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ATI ORION
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ORION
MATTSON
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RUSSELL
CAHN

MODELS 128, 130 and 135 CONDUCTIVITY METERS

INSTRUCTION MANUAL

ATI ORION
ANALYTICAL TECHNOLOGY, INC.

Table of Contents

Chapter I
Introduction

The ATI Orion Models 128, 130 and 135 Waterproof conductivity meters are the highest quality and performance full featured portable meters available today, and can be used for a wide variety of applications. They are designed for convenient use in virtually any portable application, and are available with a wide range of electrodes and accessories.
The meters are fully waterproof and dust tight meeting IP66 and NEMA 6 requirements. All models feature a large multi-function display, automatic temperature compensation, and both 2 and 4-electrode cell technology. All meters are packaged in a field kit which includes carrying case, conductivity probe, electrode holder, conductivity standards, meter holder, and line adapter where applicable.

Models 130 and 135 feature a choice of two temperature compensation algorithms as well as 50 point data-logging capability. The Model 135 includes RS232 interface, for easy compatibility with your computer or optional printer, and rechargeable batteries.

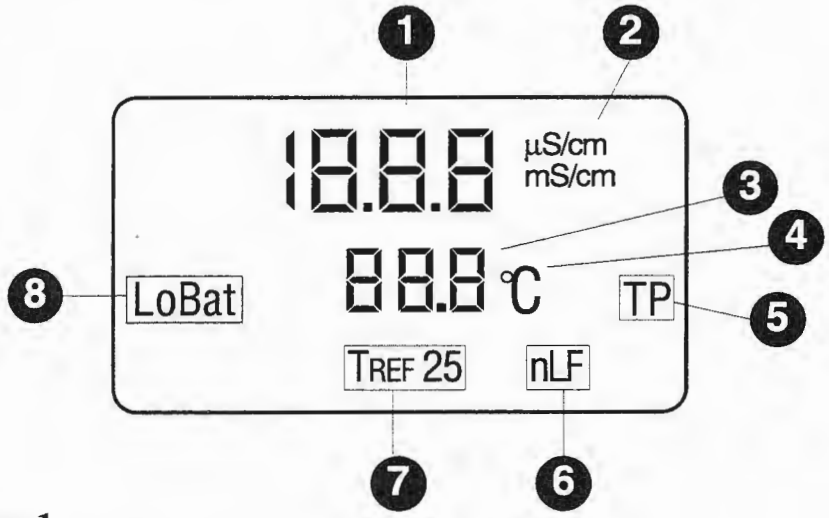

Figure 1

Display Modes – Model 128

1 Alphanumeric Display, Conductivity and User's Instructions

2 Display Units

3 Temperature Display

4 °C Indicator

