User's Guide

CDCN442
Concentration Conductivity Meter

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Instruction Manual

Conductivity and Concentration Analyzer

CDCN442

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2. Specifications

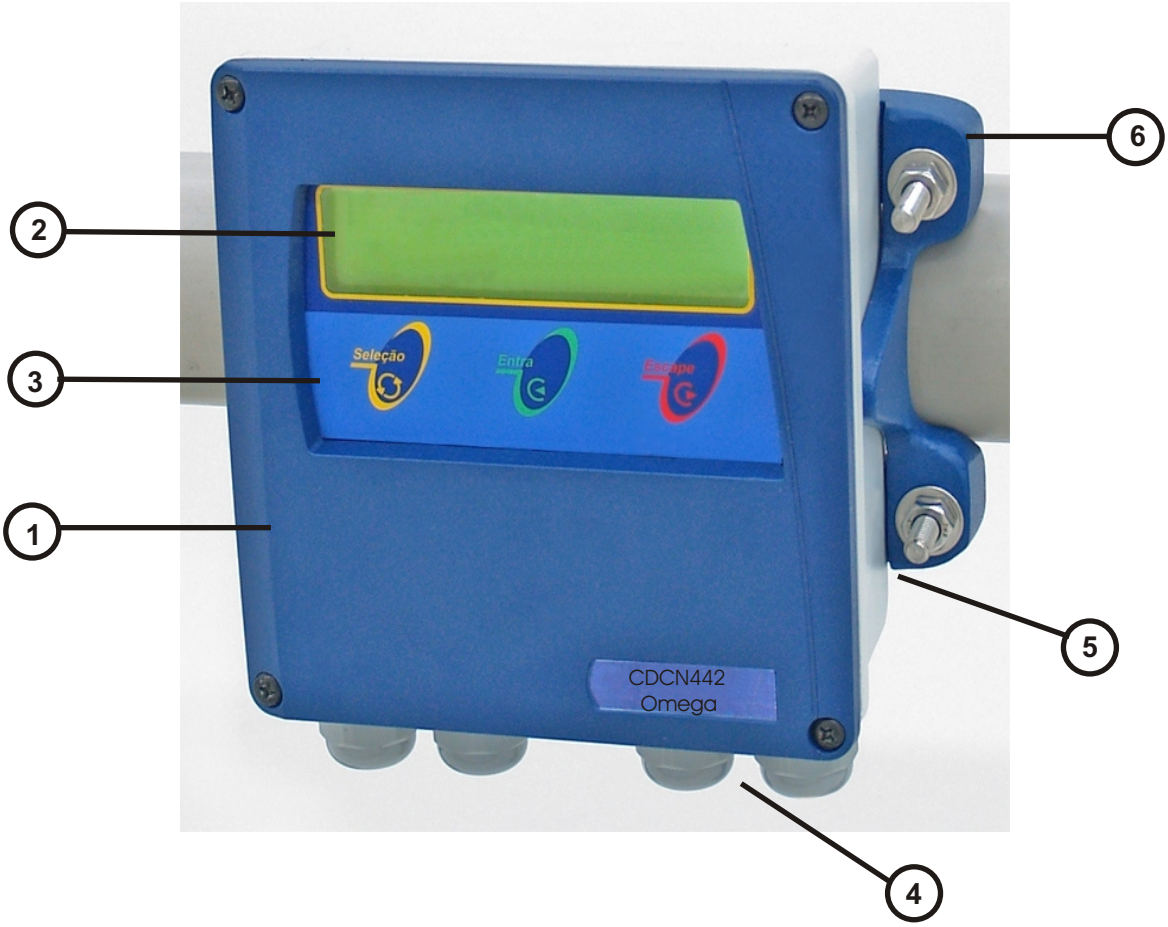
General	
Case Material	Cast Aluminum SAE 323(BASE) ABS(Frontal Lid)
Finishing	Electrostatic Epoxy Paint
Electrical Connection	Terminal Barr
Cable Inlet	Cable kncokout 3/8” (4x)
Assembly	2" Tube, Flat Surface or Panel
Enclosure	IP-68
Power Consumption	3.5 VA
Weight	1.3Kg.
Electrical Power	90 thru 240 Vac (50/60 Hz)
Operating Temperature	5 thru 40 ºC
Relative Humidity	20 thru 80%
Analyzer/Transmiter	
Display	Alphanumeric 2 lines x 16 characteres
Conductivity Ranges	5 thru 2000 mS/cm
Concentration Range	Consult list on page 11
Temperature Range	0 thru 200 ºC (Others upon request)
Automatic Temperature Compensation	0 thru 200 ºC (Others upon request)
Output Signal	Analogic 4 - 20 mA w/ adjustable output range. Digital RS485 bilateral thru software up to 36 equipments 2 Km apart.
Galvanic Isolation	2000 VAC (by opto coupler)
Line Resistance	1KOhm
Controler	
Actuation Type	Frequency Modulation, P+Di
Set-Point	1 independent from 0 thru 100% of scale
Output	1 control ON-OFF
Actuation Type	Frequency Modulation, P+Di

Sensor	
Type	Toroidal (Electrodeless)
Body Material	PVDF (Kynar)
Range	10 mS thru 2 S
Temperature (@ Atm. Pr.)	0 thru 100ºC
Max. Pressure (@ 25ºC)	10 Kgf/cm^2
Insertion lenght	100mm
Process Connection	Threaded Point 2” (CIP and others upon request)

ACCESSORIES: supplied with the equipment : installation hardware (2x), Instruction Manual, SS Clamps with nuts and washers.

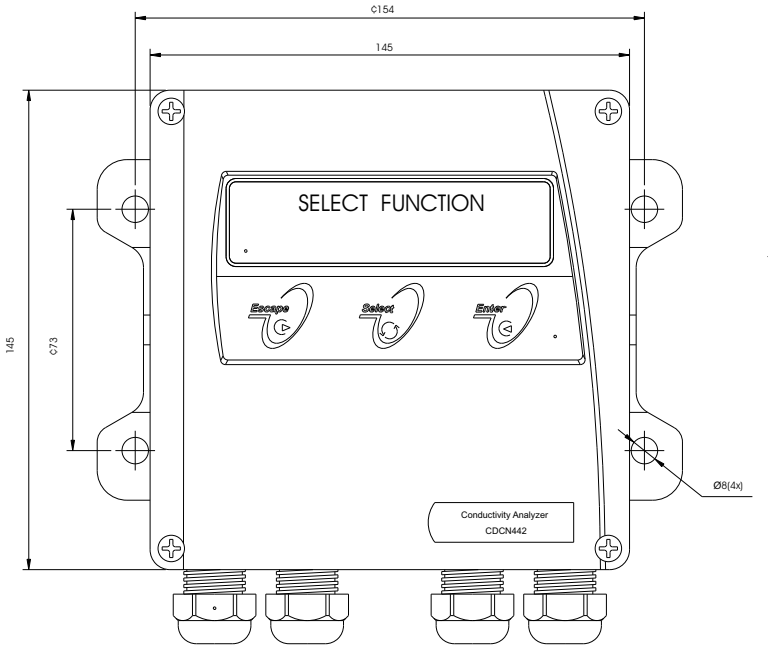
3. Mechanical Description

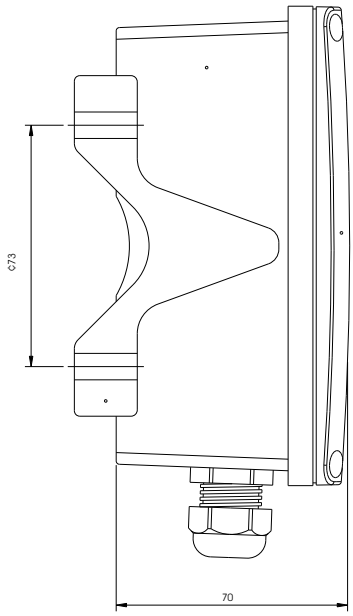
This equipment is offered in **SAE-323** aluminum with lower oxidation level, anti corrosion treatment and electrostatic epoxy paint finishing and frontal lid in ABS . Built in small and light size, complying with **IP-68** Standard.
Under the same case you will find: Local Indicator, Analyzer, Transmitter and Controller.
The mounting of the instrument can be done on 2” Tube" or in Flat Surface or Panel (DIN144).
The electrical connection is possible through a terminal block located internally at the lower portion of the case and the cable knockouts are located in the bottom of the case, 4x 3/8” BSP.

