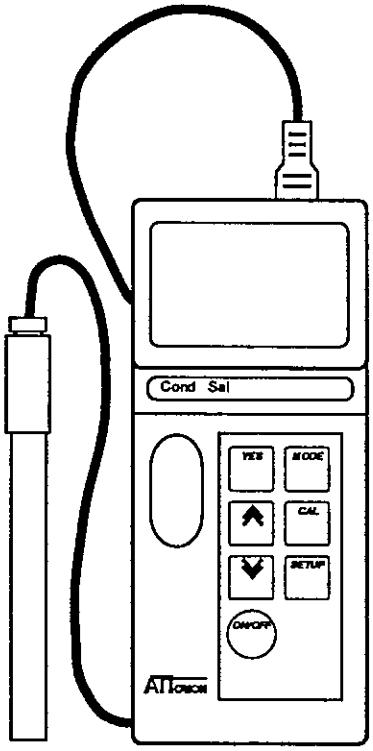
MODELS 105 and 115 CONDUCTIVITY METERS

INSTRUCTION MANUAL



ANALYTICAL TECHNOLOGY, INC.

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Chapter I Introduction

The Orion Models 105 and 115 Conductivity Meters are value priced, full featured portable meters which can be used for a wide variety of applications. Water quality, salinity, acids, bases and other samples can be easily analyzed for conductivity, salinity, and total dissolved solids (TDS).

These meters feature microprocessor design, which automates complicated and time consuming calibration and measurement procedures for a wide variety of applications. Orion's new DirectCal™ direct calibration technique allows calibration by direct input of actual calibration standard values, eliminating iterative adjustments of cell constants. A wide variety of cells, Conductivity and TDS Standards, and accessories are available.

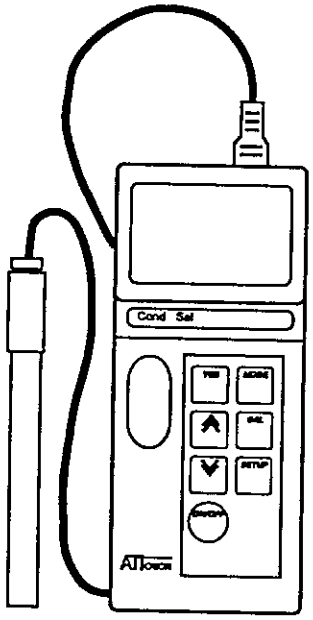


Figure 1 – Model 105

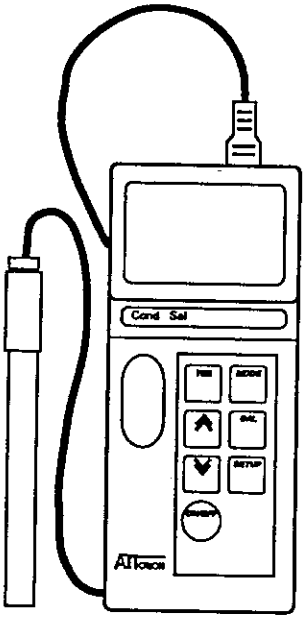


Figure 2 – Model 115

Chapter II
General Information

Instrument Descriptions

Model 105

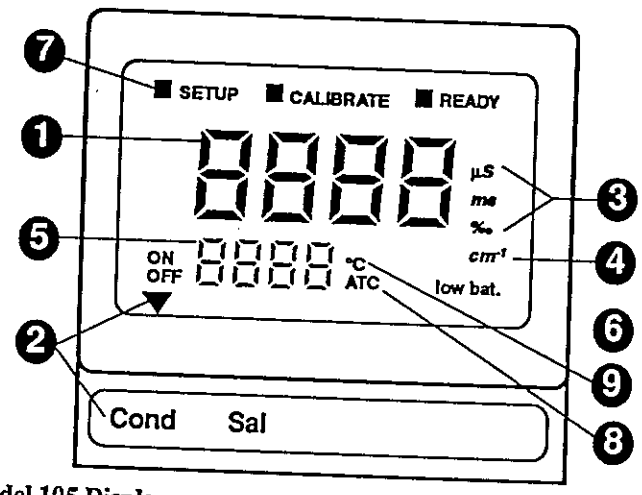
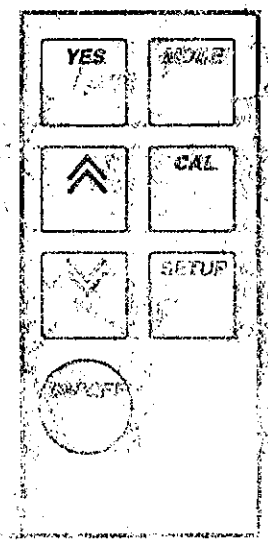


Figure 3 – Model 105 Display

Item	Display Feature	Function	Comments
1	Alphanumeric Display	Displays Conductivity, Salinityvalue, or User prompts	
2	Cond ▼	CON Indicator	Indicates Conductivity Mode
	Sal ▼	SAL Indicator	Indicates Salinity Mode
3	‰	(parts per thousand)	Salinity Units
	mS	(milliSiemens/cm)	Conductivity Units
	µS	(microSiemens/cm)	Conductivity Units
4	cm-1	Cell Constant Units	



Key	Primary Function	Comments
yes	Accepts entered or displayed values	
mode	Conductivity and Salinity Measurements	To return to active measurement from any mode, press the MODE key
"up"	Scroll values up	
"down"	Scroll values down	
cal	Calibration	
Setup	Setup	
on/off	Power	

