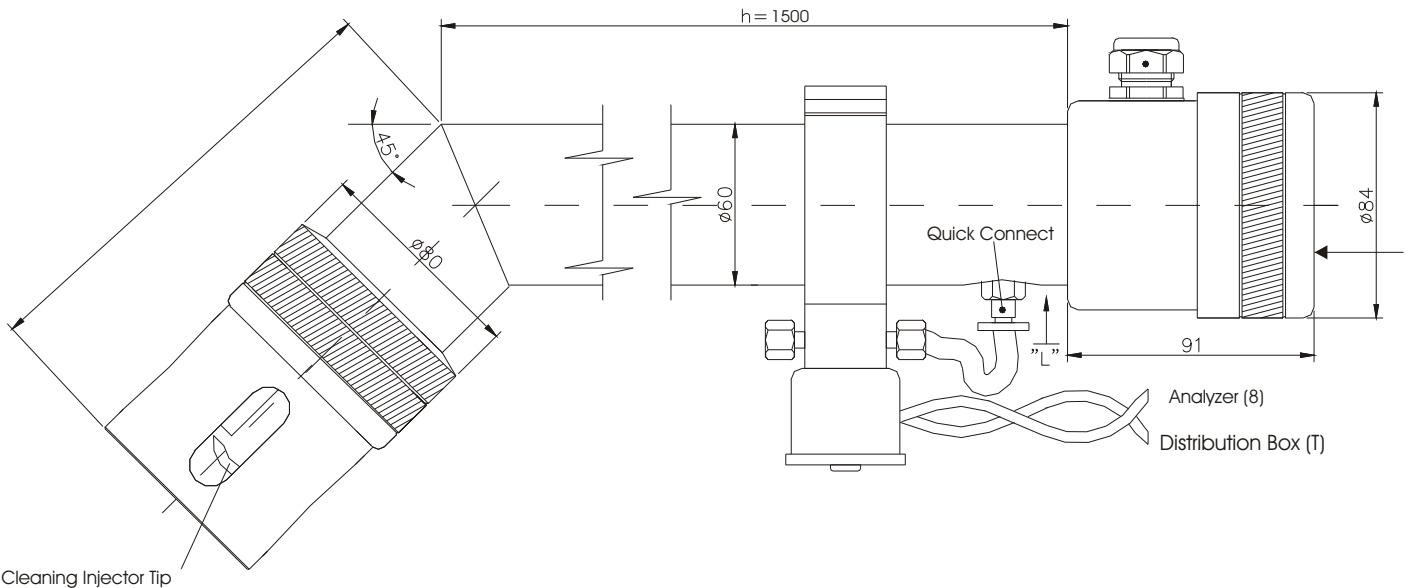
5.3 Automatic Cleaning System hose installation

Probes DOE-441, are supplied with Automatic Cleaning System, whose function is to remove any clogging at the membrane of the Dissolved Oxygen's Cell. Typically, the cleaning is done by pressurized air jet (3 bar maximum). The cleaning is executed a solenoid valve activation controlled by the equipment. The time and duration of the cleaning can be programmed, by accessing the Set Up operation of the equipment's program. At slots 12 & 13, there is a thyristor contact (S3) that commands the Solenoid for the cleaning system.



ø1/4" x 1/8" Parker U-42 Hose Installation

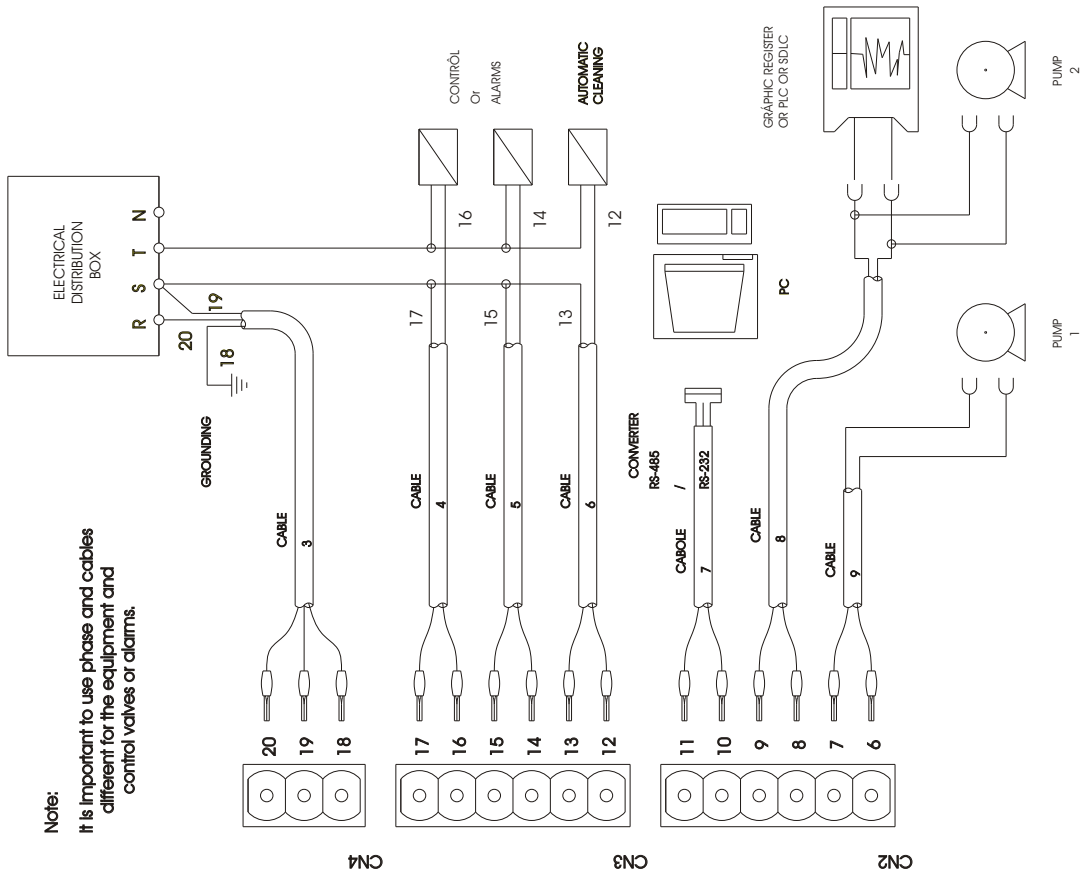
Insert the hose at the connection (quick connect) all the way down. Metal holdings located inside of the ring will attach and hold the hose, push the ring following the same direction as arrow "L" shown on below illustration. **Never pull the hose**, as it will damage the metal clips.



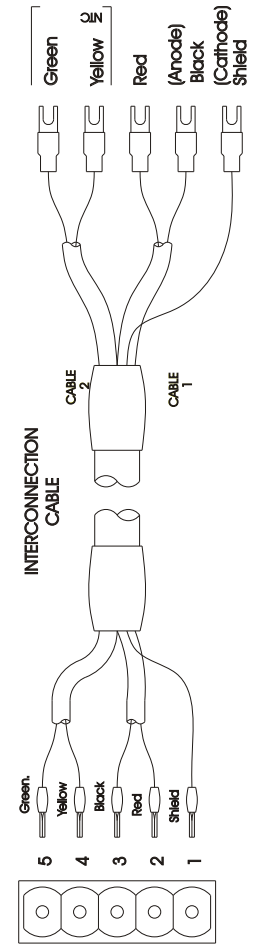
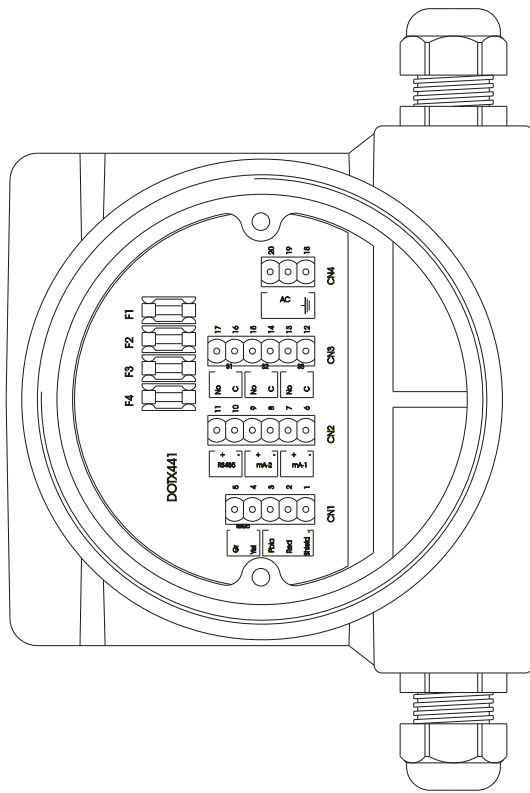
Important:

When noticed a drop in sensibility during calibration, frequently deviations of calibrated value or even reading oscillations, it is necessary to proceed with a cell maintenance. The steps in order to perform this operation, you will find on chapter 12 - Cell Maintenance, page:22.