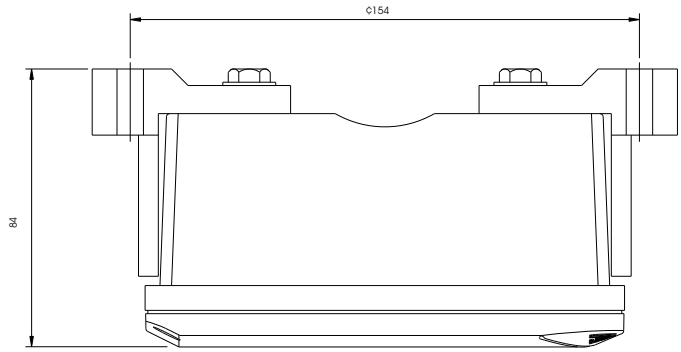


1 - Frontal Lid in ABS.
2 - Display alphanumeric 2 lines x 16 characters.
3 - 3 keys Tactile Membrane Keyboard:
<SELECT> = Select the desired operation, flashing option.
<ENTER> = Enter the program commands for analysis, confirm above Selected Function.
<ESCAPE> = Move back one step at every touch.
4 - Cable knockouts (4) 3/8” BSP.
5 - Aluminum Case (SAE-323)
6 - Installation Hardware for Wall Mounting, 2” tube and panel.

4. Dimensional







Note: Dimensions in millimeters

5. Typical Installation

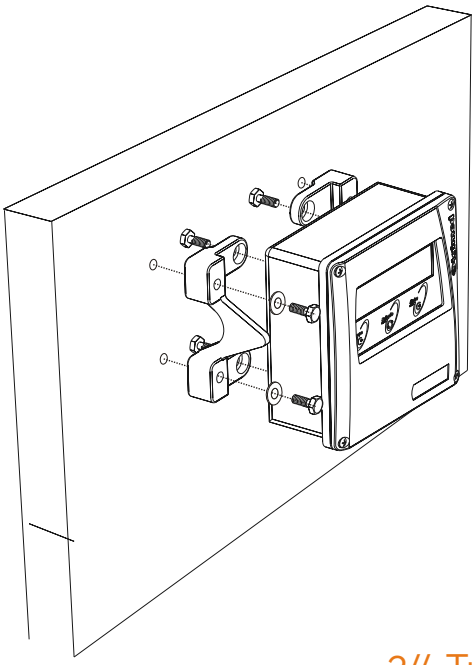
The **CDCN442** can be installed in 3 different ways: Panel, 2” Tube and Flat Surface.
For installation purpose the instrument is offered with the following hardware: 2 Installation Support, 4 SS screws ¼" x ½", 4 plain SS washers ¼", 2 "U" SS clamps , 2 SS screws and 2 SS plain ¼".
These hardware allow 3 different ways for installation, to know:

a) Installation in 2” tube: Uses 2 installation support + 2 "U" clamps with nuts and washers.

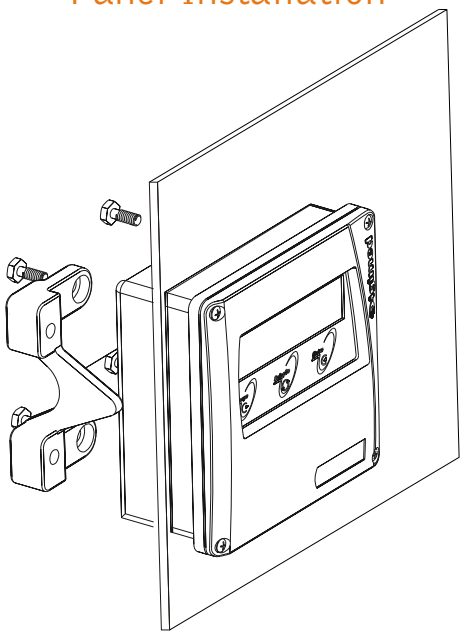
b) Installation in Panel: Uses 2 installation support ; the edges will be placed against the internal surface of the panel, 4 screws. ¼" x ½” will be used to hold it in place.

c) Installation in Flat Surface(Wall Mount): Uses 2 installation support and “U” clamps holes are also used to Hold the instrument in place at flat surface.

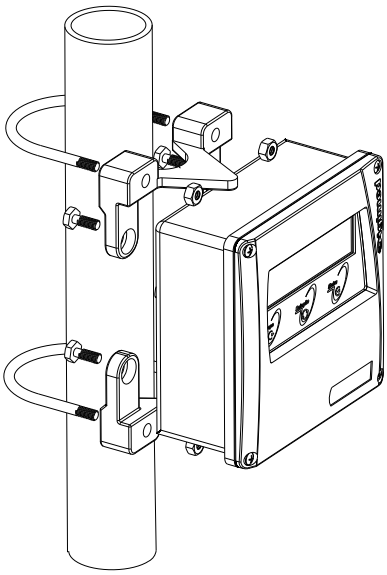
Flat Surface Installation



Panel Installation



2” Tube Installation



6. Electrical Installation

1- Remove the equipment from the box and inspect for any possible damage caused by the transportation;
2- Install the instrument in an area that offers easy access and handling, exempt of vibrations, following the installation procedures *Topic 5* - Typical Installation - page 6;
3- Avoid exposing the equipment to direct to solar rays and if necessary provide a covering;
4- Verify if the electrical installation is correct, if security hardware is available (circuit breakers);
5- Proceed with the equipment installation.

Electrical installation

1- Remove the front lid of the equipment
2- Insert the cables through the cable knockouts, certify that the connections are correct, verifying thru the identification drawing and the electrical schematic;
3- The wires must be correctly positioned in order to avoid humidity access to the equipment case,

Never mend the Toroidal Cell cables! This may cause reading errors!

Important Recommendations

1.1. The electrical power of the equipment, must be **independent** from other system components. Being so, the cable that powers the Control Valves, Solenoids, Alarms and others, must be connected directly to the Distribution box and **"never"** at the connection barr of the equipment.

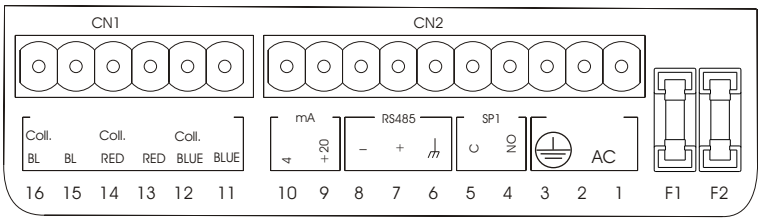
1.2.**Verify** if the **cable knockouts** of the equipment and probes are firmly attached to its respective interconnection cables. This procedure is necessary in order to preserve the enclosure protection (IP-68).

1.3.**Be careful with Humidity !!**. It diminishes the impedance, generating reading errors. Verify the cable knockouts and if necessary, dry the interconnection barr using a hair dryer.

