

**MODEL 4081
Digital Conductivity Meter
Operation Manual**



Model 4081 shown with Dip Cell, Lab Stand and Function Verifier

Date: _____

Serial No.: _____

Dwg. No.: _____

Calibration By: _____

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WARRANTY

AMBER SCIENCE INC. warrants this product to be free from defects in materials and workmanship for a period of one year from date shipped. Warranty will be allowed whenever possible, however all warranty claims will be reviewed by AMBER SCIENCE INC.

EXCLUSIONS FROM WARRANTY

This warranty shall not apply to fuses, disposable batteries, (rechargeable type batteries, pH electrodes, temperature probes and conductivity cells are warranted for 90 days), or any product or part which have been subject to misuse, neglect, tampering, accident or abnormal conditions of operations.

LIMITED WARRANTY

AMBER SCIENCE INC. is pleased to offer suggestions on the use of this product: however, we have no control over its use or intended use. No representation or warranty, whether of merchantability, fitness for any particular purpose is made beyond the repair, replacement or refund of purchase price at the sole discretion of AMBER SCIENCE INC. In no event shall AMBER SCIENCE INC. be liable for special or consequential damages for injury to person or property which may result from the use of this product. Users shall determine the suitability of this product for its intended applications before using and users shall assume all risk and liability whatsoever in connection therewith regardless of our suggestions as to applications or constructions.

RETURN OF ITEMS

Authorization must be obtained from our Customer Service department [call - (541) 345-6877] before returning any item for any reason. When applying for authorization, please include any data regarding the reason the item is being returned. All items must be carefully packed as to prevent shipping damage, and insured against loss and shipping damage. AMBER SCIENCE INC. will not be responsible for any shipping damage. Items being returned without prior authorization may not be accepted.

NOTE

AMBER SCIENCE INC. reserves the right to make changes in specifications, designs, construction and appearance of our products without notice.

SHIPPING CHECKLIST

Upon receipt, the instrument should be carefully unpacked and inspected for shipping damage. All material in the container should be checked against the enclosed packing list. If the instrument has been damaged in transit, retain all packing material and carton. Contact the carrier to file a damage claim.

MODEL 4081 Packing includes the following:

- 1- Model 4081 EC Meter
- 1- Nine Volt Lithium Battery
- 1- Pint of 718 μS Calibration Solution
- 1- Operation Manual

CONDUCTIVITY CELLS

Order Cells separately for Model 4081
800 Series with embedded thermistor

Au cells are best suited for high purity solutions
Multipurpose cells are combination dip, flow & pipette cell

- P/N 815 Dip Cell (Au) with 48" cable
- P/N 825 Dip Cell (Pt) with 48" cable
- P/N 835 Multipurpose (Au) with 48" cable
- P/N 845 Multipurpose (Pt) with 48" cable
- P/N 855 Multipurpose (Au) with 2 meter (78") cable
- P/N 865 Multipurpose (Pt) with 2 meter (78") cable
- P/N 858 Macro Flow Cell (S/S) with 2 meter (78") cable
- P/N 829 Micro Flow Cell (S/S) with one meter (39") cable

OPTIONAL ACCESSORIES

- P/N 8501 Platinizing Station for re-platinizing (Pt) cells
(does *not* include Platinizing Solution)
- P/N 8060 Function Verifier (for use with Models: 3082, 3084, 4081 & 4083)
- P/N 8061 Function Verifier (for use with Models: 3082, 3084, 4081 & 4083)
- P/N 6580 Lab Stand with Cell Holder and AC Adaptor
- P/N 6590 Soft Field Carry Case

CONDUCTIVITY CALIBRATION SOLUTION

Available in Pint, Quart or Gallon sizes:

74.7	Micro-Siemens (μS) /cm @ 25.0°C
718	Micro-Siemens (μS) /cm @ 25.0°C
1,409	Micro-Siemens (μS) /cm @ 25.0°C
6,660	Micro-Siemens (μS) /cm @ 25.0°C
58,700	Micro-Siemens (μS) /cm @ 25.0°C

INTRODUCTION

The Model 4081 is a portable battery powered microprocessor based instrument designed for the measurement of conductivity, resistivity, salinity, total dissolved solids and temperature of aqueous solutions. The conductivity meter has six ranges (not including Auto range) and measurement data is displayed on a sixteen character by two line dot matrix liquid crystal display.

INTRODUCTION CONTINUED

The meter features a smooth, splash proof front panel design with six keypad switches. One keypad for Power on, off and reset. One keypad for Function selection of conductivity, resistivity, salinity, TDS and self test. One keypad for selecting the Range (A - F) and Auto range. One keypad for Parameter selection of setting calibrate, temperature coefficient, reference temperature, the TDS Multiplier or the auto off feature. Two keypad controls of up or down (\wedge or \vee) for menu selection. The Parameter key [K] is also the key used to save the menu setting. The display will prompt the user to save the chosen menu setting by pressing the [K] key.