5 Temperature Indicator

6 Non-Linear Temperature Function Indicator

7 Reference Temperature Indicator

8 Low Battery Indicator

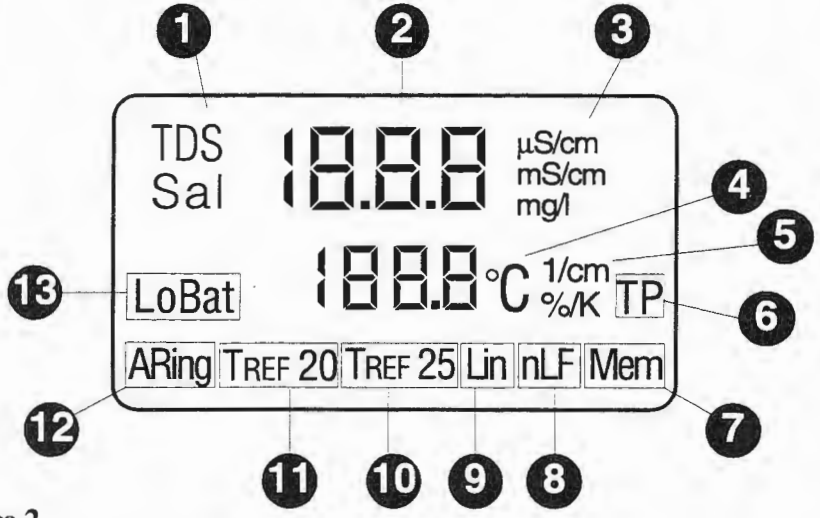

Figure 2

Display Models – Models 130 & 135

1 Display TDS, Salinity

2 Alphanumerical display, conductivity, salinity, TDS readings, and user's instructions

3 Dimension µS/cm, mS/cm, mg/l

4 Numerical Display for Cell Constant C, Linear Temperature Coefficient TC, Temperature, TDS-factor and Numerator.

5 Dimension 1/cm, %/K, °C

6 Temperature Indicator

7 Temporary Memory Function, Permanent Storage Indicator

8 Non-Linear Temperature Compensation Indicator

9 Linear Temperature Compensation Indicator

10 Reference Temperature 25 °C Indicator

11 Reference Temperature 20 °C Indicator

12 Automatic Measuring Range Selection Indicator

13 Low Battery Indicator

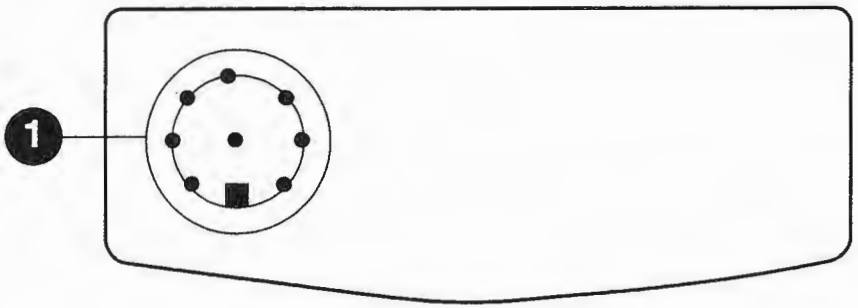

Figure 5

Rear Panel – Models 128 & 130

1 Conductivity Cell

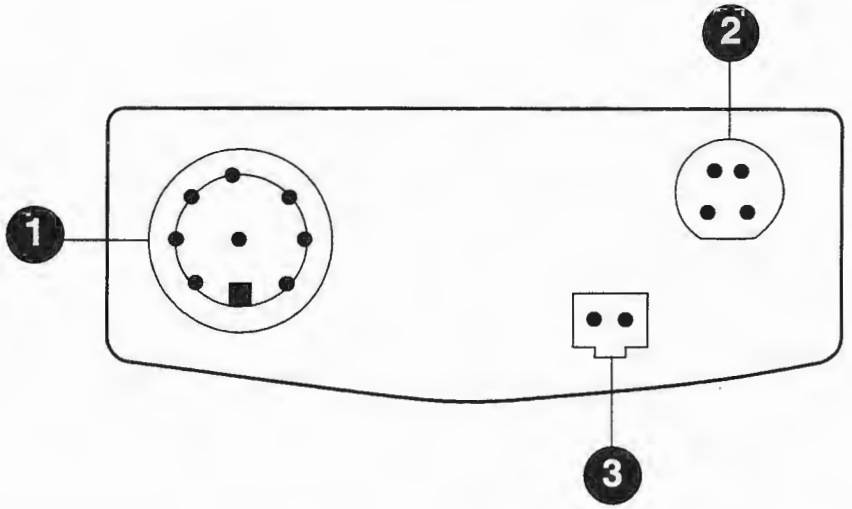

Figure 6

Rear Panel – Model 135

1 Conductivity Cell

2 RS232 Interface

3 Battery Charger (rechargeable batteries on 135 only)

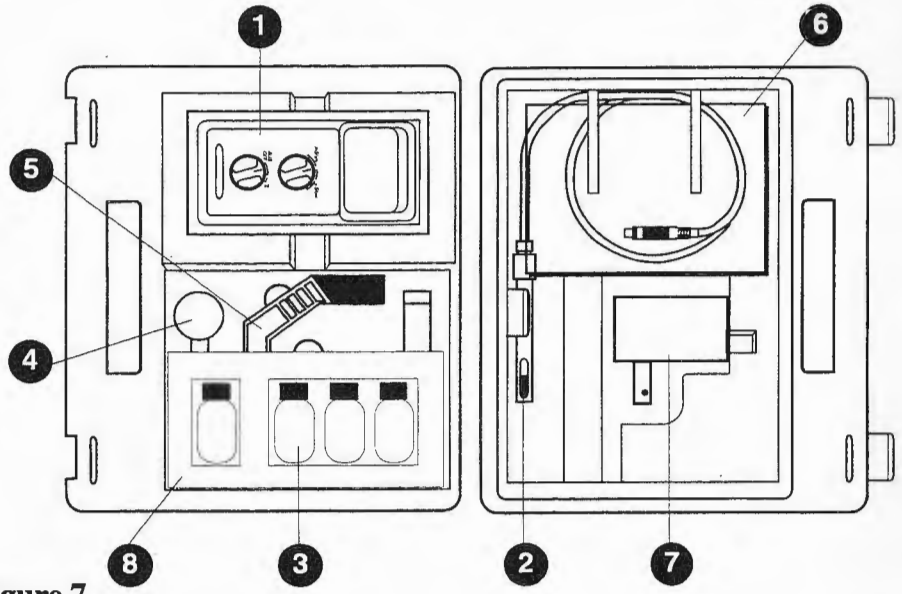

Figure 7

Meter Kit

Item	Description	Detail
1	Meter	Model 128, 130, 135
2	Conductivity Probe	For Units Shipped with Probe
3	Conductivity Standards	
4	Beaker	
5	Field Measurement Stand	
6	Manual	
7	Line Adapter	(135 only)
8	Tray	For Standards

Chapter II
System Setup

Instrument Setup

Power Source

Models 128 and *130* operate on four non-rechargeable AA alkaline batteries (1.5 V).