6. Electrical Installation



Note:
It is important to use phase and cables different for the equipment and control valves or alarms.



CN1

EQUIPMENT

CELL

7. Equipment Operation

Important Information

1 - Never forget that if the instrument is turned off, it is necessary to wait for the **cell polarization** (aprox. 12 min.).

2 - While at **READ** mode, is possible to obtain other information, such as:

By pressing **<SEL>** key, user can obtain the Temperature value, or the Set - Points, programmed during **SET UP** mode.

By pressing **<ENT>** key, it moves the equipment to **STAND BY** mode. While in **STAND BY** the outputs will be turned off, that means, the current output goes to 4 mA and the contacts to NO. The outputs must be programmed by the user.

3 - **<ESC>** key is only recognized when pressed and hold for about 5seconds. This time is necessary in order to certify that the user desires to exit the selected option.

4 - During certain program steps, it is allowed to adjust such values as: Span, salinity, barometric pressure, set-points, hystereses and others. The adjust is done by indication of arrows **<** (decrease) and **>** (increase). Press **<SEL>** key in order to choose the correct option, increase **">"** or decrease **"<"** then confirm by pressing **<ENT>** key. Press **<SEL>** key again until user reaches the desired value, then press **<ENT>** key to confirm.

5 - When power failure occurs, when the equipment turns back on the initial pre-programmed conditions will remain as prior to the power failure. Wait for the **Cell Polarization**. If the equipment is under **READ** mode, it will return to Reading and no further action will be necessary!

While at Stand By, if a power failure occurs the instrument will not return to reading mode after the polarization is completed, it will go to the main menu (select Function).

6 -Syntonizing P + Di Contol

The Period Value (Di), must be established in relation to the retention time of the process.

Example: Retention Time is equal 30 minutes, establish a period of 1 minute.

The Proportional Band (BP), must be equally established in relation to the reagent concentration and of the process homogenizing power. Start with 50 % of PB and increase or decrease it in relation to its variable response.

7. Equipment Operation (cont.)

Set Up Procedures

The Equipment offers a non-volatile memory (**E2PROM**) in order to store operation's functions (Resolution, Reading Mode, Calibration, etc) . Even when turned off from power, all functions chosen during set up will remain stored. Before you start any work with the equipment, it is recommended to **verify the SET UP conditions**, to certify that you have chosen the correct options for your work and to avoid operation errors. Press and hold **<ESCAPE>** key until reached the Select Function Menu. When at the **SELECT FUNCTION** menu, press **<SELECT>** key in order to select the function desired, flashing option, then press **<ENTER>**. In order to access the **SET UP** menu, press **<SELECT>** key until SET UP flashes, then press **<ENTER>** key to confirm the option. A Password will be requested, press in sequence (**<SELECT>**, **<ENTER>**, **<ESCAPE>**) and follow step by step the options shown at the display. In case the user desires to switch the flashing option, press **<SELECT>** key and change as needed following the display commands, then **<ENTER>** key to confirm the option chosen.

When a mistake is made and the user needs to go back to change it, press **<ESCAPE>**. The display will move back one screen at a time for every option.

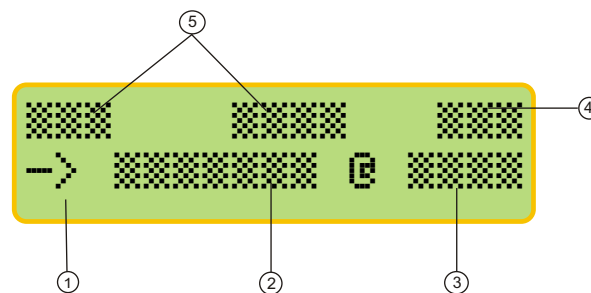
At the flow chart, the flashing option will be displayed in **Blue Color**.

Check Operation

The option Sensor **CHECK** is very useful, as it allows the user to verify the cell condition. This option is self explanatory, just press **<SELECT>** key until Check flashes, then press **<ENTER>** key to confirm the option. Then follow the display instructions as it self explanatory.

Read Operation

At this operation user will have options to **CALIBRATE** or **READ**. In case the desire is to **CALIBRATE** the Cell, press **<SELECT>** key in until **CALIBRATE** option flashes, then press **<ENTER>** key to confirm it. From this point on the program will guide the user step by step on how to proceed with a perfect calibration. In case the desire is to **READ**, press **<ENTER>** key at flashing option Read then place the cell at the sample and press **<ENTER>**, the display will then show the following format:



- 1 - The "**Prompt**" is a signal that will flash at every executed reading or depending on the Time between Readings, chosen during Set Up Mode.
- 2 - The measured value
- 3 - Reference Temperature
- 4 - Sample Temperature
- 5 - Set - Points S1 & S2 conditions

Note: while indicating the set-points, the sample temperature (4) will not be displayed.

7. Equipment Operation (cont.)

Basic Operations

Menus are self explanatory and of ease interaction. In order to input or alter data, menus are offered always as flashing option and in order to choose this option, press **<SELECT>** key, than press **<ENTER>** to confirm the option chosen. **<ESCAPE>** key is used to change option or correct data chosen at prior screens (at every touch, the program will move back one step at a time), except while at Reading Mode, when this key needs to be pressed and held for about 5 seconds in order to exit the Reading Mode.

The equipment stores all configurations at a non-volatile memory. Even when turned off, the conditions will remain stored.

Turning On the equipment

1 - Power the Equipment. The display will show the following menus as described below.

Indicates the model and firmware version of the equipment

```
OMEGA
DOTX441 V1.1
```

Software will perform an auto check of the memories and also of the display

```
AUTO CHECK
```

```
DISPLAY TEST
```

```
XXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXX
```

Cell will be Polarized and this process should take 12 minutes to complete.

```
WAIT IN
POLARIZATION
```

```
11min : 59 sec
IN POLARIZATION
```

Indicates when the Bargraph was chosen during Set Up Mode.

After the Polarization is completed, the instrument will perform the Reading operation and in order to exit and access the Main Menu, where user will be able to Set Up the instrument, press and hold for about 5 seconds **<ESCAPE>** key.

```
S1:⊗ S2:⊗ S3:⊗
-> 49.98PPM
```

```
=====
-> 49.98PPM
```

Interpreting the Read menu. For S1, the indicates that this contact was set as On during Set Up and it is now operating. For S2, the indicates that this contact was set as On during Set Up but it is not operating now. For S3, the indicates that this Contact was set to Off during Set Up.

```
S1:■ S2:□ S3:⊗
-> 49.98PPM
```

<ESCAPE>

```
DISSOLVED OXYGEN
READ/SET UP
```



Go to Page 13

7. Equipment Operation DO - Set Up

Before starting a new operation, make sure that the Set Up conditions are correct for the application being performed.

Press **<SEL>** until **Set Up** flashes then press **<ENT>**

A Password is required in order to access the **SET UP**. Press in sequence **<SEL>**, **<ENT>** and **<ESC>** keys.

In order to select the desired language, press **<SEL>** key until the desired option flashes, then press **<ENT>** key to confirm .

User can program the instrument, such as Calibration Default, Resolution, on line Calibration and more. If chosen **No**, the last configuration will remain in effect. Press **<SEL>** key until the desired option flashes, then press **<ENT>** key to confirm .

You can calibrate the instrument as factory default. Choose **Yes** and confirm and the instrument will calibrate as factory default! This option is offered in case the user does have any other way to perform a calibration procedure.