A self-test mode allows the user to check the calibration reference point and the battery status. The self test mode will also display "Auto Off" if the feature has been selected. The instrument operates on one nine volt alkaline or lithium battery. A lithium battery is supplied with the meter which will provide an average of 160 operating hours. A low battery message on the display will indicate when a fresh battery is required. An access door on the rear of the instrument allows for easy change of the nine volt battery.

CONDUCTIVITY

The basic unit of resistance is the ohm, conductance is the reciprocal of resistance, its basic unit of measurement is the mho (International System of units for mho is Siemens [S]).

In the measurement of aqueous solutions, conductivity is based on the reciprocal of the resistance of a 1-cm cube of material measured between opposite faces. This is a cell constant of 1. Conductivity cells usually consist of two metallic plates of a determined size mounted in a defined area. The cell constant "K" is the length "L" (or distance between the plates) of the conducting path in centimeters divided by the effective cross sectional area "A" of the conducting path in square centimeters ($K=L/A$). The resistance of the conductor is inversely proportional to its cross sectional area and directly proportional to its length.

The Model 4081 is designed to use a cell with a constant (K) of 10 cm^{-1} . The instrument's cell constant parameter setting is adjustable from 8.00 to 12.00. A Self Test mode allows the user to verify the cell constant reference point.

Conduction in aqueous solutions is by ionic movement and increases with temperature. This change is expressed in percent per degree "C" relative to a reference temperature normally 25.0°C and is commonly called the slope.

The Model 4081 has Automatic Temperature Compensation for slope correction with reference temperature parameter adjustable to four settings of 15, 18, 20 or 25°C . The temperature coefficient parameter is adjustable from .00% to 12.00% per degree C. When the temperature coefficient is set to .00% Automatic Temperature Compensation is turned off.

RESISTIVITY

The Model 4081 displays resistivity as a reciprocal of the conductivity. Resistivity's basic unit of measurement is the ohm. Model 4081 displays resistivity in meg ohms (M) or K ohms (K).

TOTAL DISSOLVED SOLIDS

The Total Dissolved Solids (TDS) in a solution does not change with temperature unlike Conductivity which is sensitive to temperature. The Model 4081 automatically calculates the TDS from the conductivity reading by applying the appropriate factor that the user sets or by using the preset parameter. The preset parameter is a factor of .625. However, the parameter is user adjustable from .400 to .900. The Total Dissolved Solids (TDS) will display in Parts Per Million (PPM) or Parts Per Thousand (PPT).

SALINITY

Conductivity may also be used to determine the Salinity of seawater in Practical Salinity Units (SU). The Model 4081 displays Salinity from 2.0 to 42.0 SU (Salinity Units) at one atmosphere when solution temperature is between 0 and 30°C. When the Function is set to Salinity, the Model 4081 automatically sets the Range to “F” and the Reference Temperature will automatically set to 15°C.

TEMPERATURE

Temperature of the solution is displayed in degree (C) Celsius. Each conductivity cell has two embedded thermistors for temperature determination. The temperature range is from 0°C to 70°C and will display to the right of the measurement.

OPERATION

The next section in this manual contains operating information and should be read before operating the instrument. If you have questions, please see page 13 for information on how to contact the Technical Support department.

PLACEMENT OF INSTRUMENT

The Model 4081 is a portable instrument designed for field or laboratory use. When used in the field, avoid operating in direct sunlight which may cause a reflection in the display. When used indoors, place meter on dry flat surface. An optional lab stand with cell holder and AC adaptor is available for bench top use. Do *not* operate instrument in extreme temperatures, electro-magnetic fields or in explosive or corrosive atmospheres. The instrument is splash proof, however it is not waterproof. Avoid contact with liquids around the cell connector, AC adaptor jack or battery door. Do not submerge the instrument in liquids. If instrument becomes submersed, do not use. Contact the manufacturer for repair options.

POWER ON / OFF

Each time the instrument is powered ON, it performs an auto zero check and resets the parameter settings to the original programmed settings.

Cell Constant	10.00
Temperature Coefficient	1.91%
Reference Temperature	25°C
TDS Multiplier	.625

The above settings are all adjustable (see page 13). If changes are made to the preset parameter settings during operation, the changes made will not be retained when power is turned off. When power is turned back on, the instrument will return to its original preset settings listed above.

Note: To avoid losing parameter settings in the laboratory, connect optional AC Adaptor to instrument and leave Power ON. Make sure the “Auto Off” setting has been turned off (see page 13).

When using the AC Adaptor, keep battery connected.