1.4.**Never cut or mend the cell cables**.

1.5.ON-OFF outputs are **thyristor** type, offering many advantages for the equipment, such as : spark free, quicker commutation, noise practically zero, exempt of RF interference and many more. Outputs can commutate any charge, since they are powered by **alternate tension (VAC), limited to 250V / 1A.**

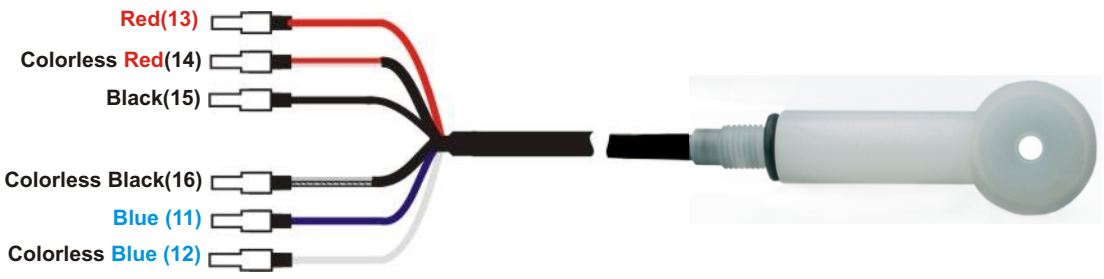
7. Interconnection Barr



Slots	Connections
1 & 2	Electrical Power 90-240Vac - 50/60 Hz
3	Grounding
4 & 5	Set Point 1Output (SP 1)
6 , 7 & 8	Digital Rs485 Output
9 & 10	Transmission Output 4 - 20mA
11 thru 16	Toroidal Cell Connection
Fuses	**Connections**
F1	General Fuse (1A / 250V)
F2	Set Point 1 Fuse (1A / 250V)

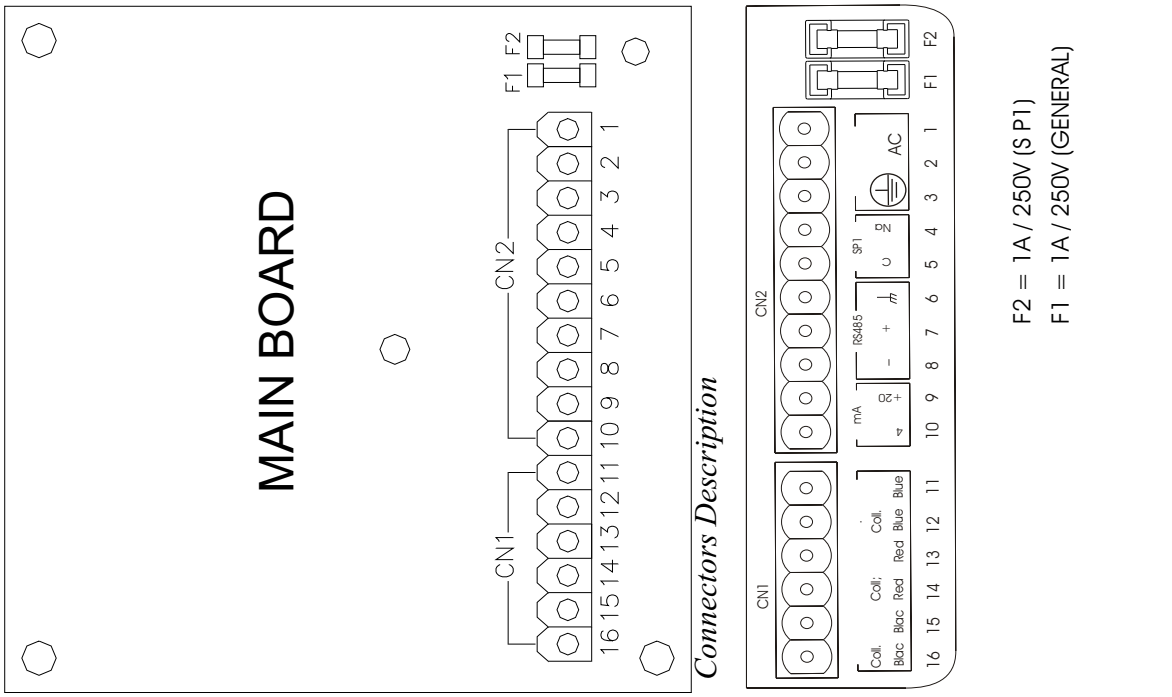
CDE-442 Cell Connection to the Inteconnection Barr

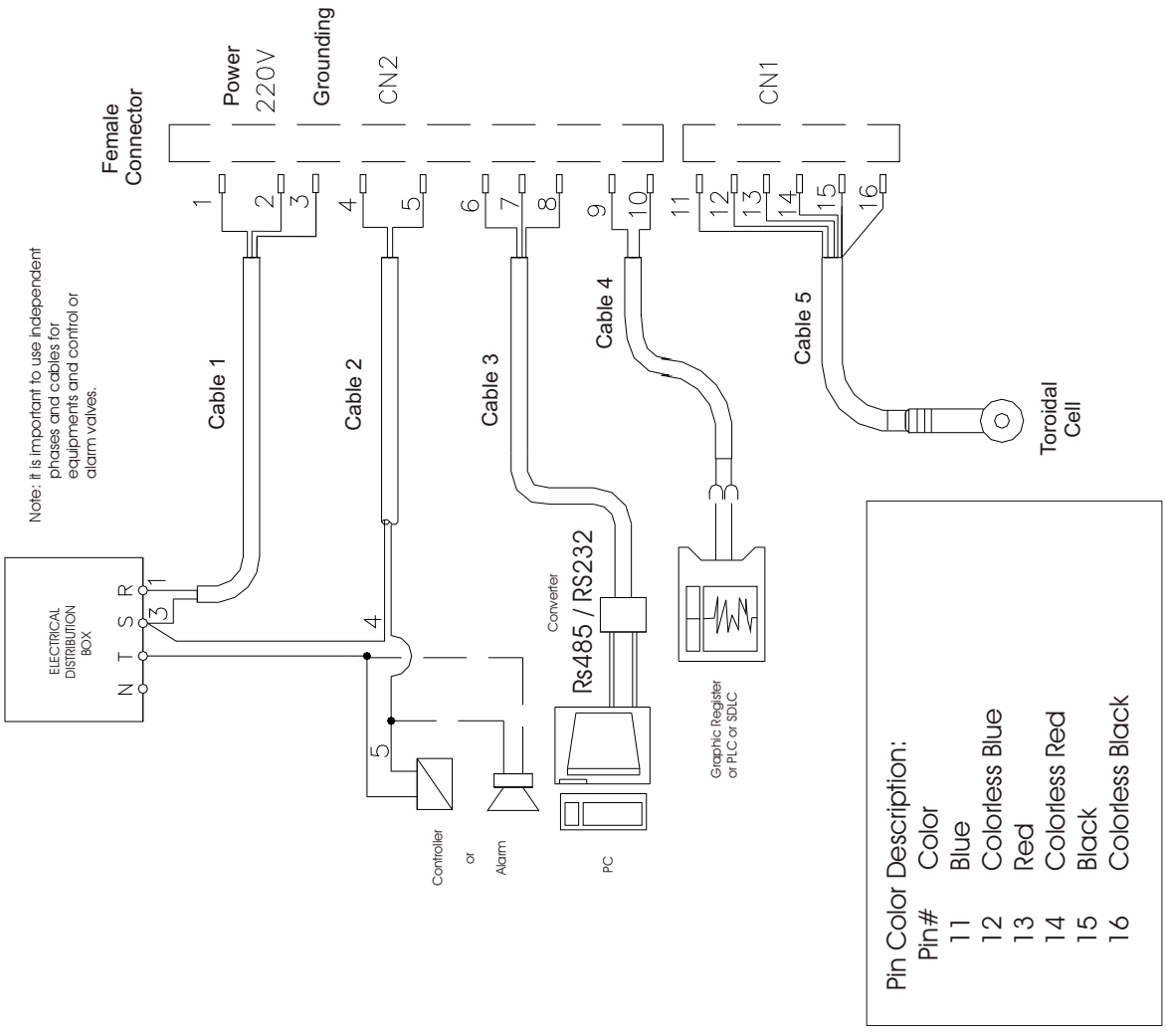
The CDE-442 cable cell offers terminal pin type, in order to be screwed in a connector Conexell Type 6 pins. For the connection, insert the cell cable and screw the terminals at the connector obeying the numerical sequence identified below.