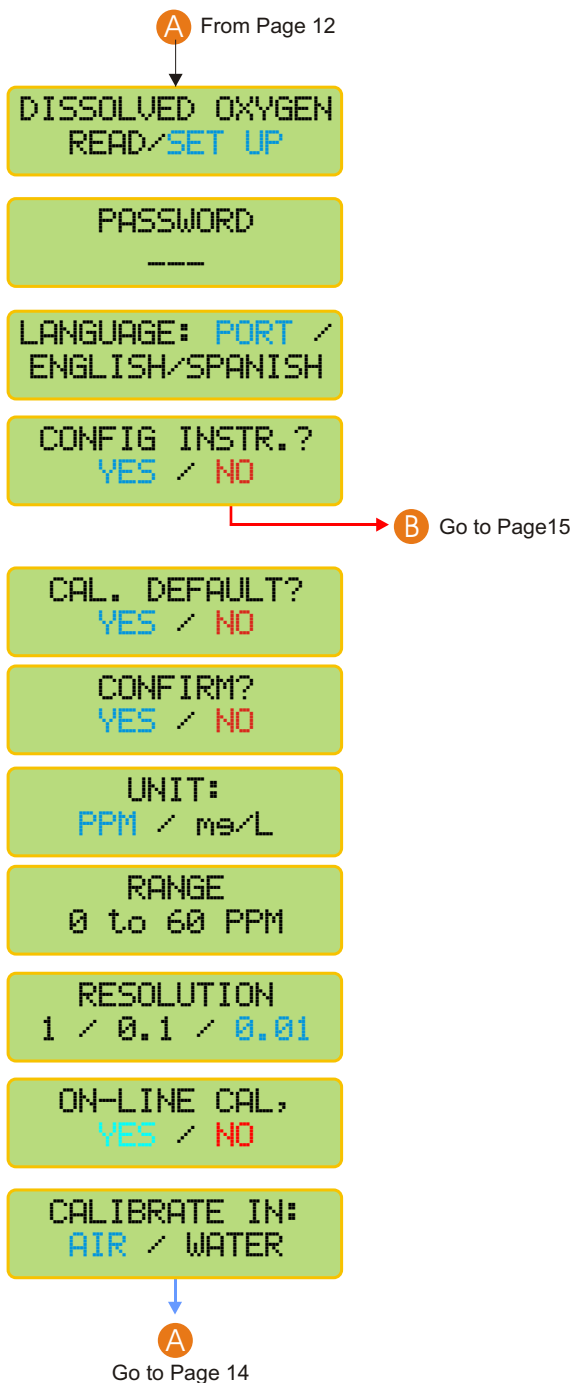
The user will be allowed to chose the unit desired. Press **<SEL>** until the desired option flashes then confirm by pressing **<ENT>**.

The Range cannot be changed. It is default from factory.

The Resolution can be chosen, by pressing **<SEL>** key until the desired option flashes and confirmed by pressing **<ENT>**

The user will be allowed to adjust the DO value read at sample. Press **<SEL>** until **MAN** flashes then confirm by pressing **<ENT>**.

User has the option to choose the Calibration type desired. Press **<SELECT>** key until the desired option flashes, then press **<ENTER>** key to confirm the option chosen. If air, calibrate the cell dry at 2cm from water surface, and if water, dip the cell into Saturated distilled water with Oxygen. See page 19.



Note A: Every time you see the symbols “>” and “<”, that means that the user can adjust the displayed value up or down.

To increase the value press **<SEL>** key until “>” flashes, then press **<ENT>** to confirm, then press **<SEL>** key and at every touch the value will increase by one unit.

To decrease the value press **<SEL>** key until “<” flashes, then press **<ENT>** to confirm, then press **<SEL>** key and at every touch the value will decrease by one unit.

If a mistake is made, press **<ESC>** key to return and correct the value!

7. Equipment Operation DO - Set Up (cont.)

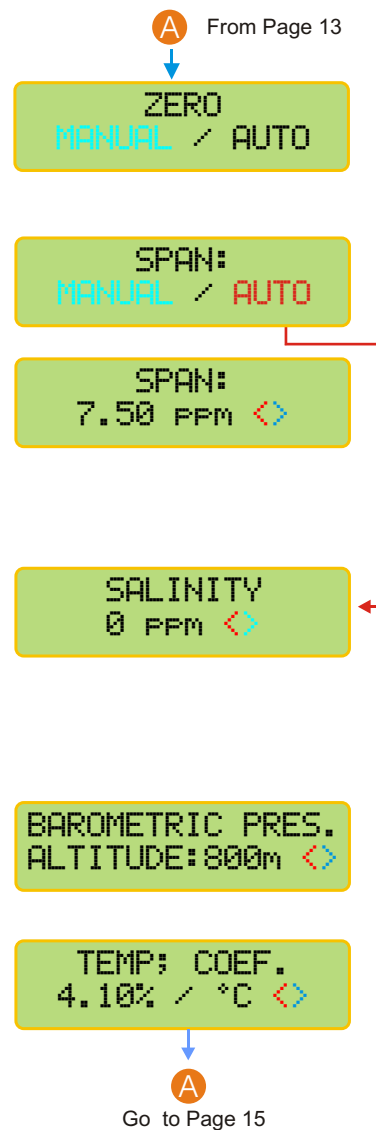
User has the option to choose the Zero calibration type desired. Press **<SELECT>** key until the desired option flashes, then press **<ENTER>** key to confirm the option chosen. If Zero Auto - Zero is achieved internally by the instrument. If Zero Manual - also known as Zero Chemical, use solution without Oxygen presence.

Span is the second calibration point and user has the option to choose between Span Manual - when user has a solution with a known dissolved oxygen value, obtained thru Winkler Method, so read values can be compared to the Winkler values or Span Auto - automatic conditions, with atmospheric air. Press **<SELECT>** key until the desired option flashes, then press **<ENTER>** key to confirm the option chosen. The Span Resolution will depend upon the Resolution chosen for Reading. Refer to page 13 (Note A) for instructions on how to adjust this value.

User can adjust the Salinity value, so the salinity compensation can be performed. So the salt concentration of the sample, needs to be known. Remember that at fresh water this value does not exceed 2000µOhms/cm, that corresponds to 1000ppm where use can consider the adjust to 0 (zero). Refer to page 13 (Note A) for instruction on how to adjust this value.

User can adjust the Barometric Pressure Altitude. Up to 4500meters. Find out the Barometric Pressure Altitude of the location where the instrument will be used and refer to page 13 (Note A) for instruction on how to adjust this value.

User can adjust the Temperature Coefficient. This is used to correct the variation imposed by the Cell Membrane. A membrane of 50 µm has a Temperature Coefficient of 4.10% / °C. In case thinner or thicker membranes are used, the correct value, must be used. Refer to page 13 (Note A) for instruction on how to adjust.



7. Equipment Operation DO - Set Up (cont.)

User can choose between the following Reading Modes:
Continuous - Read continuously after time is set
Average - Reads the average after time is set
Hold - user must press **<ENTER>** key to Read
User can program the time between Readings.
Refer to Page 13 (Note A) for instructions on how to adjust this time.

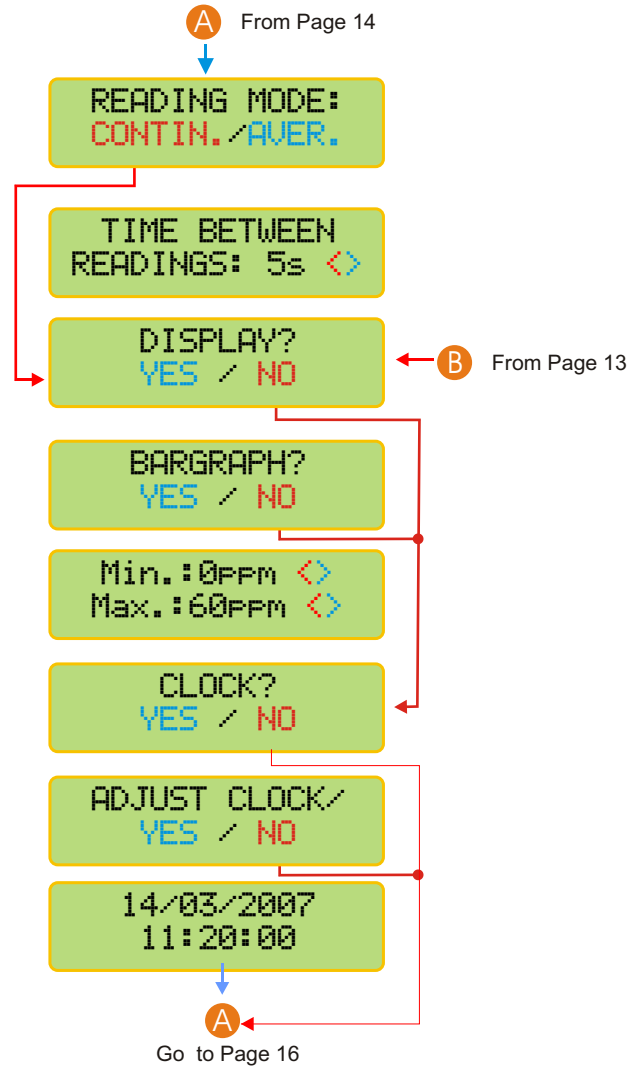
User can program the display to show information like Barr graph, Clock and more.

User can choose if desire to have Barr graph shown above the Reading screen. When Bar Graph is displayed, the information about Sensibility and Sample Temperature will not be displayed!
User can now adjust the Minimum and Maximum values for the Bar Graph. Refer to Page 13 (Note A) for instructions on how to adjust this value.

User can choose to display the clock when sending data information thru RS-485.