FRONT PANEL DIAGRAM

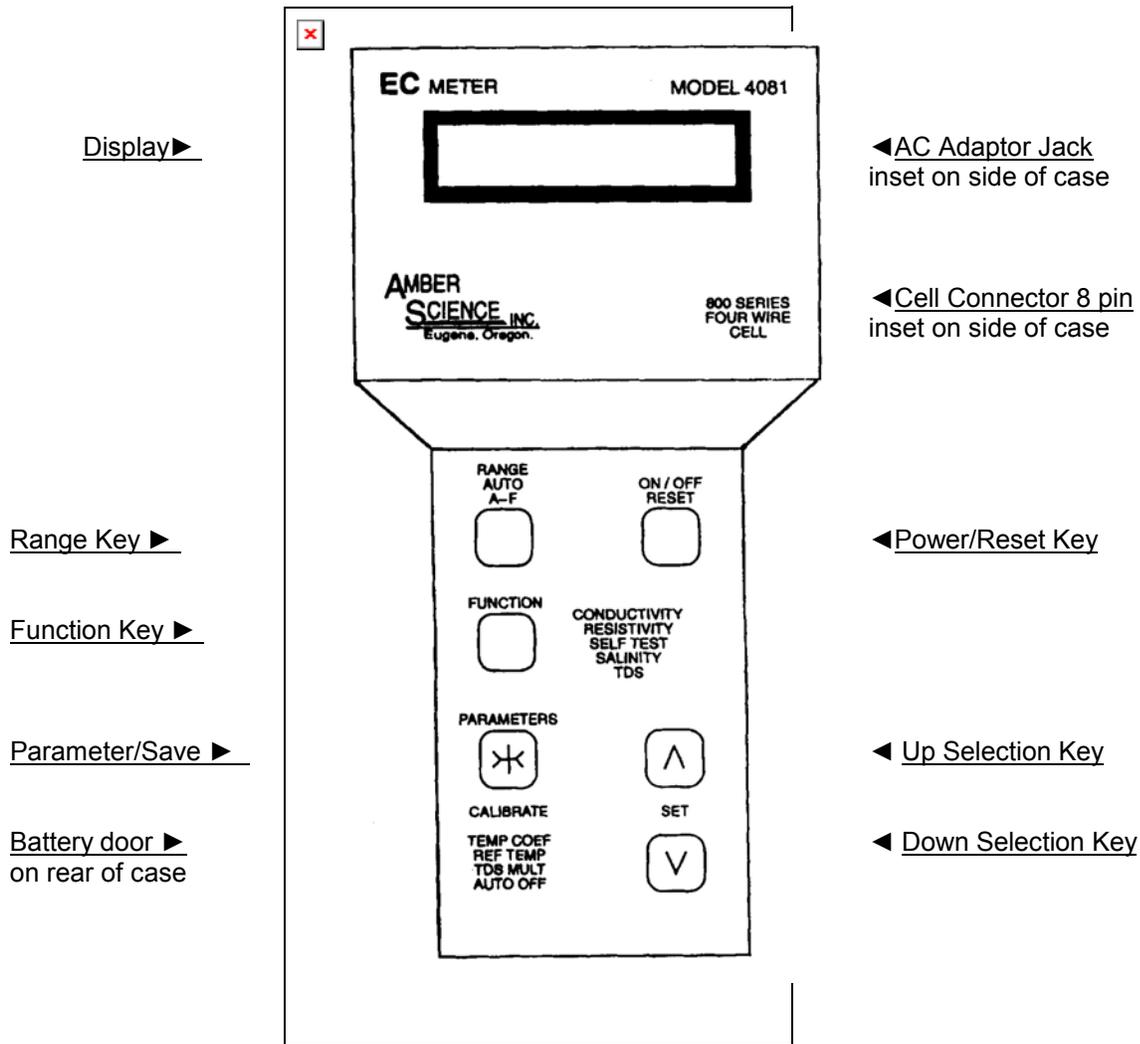


Figure 1 - Front Panel

Figure 1 - illustrates the front panel design. Located on the front panel is the display area and six keypad switches for Power, Range, Function, Parameter and Set (up and down) selection. The cell connector (8 pin circular din) and ac adaptor jack are located on the (right) side of the instrument. A nine volt battery access door is located on the rear bottom portion of the instrument case.

Please Note: Drawing for illustration only. Not to scale.

SPECIFICATIONS

- CASE: T-Style plastic enclosure, W=4.44/3.29" L=8.52" H=1.15/1.50"
Battery door on rear of instrument makes battery change easy.
- WEIGHT: 14.5 ounces (oz.) Meter only, does not include accessories.
- DISPLAY: Sixteen characters by two lines (16 x 2) Liquid Crystal Display (LCD),
Super twist (STN) Dot Matrix with character size of 2.95 x 3.80 mm.
- POWER: Nine volt lithium supplied. Battery life >160 operating hours.
Nine volt alkaline battery can be used as a replacement battery
if desired with a battery life >60 hours. User selectable "Auto off" feature.