Model 115

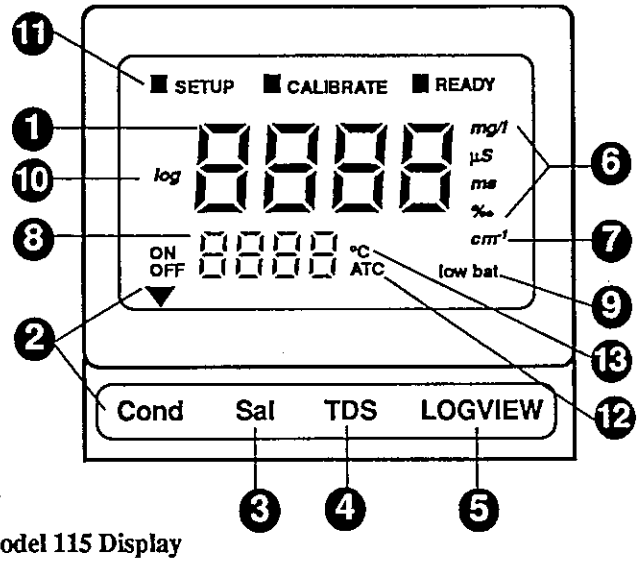


Figure 5 – Model 115 Display

Display, Model 115

Item	Display Feature	Function	Comments
1	Alphanumeric Display	Displays Conductivity, SalinityTDS value, or User prompts	
2	Cond ▼	CON Indicator	Indicates Conductivity Mode
3	Sal ▼	SAL Indicator	Indicates Salinity Mode
4	TDS ▼	TDS Indicator	Indicates TDS Mode

Item	Display Feature	Function	Comments
5	LOGVIEW ▼	Logview Indicator	Indicates Logview Mode
6	mg/L	(milligrams per Liter)	TDS Units
	mS	(milliSiemens/cm)	Conductivity Units
	µS	(microSiemens/cm)	Conductivity Units
	‰	(parts per thousand)	Salinity Units
7	cm-1	Cell Constant Units	
8	Alphanumeric Display	Displays Temperature and Log Identification Points	
9	low bat.	Indicates Low Battery	
10	log	Indicates data is stored in memory	
11	READY	Ready Indicator	Displayed when reading is stable
	SETUP	Setup Mode Indicator	
	CALIBRATE	Calibration Mode Indicator	
12	ATC	Displayed when temperature sensor attached	
13	°C	Degree Centigrade	Temperature Units

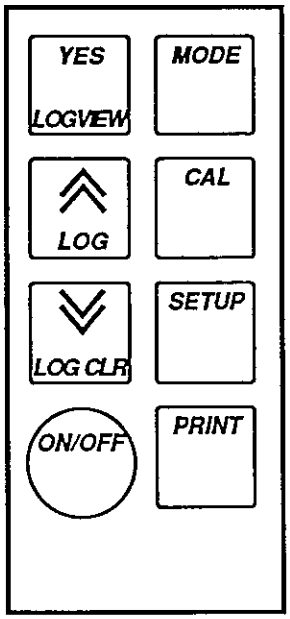


Figure 6 – Model 115 Keypad

Keypad, Model 115

Key	Primary Function	Comments
yes/LOGVIEW	Accepts entered or displayed values Views logged datapoints	In measurement modes only
	Conductivity,Salinity or TDS Measurements	To return to active measurement from any mode, press the **MODE** key

Key	Primary Function	Comments
"up"/LOG	Scroll values up Log Current Value	
"down"/	Scroll values down	
LOG CLEAR	Clears data in log	Hold down key for 3 seconds to clear data in log
cal	Calibration	
Setup	Setup	
print	Prints measured value or logged data	
on/off	Power	

Rear Panel, Models 105 & 115

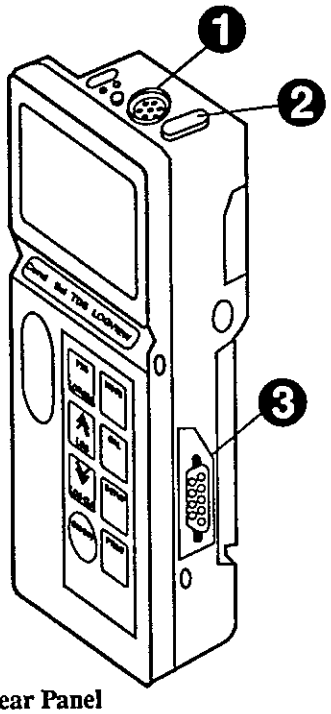


Figure 7 – Models 105and 115 Rear Panel

Item	Feature	Function	Comments
1	DIN Connector	Conductivity Probe Connection	
2	Power Connection	For connection of line adapter	
3	RS232 Connector	For printer and computer connection	Model 115 Only