After connecting the cell at CN1 at the interconnection board, tie the cable knockout firmly.

8. Electrical Schematic





9. Equipment Operation

Important Information

1-While at **Reading**, it is possible to obtain the following information:
When <SELECT> key is pressed, it is possible to obtain the Set Point and transmission values.
If <ENTER> key is pressed the equipment will go to **STAND BY.** While in STAND BY the outputs will be turned off, that means, the Current Output will go to 4mA and the contact to NO (Normally Open). The outputs must be programmed by the user during Set Up Mode.

2-<ESCAPE> key is recognized, only when pressed and held for about 5seconds. This time is necessary to certify the desire to exit this operation.

3- When a power failure occurs, the equipment, when powered again, will return to prior conditions, the Outputs and the indication will follow the conditions prior to the power failure.

4- During certain steps of the analysis program, it is allowed to adjust certain values, such as: Calibration, Reading Time, Set-Point, Hystereses, 4mA and 20mA values.

Operation Mode

The equipment is offered for many process element analysis. For this, equipment leaves factory with a pre-recorded memory with all elements listed below, allowing the user to select the desired element suitable for the desired application.
For Conductivity application the offered range is from 5 through 2000 mS/cm. For Concentration, verify below table showing all elements and its respective ranges for selection. User can also select during Set Up Operation the Unit being used g/L or %.

Element	Range
HNO_3	0 thru 280 g/L
HF	0 thru 300 g/L
NaOH	0 thru 150 g/L
NaOH	150 thru 500 g/L
H_2SO_4	0 trhu 300 g/L
H_2SO_4	350 thru 800 g/L
H_2SO_4	940 thru 998 g/L
H_2CrO_4	0 thru 100 g/L
NaCL	0 thru 260 g/L
K_2CO_3	0 thru 315 g/L
Na_2SO_4	0 thru 220 g/L
HCL	200 thru 350 g/L

As the equipment analysis program was developed obeying a standard structure, it is supplied as an example the Conductivity flow and also for Concentration for NaOH. For other elements, the only change would be the reading range.

9. Equipment Operation (cont.)

Set Up Operation

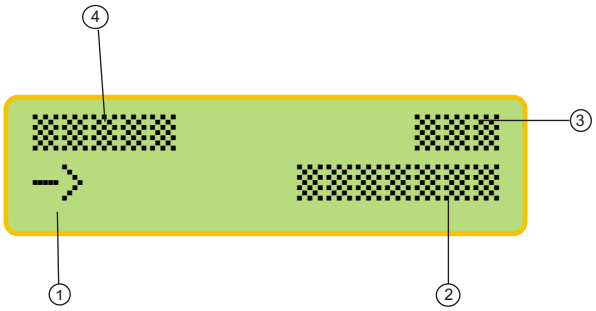
The menus are self explanatory with its respective options, that are selected by pressing **<SEL>** key. When the selected option flashes, press **<ENT>** key to confirm the selected option.
If a mistake is made, press **<ESC>** key to go back (one step at every touch) and modify the option, except while during Reading Mode, when **<ESC>** key needs to be held for about 5seconds in order to exit this mode.

The equipment offers a non-volatil memory (**E2PROM**), in order to store operations functions (resolution, reading, Calibration and more). Even when turned off from power, all functions chosen during set up will remain stored.

Before starting any work with the equipment, it is recommended to **verify the SET UP parameters,** to certify that you have chosen the correct options for the operation .
When at the **FUNCTION SELECT** menu, press **<SEL>** key in order to select the desired function, flashing option, then press **<ENT>** key. In order to access the **SET UP**, press **<SEL>** key until SET function flashes, then press **<ENT>** key to confirm the option chosen. A Password will be requested, press in sequence **<SEL>**, **<ENT>**, **<ESC>** then follow step by step the options shown at the screen. In case the user desires to change the flashing option, press **<SEL>** key until the desired option flashes then press **<ENT>** key to confirm the option.
In order to move to the next screen, user must press **<ENT>** key .

Read Operation

At this operation user will have options to **CALIBRATE** and **READ**. In case the desire is to **CALIBRATE** the Sensor, press **<SEL>** key until **Cal** option flashes, then press **<ENT>** key to confirm the option chosen. From this point on the program will guide the user step by step on how to proceed with the perfect calibration. In case the desire is to Read, press **<SEL>** key until option **Read** flashes, then press **<ENT>** key to confirm, then the Display show the following form:



1- The "**Prompt**" is a signal that flashes every time a reading is performed, depending upon the time between readings, that can be selected during Set Up Mode.
2- The measured value and the element unit.
3- Sample Temperature.
4 - Read Element.

9. Equipment Operation (cont.)

1) The CDCN442 equipment software, offers self-explanatory menus interacting with the user. The dialog between the Analysis Program and the user, is achieved thru a 2x6 alphanumeric display. The main menus and hidden options menus are displayed to the user. The hidden option menus, are displayed using arrows where one of them will flash and in order to access the hidden options, press <SELECT> key and to confirm the option chosen press <ENTER> key. Always use <SELECT> key in order to change the option at the menu, then use <ENTER> key to confirm the option chosen.

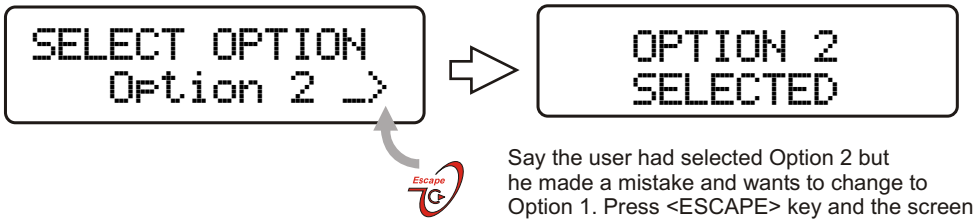
Note: at this manual the hidden options are displayed on the side of the function, as shown below:

Hidden option for
Set Up & Calibration

Note: at this manual the active Menus will be displayed in Blue color.

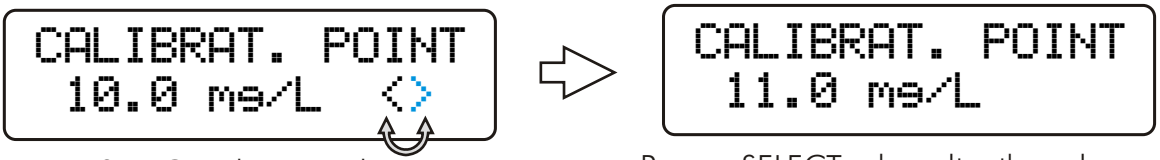
2) If a mistake or error happens and it is necessary to change data or to return to a previous screen, press <ESCAPE> key.

Find below an example.