CONDUCTIVITY RANGE:

<u>RANGE</u>	<u>FULL SCALE</u>	<u>RESOLUTION</u>	<u>ACCURACY</u>
A	0-3.300 μ S	.001 μ S	.4%
B	0-33.00 μ S	.01	.3%
C	0-330.0 μ S	.1	.2%
D	0-3.300 mS	.001 mS	.2%
E	0-33.00 mS	.01	.3%
F	0-330.0 mS	.1	.4%
Auto	0-330.0 mS	.001 μ S to .1 mS	

RESISTIVITY

RANGE: 33.33 M ohms to 3.03 K ohms (as a function of conductivity)

SELF TEST: Allows user to verify cell constant setting, battery condition and will display "Auto off" if feature has been selected.

TEMPERATURE

RANGE: 0.0°C to 70.0°C (displays to right of measurements).

TEMPERATURE

COMPENSATION: Automatic or off when Temperature Coefficient (TC) is set to .00%

<u>PARAMETERS</u>	<u>PRESET TO:</u>	<u>ADJUSTABLE FROM:</u>
Cell constant	10.00	8.00 to 12.00
Temperature Coefficient	1.91%	.00% to 12.00%
Reference Temperature	25.0°C	15, 18, 20 or 25°C
TDS Multiplier	.625	.400 to .900

SALINITY RANGE: 2.0 to 42.0 Practical Salinity Units (SU)

Range:	Automatically sets to "F"
Reference Temperature:	Automatically sets to 15°C
Temperature Coefficient:	Function of algorithm
Temperature Range:	0.0 C to 30.0°C
Accuracy:	0.4% \pm 1 digit

SPECIFICATIONS CONTINUED

TOTAL DISSOLVED SOLIDS:

Displays in Parts Per Million (PPM) or Parts Per Thousand (PPT) as a function of conductivity & the TDS multiplier.

ENVIRONMENTAL LIMITS:

Temperature: 5 To 45°C (41 to 113°F)
Humidity: 10 to 90% (Relative, non condensing)

CONDUCTIVITY CELLS:

The 800 series, four wire cell features embedded thermistors for temperature compensation and display. All Cells (except the Micro Flow Cell) have a durable epoxy body with a Cell constant (K) of 10 cm⁻¹. The connector is an 8 pin circular din and cable length varies depending on part number. A variety of cells are available depending on application. Please see page 14 for additional information on Cells.

Part #	Description
815	Conductivity Dip Cell (Au) with 48" cable
825	Conductivity Dip Cell (Pt) with 48" cable
835	Conductivity Multi-Purpose Cell (Au) with 48" cable
845	Conductivity Multi-Purpose Cell (Pt) with 48" cable
855	Conductivity Multi-Purpose Cell (Au) with 2 meter cable
865	Conductivity Multi-Purpose Cell (Pt) with 2 meter cable
829	Conductivity Micro Flow Cell (S/S) Cell K = 100 cm ⁻¹
858	Conductivity Macro Flow Cell (S/S) with 2 meter cable

ACCESSORIES:

Part No. 6580 Lab stand with cell holder and AC Adaptor (115 VAC).
Part No. 6590 Soft Field Carry Case.
Part No. 8060 Function Verifier
Part No. 8061 Function Verifier
Part No. 8501 Platinizing Station (for re-platinizing Pt plated Cells).

WARRANTY:

One year (12 months) parts & labor. See page 3 for warranty details.

CALIBRATION

Plug in a clean dry Conductivity Cell to connector (8 pin) on right side of instrument case. Power on instrument by pressing the On key. Wait about 15 seconds for instrument to complete its auto zero check.

Supplies Needed: Three Clean Test Tubes or Beakers
 Calibration Solution of Known Value
 And if available a test tube or beaker filled with
 High purity water (for soaking and rinsing the cell in)

If possible, soak cell in test tube or beaker filled with deionized or high purity water for 2 or 3 minutes prior to using the cell. This will help to wet plates of cell before taking actual measurements.

Prepare three samples of calibration solution (1 pint 718 shipped with the instrument or standard of your choice) by pouring a small amount of standard solution into each of the (3) clean test tubes or beakers. (example: ½ ounce into 19 x 150 mm tube or 60 ml into a 100 ml beaker). Immediately replace cap on calibration solution bottle to avoid contamination.

The instrument should be in the Conductivity Function, if not press the Function key until the Conductivity Function is reached.