Conductivity Measurement Theory

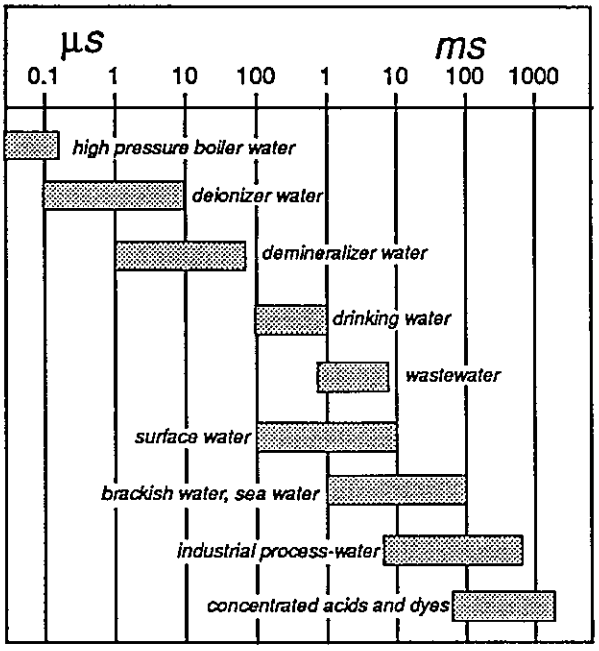


Figure 8 – Ranges of Common Aqueous Solutions

The term conductance refers to the ability of materials to carry an electric current. Liquids which carry an electric current are referred to as electrolytic conductors. Under the influence of an electric field, the flow of current through an electrolytic conductor is accomplished by the movement of positive and negative ions. The conductance of a liquid is defined by the ratio of current to voltage between any two points within the liquid. As the two points move closer together or further apart the ratio will change. For analytical purposes, a dimension is given to the measurement; i.e., the physical parameters of the measurement.

By defining the physical parameters of the measurement, a standard measure is created. The standard measure is referred to as specific conductance or conductivity, which is defined by the reciprocal of the resistance in ohms, measured between the opposing faces of 1 cm cube of liquid at a specific temperature. The units used to define conductance are: 1/ohm = 1 mho = 1 Siemen (S) = 1000 mS = 1,000,000 µS. The conductivity value is obtained by multiplying the conductance value by the cell constant. See Figure 8 for Conductivity Ranges of Common Aqueous Solutions.

Cell Constants

In theory, a conductivity measuring cell is formed by two 1 cm square surfaces spaced 1 cm apart. The theoretical cell just described has a cell constant of K = 1.0 cm-1. The cell constant, K, is defined as the ratio of the distance between the electrodes, d, to the electrode area, A. However, the existence of a fringe-field affects the electrode area by the amount AR, therefore K = d/(A + AR). See Figure 9. Because it is normally impossible to measure the fringe-field effect and the amount of AR to calculate the cell constant, K, the actual K of a specific cell is determined by a comparison measurement to a standard solution of known conductivity (e.g., 0.01 M KCl).

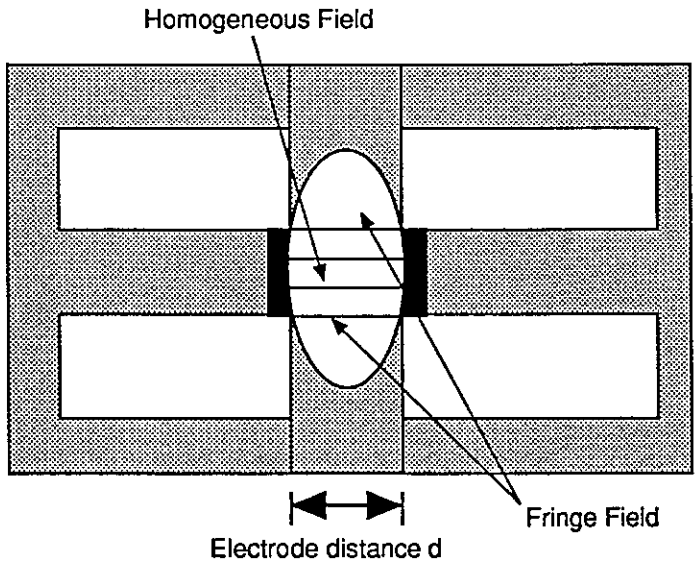


Figure 9 –

Cells of different physical configuration are characterized by their cell constant, K. Often for considerations having to do with sample volume or space, a cell's physical configuration is designed differently. Cells with constants of 1.0 cm-1 or greater normally have small, widely spaced electrodes. Cells with constants of 0.1 cm-1 or less normally have large closely spaced electrodes.

Since K is a "factor" which reflects a particular cell's physical configuration, the cell constant must be multiplied by the observed conductance to obtain the actual conductivity reading. For example, for an observed reading of 200 µS using a cell with K = 0.1 cm-1, the conductivity value is 200 µS x 0.1 cm-1= 20 µS/cm.

Solutions with low conductivity, up to 1-2 mS, are best measured with cells having a cell constant of K = 0.1 cm-1. Cells with K = 1.0 cm-1 are best used for solutions with conductivity of > 1 µS to 100 mS. Cells with K = 10.0 cm-1are best used for solutions with conductivity of 10 µS to 2000 mS. See Figure 10 for typical conductivity ranges for cell constants.

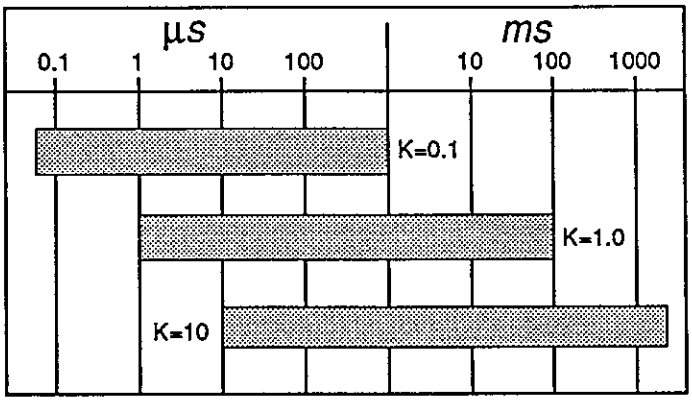


Figure 10 –

Temperature Effects on Conductivity

The conductivity of a solution with a specific electrolyte concentration changes with temperature. The relationship of the change in conductivity as a function of temperature is described by a solution's temperature coefficient. Temperature coefficients vary with each solution. Some examples are shown in Table 1. The Models 105 and 115 use a 2.1%/°C fixed temperature coefficient, which is representative of many aqueous samples, to compensate for temperature changes.