- The estimated battery life is between 1000 to 3000 hours (128), or 500 to 2500 hours (130), for continuous operation

The *Model 135* operates on four standard AA rechargeable Nickel-Cadmium batteries (1.2 V, 700 mAh).

- Life for a full charge is approximately 150 to 800 hours of normal use.
- Charging time for the 135 is approximately 16 hours.

– Both *Models 130* and *135* will switch off one hour after the last key operation, except when the serial port of the Model 135 is connected to an external device and turned on.

– The *Model 128* will switch off automatically three (3) hours after the last actuation of selector switch.

– The **LoBat**, low battery indicator indicates that approximately 20 hours of operation time are remaining.

Battery Installation

(Note - Meters are shipped with batteries installed.)

1. Switch the meter off before opening.
2. Open the meter by removing 4 screws located on the bottom of the case. Remove the rear case cover. Remove and discard old batteries.
3. Insert battery pushing gently until it locks in place. Make sure polarity is correct as shown in the battery compartment.

   Caution:

   - *Use only standard non-rechargeable alkaline AA batteries in the Model 128 & 130*
   - *Use only standard rechargeable nickel-cadmium AA batteries (1.2 V, 700 mAh) in the Model 135.*
   - *Type of Line Adapter: 110 VAC: Cat No. 080020*
     (For Model 135 only) 220 VAC: Cat No. 080021
   - *Always replace batteries in sets of four.*
   - *Check the condition of batteries at least once per year.*
4. Replace the rear cover. Replace and tighten the four screws snugly. Be sure the rubber seals around each screw are intact, or leakage into the meter may result. Do not over tighten!

Power Up

Model 128

1. Switch the ***ON/OFF*** selector to the ***ON*** position to turn meter on. All display annunciators will briefly be displayed.

Model 130 & 135

1. Press the ***ON/OFF*** key to turn meter on. All display annunciators will briefly be displayed.
2. Current operating parameters serial port (on,off), cell constant, and temperature coefficient will be displayed sequentially.
3. If **LoBat** indicator remains on, replace or recharge battery.
4. The meter will then return to the last selected operational mode.

Setting the cell constant C

Models 130 & 135

1. Immerse the cell into the appropriate standard solution.
2. Press the ***C*** key to select the free adjustable cell constant. (Default constant is set at 0.475 cm^{-1})
3. Press the ***C*** key again to select the fixed cell constant at 0.100 cm^{-1}.
4. Press the ***C*** key a third time to switch back to free adjustable cell constant.
5. Use the ⩝ ⩛ keys to adjust the cell constant.
6. Press the χ key to return to measurement mode.
7. Verify adjustment in the standard solution.
8. Repeat steps 2 though 6 if further adjustment is necessary.

Setting the temperature function TC

Models 130 & 135

1. Immerse electrode into the sample solution.
2. Press the ***TC*** key, *nLF* will be displayed for natural water.
3. Press ***TC*** key again for no temperature compensation, 0.00 will be displayed.
4. Press ***TC*** key a third time for adjustable temperature compensation mode, 2.00 will be displayed.
5. Use ⩝ ⩛ keys to adjust temperature compensation value to desired value.
6. Press the χ key to return to measurement mode.

Conductivity Measurement

Model 128

1. Rinse the cell in deionized water and blot dry.
2. Immerse the cell into the sample solution.
3. Use the selector switch to select measurement range corresponding to the required resolution.

   (*If *OFL* is displayed, select the next higher measurement range on the selector switch.)
4. Record measurement value on display.

Model 130 & 135

1. Rinse the cell in deionized water and blot dry.
2. Immerse the cell into the sample solution.
3. Press the χ key until conductivity mode is displayed. Conductivity measurement is done continuously.
4. Record measurement value displayed.
5. If *OFL* is displayed, see **Troubleshooting** section.

NOTE: Cell constant, temperature coefficient, and reference temperature must be properly set to obtain an accurate reading.

Salinity Measurement

Models 130 & 135

1. Immerse electrode into the sample solution.
2. Press the χ key until the *Sal* annunciator is displayed.
3. Record value displayed.

Measurement of Total Dissolved Solids (TDS)

Models 130 & 135

1. Immerse electrode into the sample solution.
2. Press the χ key until the TDS annunciator is lit.
3. Press the ⩓ ⩔ to set desired TDS factor.
4. Record value displayed.

NOTE: Calibration should be done before measurement of salinity or TDS. See page 12 for procedure.

Selecting the Reference Temperature

Models 130 & 135

1. Switch off the instrument.
2. To change the temperature reference, while meter is still off hold down the ***TC*** key, while pressing the **ON/OFF** key, then release both keys, the *Tref 20* annunciator will at this point be lit.
3. To switch the reference temperature back again, turn instrument off, and repeat step 2. After completing step 2 the *Tref 25* annunciator will at this point be lit again.

