



INSTRUCTION MANUAL

Ωmega-Tip-Z

Measures Fluid-Filled Micropipette Electrode
Resistance And Metal Microelectrode Tip Impedance

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ABOUT THIS MANUAL

The following symbols are used in this guide:



This symbol indicates a CAUTION. Cautions warn against actions that can cause damage to equipment. Please read these carefully.



This symbol indicates a WARNING. Warnings alert you to actions that can cause personal injury or pose a physical threat. Please read these carefully.

NOTES and TIPS contain helpful information.

INTRODUCTION

Ωmega-Tip-Z's measuring circuit is largely unaffected by electrode offset or tip junction potentials. Resistances up to 2000 megohms may be measured for micropipettes and metal tip impedance up to 20 megohms. Both are displayed on a digital LCD.

The gold-plated miniature preamplifier probe allows the user to conveniently monitor microelectrode resistance while beveling pulled glass microcapillary electrodes. **Ωmega-Tip-Z** is an excellent adjunct to any microelectrode beveler. Battery operated, **Ωmega-Tip-Z's** micro-powered circuitry allows low noise recording for hundreds of hours.

Ωmega-Tip-Z can also measure DC electrode tip potential with micropipette electrodes up to 2000 mV.

For measuring resistance on a prepulled glass micropipette you will require an **EHBF** microelectrode holder. For metal microelectrode impedance testing you will require part number **5468** electrode adapter. For both applications, a reference electrode is required we recommend part number **RC1T**. All three accessories are sold separately.

Parts List

After unpacking, verify that there is no visible damage to the sensor. Verify that all items are included:

- (1) **Ωmega-Tip-Z** meter
- (1) **711P** Miniature Preamplifier Probe
- (1) Instruction Manual



Unpacking

Upon receipt of this instrument, make a thorough inspection of the contents and check for possible damage. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed damage should be reported at once to the carrier and an inspection requested. Please read the section entitled "Claims and Returns" on page 7 of this manual. Please contact WPI Customer Service if any parts are missing at 941.371.1003 or customerservice@wpiinc.com.

Returns: Do not return any goods to WPI without obtaining prior approval (RMA # required) and instructions from WPI's Returns Department. Goods returned (unauthorized) by collect freight may be refused. If a return shipment is necessary, use the original container, if possible. If the original container is not available, use a suitable substitute that is rigid and of adequate size. Wrap the instrument in paper or plastic surrounded with at least 100mm (four inches) of shock absorbing material. For further details, please read the section entitled "Claims and Returns" on page 7 of this manual.

OPERATION

Quick Check

To check the operation of the instrument quickly, use a 10 or 20 Megohm resistor in lieu of a micropipette. Connect the probe cable to the mating receptacle on the front panel.

Connect the resistor between the tip of the probe and the pin jack terminal labelled Reference. All resistance and voltage measurements should be made between these two terminals. Turn the Power switch **On**, set Mode switch to Ω , set Range to **200 M Ω** , and set Function to **μ Pipette**. The selected resistor value in Megohms should be displayed. To measure potential, change the Mode switch to **V**. A reading of only a few millivolts will be displayed when the tip of the probe is connected to the **Reference** jack. Rotate the **Offset** knob and note that the reading can be adjusted to zero.



CAUTION: Be sure to make the junctions between the resistor and the probe or pin jack terminals tight to avoid fluctuation of readings.

Resistance Measurement of Fluid-Filled Microelectrodes

The resistance of electrolyte-filled glass micropipette electrodes may be measured as suggested by Figure 1.

When the micropipette is filled with an electrolyte (for example, 0.1 M to 3M KCl) and inserted into WPI electrode holder **EHB**F, the chlorided* silver wire in the holder contacts the filling solution in the shank of the pipette. The probe, with electrode

attached, is advanced with a positioning device (see WPI catalog for some types that are available) into a reference bath containing electrolyte solution (150 mM). A separate silver wire or reference electrode **RC1T** (supplied) is placed in the bath and connected with a wire to the Reference jack on **Ωmega-Tip-Z's** front panel. Higher tip resistances are achieved by using lower saline molarities in the micropipette.

Chloriding the EHF Silver Wire

Use the electrode cleaning attachment (**5496** phone plug to alligator clips) with the red positive alligator clip connected to the 2 mm socket of the **EHBF** holder and the black (negative) clip connected to the **RC1T** Ag/AgCl pellets 2 mm pin. Place the Ag wire in the bath with the tip of the **RC1T** pellet immersed. Push the cleaning button to chloride the Ag wire (30 seconds to 1 minute in 150 mM saline.)

NOTE: Using 1M to 3M KCl will shorten the time to chloride the wire.

NOTE: Chassis Gnd (the instrument case and circuit ground) should not be connected to the solution. In the event that a grounded electrode is present in the solution, it is important that the chassis does not connect to that ground electrode via a conductive path.