By definition, temperature compensated conductivity of a solution is the conductivity which that solution exhibits at the reference temperature. The temperature is chosen to be either 25°C or 20°C. A measurement made at the reference temperature needs no compensation. The closer the sample is to the reference temperature, the smaller the error will be if the meter temperature coefficient is incorrect. The Models 105 and 115 automatically compensate for temperature changes based on the temperature coefficient and the reference temperature when a temperature measurement is simultaneously made.

Table 1
Typical Temperature Coefficients Between 25 and 50°C
(percent change of Conductivity per °C)

Solution	%/°C
Ultrapure Water	4.55
Salt (KCl)	2.01
Salt (NaCl)	2.12
5% NaOH	1.7
Dilute Ammonia	1.88
10% HCl	1.32
5% Sulfuric Acid	0.96
98% Sulfuric Acid	2.84
Sugar Syrup	5.64

Salinity

Salinity is a measure of the total dissolved salts in a solution and is used to describe seawater, as well as natural and industrial waters. Salinity is a relative scale based on a KCl solution. A Salinity value of 35 is relative to seawater at 15 °C and a conductivity value equivalent to a KCl solution containing 32.4356 g KCl in 1 Kg of solution. The units to describe salinity are ‰ or ppt (parts per thousand). Orion Models 105 and 115 calculate the salinity based on the Pratical Salinity Scale of 1978, as referenced in Standard Methods 2520 B and D.

Total Dissolved Solids Measurement

The standard method of determining TDS (Total Dissolved Solids) is by evaporating the sample to dryness at 180°C and weighing the residue. Conductivity may be used to estimate TDS by calculating the concentration of sodium chloride equivalent to a given conductivity and temperature value. Orion conductivity systems report a sample's TDS value in mg/L of sodium chloride by comparing its conductivity and temperature to data stored in the meter's memory. Data was obtained from the International Critical Tables. For TDS values between 0 to 19,900 mg/L and temperature values between 5 and 50°C, the displayed TDS value agrees with Critical Tables values with an accuracy of 0.87% R.S.D.

Chapter III
General Information

Instrument Setup

Power Source

Models 105 and 115 operate on either one 9 V alkaline battery, one 9 V lithium battery, or an AC line adapter (Cat No. 020125 for 110 V, Cat No. 020130 for 220 V, or Cat. No. 020135 for 240 V). The estimated battery life is 45 hours of continuous operation for an alkaline battery and 80 hours of continuous operation for a lithium battery.

Battery Installation

1. Open battery compartment by pushing closure up. This is most easily accomplished by using a coin, such as a dime, and inserting it into the slot on the side of the meter.

2. Insert battery by pushing gently until it locks in place. Ensure polarity is correct as shown in the battery compartment.

3. Replace battery compartment cover.

NOTE: Recalibrate after replacing the battery. Without the battery installed or meter plugged into line power the meter loses calibration data and other information in memory. To prevent loss of data in the field, turn meter off if the low battery signal comes on. Check and replace batteries regularly prior to field use.

Self-Diagnostics Checkout

NOTE: Self test will not function with a low battery.

1. Disconnect the conductivity cell for the following test. If the cell is attached and immersed in solution, the meter will fail "Test 3."
2. Press the ON/OFF key to turn meter off.
3. Press and hold the YES key while pressing the ON/OFF key. The instrument automatically performs electronic and hardware diagnostic tests.
4. After Test 7, a "0" will appear on the display. Press each key (the numeric digits will change with each keypress).

   NOTE: All keys must be pressed within 10 seconds to complete this test.
5. After the Test 7, the meter will display "Test 8" and then turn off.
6. If any problems are found during self-test, the meter will display an operator assistance code until the **YES** key is pressed. See page 00 for operator assistance codes.
7. If the operator does not wish to perform the self-diagnostics checkout, the meter may be turned on by pressing the **ON/OFF** key.

Power Up

1. Connect the conductivity cell to the meter.
2. Press the ON/OFF key to turn meter on. All display indicators will be displayed briefly, followed by the meter model number. If "low bat." indicator remains on, replace battery or use line adapter.

Auto Shutoff

The meter will automatically shutoff 20 minutes after the last keypress. The Auto Shutoff feature is always turned on. To turn the feature off, press the **MODE** key while turning the meter on. Auto Shutoff will be activated when the meter is turned off and on again.

Setup Menu

Three features are accessed by pressing the **Setup** key to access the setup menu. The "SETUP" indicator at the top left of the display will be illuminated.

- Scroll through Setup choices by pressing the **YES** key.
- Changes are made with the ≈ or ≈ keys.
- All changes must be acknowledged by pressing the **YES** key.
- Return to Measure mode by pressing the **MODE** key.

