



# Ωmega-Tip-Z

*Measures fluid-filled micropipette electrode  
resistance and metal microelectrode tip impedance*

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## **World Precision Instruments, Inc.**

### **USA**

International Trade Center, 175 Sarasota Center Blvd., Sarasota FL 34240-9258  
Tel: 941-371-1003 • Fax: 941-377-5428 • E-mail: sales@wpiinc.com

### **UK**

Astonbury Farm Business Centre • Aston, Stevenage, Hertfordshire SG2 7EG  
Tel: 01438-880025 • Fax: 01438-880026 • E-mail: wpiuk@wpi-europe.com

### **Germany**

Liegnitzer Str. 15, D-10999 Berlin  
Tel: 030-6188845 • Fax: 030-6188670 • E-mail: wpide@wpi-europe.com

### **Internet**

[www.wpiinc.com](http://www.wpiinc.com) • [www.wpi-medical.com](http://www.wpi-medical.com)  
[www.nitricoxide.net](http://www.nitricoxide.net) • [www.pipetter.com](http://www.pipetter.com)

www.wpiinc.com

## **INSTRUCTION MANUAL**

Serial No. \_\_\_\_\_

101304

**World Precision Instruments**

## Warranty

WPI (World Precision Instruments, Inc.) 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 10 days after receipt of shipment. Claims for lost shipments must be made within 30 days of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim settles. 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.
- WPI cannot be held responsible for items damaged in shipment en route to us. Please enclose merchandise in its original shipping container to avoid damage from handling. We recommend that you insure merchandise when shipping. The customer is responsible for paying shipping expenses including adequate insurance on all items returned.
- Do not return any goods to WPI without obtaining prior approval and instructions (RMA#) from our returns department. Goods returned unauthorized or by collect freight may be refused. The RMA# must be clearly displayed on the outside of the box, or the package will not be accepted. Please contact the RMA department for a request form.
- Goods returned for repair must be reasonably clean and free of hazardous materials.
- A handling fee is charged for goods returned for exchange or credit. This fee may add up to 25% of the sale price depending on the condition of the item. Goods ordered in error are also subject to the handling fee.
- Equipment which was built as a special order cannot be returned.
- Always refer to the RMA# when contacting WPI to obtain a status of your returned item.
- For any other issues regarding a claim or return, please contact the RMA department.

**Warning: This equipment is not designed or intended for use on humans.**

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

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**

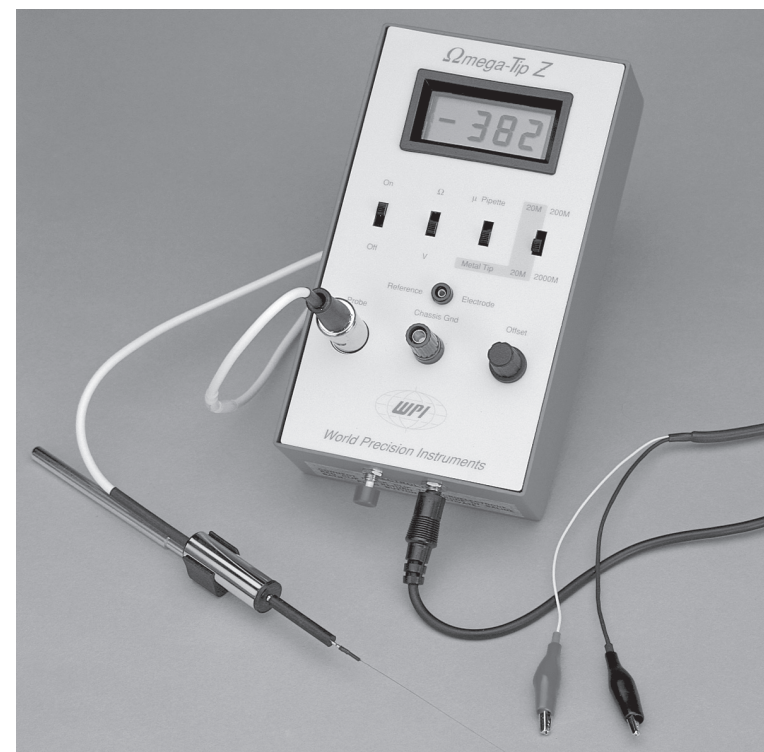
Batteries will rarely require replacement. Replace batteries annually or when the **Lo-Batt** indicator on the LCD digital meter is displayed.