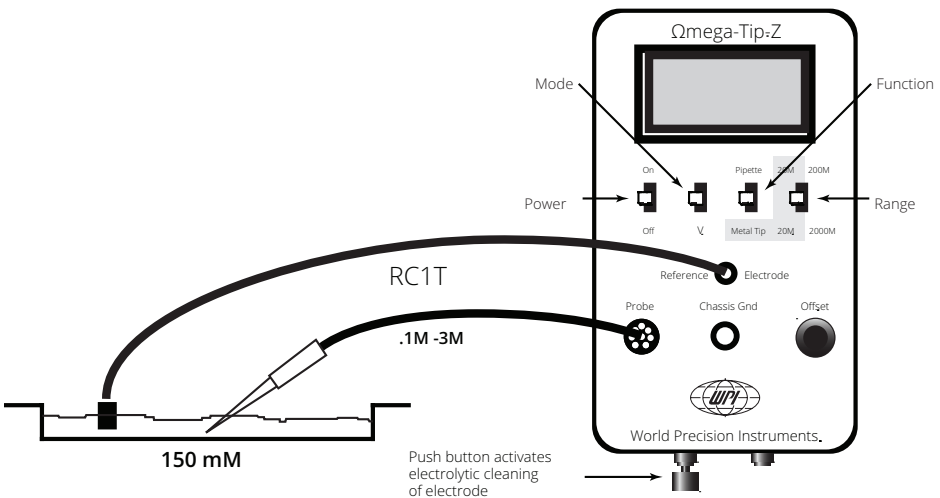


Fig. 1—Measuring the resistance of electrolyte-filled glass micropipette electrodes

For best performance, the tip of the micropipette electrode should not be immersed to a depth of more than 1 mm into the electrolyte bath solution.

In the micropipette (glass electrode) mode, when the range is set too 200 MΩ, the measuring frequency is 12.5 Hz using a current of 10 nA. However, when the range is set to 200 MΩ, although the measuring frequency is still at 12.5 Hz, the current passing through the electrode is 1 nA.

At electrode resistance readings much above 300 to 400 megohms, line frequency interference may cause some instability in the digital display. Grounded aluminum foil or metal screening around the measuring probe and electrode will often improve the stability of the resistance reading.

Impedance Measurement of Metal Microelectrodes

Measuring metal microelectrode tip impedance is similar to that of measuring micropipette resistance described above. WPI part number **5468** is an adapter with which to hold metal wire electrodes on the probe tip of the instrument. Note that there is only one impedance range, i.e. **20 M Ω** . Set the Function and Mode slide switches to **Metal Tip** and Ω , respectively. Immerse the metal tip of the electrode into a saline electrolyte containing the reference electrode. Most metal microelectrodes' impedances. Most of the metal microelectrodes sold by WPI fall into the 0.5 to 2 M Ω range. In the Metal Tip mode, the measuring current is 10 nA and the frequency is 500 Hz, providing a range of 20 M Ω .

WPI metal microelectrodes are calibrated at 1000 Hz and the measured impedance is noted on the box. The user should re-measure the metal microelectrodes with the **Ω mega-Tip-Z** to establish a 500 Hz baseline impedance.

Electrolytic "Cleaning" of Metal Microelectrodes

If the electrodes are to be reused, or if you cannot obtain low impedance, or if the electrodes have been sterilized or stored for very long periods, electrolytic cleaning will often renew the electrode surface. Connect the cable assembly provided to the electrolysis jack at the foot of the instrument. Connect the black clip to the electrode shank and the other clip to a reference electrode. Immerse the electrode pair in saline. When the push button next to the jack is pushed, approximately -3 volts (through an internal resistance) will be applied to the metal electrode and it should exhibit bubbles issuing from the electrode tip. A short one-minute treatment should suffice.

Voltage Measurement

Tip and fluid junction potential can be measured with the Mode switch in the V position. This can be a useful feature. Users of ion-selective electrodes can use electrode potential as an index of bevelling. It has been observed that cation selective electrodes (Na⁺, K⁺, etc.) will increase potential in the + direction when a little tip bevelling is done. Anion electrodes will move in the opposite direction.

First, micropipettes are pulled and the tips filled with liquid ion exchange material. The electrode shank is back-filled with an appropriate chloride solution and the bath concentration of the chosen cation is selected to be one-tenth of the filling solution. Since resistances of ion-selective micropipette electrodes can be in the gigaohm range, careful electrical shielding will be necessary (see paragraph above).

Battery Replacement

Batteries will rarely require replacement. Replace batteries annually or when the **Lo-Batt** indicator on the LCD digital meter is displayed.