Display	Feature	Options	Comments
S-1	Temperature Coefficient	0.0 to 2.5%/°C 0.0 or 2.1%/°C	Model 115 Model 105
S-2	Manual Temperature Input	-5 to 105 °C	For Manual Temperature Compensation mode (sample temperature)
S-3	Reference Temperature	o 25 °C o 20 °C	

NOTE: Manual Temperature Input is not accessible in the Setup mode when an external temperature sensor is attached to the meter.

Chapter IV
Operation

Calibration of the Cell Constant

The conductivity cell constant may shift with time. It is recommended to calibrate the cell constant against known conductivity standards. The Model 105 calibrates by a cell constant adjustment method. The Model 115 calibrates either by adjusting the cell constant or by performing a direct calibration. For best results, calibrate at the chosen reference temperature.

NOTE: To return to active measurement modes from the calibration mode, press the MODE key.

Calibration – Cell Constant Adjustment Method (Models 105 & 115)

1. Initiate calibration by pressing the **CAL** key. The "CALIBRATE" indicator and the last cell constant will appear on the display.
2. Estimate the cell constant of the cell you are using. Use the ⩓ or ⩔ key to move the decimal point, then press the **YES** key to accept the decimal placement. Enter the cell constant value by scrolling each digit with the ⩓ or ⩔ key, then accepting the value by pressing the **YES** key.
3. Place the conductivity cell in the standard.
4. Press the **MODE** key to return to conductivity measurement mode.
5. Compare the displayed value of the standard to its specified value at the standard's temperature (See table page 00).
6. If the correct standard value is not displayed, calculate the percentage error in the displayed value from step 5.

$$\text{Percent Error} = \frac{\text{Displayed Value}}{\text{Standard Value}}$$

7. Return to step 1, and change the cell constant by this percentage.
8. Repeat steps 2 through 7 until the desired calibration accuracy is obtained.

DirectCal® Direct Calibration Method (Model 115 only)
(Easiest Calibration Method!)

1. Initiate by pressing the **CAL** key. The "CALIBRATE" indicator will appear at the top center of the display.
2. Press the **CAL** key until the correct range for your standard appears on the display. The displayed values are 199.9 µS, 1999 µS, 19.99 mS, and 199.9 mS. The calibration ranges may be scrolled through multiple times by pressing the **CAL** key. The chosen range should be between 10 and 100% of the conductivity standard. For example, 1413 µS would be the 1999 µS range.

   NOTE: When "1.000 cm-1" appears on the display, you are back to calibration by cell constant adjustment method.
3. Place the conductivity cell in the standard.
4. Enter the value of the standard by scrolling each digit with the ≪ or ≫ key, then accepting the value by pressing the **YES** key.

   NOTE: Be sure to select the standard value at the actual standard temperature. (See table page 00.)
5. After the last digit has been entered and accepted by pressing the **YES** key, the screen will go blank. The meter will perform the calibration, and return to measurement mode.

   NOTE: Calibration for TDS and Salinity must be done in conductivity mode, using conductivity units.

Measurements

Press the **MODE** key to move between conductivity, salinity, and TDS on the Model 115, or between conductivity and salinity on the Model 105.

NOTE: You should either use a temperature compensated conductivity cell, an ATC probe, or manual temperature compensation with the actual sample temperature entered in the meter. Significant errors may result if the effects of temperature are ignored. Salinity and TDS measurements always require automatic or manual temperature compensation.

Conductivity Measurement

Place the conductivity probe in the sample. In conductivity mode, the current units of either mS (milliSiemens) or µS (microSiemens) will be displayed.

Salinity Measurement

Place the conductivity probe in the sample. Press the **MODE** key until units of ‰ (parts per thousand) are displayed.

TDS Measurement (Model 115 Only)

Place the conductivity probe in the sample. Press the **MODE** key until units of mg/L are displayed.

Ready Indication

After the signal has reached stability, the "READY" indicator at the top right of the display will be displayed.

Auto Range Selection

Both the 105 and 115 feature automatic range selection. The most accurate range is automatically chosen by the meter based on the sample's conductivity value. A small amount of overlap is provided between all ranges to avoid "range flip" when measuring a sample whose conductivity is near the end of a range.

Temperature Compensation and Measurement

Automatic Temperature Compensation

When a conductivity cell with an integral temperature sensor or an ATC probe is connected, the meter automatically recognizes the connection and the "ATC" indicator will be displayed. The measured values are automatically temperature corrected.

Measurement of Conductivity with an External Temperature Probe

Temperature compensation is most conveniently accomplished by using an Orion Conductivity/Temperature probe. However, a separate ATC probe may be used with the appropriate adapter. See ordering information for details.

Manual Temperature Compensation

It is recommended that the temperature of the sample be accurately determined for use with this method. Errors of 1% to 3% per °C are typically encountered if the effects of temperature are ignored.

NOTE: An external temperature sensor must not be plugged into the meter for manual temperature compensation.

To change the temperature:

1. Press the **SETUP** key to enter setup mode.
2. Press the **YES** key until "S-2" is displayed.
3. Using the ⩝ and ⩛ keys, adjust the displayed temperature to the sample temperature.
4. Acknowledge the change by pressing the **YES** key.
6. Return to active measurement modes by pressing the **MODE** key.

No temperature compensation

Use of this mode will result in reporting the actual conductivity of the sample at its current temperature. It will not be converted to conductivity at the reference temperature, as is the case with automatic or manual temperature compensation.