Using a clean cell, dip the cell into the first sample. Move cell up and down a few times to dislodge any air bubbles. Withdraw cell and dispose of excess solution by gently shaking off. Do not touch or wipe off cell. Place the cell into the second sample of solution for ten seconds then withdraw cell and again shake off excess solution. Place cell into third test tube or beaker.

Next, press the Parameter key once for Calibrate. Use the [Λ or V] set keys to adjust the reading to the value of the calibration solution (example .718). The meter will prompt you to press to save. Meter will then display the value of the Calibration solution and the meter is now calibrated and ready to make measurements of unknown solutions. See page 11 for Making Measurements of Unknown Solutions.

REFERENCE TEMPERATURE

The solution temperature is displayed to the right of the reading. All conductivity readings are temperature compensated to 25°C which is the preset parameter setting. The preset reference temperature may be changed to 15, 18, or 20°C by pressing the Parameter [K] key and changing the REF TEMP to your desired reference temperature.

The Automatic Temperature Compensation may be turned off by pressing the Parameter [K] key and changing the TEMP COEF to .00%. ATC will then be turned off.

CALIBRATION FREQUENCY

The Model 4081 features a Self Test Function (see page 12) which allows the calibration reference point (cell constant) to be checked. Calibration of the instrument with the cell using a Standard Calibration Solution should be performed on a routine basis. The frequency is a determination made by the user. The last page of this manual (page 17) contains a form which may be used for recording calibration data.

See page 12 under Self Test Section (Cell Constant) for more information about the calibration reference point.

MAKING MEASUREMENTS OF UNKNOWN SOLUTIONS

Supplies needed: Model 4081 Conductivity Meter, Cell, (3) clean test tubes or beakers containing samples of unknown solution. If only a limited amount of unknown solution is available then one sample (minimum sample required -1 ml in a 12 mm I.D. test tube) will suffice.

1. Prior to making measurements of unknown solutions, perform Calibration (page 10).
2. If possible, place cell in beaker of high purity water (deionized water) and let soak for 2 to 3 minutes.
3. If beaker of high purity water is not available, place cell into first sample of unknown solution. Cell should be dipped into solution at least 1.5" (or 4 cm) for proper measurement.
4. If only one sample is available, take measurement after reading has become stable.
5. If three samples of unknown solution is available, place cell in first test tube or beaker for 10 seconds, remove cell and gently shake off excess solution and then place cell in second beaker or test tube for 10 seconds, again remove and gently shake off excess solution. Place cell into third sample and record measurement.

REFERENCE TEMPERATURE

The solution temperature is displayed to the right of the reading. All conductivity readings are temperature compensated to 25°C which is the preset parameter setting. The preset reference temperature may be changed to 15, 18, or 20°C by pressing the Parameter [K] key and changing the REF TEMP to your desired reference temperature.

The Automatic Temperature Compensation may be turned off by pressing the Parameter [K] key and changing the TEMP COEF to .00%. ATC will then be turned off.

MAKING RESISTIVITY MEASUREMENTS

Calibrate the instrument and cell using a Conductivity Standard Calibration Solution (refer to page 10). To make Resistivity measurements, select Resistivity from the Function keypad. The display will read 'out of range' until the cell is placed in solution.

Resistivity measurements will display only in A, B, C or Auto Range only. If the meter is in C range and the display reads 'out of range' press the Range key until you go to B range. If display still reads 'out of range' press Range key to go down to the A range or Auto Range. Record Resistivity measurement once it becomes stable.

Note: If display continues to read 'out of range' press the Function key four times and take your measurement in Conductivity instead.

MAKING TOTAL DISSOLVED SOLIDS MEASUREMENTS

To make TDS measurements, the instrument should be calibrated using a Conductivity Standard Calibration Solution (refer to page 10). TDS measurements will be displayed in Parts Per Million (PPM) in the A, B, or C Range or in Parts Per Thousand (PPT) in the D, E, or F Range. Auto Range will correctly display whether the measurement is PPM or PPT.

1. Press the Function key until TDS appears in the display.
2. Meter will read 'out of range' until cell is placed in solution.
3. Place your cell in the solution to be measured, select appropriate range (or Auto Range) and record measurement.

TDS MULTIPLIER

When measuring TDS, the Model 4081 uses the preset TDS multiplier of .625. If you choose to change the preset multiplier, press the Parameter key until 'Set TDS Mult' appears in the display. Then press the SET key [Λ or V] until the multiplier of your choice appears. Note: The TDS multiplier is adjustable from .400 to .900 only.