Say the user had selected Option 2 but he made a mistake and wants to change to Option 1. Press <ESCAPE> key and the screen will move bak to prior screen.

3)In certain program steps, where value adjustments are offered, the symbols "<" (decrease) and ">" (increase), follow steps as shown below:



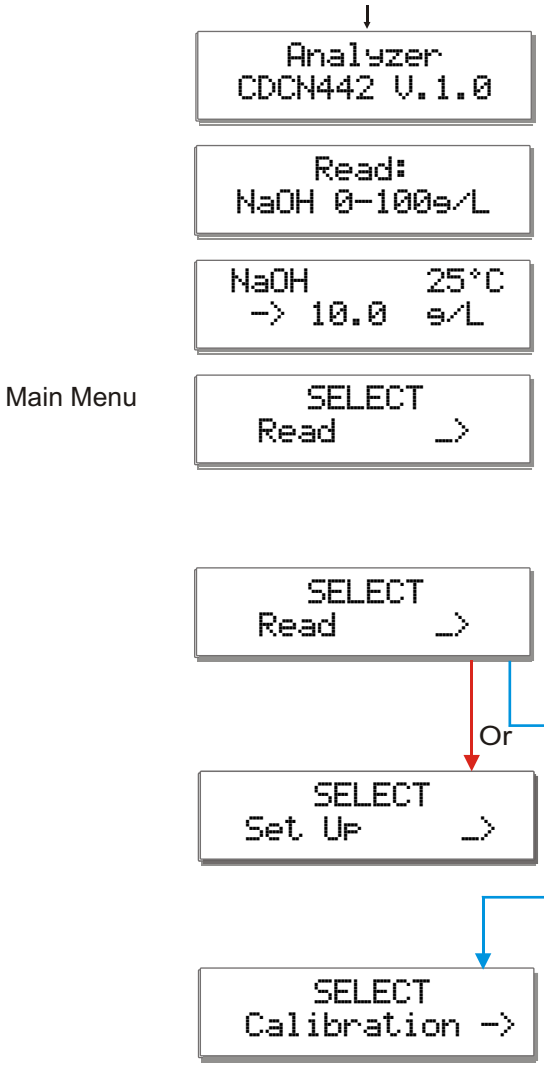
Press <SELECT> key in order to alternate betwen options decrease (<) or increase (>) from the value displayed, then confirm by pressing <ENTER> key.

Press <SELECT> key alter the value. When reached the desired value, press <ENTER> key accept the value and move to next step.

4) The equipment stores the configuration on a non-voltile memory (E^2PROM). Even when turned off, the last working conditions will be sustained.

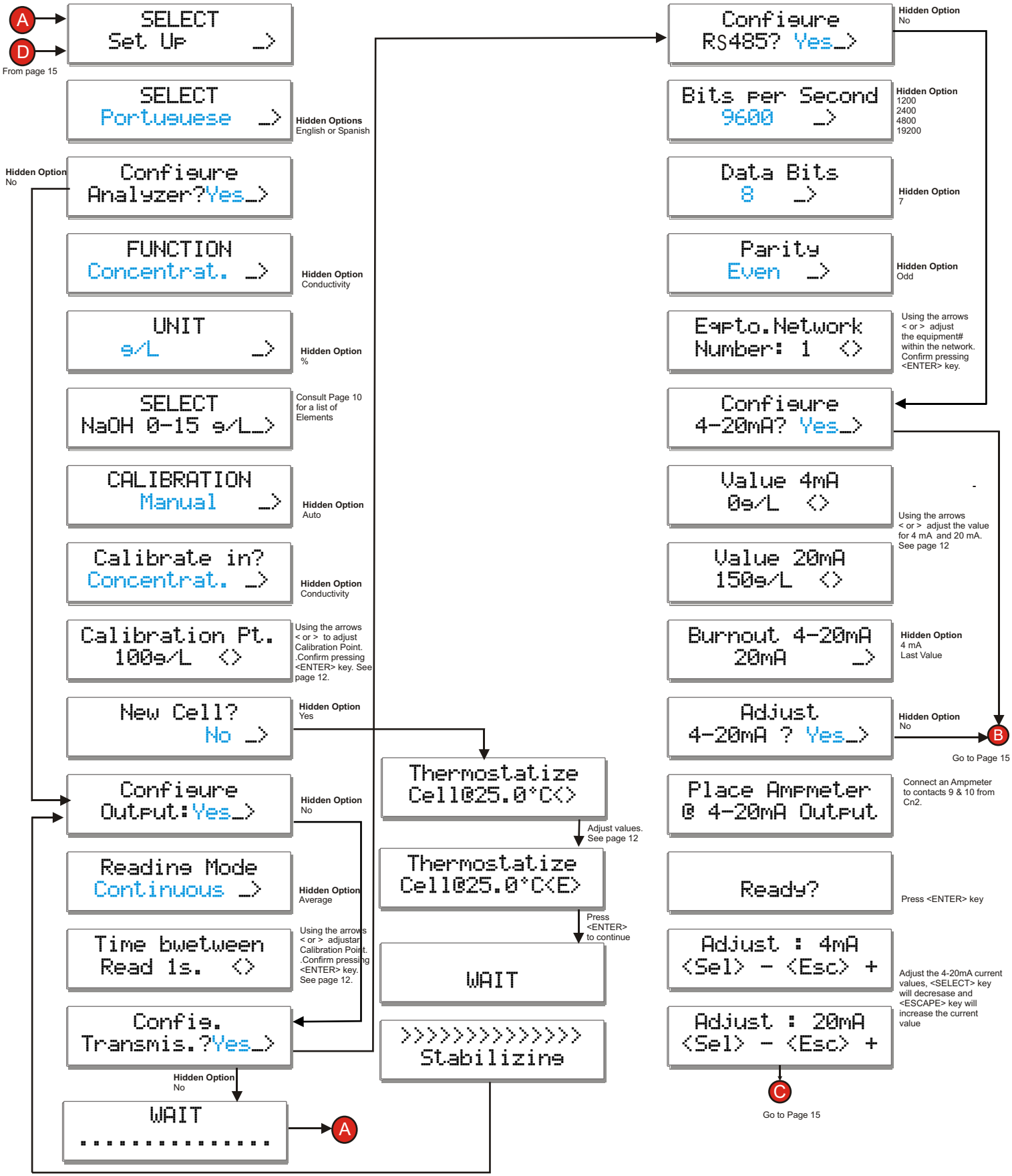
9. Equipment Operation (cont.)

When powering the equipment, the display will show the model and software version then the aplication where the equipment was last being used at the process.Finally the Process Reading will be displyed.