User can adjust date and clock, if desired.

Use **<SELECT>** key to change numbers and when finished, press **<ENTER>** key. If a mistake is made, press **<ESCAPE>** key to move back.



7. Equipment Operation DO - Set Up (cont.)

User has the option to configure Contacts SP 1, SP 2 and SP 3
 Press **<SELECT>** key to choose the desired option then
 press **<ENTER>** key to confirm.

If user chooses Contact S1 as On, while at Reading Mode, a or a will be displayed after the S1, indicating that this Contact is On. If user chooses Contact S1 as Off, while at Reading Mode, a will be displayed after the S1, indicating that this Contact is Off.

User can program the SP 1 for Alarm or P+Di.
 Press **<SELECT>** key to choose the desired option then
 press **<ENTER>** key to confirm

User can adjust the value for SP 1.
 Refer to Page 13 (Note A) for instruction on how to adjust this value. Resolution will depend upon the Resolution chosen while at Set Up.

User can choose the Acting desired.
 Press **<SELECT>** key to choose the desired option then
 press **<ENTER>** key to confirm .

User can adjust the value for Hystereses.
 Refer to Page 13 (Note A) for instruction on how to adjust this value. Resolution will depend upon the Resolution chosen while at Set Up.

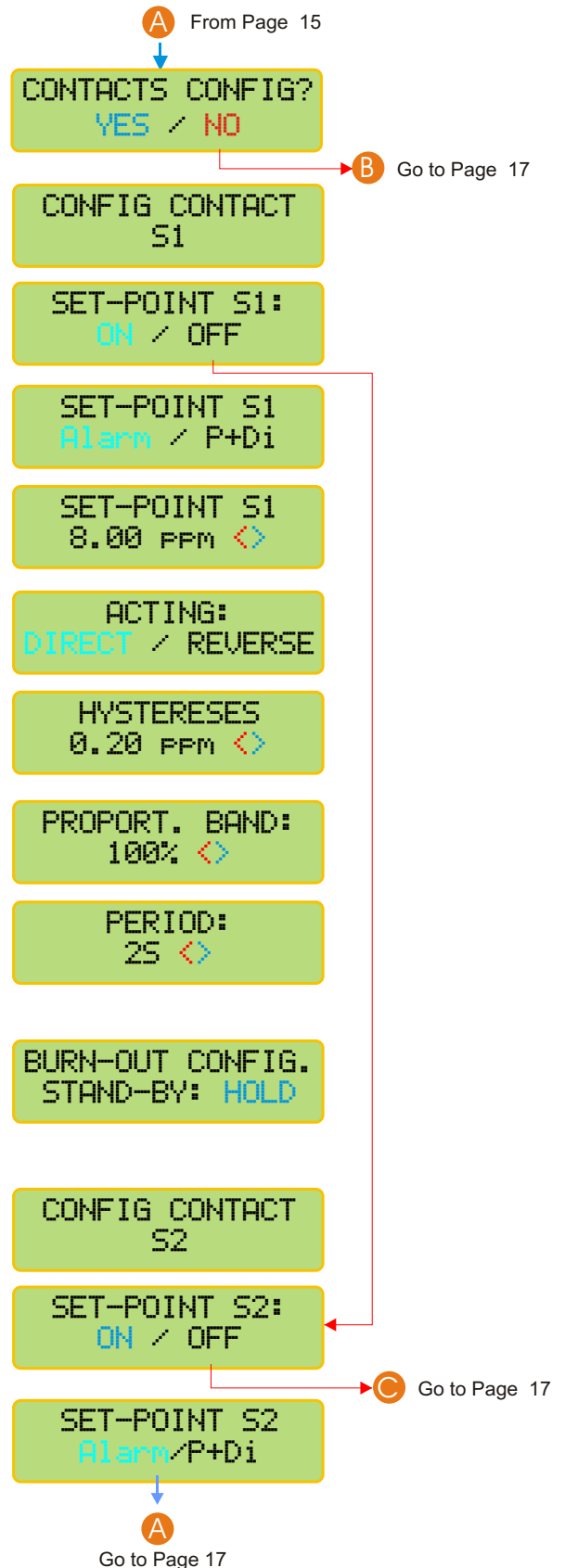
User can adjust the percent for Proportional Band.
 Refer to Page 13 for instruction on how to adjust this value.

User can adjust the time for Period.
 Refer to Page 13 for instruction on how to adjust this value.

For the Burn Out configuration, user will have three options as:
 On - Contact is going to stay On all the time, Off - contact will stay Off all the time or Hold - contact is going to follow the last situation, before going to Hold status.
 Press **<SEL>** key until the desired option flashes, then press **<ENT>** to confirm.

If user chooses Contact S2 as On, while at Reading Mode, a or a will be displayed after the S2, indicating that this Contact is On. If user chooses Contact S1 as Off, while at Reading Mode, a will be displayed after the S1, indicating that this Contact is Off.

User can program the SP 2 for Alarm or P+Di.
 Press **<SELECT>** key to choose the desired option then
 press **<ENTER>** key to confirm



7. Equipment Operation DO - Set Up (cont.)

User can adjust the value for SP 2.
Refer to Page 13 (Note A) for instruction on how to adjust this value. Resolution will depend upon the Resolution chosen while at Set Up..

User can choose the Acting desired.
Press **<SELECT>** key to choose the desired option then press **<ENTER>** key to confirm

User can adjust the value for Hystereses.
Refer to Page 13 for instruction on how to adjust this value. Resolution will depend upon the Resolution chosen while at Set Up.

User can adjust the percent for Proportional Band.
Refer to Page 13 for instruction on how to adjust this value.

User can adjust the time for Period.
Refer to Page 13 for instruction on how to adjust this value.

For the Burn Out configuration, user will have three options as: On - Contact is going to stay On all the time, Off - contact will stay Off all the time or Hold - contact is going to follow the last situation, before going to Hold status.
Press **<SEL>** key until the desired option flashes, then press **<ENT>** to confirm.

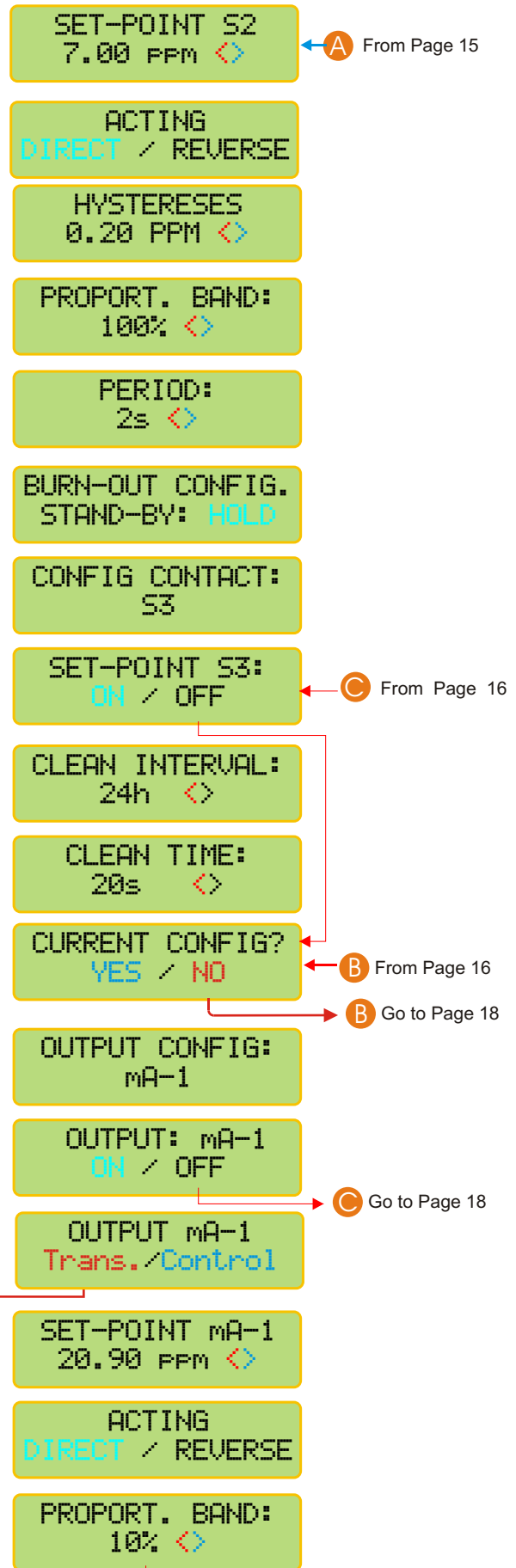
If user chooses Contact S3 as On, while at Reading Mode, a or a will be displayed after the S3, indicating that this Contact is On. If user chooses Contact S1 as Off, while at Reading Mode, a will be displayed after the S1, indicating that this Contact is Off. **Set Point 3 is for Cleaning purpose Only and it is strongly recommended to use this function for DO measurements.**

User can program the Cleaning Interval (up to 99hours) and also the Cleaning Time (up to 99minutes). Refer to Page 13 (Note A) for instruction on how to adjust this value.