MAKING SALINITY MEASUREMENTS

Calibrate the instrument and cell using a Conductivity Calibration Solution (refer to page 10). To make Salinity measurements, select Salinity by pressing the Function Key until 'Salinity' appears in the display. The instrument automatically sets the Range to 'F' and the reference temperature to 15°C. The temperature of the solution being measured should be in the 0 to 30°C range. Place your cell in the solution to be measured. The display will read between 2.0 to 42.0 SU (Salinity Units). If the display flashes 'out of range' then the sample is above or below the Salinity measurement range. Take your reading in Conductivity instead.

SELF TEST

Cell Constant

The Self Test Function allows the user to check the cell constant reference point. This feature may be useful prior to turning the power off. Press the Function key until 'Self Test' appears, the cell constant number is to the right of 'Self Test'. Record the number and use this number as a reference point (see page 17). When power is turned off, the instrument does not retain previous calibration, instead when the instrument is powered on, it performs the auto zero check and parameters are returned to their preset parameter settings. If the prior cell constant reference point has been noted, Power On and let instrument perform the auto zero check, then press the Parameter key (when in Conductivity Function) and you can adjust the cell constant to the previous number. This feature should not be used in place of calibrating with a known Calibration Solution, instead it may be used when the same person is using the instrument periodically throughout the week and turning the power on and off each day. Routine calibration is still necessary.

Battery Status

The Self Test Function also allows the user to check the battery status. The display will read Batt OK when battery voltage is sufficient. The display will flash Battery Low when a fresh new battery is needed.

Installing new battery

To install a new battery, turn power off and remove cover on rear bottom portion of case. Remove old battery and replace with a new nine volt alkaline or lithium battery. Place + side of battery on + side (marked on case), place battery in at angle with non terminal (bottom of battery) in first, then press terminal side of battery down into place. Battery should fit snug. Replace battery cover, and Power On instrument. Allow 15 seconds for instrument to complete the auto zero check.

Auto Off Feature

The instrument has an auto off feature that can be turned on or off by the user. To save battery life when the instrument is not in use, the power will be turned off automatically after about 30 minutes of non use. To change the auto off setting, press the Parameter key until the instrument displays Auto Off Y/N (Yes / No) use the set keys (Λ or V) to set Yes or No. The display will then prompt you to save your setting by pressing the Parameter [Ж] key.

PARAMETERS

The Parameter [Ж] key allows the user to set the following parameters: Calibrate, Temperature Coefficient, Reference Temperature, TDS Multiplier, and Auto Off.

Calibrate: Use this function to calibrate the instrument to a known Conductivity Standard Reference Solution (see page 10) or to change the cell constant reference point (see page 12).

Temp Coef: The temperature coefficient is preset to a setting of 1.91%. This setting is adjustable from .00 % to 12.00 %. Changing the Temperature Coefficient to .00% will turn the Automatic Temperature Compensation (ATC) Off.

Ref Temp: The reference temperature is preset to 25.0°C. This setting is adjustable and the user may change the reference temperature to 15, 18, 20 or 25°C.

TDS Multiplier: The TDS multiplier is preset to .625. It is adjustable from .400 to .900.

Auto Off: The auto off feature is designed to save battery life. The feature may be turned on or off by selecting Auto Off and Yes or No. The display will prompt you to save your setting.

Parameter [Ж] key

After pressing the Parameter [Ж] key and choosing your selection, the display will prompt you to use the up and down [Λ or V] set keys. The display will then prompt you to Save your setting by pressing the [Ж] key.

Note: If changes are made to any of the parameter settings, they will not be retained when power is turned off. When power is turned back on, the instrument performs an auto zero check and returns the parameter settings to their original preset settings.

TECHNICAL SUPPORT

If Technical Assistance is needed, please call Amber Science at (541) 345-6877 (Monday - Friday, [except holidays] 7 am to 4 pm Pacific time zone). Other ways to contact Amber Science include: E-mail - info@amberscience.com or via the World wide web - <http://www.amberscience.com>, Fax # (541) 345-6277 or by mail to: Amber Science, 277 Blair Blvd., Eugene, OR 97402-4147 USA.

RETURN OF ITEMS

Authorization must be obtained from the Customer Service Department before returning items for any reason. Should the instrument be in need of repair and has not been subject to abuse or misuse, please return freight prepaid and adjustments will be made without charge under warranty. Out of warranty items will be repaired on a charge basis with customer approval. The Customer Service Department will issue an R.A.# and instructions for returning the instrument. Please include a note with any data regarding the reason the item is being returned.

CONDUCTIVITY CELLS

There are several types of conductivity cells available. Choose one that is suitable for your application.

Au Cells

The (Au) cell is recommended for measurements of low conductivity or high purity solutions. The (Au) multipurpose cell in the flow configuration is recommended for ultra pure water (grab samples of ultra pure water are subject to contamination from the vessel and atmospheric gases). The (Au) cell has much less tendency to carry over solution from one measurement to the next. The (Au) cells require less maintenance than the (Pt) cells since no re-platinizing is required.