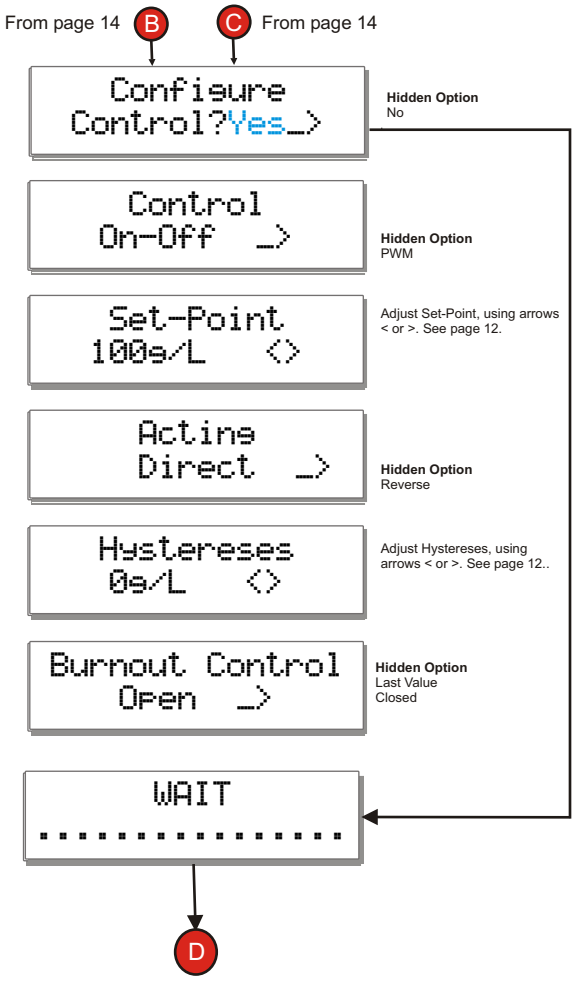


9.1 Equipment Operation - Concentration Set Up

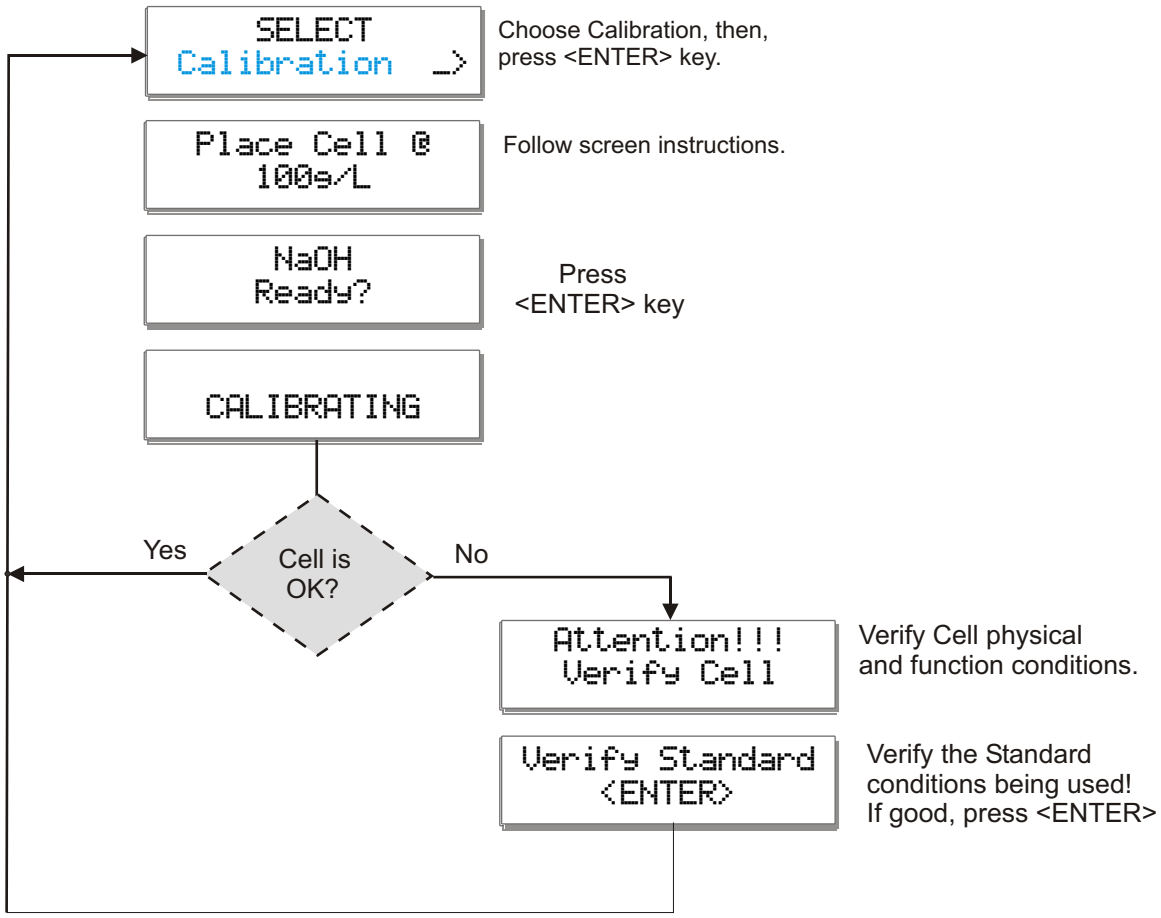
Cocentration Set Up Menu: allows user to prepare the equipment for process concentration analysis, as desired by the user.



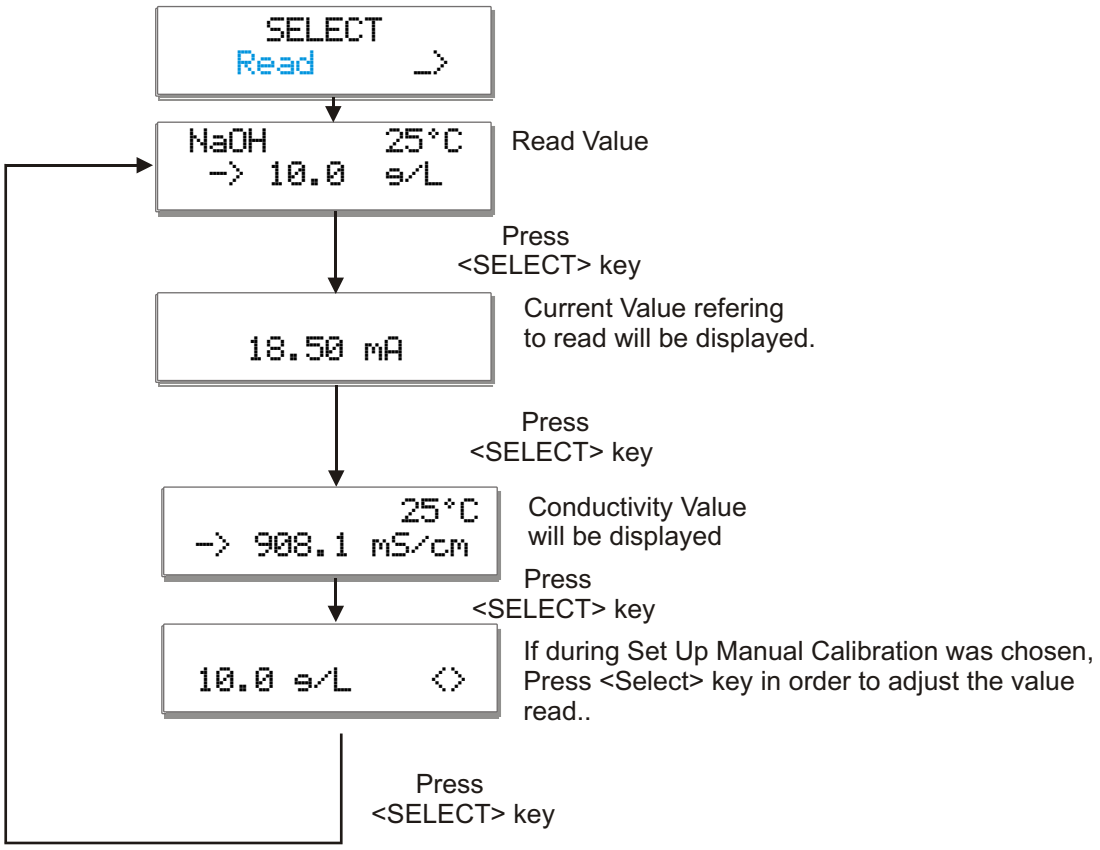
9.1 Equipment Operation - Concentration Set Up