To replace batteries, remove four screws on the bottom of the instrument case. Withdraw the front panel and remove the old battery cells. Install six AA alkaline cells as the polarity markings indicate. Close the case and test the instrument using the Brief Test described above.

To conserve batteries, remember to turn power off when the instrument is not in use.

REQUIRED ACCESSORIES

Part Number	Description
EHBF	Glass Electrode Holder
5468	0.031" Metal Electrode Adaptor
RC1T	Silver/Silver Chloride Reference Cell

SPECIFICATIONS

INPUT RESISTANCE.....	10 ¹² Ω, typical
INPUT LEAKAGE CURRENT.....	1 pA, typical
MAX. INPUT VOLTAGE SWING.....	± 2 V
VOLTMETER	
Range	0 to ±2000 mV DC
Accuracy	± 0.1% of reading, ± 1 least significant digit
Resolution	1 mV (3.5 digits)
OHMMETER	
Range	0 to 20 MΩ @ 500 Hz (metal) 0 to 200 MΩ or 0 to 2000 MΩ @ 12.5 Hz (micropipette)
Measurement.....	10 nA and 1 nA (micropipette) 10 nA (metal)
Resolution	10 KΩ
Accuracy	± 20%
PROBE	1.2 cm diameter × 3.2 cm long
PROBE HANDLE	4.7 mm diameter × 8.9 cm long
PROBE CABLE	1.5 m
MAIN HOUSING.....	7 × 4 × 2 in. (18 × 10 × 5 cm)
POWER	6 AA 1.5 V alkaline cells, supplied
SHIPPING WEIGHT.....	4 lb. (1.8 kg)

DECLARATION OF CONFORMITY



WORLD PRECISION INSTRUMENTS, LLC.
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DECLARATION OF CONFORMITY CE

We: World Precision Instruments, Inc.
175 Sarasota Center Boulevard
Sarasota, FL 34240-9258, USA

as the manufacturer/distributor of the apparatus listed, declare under sole responsibility that the product(s):

OMEGA TIP-Z

To which this declaration relates is/are in conformity with the following standards or other normative documents:

Low Voltage Directive (Safety) 2014/35/EU:

- EN 61010-1:2010+A1:2019
- EN IEC 61010-2-030:2021+A11:2021

EMC Directive 2014/30/EU:

- EN IEC 61326-1:2021
- EN IEC 61326-2-3:2021

Issued On: December 12, 2022



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F-QC-006 Rev D

WARRANTY

WPI (World Precision Instruments) warrants to the original purchaser that this equipment, including its components and parts, shall be free from defects in material and workmanship for a period of one year* from the date of receipt. WPI's obligation under this warranty shall be limited to repair or replacement, at WPI's option, of the equipment or defective components or parts upon receipt thereof f.o.b. WPI, Sarasota, Florida U.S.A. Return of a repaired instrument shall be f.o.b. Sarasota.

The above warranty is contingent upon normal usage and does not cover products which have been modified without WPI's approval or which have been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. The above warranty will not apply if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electric power, air conditioning, humidity control, or causes other than normal and ordinary usage.

To the extent that any of its equipment is furnished by a manufacturer other than WPI, the foregoing warranty shall be applicable only to the extent of the warranty furnished by such other manufacturer. This warranty will not apply to appearance terms, such as knobs, handles, dials or the like.

WPI makes no warranty of any kind, express or implied or statutory, including without limitation any warranties of merchantability and/or fitness for a particular purpose. WPI shall not be liable for any damages, whether direct, indirect, special or consequential arising from a failure of this product to operate in the manner desired by the user. WPI shall not be liable for any damage to data or property that may be caused directly or indirectly by use of this product.

Claims and Returns

Inspect all shipments upon receipt. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. All claims for shortage or damage must be made within ten (10) days after receipt of shipment. Claims for lost shipments must be made within thirty (30) days of receipt of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim is settled. In some instances, photographic documentation may be required. Some items are time-sensitive; WPI assumes no extended warranty or any liability for use beyond the date specified on the container

Do not return any goods to us without obtaining prior approval and instructions from our Returns Department. Goods returned (unauthorized) by collect freight may be refused. Goods accepted for restocking will be exchanged or credited to your WPI account. Goods returned which were ordered by customers in error are subject to a 25% restocking charge. Equipment which was built as a special order cannot be returned.

Repairs

Contact our Customer Service Department for assistance in the repair of apparatus. Do not return goods until instructions have been received. Returned items must be securely packed to prevent further damage in transit. The Customer is responsible for paying shipping expenses, including adequate insurance on all items returned for repairs. Identification of the item(s) by model number, name, as well as complete description of the difficulties experienced should be written on the repair purchase order and on a tag attached to the item.

** Electrodes, batteries and other consumable parts are warranted for 30 days only from the date on which the customer receives these items.*



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