1. Press the **SETUP** key to enter setup mode.
2. When "S-1" is displayed, 2.1%/°C or the last temperature coefficient in memory will be displayed.
3. Use the ⩓ or ⩔ key to change the value to 0.0%/°C.
3. Acknowledge the change by pressing the **YES** key.
4. Return to active measurement modes by pressing the **MODE** key.

NOTE: In salinity and TDS modes, only automatic and manual temperature compensation is available. If no temperature probe is plugged into the meter, manual temperature compensation at the currently selected manual temperature setting (default is 25°C) is used.

Data Logging (Model 115 only)

Storage

1. To log data from any measurement mode, simply press the **LOG** key. The current reading will be written to the log, and a log point (L-01 to L-50) will be displayed in place of the temperature value display. After display of the logged reading for approximately one second, the display will return to an active reading.
2. A maximum of 25 points can be stored. Data logging after 25 points will result in an "E-26" error message on the display. If this happens, the log must be cleared to continue logging data.
3. The "log" indicator on the display will be lit whenever there is any data in the log.

Readout of Stored Data

1. To view data, press the **LOG VIEW** key. Point L-01 will be displayed. The temperature display will alternate between the log indentification point and the temperature of the data point (if applicable).
2. To view other points, use the ≽and ≼ keys to scroll through the data.
3. To return to active measurement modes, press the **MODE** key or the **LOG VIEW** key.

Printing of Stored Data

1. To print all the logged data, press the **LOG VIEW** key.
2. Press the **PRINT** key while in LOG VIEW mode to start data transmission. The entire log will be printed. Each data set is separated by one blank line. The following information is printed:
   - Log number
   - Measured value
   - Reference temperature
   - Sample temperature
   - "MAN" if manually temperature compensated

Erasure of Stored Data

1. To clear all data in the log, exit from log view by pressing the **MODE** key.
2. Press and hold the **LOG CLR** key for 3 seconds. The "LOG" indicator will disappear from the display, indicating that the log is cleared.

   CAUTION: This will permanently erase all data from the log.

Print Function (Model 115 only)

To print the current reading to a printer or computer while in any measurement mode, press the **PRINT** key.

Chapter VI Troubleshooting

Error Messages

Displayed Error Message	Cause	Action
E-2	Memory failure	Call Orion for service
E-3 through E-6	Hardware failure	Call Orion for service
E-7	Keypad failure -	Call Orion for service
E-20	Reading out of range	Adjust cell constant Verify cell constant appropriate for sample conductivity
E-22	Cell Constant out of range	Adjust cell constant Clean conductivity cell Replatinize conductivity cell
E-26	Data logger full	Clear data from memory
E-29	Printer error	Verify printer is attached Verify printer is on Check printer operation (on line)
E-40	Memory checksum error	Call Orion for servic

Chapter VII
Warranty

Orion's warranty covers failures due to manufacturer's workmanship or material defects from the date of purchase by the user. User should return the warranty card to Orion and retain proof of purchase. Warranty is void if product has been abused, misused, or repairs attempted by unauthorized persons.

Warranties herein are for product sold/installed by Orion or its authorized dealers.

Any product sold by a U.S. or Canadian distributor must be returned to Orion by the dealer for any warranty work. A Return Authorization Number must be obtained from Orion Laboratory Technical Service before returning any product for in-warranty repair or replacement.

In the event of failure within the warranty period, Orion will at Orion's option, repair or replace product not conforming to this warranty. There may be additional charges, including freight, for warranty service performed in some countries. For service, call Orion (or its authorized dealer outside the United States and Canada). Orion reserves the right to ask for proof of purchase, such as the original invoice or packing slip.

Laboratory pH Meters, pH/ISE Meters, PerpHecT® pH/ISE Meters, Sage™ Pumps, CahnÆ Balances, 950 ROSS® Fast QC™ Titrator, 960 Titrator PLUS™, Karl Fischer Titrators, pHuture® Conversion Box are warranted to be free from defects in material and workmanship for a period of twelve (12) months from the date of purchase by the user or eighteen (18) months from date of shipment from Orion, whichever is earlier, provided use is in accordance with the operating limitations and maintenance procedures in the instruction manual and when not having been subjected to accident, alteration, misuse, or abuse.

The warranty period for 960 Titrator PLUS pumps is three (3) months from date of purchase.

Economy Line Electrodes, Models 91-05, 91-06, 91-15, 91-16, 91-25, 91-26, 91-35, 91-36, 92-06, are warranted to be free from defects in material and workmanship for a period of three (3) months from date of purchase by customer or six (6) months from date of shipment from Orion, whichever is earlier. Warranty also includes failure for any reason (excluding breakage), except abuse, provided the electrode is not used in solutions containing silver, sulfide, perchlorate, or hydrofluoric acid; or in solutions more than one (1) molar in strong acid or base at temperatures above 50° C.

Ion Selective Electrodes, ionplus™ Electrodes, ROSS Electrodes, Sure-Flow® Electrodes, PerpHecT Electrodes, Standard Line pH Electrodes, Tris pH Electrodes, pHuture™ pH probes, Series 100 Conventional Conductivity Cells, temperature probes and compensators (except those models noted) are warranted to be free from defects in material and workmanship for a period of twelve (12) months from the date of purchase by the customer or eighteen (18) months from date of shipment from Orion, whichever is earlier, except for abuse or breakage of electrodes. 93 and 97 ionplus Series sensing modules are warranted to give six (6) months of operation if placed in service before the date indicated on the package, except 93-07 and 97-07 Nitrate modules are warranted to give ninety (90) days of operation if placed in service before the date indicated on the package.