9.2 Equipment Operation - Concentr. Calibration



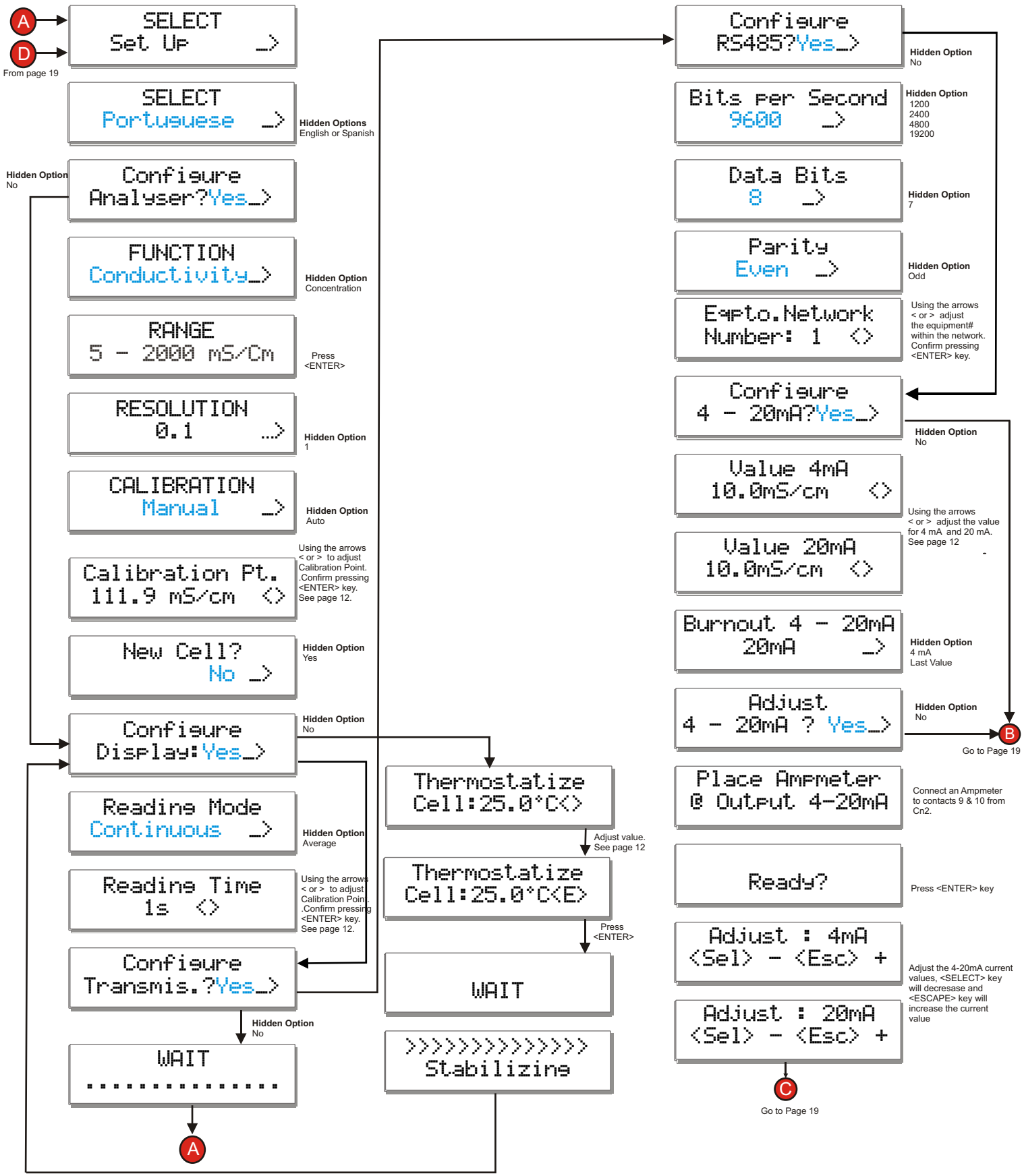
9.3 Equipment Operation - Concentration Read



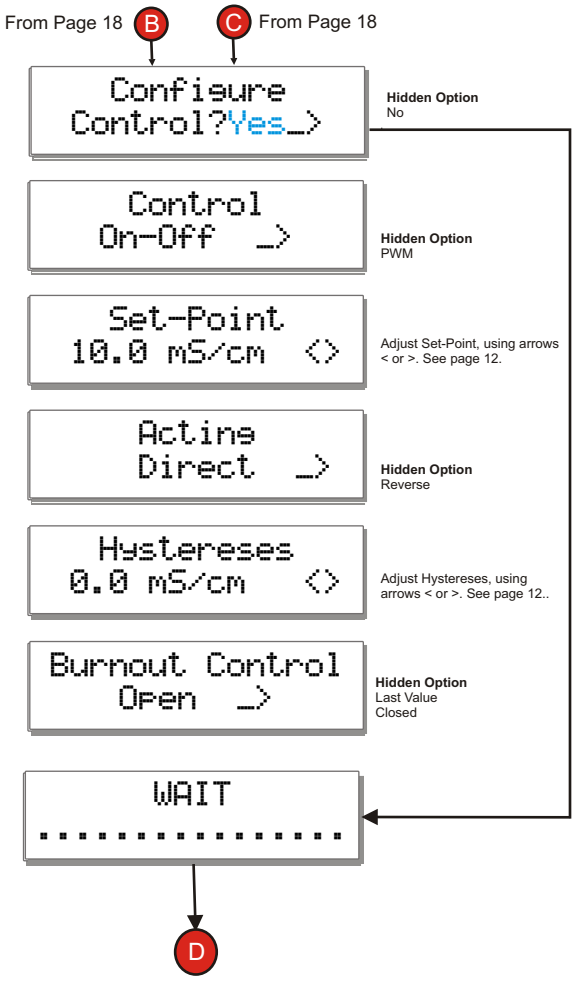
NOTE: during read Mode, pressing and holding <ESCAPE> key will instruct the program analysis to exit the mode, moving back to the Main Menu. This action will not halt the Reading Operation while user performs another operation, reading will still be performed by the instrument.
If user desires to halt Reading Operation, first place the instrument in Stand-By pressing <ENTER> key, then press and hold <ESCAPE> key to exit reading and access other program area.