Pt Cells

The (Pt) cells are needed for measuring solutions with high conductivity readings such as Sea Water. The (Pt) cells will require re-platinizing on occasion. Anytime a (Pt) cell is cleaned it should be re-platinized. This can be accomplished with the Model 8501 Platinizing Station and with (ASTM D1125) Platinizing Solution. The cell may also be returned to the manufacturer for cleaning and re-platinizing. Providing the cell has been kept in good condition the cell will be re-platinized for a nominal charge. Please contact Amber Science for a Return Authorization number before returning the Conductivity Cell.

Dip Cells

Dip Cells are used to dip into a test tube or beaker. They require a minimum sample of 1 ml in the smallest diameter test tube the cell will fit into (i.e. 12 mm I.D. test tube). Dip Cells are available with gold (Au) or platinum (Pt) plated electrodes.

Multi-Purpose Cells

The multi-purpose cells can be used three ways - dip cell, flow cell and as a pipette cell. The multi-purpose cell is also available with Au or Pt plates. See next page for more information on the multi-purpose cells.

Micro Flow Cell

When using the P/N 829 Micro Flow Cell which has a cell constant of 100 cm^{-1} , all displayed readings must be multiplied by 10. Use only non-metallic tubing or fittings for connections on the stainless steel tubing. The maximum temperature is 50°C and the maximum recommended pressure is 50 P.S.I. Mount the micro flow cell so that the solution flows upward. This will help to clear any air bubbles. Please read the instruction sheet that is included with all micro flow cells.

Use of Conductivity Cells

It is important to remember that the conductivity cell is delicate sensor and should be cared for properly. Before using the Dip cell it should be rinsed or soaked in high purity or deionized (DI) water for two to three minutes (if available). Carefully, shake off excess solution and dry with a clean lab wipe. If possible, rinse cell in a sample of the solution to be measured before the actual measurement is made. Once the Dip cell is placed in the sample for measurement, it is helpful to agitate the cell by gently moving up and down and few times. This will aid in dislodging any air bubbles. Allow sufficient time for temperature equilibration (10 to 15 seconds) before recording measurement. When finished using the cell, rinse in high purity or DI water or an appropriate solvent (do not use aqua regia) to remove any residue which has contaminated the plates. Wipe off cell with clean lab wipe and *store dry*.

For bench top use, an optional Lab Stand with Cell Holder and 115 V AC Adaptor is available. Order Part Number: 6580 Lab Kit. For convenience, an o-ring on the conductivity dip or multipurpose cell allows the cell to be vertically positioned in the cell holder which is part of the optional Lab Kit

For field use, an optional Soft Field Carry Case is available. Order Part Number: 6590.

MULTIPURPOSE CELLS

CAUTION:

Before applying vinyl tubing to the Cell, soak tubing in warm water for 5 minutes. This will make tubing easier to apply to the end of the Cell.

MULTI-PURPOSE CONDUCTIVITY CELL

Doc.# x35x45 Rev 10/2000

The multi-purpose cell can be used in three different configurations:

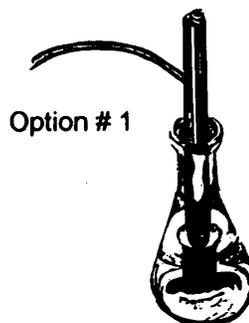
1. Dip Cell -For dipping into a test tube or beaker
2. Pipette Cell -For measuring small sample amounts.
3. Flow Cell -For using in a in-line flow system.

Included with the Multi-Purpose Cell are the following parts:

- (2) 10" pieces of vinyl tubing
- (2) plastic clamps
- (2) plastic mounting tabs
- (2) 6" zip ties
- (1) piece foam pipe insulation
- (1) rubber bulb

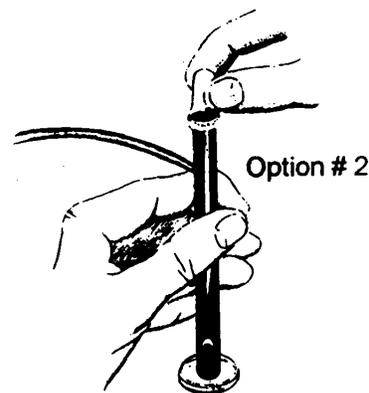
Option #1 Dip Cell

The multi-purpose cell can be used as a dip cell by simply dipping the cell into a test tube or beaker filled with solution. The cell must be immersed at least 1.5" for proper measurement.