ORION® pHuture® Probe (Cat. No. 615700), Low Maintenance Triode™ (Cat. No. 9107BN), and PerpHecT Low Maintenance Triode (Cat. No. 9207BN), Waterproof Triode (Cat. No. 9107WP), QuiKcheK™ Meters, and Micro Electrodes are warranted to be free from defects in material and workmanship for a period of six (6) months from date of purchase by the customer or twelve (12) months from date of shipment from Orion, whichever is earlier when used in accordance with the operating limitations and maintenance procedure in the instruction manual and when not having been subjected to accident, alteration, misuse or abuse.

Series 100 Conductivity Meters (Models 105, 115, 125, 150), Series 100 DuraProbe™ Conductivity Cells and Series 800 Dissolved Oxygen Meters (Models 810 and 850) and Probes and Multi-Parameter Meter (Model 1260) are warranted to be free from defects in material and workmanship for a period of twenty-four (24) months from the date of purchase by the user or thirty (30) months from the date of shipment from Orion, whichever is earlier, provided use is in accordance with the operating limitations and maintenance procedures in the instruction manual and when not having been subjected to accident, alteration, misuse, or abuse.

Waterproof meters (Models 830, 835, 260, 265, 128, 130, 135, 142 and 842), Conductivity meter (Model 162), pH meter (Model 545), pH/Conductivity meter (Model 550), and Dissolved Oxygen meter (Model 862) are warranted to be free from defects in material and workmanship for a period of thirty-six (36) months from the date of purchase by the user or forty-two (42) months from date of shipment from Orion, whichever is earlier, provided use is in accordance with the operating limitations and maintenance procedures in the instruction manual and when not having been subjected to accident, alteration, misuse or abuse.

ORION Meter, Electrode, Analytical System Accessories, Solutions, Series 800 Dissolved Oxygen Probe Membranes and Cahn Balance Accessories such as cables, printers, and line adapters carry an "out-of-box" warranty. Should they fail to work when first used, contact Orion immediately for replacement. Should ORION Solutions or Buffers be unusable when first "out-of-box" contact Orion immediately for replacement

THE WARRANTIES DESCRIBED ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER STATUTORY, EXPRESS OR IMPLIED INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND ALL WARRANTIES ARISING FROM THE COURSE OF DEALING OR USAGE OF TRADE. THE BUYERíS SOLE AND EXCLUSIVE REMEDY IS FOR REPAIR OR REPLACEMENT OF THE NON-CONFORMING PRODUCT OR PART THEREOF, OR REFUND OF THE PURCHASE PRICE, BUT IN NO EVENT SHALL ORION (ITS CONTRACTORS AND SUPPLIERS OF ANY TIER) BE LIABLE TO THE BUYER OR ANY PERSON FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHETHER THE CLAIMS ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE), OR OTHERWISE WITH RESPECT TO OR ARISING OUT OF THE PRODUCT FURNISHED HEREUNDER. Representation and warranties made by any person, including its authorized dealers, representatives and employees of Orion which alter or are in addition to the terms of this warranty shall not be binding upon Orion unless in writing and signed by one of its officers.

NOTE: For in- or out-of-warranty repair or service, contact Orion Technical Service (or its authorized dealer outside the United States and Canada). Technical Service will issue a Return Authorization (RA) for all warranted services. You must have an Orion RA prior to returning/forwarding any product to Orion.

Chapter VIII
Notice of Compliance

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

"This digital apparatus does not exceed the (Class A) limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications."

"Le présent appareil numérique n' émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques (de la class A) prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada."

Chapter IX
Specifications

The following table contains conductivity values for Orion Conductivity/TDS Standards at a range of temperatures. The conductivity value at the temperature of the standard should be used when using the DirectCal' calibration procedure available on the Model 115. For higher accuracy, data in this table may be interpolated between integral temperature readings. There may be small differences between the values shown here and other values in the literature. These small differences are due to using kilograms of water rather than liters, as well as changes in assigned molecular weights, definitions of the Siemen, the use of slightly different temperature scales, and whether or not the inherent conductivity of water was subtracted out. For further information, see "Review of Electrolytic Conductance Standards", Wu, Koch, Hamer and Kay, J. Soln. Chem. 1987,16, 985-997.

Table of Conductance vs. Temperature. Values shown are in S (microSiemens).

Temperature, °C	Conductivity Standard 011006	Conductivity Standard 011007	Conductivity Standard 011008
0	7135	773	54
1	7344	796	56
2	7555	820	58
3	7768	843	59
4	7983	867	61
5	8200	891	63
6	8418	915	64
7	8638	940	66
8	8860	964	68

Temperature, °C	Conductivity Standard 011006	Conductivity Standard 011007	Conductivity Standard 011008
9	9084	989	70
10	9309	1014	72
11	9535	1039	73
12	9763	1065	75
13	9993	1090	77
14	10224	1116	79
15	10457	1142	81
16	10690	1168	83
17	10926	1194	85
18	11162	1220	87
19	11400	1247	88
20	11639	1273	90
21	11879	1300	92
22	12121	1327	94
23	12364	1354	96
24	12607	1381	98
25	12852	1409	100
26	13098	1436	102
27	13345	1464	104
28	13593	1491	106
29	13842	1519	108