User has the option to configure Current.
Press **<SELECT>** key to choose the desired option then press **<ENTER>** key to confirm.

User has the option to choose using Output mA-1.
Press **<SELECT>** key to choose the desired option then press **<ENTER>** key to confirm.

User has the option to configure Output mA-1.
Press **<SELECT>** key to choose the desired option then press **<ENTER>** key to confirm.



Go to Page 18

Go to Page 18

7. Equipment Operation DO - Set Up (cont.)

User will be able to adjust the Rate and Reset values. Refer to Page 13 for instruction on how to adjust these values.

For the Burn Out configuration, user will have three options as: 4mA, 20mA or Hold.

Press **<SEL>** key until the desired option flashes, then press **<ENT>** to confirm.

User will be able to calibrate output mA-1.

Press **<SELECT>** key to choose the desired option then press **<ENTER>** key to confirm

Connect Amp Meter to output 4-20mA mA-1 and it will be possible to adjust them, then press **<ENTER>** when ready.

Adjust the value as needed by pressing **<SELECT>** (to decrease) or **<ESCAPE>** (to increase) keys, so the outputs can be adjusted. **<SELECT>** key will decrease the value and **<ESCAPE>** key will increase.

User has the option to choose using Output mA-2.

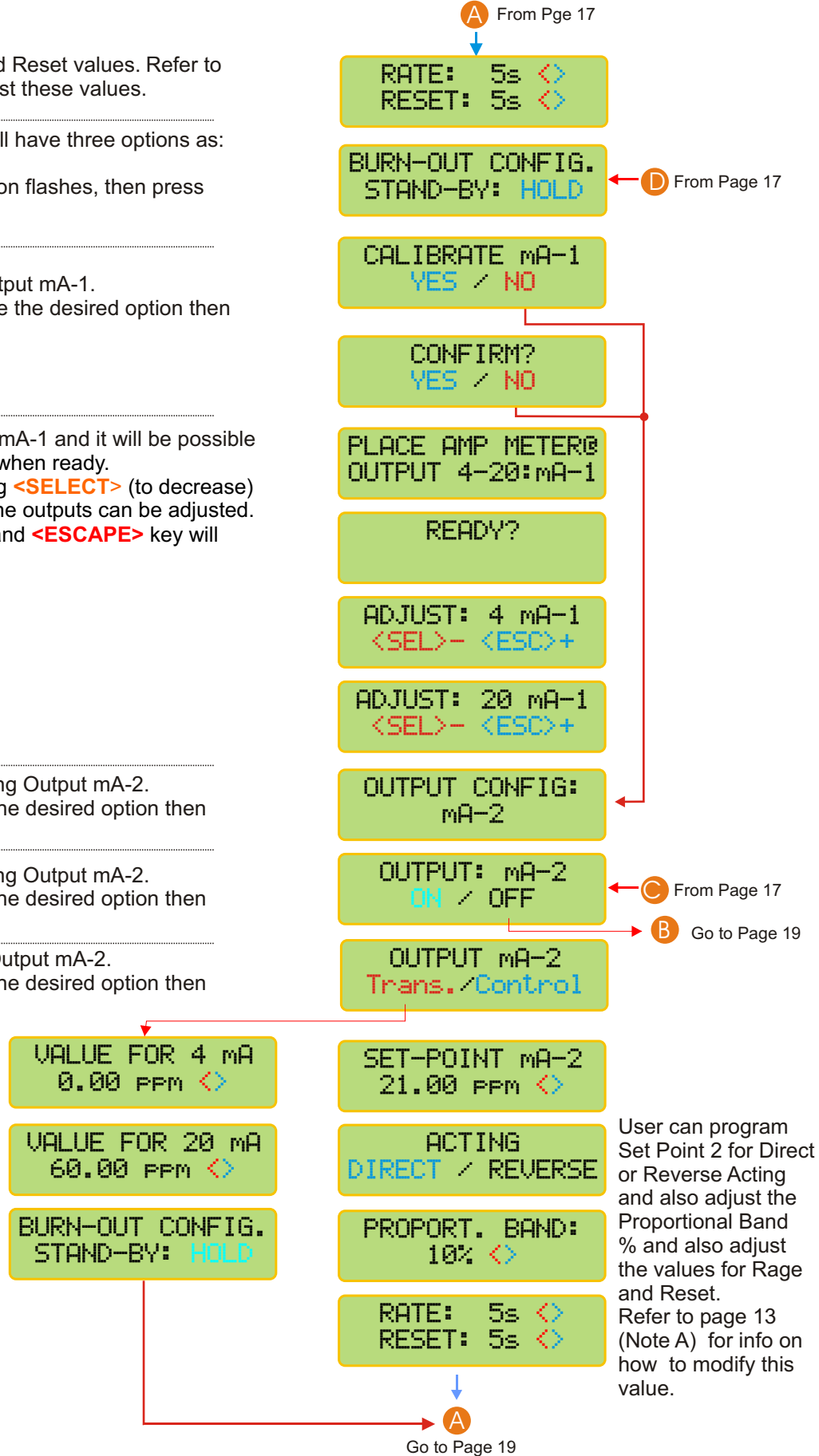
Press **<SELECT>** key to choose the desired option then press **<ENTER>** key to confirm.

User has the option to choose using Output mA-2.

Press **<SELECT>** key to choose the desired option then press **<ENTER>** key to confirm.

User has the option to configure Output mA-2.

Press **<SELECT>** key to choose the desired option then press **<ENTER>** key to confirm.



User can program Set Point 2 for Direct or Reverse Acting and also adjust the Proportional Band % and also adjust the values for Rate and Reset. Refer to page 13 (Note A) for info on how to modify this value.

7. Equipment Operation DO - Set Up (cont.)

For the Burn Out configuration, user will have three options as: 4mA, 20mA or Hold.
 Press **<SEL>** key until the desired option flashes, then press **<ENT>** to confirm.

User will be able to calibrate output mA-2.
 Press **<SELECT>** key to choose the desired option then press **<ENTER>** key to confirm

Connect Amp Meter to output 4-20mA mA-2 and it will be possible to adjust them, then press **<ENTER>** when ready.
 Adjust the value as needed by pressing **<SELECT>** (to decrease) or **<ESCAPE>** (to increase) keys, so the outputs can be adjusted.
<SELECT> key will decrease the value and **<ESCAPE>** key will increase.

User will have the option to configure digital output RS-485 for Proprietary or Modbus Protocol. Press **<SELECT>** key to choose the desired option then press **<ENTER>** key to confirm .

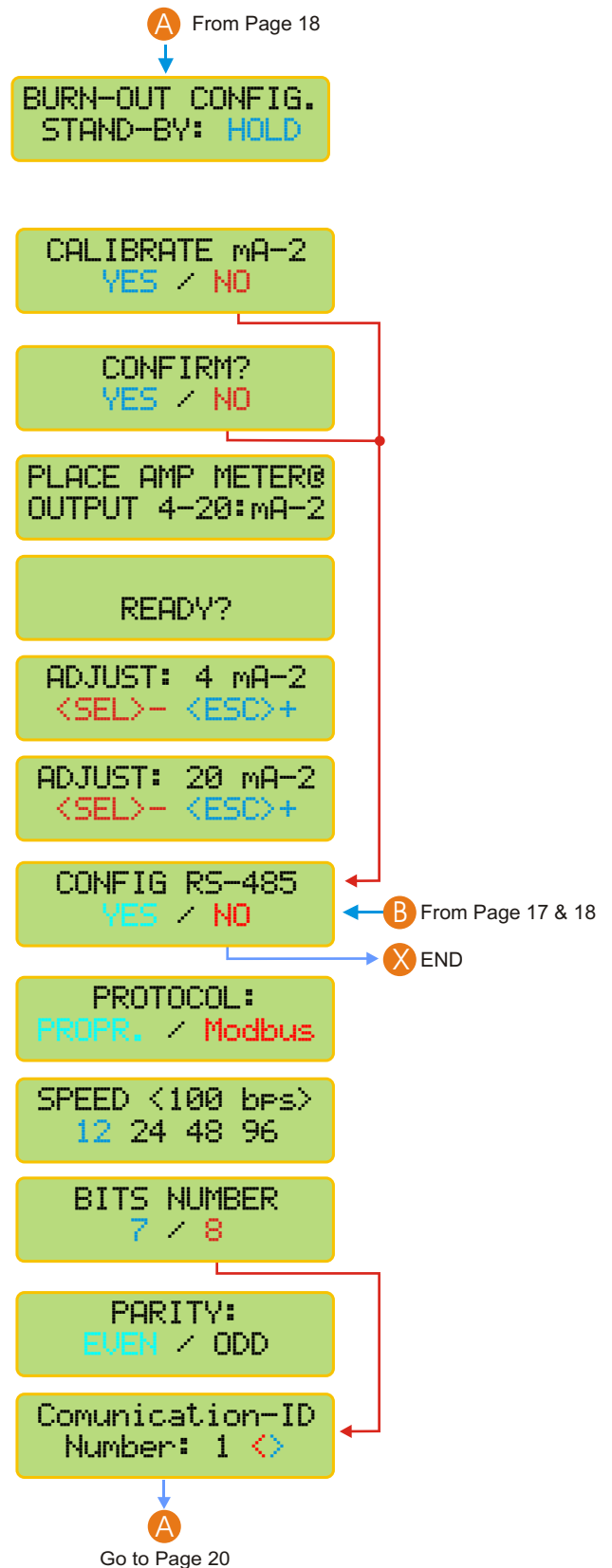
User can choose the protocol desired.