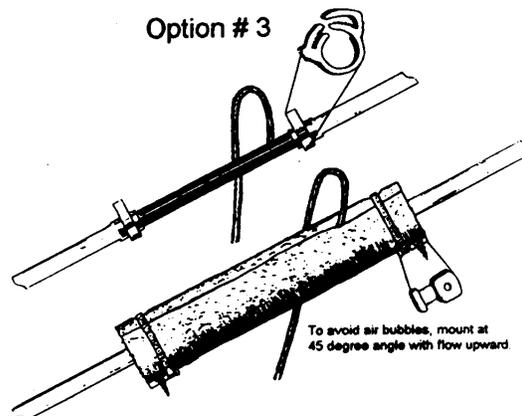
Option #2: Pipette Cell

Included in the package with the multi-purpose cell is a rubber bulb. Attach the bulb to the top end of the cell (near the cable). Squeeze bulb. While holding cell at slight angle, immerse cell in sample and release bulb to draw up the sample into the cell. Wait until reading becomes stable, record measurement and then squeeze bulb again to release the solution.



Option #3 Flow Cell

Carefully attach the (2) 10" pieces of vinyl tubing to each end of the cell. To prevent leaks, (2) clamps have been provided which may be used to secure the vinyl tubing to each end of the cell. A piece of pipe insulation has been supplied which will aid in isolating the cell from ambient temperature changes. Insert the cell into the pipe insulation. If it is desired to mount the cell in a fixed location, (2) mounting tabs have been provided. To avoid air bubbles, it is suggested that the cell be mounted at a 45° angle. Using screws (not provided) attach mounting tabs to a wall, bench or other desired object or location. Next, insert zip tie through mounting tab and around insulation containing cell. Secure zip tie. Flow cell is now mounted and ready for use. The flow method is ideal for measuring high purity water.



CELL CONSTANT

All conductivity cells have a slightly different cell constant, approximately 10 cm^{-1} (some examples: 10.04, 10.09 or 10.11). Each time calibration is performed the cell constant should be noted. If you notice a change, this may be an indication that the conductivity cell is in need of cleaning. Follow the instruction sheet that was included with the conductivity cell, see below *or* contact the Technical Support department at Amber Science for instructions on how to clean your conductivity cell. Please have the part number of your cell available when contacting Tech Support.

CLEANING CELLS

To clean a conductivity cell, wet a cotton tipped applicator with a solvent appropriate to remove any residue that has contaminated the plates of the cell. Choose a solvent (ie: Isopropanol 99%) that will not damage the epoxy tube the cell is constructed of (do **not** use Aqua Regia to clean cell or remove old platinum). Insert the wetted swab through the bottom of the cell. You may need to do this several times until the swab shows no residue. Then clean with a mild detergent or liquid soap and rinse in warm DI or tap water. Remember, if it is a platinum (Pt) cell, it will need to be re-platinized after it has been cleaned. Conductivity cells should be stored clean and dry when not in use.

MAINTENANCE

The Model 4081 requires no general maintenance, other than calibration on a routine basis. Replace nine volt battery when needed (see page 12). Occasional cleaning may be done with a damp cloth and a mild detergent. Do *not* allow fluids to run into the instrument. Conductivity cells should be cleaned and inspected periodically and replaced when necessary.

CONDUCTIVITY STANDARDS

One pint of 718 standard calibration solution was included with the meter or choose a standard that is close to the range you expect to measure. For example, if measuring DI water or a sample low in conductivity, use a low standard of 75 to 100 μS . Standards less than 75 μS are easily contaminated and therefore not always reliable. You can choose from a variety of Conductivity Standards available or make your own.

Reference Solution @ 25°C	Approximate Normality of Solution	Grams of KCl weighed in Air per 1 liter of Solution @ 20°C
1408.8 μS	.01	.7440
12856 μS	.1	7.4365
111342 μS	1	74.2460

SALINITY REFERENCE STANDARD

Reference solution @ 15°C	Grams of K C l per 1 kilogram of solution
35.0 Practical Salinity Units	32.4356

REFERENCE LITERATURE

Standard Methods, 20 th Edition	ISBN 0-87553-225-7
ASTM Standards (2000), Volume 11.01	ISBN 0-8031-2814-2

CALIBRATION DATA

Calibrating the instrument with a Conductivity Calibration Solution should be performed periodically. Calibration frequency (daily or before each use) is a determination made by the user. Below is a form that may be duplicated to record calibration data. **Note:** If NIST traceability is a requirement for your company, use a NIST or NIST traceable calibration solution. Determine the uncertainty and properly document the calibration. The *Guidelines for Expressing Uncertainty* is NIST Technical Note 1297. More information is available on the web at www.nist.gov/traceability.

Model # _____ Serial Number _____ Cell Part # _____ Cell Mfd. date _____

Date (mm-dd-yy)	Standard Value μ S	Lot # / Exp. Date	Self-Test (cell K)	Employee Name