Temperature, °C	Conductivity Standard 011006	Conductivity Standard 011007	Conductivity Standard 011008
30	14091	1547	110
31	14342	1575	112
32	14593	1603	114
33	14845	1631	117
34	15098	1660	119
35	15352	1688	121
36	15607	1717	123
37	15862	1745	125
38	16117	1774	127
39	16374	1803	129
40	16631	1832	131
41	16888	1861	134
42	17146	1890	136
43	17404	1919	138
44	17663	1948	140
45	17922	1977	142
46	18181	2007	145
47	18441	2036	147
48	18701	2065	149
49	18962	2095	151
50	19222	2124	154

Meter Performance Specifications

Specification	Model 105	Model 115
Display	LCD, 4 1/2 Digit	LCD, 4 1/2 Digit
Conductivity		
Measurement Range	0 to 199,900 µS	0 to 199,900 µS
Range 1	0 to 199.9 µS	0 to 199.9 µS
Range 2	200 to 1999 µS	200 to 1999 µS
Range 3	2.00 to 19.99 mS	2.00 to 19.99 mS
Range 4	20.0 to 199.9 mS	20.0 to 199.9 mS
Resolution in Range 1	0.1 µS	0.1 µS
Accuracy	±0.5% of full scale reading within each range, max	±0.5% of full scale reading within each range, max
Cell Constant Range	0.07 to 14.99	0.07 to 14.99
Displayed Resolution	.0700, 0.070, 1.000, 10.00	.0700, 0.070, 1.000, 10.00
Salinity		
Measurement Range	0.0 to 80.0 ppt (‰)	0.0 to 80.0 ppt (‰)
Accuracy	±0.5% max	±0.5% max
Total Dissolved Solids		
Measurement Range	N/A	0 to 19900 mg/L
Accuracy	N/A	±0.5%
Resolution	N/A	3 significant digits, 1 mg/L
Calibration	N/A	In Conductivity Mode

Specification	Model 105	Model 115
Temperature Measurement		
Range	-5.0 to 105.0 °C	-5.0 to 105.0 °C
Relative Accuracy	±1.0 °C	±1.0 °C
Resolution	0.1 °C	0.1 °C
Temperature Compensation	Auto and Manual	Auto and Manual
Temperature Coefficient	0.0 or 2.1%/°C Fixed	2.1%/°C Fixed 0.0 to 2.5%/°C Variable
Reference Temperature	20 or 25 °C, Selectable	20 or 25 °C, Selectable
Ready Indicator	Yes	Yes
Low Battery Indicator	Yes	Yes
Inputs		
Conductivity Probe	8 pin DIN	8 pin DIN
Power	Pin connector for power adapter	Pin connector for power adapter
ATC Probe	No separate connector, use adapter 011210	No separate connector, use adapter 011210

Specification	Model 105	Model 115
Outputs		
RS232 (one way)	N/A	Yes
Connector	N/A	Standard 9 Pin "DB9"
Baud Rate	N/A	1200
Parity	N/A	None
Handshake	N/A	Yes
Data Bits	N/A	8
Stop Bit	N/A	1
Print on demand	N/A	Yes
Power	9 V Alkaline Battery, 110 V, 220 V, or 240 V Line Adapter	9 V Alkaline Battery, 110 V, 220 V, or 240 V Line Adapter
Auto Shutoff	20 minutes	20 minutes
Operation time on alkaline batteries, typical	45 hours	45 hours
Operation time on lithium batteries, typical	80 hours	80 hours
Data Logging	N/A	25 data set storage
Display output	N/A	Yes
RS232 output	N/A	Yes

Chapter X
Ordering information

Catalog No.	Description
010500	Model 105 and Conductivity Cell, Model 010510
010502	Model 105 only
011500	Model 115 and Conductivity Cell, Model 010510
011502	Model 115 only
010510	Conductivity Cell with Integral Temperature Sensor, Epoxy, K = 1.0
011010	Conductivity Cell, Glass, K = 1.0
011020	Conductivity Cell, Glass, K = 0.1
011050	Conductivity Cell, Epoxy, K = 1.0
927005	ATC Probe, Epoxy Body, 3.5 mm connector
927006	ATC Probe, Glass Body, 3.5 mm connector
011006	Conductivity/TDS Standard, 12.9 mS/cm, 7230 ppm as NaCl, 5 x 60 mL Bottles
011007	Conductivity/TDS Standard, 1413 µS/cm, 692 ppm as NaCl, 5 x 60 mL Bottles
011008	Conductivity/TDS Standard, 100 µS/cm, 47 ppm as NaCl, 5 x 60 mL Bottles
0105PK	Platinizing Kit. Includes Fixture, Vessel, and Solution (60 mL)
010110	Platinizing Vessel and Solution (60 mL)
011210	Adapter, Dual banana plug connector Cells and ATC probes to 8 pin DIN connector

Catalog No.	Description
011211	Adapter, 7 pin DIN connector Cells to 8 pin DIN connector
011220	Calibration Kit, 4 precision conductance/resistance calibrators in container
080150	Field Carrying Case. For meter, probe, and accessories
020125	Line Adapter, 110V
020130	Line Adapter, 220V
020135	Line Adapter, 240 V
0ACBL0	Cable, RS232, for use with IBM PC compatibles
0900A0	Printer, Model 900A, attachable, 110V (No cable required, Model 115 only)
0900A1	Printer, Model 900A, attachable, 220V (No cable required, Model 115 only)
0900A2	Printer, Model 900A, no line adapter
0900A4	Printer Paper for Model 900A
0900A6	Printer Battery for Model 900A, rechargeable

Part No. 223500-002 Rev. A 10/95

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