Switching between Measuring Ranges

(Automatic to Manual)

Models 130 & 135

1. Switch off the instrument.
2. To turn on AutoRange, press and hold the ⩓ key while the meter is still off, press the ***ON/OFF*** key, holding the ⩔ key down, then release both keys, the *ARng* annunciator will be lit at this point.
3. To switch to manual, press and hold the ⩔ key while the meter is still off, press the ***ON/OFF*** key, holding the ⩔ key down, then release both keys, the *ARng* annunciator will disappear.
4. To manually change ranges in conductivity, or to change to salinity or TDS mode, continue to press χ.

Data Logging

Models 130 & 135

Storage

1. Press the χ key. Storage is only possible in Conductivity, Salinity and TDS modes.
2. To log data from concentration or percent saturation mode, press the ***STO*** key. The current reading will be written to the log, and a log identification point (01 to 50) will be displayed (On the temperature display). After display of the logged reading for approximately one second, the display will return to active.
3. After using the 50th storage location, the instrument will display *Ful Sto*.
4. Pressing the ***RUN/ENTER*** key will overwrite an already occupied storage location. (This functions only when all 50 storage registers are full.) Pressing any other keys prevents overwriting of stored data.
5. To continue to overwrite stored data, press the ***STO*** key, then the ***RUN/ENTER*** key for each data point.

Readout of Stored Data

1. Press χ key to get into either LF, Sal or TDS operation mode. Readout is possible in only these three modes.
2. Press the ***RCL*** key. The log identification point will be briefly displayed, then the conductivity value and the temperature, with the Mem annunciator displayed. This logged information will remain on the display until another key press, or until the meter shuts off automatically after one hour.
3. To scroll through the stored data, use the ⩓ or the ⩔ key. Hold down the key in order to more quickly review the data.

Clearing Storage

1. Turn instrument off.
2. Press and hold down the ***STO*** key, while depressing the ***ON/OFF*** key, then release both simultaneously. Clr Sto will be displayed
3. Press the **Run/Enter** key to erase all data.
4. – – – Sto will be displayed, confirming the erasure.
5. Pressing any other key before the **Run/Enter** key prevents erasure of the data.

Chapter III
Use with Printers and Computers

One way communication to printers and computers is available on the on Model 135 only.

Serial Interface

Connect cable to port 2 of the Model 135.
For computer, use cable Cat. No. 080033
For printer, use cable Cat. No. 080034

Data Transmission Settings

Baud Rate	4800
Parity	None
Handshake	RTS/CTS Handshake
Data Bits (PC only)	8
Stop Bits (PC only)	1

Turning Serial Interface ON

1. Press the χ and the ***ON/OFF*** keys simultaneously, keeping the key depressed while switching on the instrument.

Turning Serial Interface OFF

1. Press the χ key and the ***ON/OFF*** keys simultaneously, keeping the key depressed while switching on the instrument.
2. Instrument transmits a value pair (Example 903 S/cm and 21.2 °C) by pressing ***RUN/ENTER*** key via RS232 interface.

Continuous Transfer of Measured Values

1. Turn Interface on, as described above.
2. Connect your serial device (Printer or Computer) to the meter.
3. Data from the display will be transmitted continuously through the serial port.

Readout of Data in Memory

1. Press ***RCL*** key to set meter to memory readout.
2. Press ***Run/Enter.*** All data in memory will be transmitted from oldest to newest value.

Chapter IV
Troubleshooting

Power Up and Self Diagnostics Checkout

Self Diagnostics Test and Internal Slope Adjustment

Model 130 & 135

1. Hold down the ***RUN/ENTER*** key while pressing the ***ON/OFF*** key to turn the meter on.
2. The meter will perform internal self-diagnostic tests and an internal slope adjustment.

Error Messages

Displayed Error Message and Symptom	Cause	Action
OFL (Main Display) Indication range exceeded	The test value is out of measuring range	Select next-higher measuring range
LoBat	Batteries nearly discharged	Change or charge batteries
Eo *(Displayed on Model 130 & 135)*	Timeout of the serial interface	Check connected printer or computer.
OFL (Temperature Display)	No probe connected or defective probe	Check probe.

Chapter V
Accessories

Protective Plastic Probe Sleeve Cat. No. 080044

The Protective Probe Sleeve Cat. No. 080044 is a rugged, 3 piece sleeve which fits on any 0830XX series probe. A two piece sleeve assembly attaches to the cap of the probe, and the protective sleeve attaches by a threaded connection to this sleeve assembly.

Protective Stainless Steel Probe Sleeve Cat. No. 013044

The Protective Probe Sleeve Cat. No. 013044 is a rugged, 3 piece sleeve which fits on any 0830XX series probe. A two piece sleeve assembly attaches to the cap of the probe, and the protective sleeve attaches by a threaded connection to this sleeve assembly.