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.*

**Specifications**

INPUT RESISTANCE.....	10 <sup>12</sup> 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 x 3.2 cm long
PROBE HANDLE .....	4.7 mm diameter x 8.9 cm long
PROBE CABLE.....	1.5 m
MAIN HOUSING.....	7 x 4 x 2 in. (18 x 10 x 5 cm)
POWER.....	6 AA 1.5-volt alkaline cells, supplied
SHIPPING WEIGHT .....	4 lb (1.8 kg)



**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 bevelling pulled glass microcapillary electrodes. Ωmega-Tip-Z is an excellent adjunct to WPI's model **1300M** 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.

One model **EHB**F holder, one **5468** metal electrode adapter and a reference electrode are provided with the instrument.

## 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  $\Omega$ , set Range to **200 M $\Omega$** , and set Function to  **$\mu$  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.

**WARNING:** 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, 3 M KCl) and inserted into WPI electrode holder EHBF, the 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. A separate silver wire or reference electrode (supplied) is placed in the bath and connected with a wire to the Reference jack on Omega-Tip-Z's front panel.

**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.

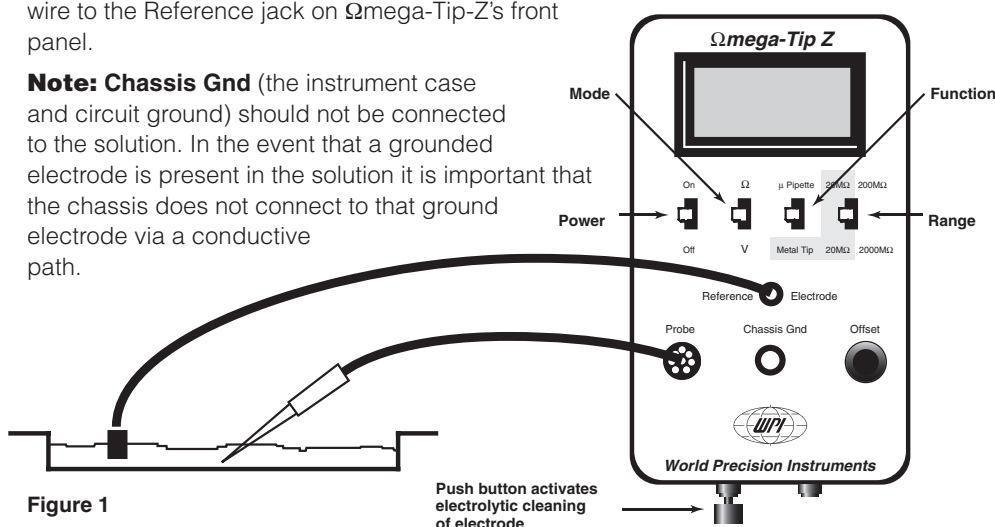


Figure 1

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 M $\Omega$ , the measuring frequency is 12.5 Hz using a current of 10 nA. However, when the range is set to 2000 M $\Omega$ , 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 $\Omega$** . Set the Function and Mode slide switches to **Metal Tip** and  $\Omega$ , 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 $\Omega$  range. In the Metal Tip mode, the measuring current is 10 nA and the frequency is 500 Hz, providing a range of 20 M $\Omega$ .

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 Omega-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<sup>+</sup>, K<sup>+</sup>, 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.