9.4 Equipment Operation - Conductivity Set Up

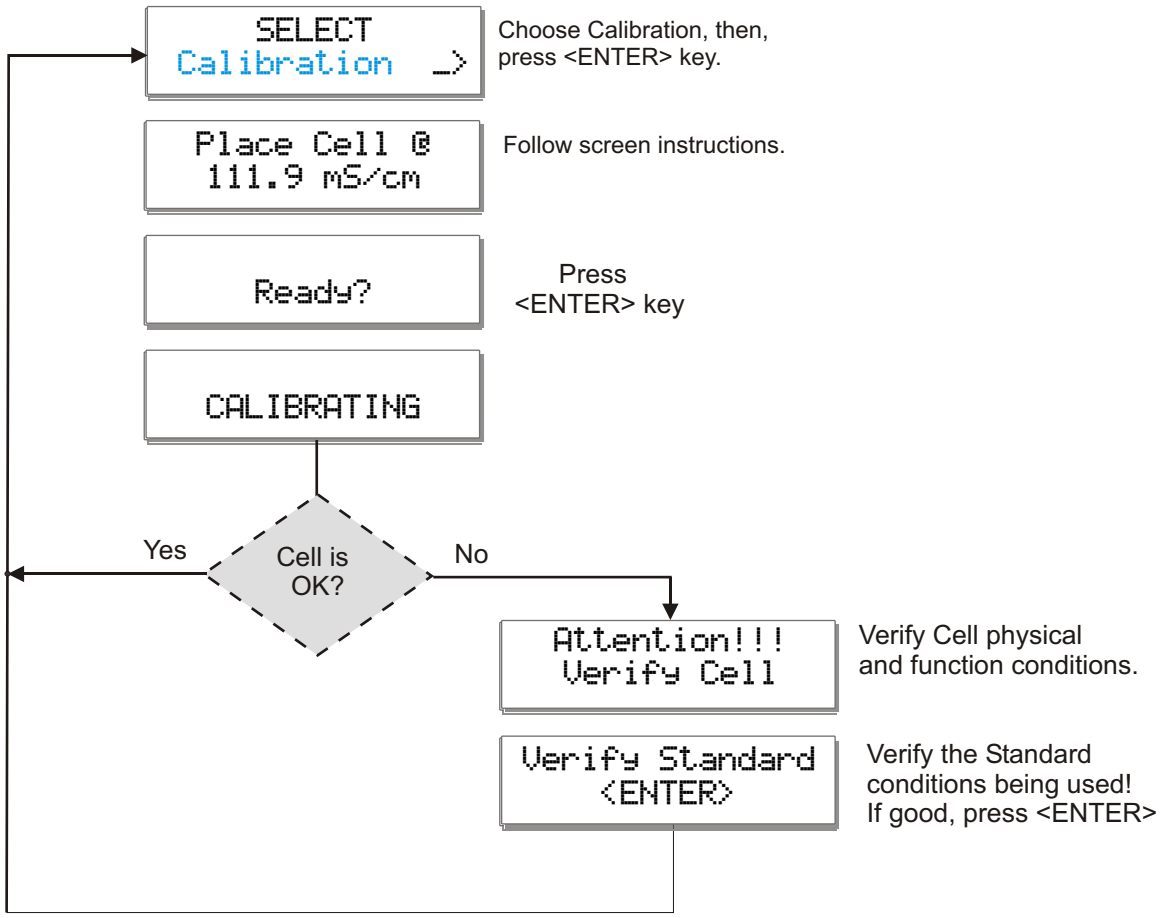
Conductivity Set Up Menu: allows user to prepare the equipment for process conductivity analysis, as desired by the user.



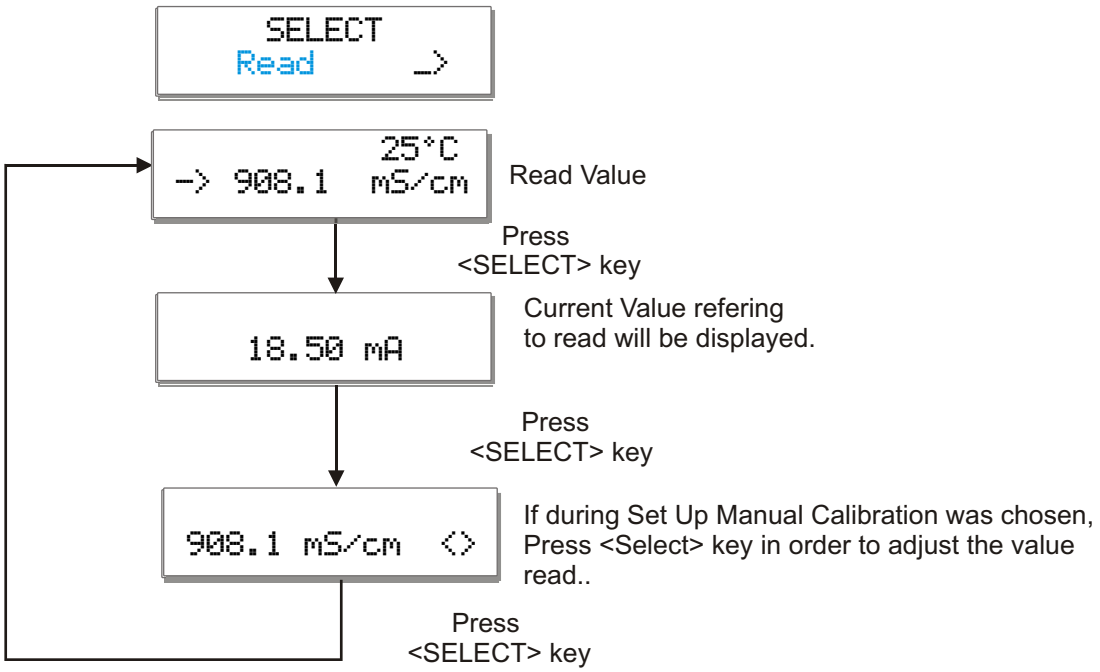
9.4 Equipment Operation - Conductivity Set Up



9.5 Equipment Operation - Conduct. Calibration



9.6 Equipment Operation - Conductivity Read



NOTE: during read Mode, pressing and holding <ESCAPE> key will instruct the program analysis to exit the mode, moving back to the Main Menu
If <ENTER> key is pressed, the equipment will go to Stand -by Mode.

NOTE: during read Mode, pressing and holding <ESCAPE> key will instruct the program analysis to exit the mode, moving back to the Main Menu. This action will not halt the Reading Operation while user performs another operation, reading will still be performed by the instrument.
If user desires to halt Reading Operation, first place the instrument in Stand-By pressing <ENTER> key, then press and hold <ESCAPE> key to exit reading and access other program area.

10 Cell Maintenance

It is recommended a visual inspection of the cell periodically and if noticed the cell is dirty, please wash it using neutral detergent and wash it throughly.
After the cleaning please proceed with the cell calibration.

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 > > V V V V V V **mS** C C C C C C **m A**

Example of answer for an *un-stable* value

L > 20 **mS** 1 2 . 0 0 **m A**

Example of answer for a *stable* value

L > > 20 **mS** 1 2 . 0 0 **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

12. Troubleshooting

Symptom	Verify	Action
Equipment does not power on	Electrical Power General Fuse F1 If power is present at Pins 1 & 2 from CN2 connector	Verify the circuit breaker; Replace fuse; Verify terminal barr, Connector & Power Cable
Set- Point does not operate or fails	Set Up – verify if Set Point 1 was selected. Contacts 4 & 5 from CN2 Fuse F2 (Set-Point)	Enable Set Point 1 thru the Set Up Menu; Verify if wires for Set – Point, Are properly connected; Replace Set Point Fuse.
Output Current 4–20mA, does not operate.	Set Up – verify if 4-20mA values were adjusted.	Enable and adjust 4-20mA values thru Set Up Menu.
Equipment does not calibrate	Valid Standard Solution; Standard Solution Fungus; Set Up is correctly programmed.	Use a new Standard Solution. Use a new Standard Solution. Re-do Set Up procedure.
Equipment does not read correctly	Keyboard does not function properly Calibrated with a wrong Standard Solution value; If cell is damaged; Cell cable damaged.	Replace keyboard; Re-do calibration using a new Standard Solution. Replace Cell. Replace Cable.
Serial port does operate	if Serial port is on.	Enable RS485 thru the Set Up menu.

Symptom	Verify	Action
Equipment does not power on	Electrical Power	Verify the circuit breaker
	If Pins1&2 from the terminal barr are powered	General Fuse F1 Verify the equipment connectors and power cable
Suspicious Calibration	Standard Solution Expiration Date	Use a new Standard Solution
	Fungus presence at Standard Solution	Use a new Standard Solution
	If the Set Up operation was performed correctly	Re-do Set Up operation
Equipment does not allow new calibrations	If the Standard Solution value is compatible with the calibration curve values	Replace Standard Solutions. Contact Customer Service.
Equipment does not read correctly	If the keyboard is working properly	Replace keyboard
	Damaged cell, broken or damaged cable	Replace Cell
Serial Port not working properly	If Serial Port is on	Access the Set Up Menu and verify if RS485 is enabled

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.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

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.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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