Rubber Meter Cases and Carrying Straps

Rubber Meter Case with Handles Cat. No. 080053

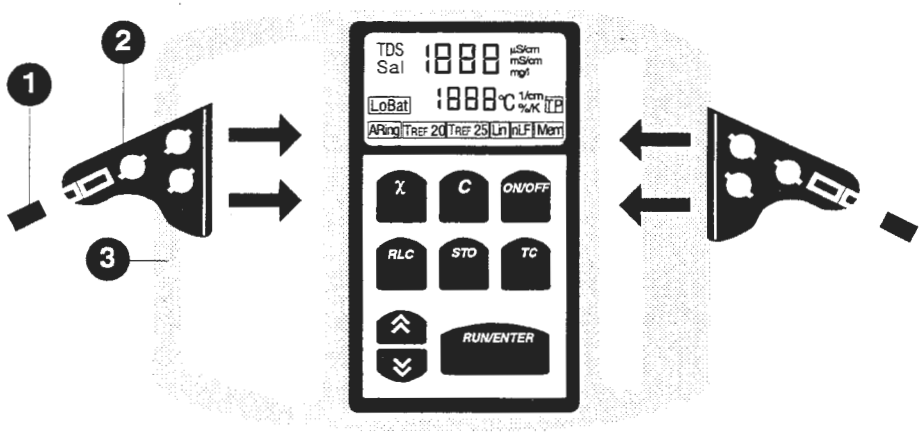

Figure 8

Assembly Instructions

1. Insert meter into case.
2. Fasten end straps 1 to holding clips 2 (pass through loops and draw back).
3. Place holding clips 2 in slots on the back of the case 3 and slide down.

Rubber Meter Case Cat. No. 080051

Carrying Strap and Probe Quiver Cat. No. 080052

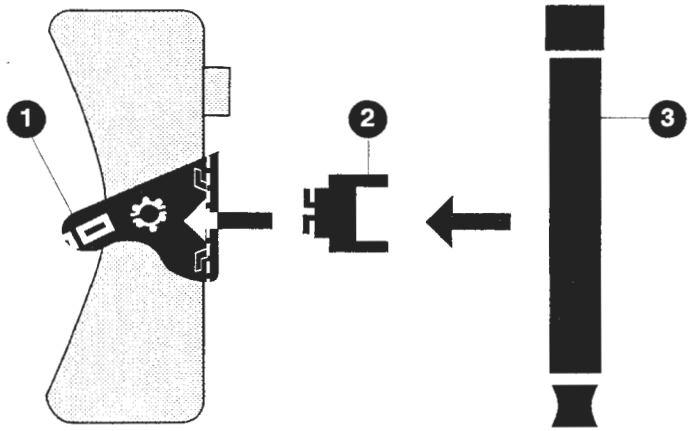

Figure 9

Assembly Instructions

1. Insert meter into case.
2. Fasten strap to case same as 080053, above.
3. Attach Probe Quiver Clip 2 into the notch on the carrying strap clip 1.
4. Press Probe Quiver 3 into Probe Quiver Clip 2.
5. Probe Quiver 3 is adjustable within a range of 90°.

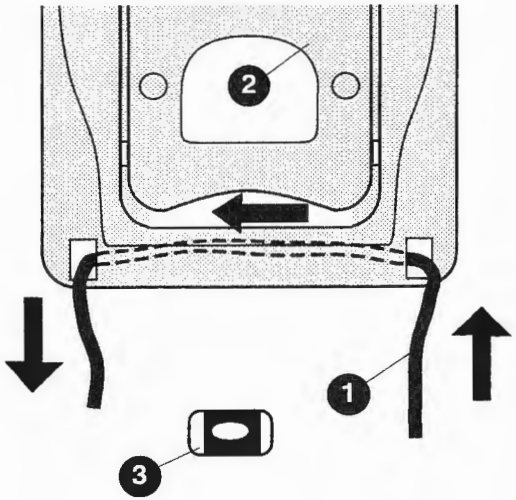

Figure 10

Assembly Instructions

1. Insert strap 1 to case as shown through slots at the bottom of the case 2.
2. Connect strap ends with strap clip 3.

Cables and Cable Connections

Connect to port 2 of the Model 135.