User can choose the Speed.

User can choose the Bits Number.

User can choose the Parity.

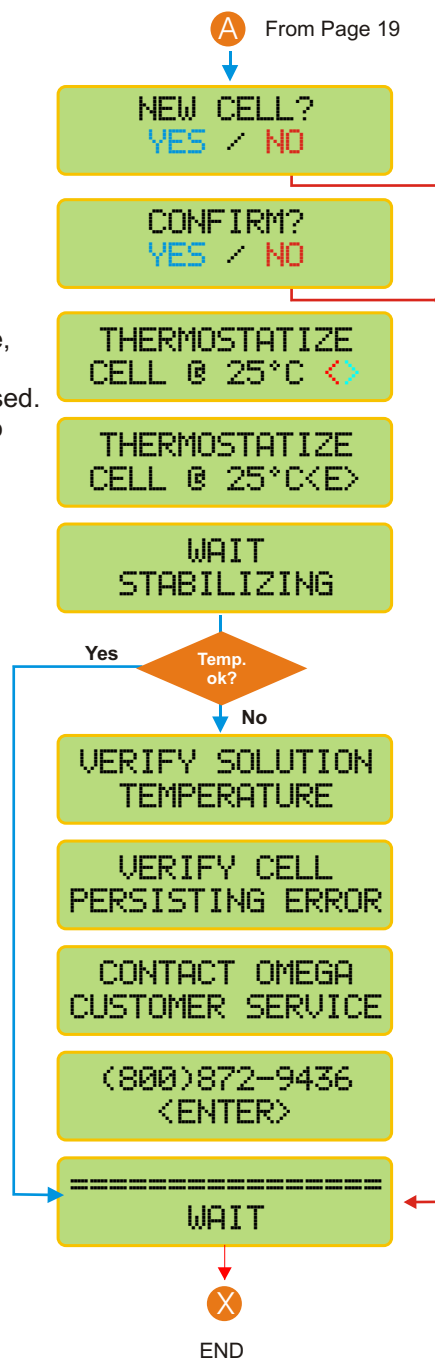
User will be able to define the instrument identification number within the network, up to 256 instruments. Refer to Page 13 (Note A) for instruction on how to adjust this value.



7. Equipment Operation DO - Set Up (cont.)

If user is changing the cell of the instrument, it is necessary to adjust its temperature. If changing the cell, choose **Yes** and confirm.

First find out any sample temperature (any sample, like tap water), then adjust the temperature at the screen, to match the sample temperature being used. Refer to page 13 (Note A) for instruction on how to modify this value. Dip the cell into the used sample, then press **<ENTER>** key.



7. Equipment Operation DO - Calibration

Press **<SEL>** until **Read** flashes then press **<ENT>** key.

DISSOLVED OXYGEN
READ/SET UP

Press **<SEL>** until **Calibrate** flashes then press **<ENT>** key.

DO: READ /
CALIBRATE

Depending on option chosen during Set Up Mode for Zero:
Auto Zero or Manual Zero.

Auto **ZERO** Manual

WAIT
AUTO ZERO

PLACE CELL @
ZERO CHEMICAL

READY?

WAIT ZERO
CHEMICAL

Depending on option chosen during Set Up Mode
for Span: Auto Span or Manual Span.

Auto **SPAN** Manual

PLACE CELL
IN: 7.50 PPM

Depending on option
hosen during Set Up
Mode for Calibration
Type: in Air or in Water

Air **CAL. IN** Water

SIMULATE 100%
HUMIDITY

DIP CELL INTO
AIRY WATER

READY?

=====

WAIT

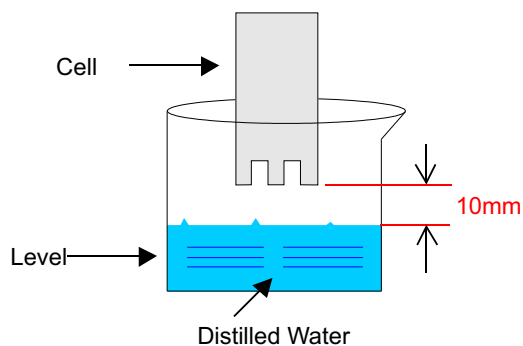
GO TO SAMPLE!
READY?

Airy water is water place inside a
Reservoir and O₂ is directly
pumped inside this reservoir,
mixing with the water.
Press **<ENT>** key when ready.

Simulate 100% Humidity as shown on below picture.
This option is show if user had chosen to calibrate in
Air. Press **<ENT>** key when ready.

Dip Cell into sample to be measured. Make sure that
the sample is being stirred.
Stirring is crucial for DO measurement and without it
the result will not be correct!
Then press **<ENTER>** key when ready.

Follow this procedure in order to simulate 100% humidity.



7. Equipment Operation DO - Read

Press **<SEL>** until **Read** flashes then press **<ENT>** key.

DISSOLVED OXYGEN
READ/SET UP

Press **<SEL>** until **Read** flashes then press **<ENT>** key.

DO - READ /
CALIBRATE

Dip Cell into sample to be measured. Make sure that the sample is being stirred.
Stirring is crucial for DO measurement and without it the result will not be correct!
Then press **<ENTER>** key when ready.

GO TO SAMPLE!
READY?

Reading display, when the bargraph function was not chosen during Set Up Mode.

The reading will be displayed and also the Set Points conditions. If user had chosen Contacts (S1, S2 and S3) as On, a or will be displayed after the Contact Set Point number, indicating that this Contact is On. If user has chosen Contacts (S1, S2 and S3) as Off, a will be displayed after the contact Set Point number, indicating that this Contact is Off. **Set Point 3 is for Cleaning purpose Only and it is strongly recommended to turn On this Set Point.**

S1: S2: S3:
-> 49.98PPM

=====
-> 49.98PPM

Press **<SEL>** and it will be able to verify the temperature

S1: S2: S3:
23.2°C

Press **<SEL>** and it will be able to verify the values for Current Output, chosen during Set Up Mode.

mA-1: 4.00mA
mA-2: 20.00mA

Press **<SEL>** and it will be able to adjust the value Read, if chosen this procedure during Set Up Mode (On Line Calibration-page 13). Refer to page 13 for instructions on how to adjust this value.

ON LINE CALIBR.:
3.93PPM <>

Press **<SEL>** and it will be able to fine tune the Current outputs (mA-1 and mA-2, if they were chosen for Control Purpose (pages 17 & 18), based on the process situation.
Confirm the option chosen.

FINE TUNE PROC.?
YES / NO

CONFIRM?
YES / NO

At this point the user will be able to adjust the mA Output Current. Press **<SEL>** to decrease the value or **<ESC>** to increase the value this value should be adjusted until reached an ideal current output value for the value being read by the cell.