For computer, use: Cat. No. 080033

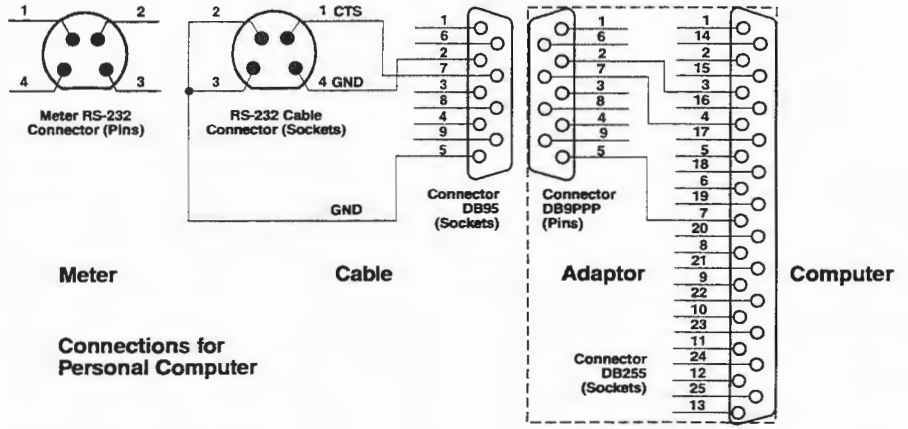

Figure 11

For printer, use: Cat. No. 080034

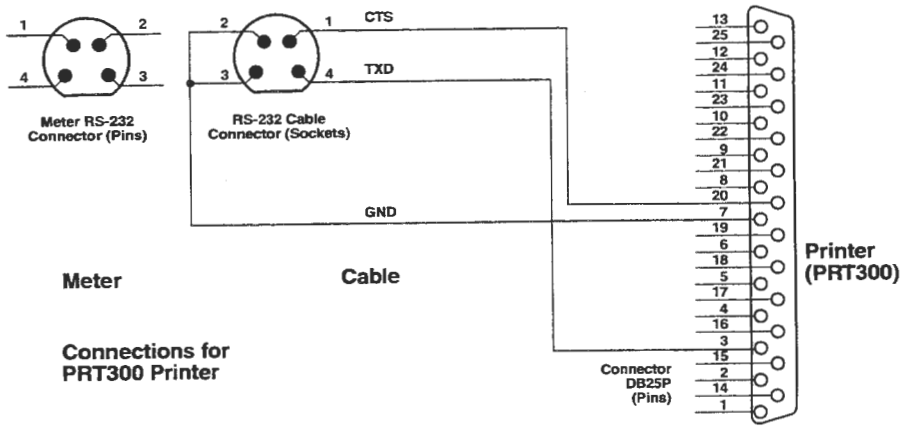

Figure 12

Use with Orion Printer Models PRT300 and PRT301

Dip switch settings must be set as follows. For further information see the printer instruction Manual

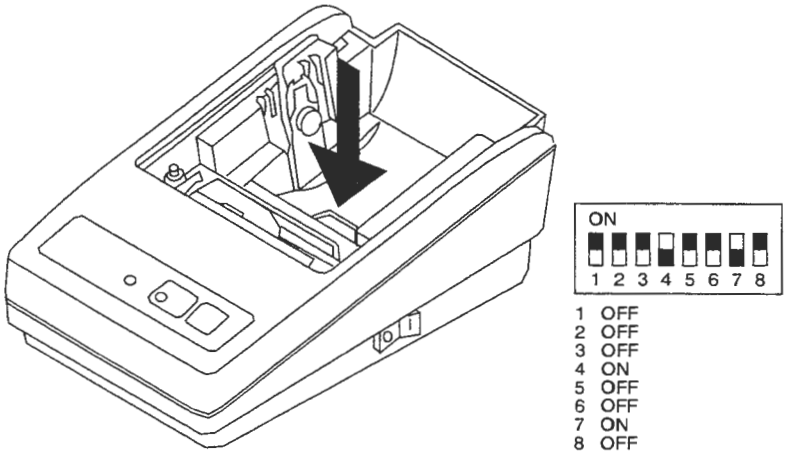

Figure 13

Chapter VI
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, Cahn® 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.

In the event of failure within the warranty period, ATI Orion • Cahn will at ATI Orion • Cahn'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 ATI Orion • Cahn (or its authorized dealer outside North America). ATI Orion • Cahn reserves the right to ask for proof of purchase, such as the original invoice or packing slip.

Economy Line Electrodes

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 BUYER'S 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 VII
Notice of Compliance

WARNING: This meter may radiate radio frequency energy and if not installed and used properly, that is in strict accordance with the manufacturer's instructions, 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 in a commercial environment. Operation of the meter in a residential area may 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.

Note: *To meet or exceed FCC regulations the ATI Orion-supplied line converters must be used.*

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 VIII
Specifications

Specifications	Model 128	
Measurement Modes	Range:	Resolution:
Conductivity	0.0 to 199.9 μS cm^{-1}	0.1 μS cm^{-1}
	0 to 1999 μS cm^{-1}	1 μS cm^{-1}
	0.00 to 19.99 mS cm^{-1}	0.01 mS cm^{-1}
	0.0 to 199.9 mS cm^{-1}	0.1 mS cm^{-1}
Cell Constant	0.475 cm^{-1} fixed	
Reference Temperature	25 °C fixed	
Temperature Compensation	Compensation of natural water (nLF)	
Accuracy (at operating temperature -10 °C to 55 °C)	± 0.5% of measurement value ± 1 digit for sample temperature 0 °C to 35 °C.	
Temperature		
Range	-5 °C to +99.9 °C	
Resolution	0.1 °C	
Accuracy (instrument) (at operating temperature -10 °C to +55 °C)	± 0.1 °C ± 1 digit	
Display	LCD matrix multi-message display height: 35 x 60 mm	
Operating elements	2 selector switches	
Inputs	8-pin DIN plug, IP67	