CONTROL for mA 1?
No / Yes

FINE TUNE mA-1?
YES / NO

<SEL> 10.00<ESC>
3.93PPM mA-1

CONTROL for mA 2?
No / Yes

FINE TUNE mA-2?
YES / NO

<SEL> 10.00<ESC>
3.93PPM mA-2

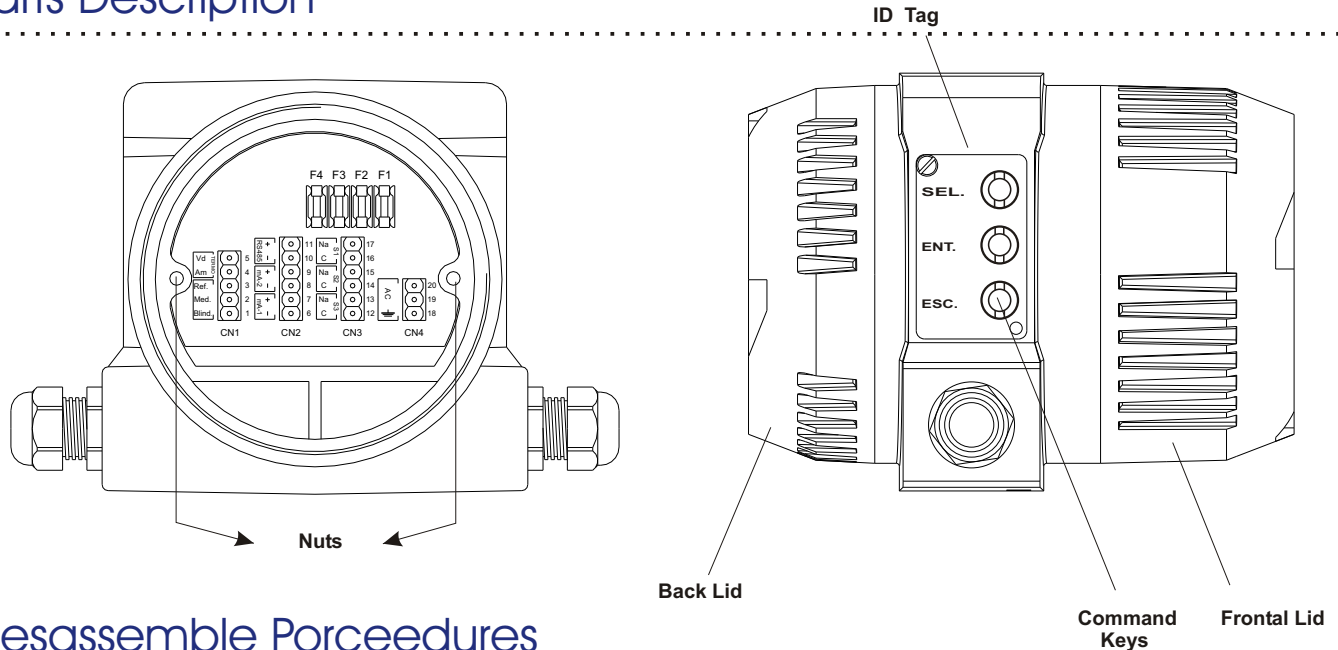
END

8. Maintenance

Case Disassemble/Assemble Method

This method has an objective to instruct technical personal for assemble and disassemble or the case.
Necessary Material: Hex Tool 1/4 "

Parts Description



Desassemble Porceedures

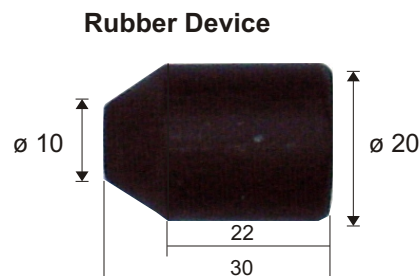
- 1 - Unscrew back and front al lids.
- 2 - Using a Hex Tool 1/4", unscrew nuts used to attach the electronic circuit boards set to the case.
- 3 - Remove the electronic circuit boards, from the back lid, being careful not to damage the circuits.

Assemble Proceedures

- 1 - Place the electronic circuit boards set inside the case, insert if from back lid.
- 2 - Using the Hex Tool, re-attach the electronic circuit boards to the case, by the nuts.
- 3 - Thread the front and back lids to the case.

Note: If necessary to maintain the command keys, execute the following steps:

- 1 - Remove identification Tag;
- 2 - Using the Rubber device (need to request from factory), press with some pressure over the command keys and turn it counter clockwise in order to unscrew it;
- 3 - Remove the spring and the contact pin;
- 4 - Make the necessary maintenance and proceed with the assembly, following the same steps in reverse.



* Dimensions in milíimeters

9. Cell Maintenance

A periodical cell maintenance consists of replacing the ELECTROLYTE, the MEMBRANE and cleaning of the Ag/AgCl/Pt ELECTRODE. The maintenance must be executed when notice sensibility lost during calibration or frequent deviations of the calibrated value.

These factors could occur caused by: Silver Phosphate clogging at the Anode, impurity clogging, grease or even membrane mechanical damage. Initiate this operation by replacing the electrolyte solution, if necessary proceed with Ag/AgCl/Pt Electrodes cleaning (verify again) and if even needed, replace the membrane.



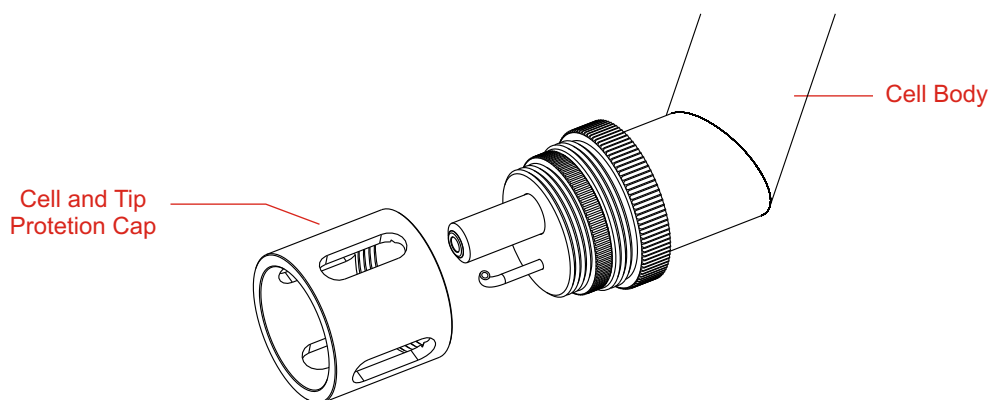
ATTENTION

The Silver Anode is treated superficially with Silver Chloride, presenting a dark grey color and this is normal.

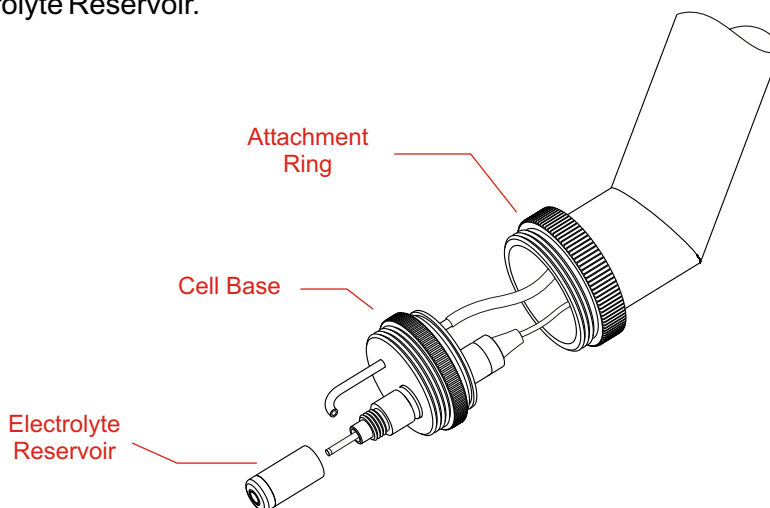
Electrolyte Replacement

The electrolyte consists of a Tribasic Phosphate Sodium solution ($\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$). In order to replace it, proceed as follow:

1. Unscrew the Cell and Tip Protection Cap from the body, as shown below.



2. Unscrew the Electrolyte Reservoir.



3. Wash the Electrolyte Reservoir interior and exterior using distilled or deionized water

4. Rinse it with Tribasic Phosphate Solution, provided with the unit, then remove it immediately.

5. Fill the Electrolyte Reservoir with Tribasic Phosphate Solution (DOA-21RS) up to the beginning of the internal thread. Make sure small bubbles will not be created while filling the reservoir. Shake or tap the Reservoir in order to remove these bubbles. Bubbles will interfere with the reading!

6. Reinstall the Electrolyte Reservoir into the cell being careful in order not to touch or damage the membrane.

7. Proceed with the instrument calibration.

9. Cell Maintenance (cont.)

Membrane Replacement

In order to proceed with the membrane replacement, the cell is supplied with an Industrial Cell Maintenance Kit (DOA-21MK) composed of 6 Electrolyte Reservoir, already supplied with its own membrane and Electrolyte Solution (DOA-21RS).