Specifications — Model 128

Environmental Conditions

Ambient temperature	operation:	-10 °C to +55 °C
	storage:	-25 °C to +65 °C
Relative humidity	yearly mean:	< 80%
	30 days/year:	< 100%
	other days:	> 90%

EMC, Safety, and Protection

FCC part 15 Subpart B, Limit class A
EN 50081-1
EN 50082-2
CE
IEC 1010 / class 3
IEC 529
IP 66

Power Supply

4 x 1.5 V batteries, Type AA

Operation Time

1000 - 3000 operating hours with alkali/manganese batteries
Energy reduction by automatic switch-off after approximately 3 hours

Housing

Dimensions / Weight: 172 x 80 x 37 mm / approx. 0.3 kg:

Specifications — Model 130 and 135

Measurement Modes

Conductivity

Range:	Resolution:
0.0 to 199.9 μS cm^{-1}	0.1 μS cm^{-1}
0 to 1999 μS cm^{-1}	1 μS cm^{-1}
0.00 to 19.99 mS cm^{-1}	0.01 mS cm^{-1}
0.0 to 199.9 mS cm^{-1}	0.1 mS cm^{-1}
0 to 500 mS cm^{-1}	1 mS cm^{-1}

Additional measurement range with cell constant 0.1 cm^{-1}

Range:	Resolution:
0.00 to 19.99 μS cm^{-1}	0.01 μS cm^{-1}

Accuracy: ± 0.5% of measurement value ± 1 digit at operating temperature -10 °C to +55 °C

Salinity

Range: 0.0 to 70.0
Resolution: 0.1
Accuracy: after adjustment (via cell constant) to 35.0:

1. ± 0.1 in the range 0.0 to 42.0 at test sample temperature 5 °C to 25 °C
2. ± 0.2 in the range 0.0 to 42.0 at test sample temperature 0 °C to 5 °C
3. better than 3% of measurement value in the range 42.0 to 70.0

Specifications	Model 130 and 135
TDS	
Range:	0 to 1999 mg/l
Resolution:	1 mg/l
Accuracy:	± 2% ± 1 digit at test sample temperature 15 °C to 35 °C. Factor adjustable between 0.40 and 1.00.
Temperature	
Range:	-5 to 99.9 °C
Resolution:	0.1 °C
Accuracy:	0.1 °C ± 1 digit at operating temperature -10 °C to +55 °C
Cell Constant	Setting ranges: 0.1 and 0.475 cm^{-1} fixed 0.45 to 1.30 cm^{-1} adjustable
Reference temperature	20 °C or 25 °C selectable
Temperature compensation	automatically, 3 modes, selectable: 1. Linear compensation (Lin), coefficient adjustable between 0.5%/°C and 3.00%/°C in the range of -5 to 90 °C. 2. Compensation of natural water (nLF). Ultra pure water function for neutral water; coefficient fix. 3. No Compensation

Specifications	Model 130 and 135
Accuracy:	1. Linear compensation (Lin): 0.5% of measurement value ± 1 digit for • TC: = 0.5 to 2.5%/°C and test sample temperature +5 °C to 75 °C and • TC: = 2.5 to 3.00%/°C and test sample temperature 10 °C to 75 °C. 2. Non-linear compensation (nLF): 0.5% of measurement value ± 1 digit for test sample temperature 0 to 35 °C. 3. No compensation 0.5% of measurement value ± 1 digit for test sample temperature -5 °C to +99.9 °C
Data storage	Ring memory Number of values: 50 pairs Output: 1. Display 2. RS232-interface Data Protection: no time limit
Display	LCD matrix display height: 35 x 60 mm
Keyboard	9 key elastomeric, waterproof
Inputs	
Conductivity Cell	8-pin DIN plug (IP67)
Charging socket	2-pin socket with pin contacts for battery charger (IP67) Voltage: 12 V Current: 70 mA

Specifications	Model 130 and 135	
Outputs		
Digital interface RS232 (Model 135 only)	4-pin socket with pin contacts for RS232 Computer Interface Cable Cat. No. 080033 or Printer Cable Cat. No. 080034	
	serial interface, data output only	
	Baud Rate:	4800
	Data bits:	8
	Stop bit:	1
	Parity:	none
	Handshake:	RTS/CTS
	Max. cable length:	15 m
	Output format:	ASCII strings
Environmental Conditions		
Ambient temperature	operation:	-10 °C to +55 °C
	storage:	-25 °C to +65 °C
Relative humidity	yearly mean:	< 80%
	30 days/year:	< 100%
	other days:	< 90%
EMC, Safety, and Protection	FCC part 15 Subpart B, Limit class A EN 50081-1 EN 50082-2 CE IEC 1010 / class 3 IEC 529 IP 66	

Specifications	Model 130 and 135
Power supply	4 x 1.5 V Alkaline non rechargeable batteries, Type AA (Model 130) 4 x 1.2 V NiCd, Type AA rechargeable batteries (Model 135)
Type of Line Adapter	110 VAC Cat. No. 080020 (ref: Friwo FW 1199/ 11.7880, Part No. 1794043) 220 VAC Cat. No. 080021 (ref: Friwo FW 1199/ 11.7864, Part No. 1762613)
Operation time	500 - 2500 operating hour with alkali/ manganese batteries (Models 128 and 130) or 150 - 800 operating hours with NiCd rechargeable batteries (Model 135) Energy reduction by automatic switch-off after approximately 1 hour.
Data storage when changing batteries	Settings and measurement values remain stored. Operation mode at startup: conductivity measurement.
Housing	
Dimensions / Weight	172 x 80 x 37 mm / approximately 0.3 kg

NOTE: *The above specifications apply to the meter only. The actual system performance specifications depend on cell and sample condititions as well.*

Chapter IX
Ordering Information

Meters

012800	Meter Kit, Model 128, Includes Meter, 013010 Cell, Field Case, Beaker, 010030 Electrode Holder, 011006 Conductivity/TDS Standard (60 mL), 011007 Conductivity/ TDS Standard (60 mL), Instruction Manual.
012802	Meter Kit without Cell, Model 128, Includes Meter, Field Case, Beaker, 010030 Electrode Holder, 011006 Conductivity/TDS Standard (60 mL), 011007 Conductivity/ TDS Standard (60 mL), Instruction Manual. Order Cell separately.
013000	Meter Kit, Model 130, Includes Meter, 013010 Cell, Field Case, Beaker, 010030 Electrode Holder, 011006 Conductivity/TDS Standard (60 mL), 011007 Conductivity/ TDS Standard (60 mL), Instruction Manual.
013002	Meter Kit without Cell, Model 130, Includes Meter, Field Case, Beaker, 010030 Electrode Holder, 011006 Conductivity/TDS Standard (60 mL), 011007 Conductivity/ TDS Standard (60 mL), Instruction Manual Order Cell separately.
013500	Meter Kit, Model 135,110 V, Includes Meter, 013010 Cell, Field Case, Line Adapter, Beaker, 010030 Electrode Holder, 011006 Conductivity/TDS Standard (60 mL), 011007 Conductivity/TDS Standard (60 mL), Instruction Manual.

Meters

013501	Meter Kit, Model 135, 220 V, Includes Meter, 013010 Cell, Field Case, Line Adapter, Beaker, 010030 Electrode Holder, 011006 Conductivity/TDS Standard (60 mL), 01100 7 Conductivity/TDS Standard (60 mL), Instruction Manual.
013502	Meter Kit, Model 135,without Cell or Line Adapter, Includes Meter, 013010 Cell, Field Case, Beaker, 010030 Electrode Holder, 011006 Conductivity/TDS Standard (60 mL), 011007 Conductivity/TDS Standard (60 mL), Instruction Manual. Order Cell and Line Adapter separately.

Cells

013010	Conductivity Cell, 3m Cable, K = 0.475 cm^{-1}
013030	Conductivity Cell, 10m Cable, K= 0.475 cm^{-1}
013060	Conductivity Cell, 20m Cable, K = 0.475 cm^{-1}
013016	Conductivity Cell, Ultra pure Water, Stainless Steel, K = 0.1 cm^{-1}. Includes Flow-Through Cell 013017.
013020	Conductivity Cell, Glass/Platinum, 4 electrode, K = 1.0 cm^{-1}
013018	Conductivity Cell, Epoxy/Graphite, 4 electrode, Flow-Through, K= 0.8 cm^{-1}

Other Accessories

011006	Conductivity/TDS Standard, 12.9 µS/cm (0.1M KCl), 5 x 60 mL
011007	Conductivity/TDS Standard, 1413 µS/cm (0.01M KCl), 5 x 60 mL
011008	Conductivity/TDS Standard, 100 µS/cm, 5 x 60 mL
010030	Electrode Holder, for use with Field Case.
013025	Cable, 8 pin DIN to 7 pin DIN for use with 013018 and 014018 Cells.
013017	Flow-Thru Cell, Glass, for use with 013016 and 014016 Cells
080050	Field Case
080051	Armored Rubber Case
080052	Armored Rubber Case, Handles
080053	Meter Holder, Quiver, Strap
013044	Protective Sleeve, Stainless Steel, for use with 013010, 013030, 013060
080044	Protective Probe Sleeve, Plastic, for use with 013010, 013030, 013060
080020	Line Adapter, 110V, for use with Models 135, 835, 265.
080021	Line Adapter, 220V, for use with Models 135, 835, 265.
080033	Cable, computer interface RS232, 9/25 Adapter, for use with Models 135, 835, 265.
080034	Cable, Printer, for use with Models 135, 835, 265, printers PRT300 and PTR301.

Other Accessories

PRT300	Printer, Ink-Based, 110V. Requires cable listed above.
PRT301	Printer, Ink-Based, 220V. Requires cable listed above.