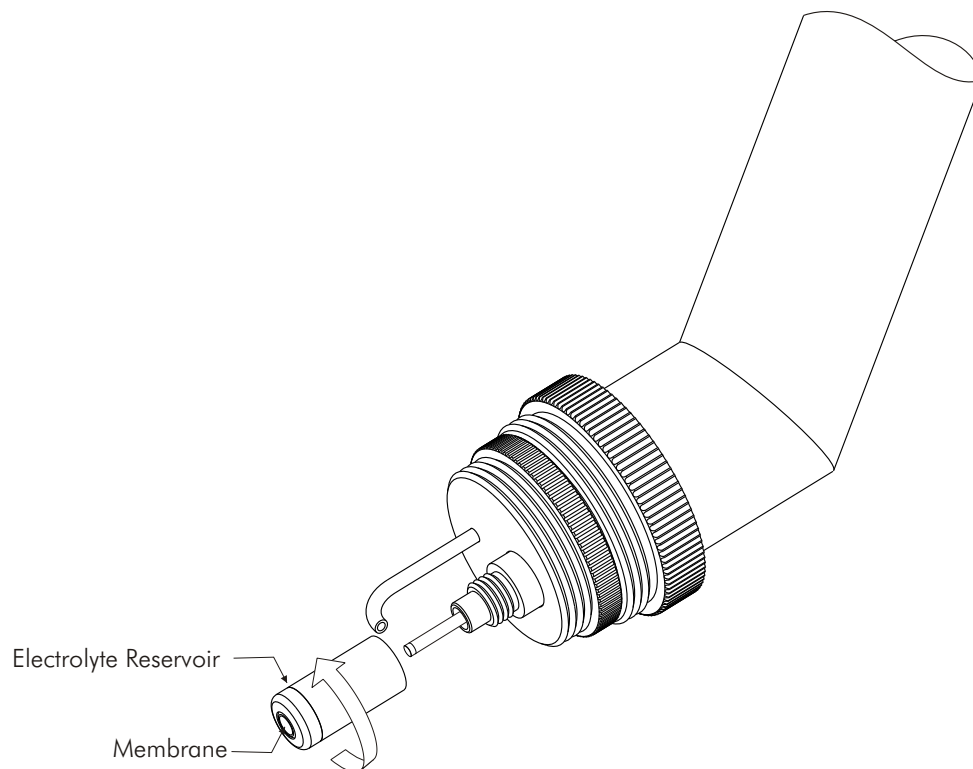
In order to replace the membrane, just un-thread and remove the old Electrolyte Reservoir and discard it.

Fill up the new Electrolyte Reservoir, up to the beginning of the thread, using the electrolyte solution (DOA-21RS) supplied with the instrument, dropping it gently into the reservoir, avoiding to generate bubbles.

Bubbles will interfere with the reading and must be avoided.

After replacing the membrane, look at the membrane tip and inspect it visually, if noticed any bubble presence, remove the Electrolyte Reservoir, tip it using your finger tips by tapping on it so the micro bubbles can be released from the membrane.

Refill the reservoir, up to the beginning of the thread and screw it back at the cell and visually re-inspect for bubbles, again!



9. Cell Maintenance (cont.)

Cell Replacement

In order to proceed with the DO Cell (DOE-441-R) replacement, follow as below.

1. Unscrew the Cell and Tip Protection Cap (shown at figure A).

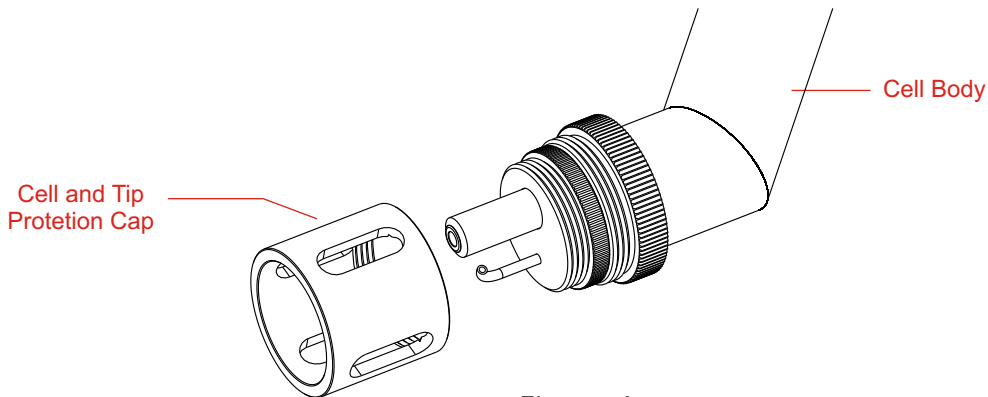


Figure A

2. Unscrew the attachment ring (shown at Figure B);

2.1 Pull out the cell base up to the cable extension limit and the air cleaning hose (shown at figure B);

2.2 Unscrew the cell connector from the cell, then disconnect the cleaning hose pushing the quick connect (making an "L" movement), in order to remove the cleaning hose (shown at figure C);

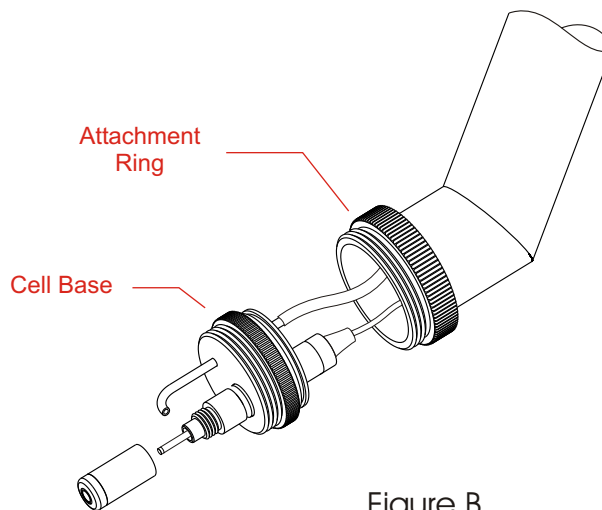


Figure B

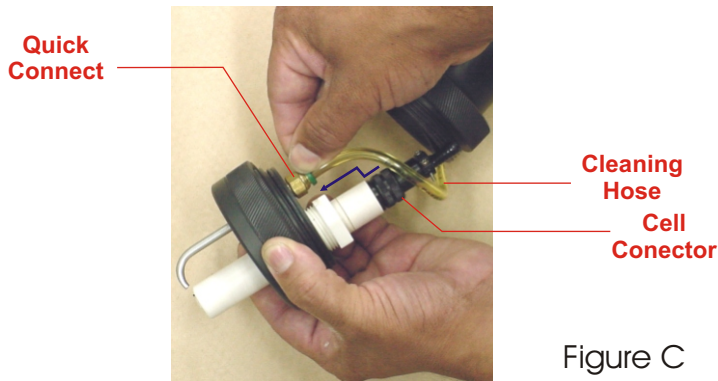


Figure C

9. Cell Maintenance (cont.)

2.3 Move the base to a bench in order to start the membrane replacement;

2.4 Using an 27mm or 1" 1/6 tool, unscrew the H-8 connector and remove the cell (shown at figure D);



Figure D

3. With the new cell on hands, proceed with the reverse operation as described above and on page 26.

9. Cell Maintenance (cont.)

Ag / AgCl / Pt Electrode Cleaning

The Cell electrode is composed internally by a silver anode that is superficially treated presenting a dark grey color and Pt cathode. This electrode offers a limited life and requires maintenance. But, its use in contaminated solutions, cause the anode to get dirty and requires a periodical cleaning.

In order to clean the cell electrode, proceed as:

1. Unscrew the Cell Protection Cap;
2. Unscrew the Electrolyte Reservoir being careful in order not to touch or damage the membrane;
3. Wash the electrode using deionized water;
4. Using a soft absorbent paper, carefully clean the anode and cathode; rinse using deionized water;
5. Refill the Electrolyte Reservoir with electrolyte (DOA-21RS) up to the beginning of the thread and screw it back to the Electrode, like described on prior pages of the Cell Maintenance.



10. Proprietary Communication Protocol

1) Proprietary:

Order:

ESC	ID	P	CR	LF	
0x1B		0x50	0x0D	0x0A	Hexadecimal

The ID is configured at the instrument from 1 to 32.

Answer:

L > > VVVVVVV mgO₂/L CCCCCC m A

Example of answer for an un-stable value

L > 5.00 mgO₂/L 12.00 m A

Example of answer for a stable value

L > > 5.00 mgO₂/L 12.00 m A

Note: a) When the answer comes a C instead of a L, it means that the equipment is under calibration function (is being operated in location by the user, executing the calibration operation at the instrument).

b) When the answer comes an S instead of a L, it means that the equipment is under Set Up function and it is being operated in location by the user.

2) RS485 – It is a “physical location”, where the proprietary protocol will be “transported”.

As factory default, this communication comes configured as:

Speed = 9600

Parity = none

Number of Bits = 8

Stop Bit = 1

ID = 1

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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