

**OPERATING INSTRUCTIONS**  
**GENERAL DEVICES**  
**MODEL EIM 105-10Hz**  
**PREP-CHECK ELECTRODE IMPEDANCE METER**

## OVERVIEW

The EIM 105-10Hz is a hand-held, battery powered device intended to measure the electrical impedance of bio-potential electrodes applied to patients. Impedance readings are measured at 10 Hz with no D.C. polarizing current and are presented on a large liquid crystal display with interpretation assisted by color coded “GOOD” and “POOR” lamps.

By means of a lead selector switch, impedance is measured between selected electrode and the two other electrodes. The other two electrodes are automatically placed in a parallel combination. This feature simplifies the identification of a bad electrode, electrode site or lead wire.

A standard 9-volt battery powers the meter. Battery life is enhanced by an Auto-Off feature, eliminating the possibility of accidentally leaving the instrument on when not in use. The meter also includes a built-in 100K precision test impedance which is used to verify operation and accuracy of the instrument.

## CONTROLS AND INDICATORS

### “ON” BUTTON

The ON button turns the Prep-Check on. The Prep-Check automatically turns itself off after approximately one and a half (1.5) minutes.

### “GOOD” LIGHT

The green GOOD light flashes at impedances BELOW 5,000 ohms, indicating an acceptable electrode impedance.

The GOOD light flashes brighter as impedance decreases (improves).



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## **“POOR” LIGHT**

The red POOR light flashes at impedances ABOVE 15,000 ohms, indicating poor electrode contact OR a defective wire or patient cable.

The red POOR light flashes brighter as impedance increases (worsens).

The red POOR light flashes momentarily if a lead wire or electrode is intermittently defective.

## **LEAD WIRE/PATIENT CABLE JACKS**

The three color-coded safety DIN (shrouded 0.060”) jacks marked “+”, “C” and “-” accept standard safety DIN lead wire connectors.

## **“LEAD SELECTOR” SWITCH**

The four position LEAD SELECTOR switch is used to select the lead to be tested and to check the functionality and accuracy of the instrument.

The switch selects ONE of up to THREE electrodes to be checked. The two remaining electrodes are connected together (in parallel) for a “return path”.

The impedance of the parallel combination of two electrodes is always LESS than either electrode.

An example of how the lead SELECTOR switch works is as follows:

When the lead selector switch is pointing to the “+” position, the meter is assessing the “+” electrode impedance. The impedance measured represents the SUM of the “+” electrode and the parallel combination of the “C” and the “-” electrodes (the “C” and the “\_” are connected together). If the “+” electrode had an impedance of 2K Ohms, the “C” electrode an impedance of 3K Ohms, and the “-” electrode an impedance of 150K Ohms (a bad electrode), the meter would read (approximately) 5K Ohms for both the “+” and the “C” positions. When the switch is moved to the “-” position however, the reading would be 150K Ohms.

The “T” (TEST) position introduces an impedance of 100,000 ohms. In the TEST mode, the digital display must read between 97.0 and 103.0 and the red “POOR” light must be ON. The digital display must read between 97.0 and 103.0.

## **CONTACT IMPEDANCE DIGITAL DISPLAY**

The CONTACT IMPEDANCE display indicates contact impedance in thousands of ohms (K ohms). For example, a reading of “50.0” indicates 50,000 (50 K) ohms. The highest reading is “199.9” (199,900 ohms). Impedances above 199,900 (199.9K) ohms read “1. ”.

The “BAT” legend appears in the lower left hand corner of the display when the Prep-Check’s battery requires replacement.

## **OPERATION**

The PREP-CHECK is used to test electrode contact impedance as follows:

Prepare electrode site using recommended procedures.

Attach lead wires to electrodes.

Apply electrodes to prepared sites using recommended procedures.

Place lead wires in the appropriate jacks of the PREP-CHECK.

Measure impedance.

Good contact is indicated by the green "GOOD" light. The digital readout should read less than 5,000 (5K) ohms (05.0). Poor contact impedance is indicated by the red "POOR" light (impedance GREATER than 15,000 (15K) ohms (15.0).

Electrodes indicating poor may have to be replaced or the site prepped again.

Lead wires are checked by stretching the lead wire with moderate force. A defective lead wire will cause the red "POOR" light to flash briefly or stay on continuously.

Lead wire snaps may be tested by moving them around on the electrode. A bad snap will cause the red "POOR" light to flash briefly or stay on continuously.

Remove lead wires from the PREP-CHECK and connect to the monitor cable.

## **TROUBLESHOOTING**

At times it is difficult to identify the source of a high impedance or an electrode problems. The possible causes are 1) the electrode, 2) the prep, 3) the lead wire, 4) the connector adapters, and 5) the meter. Each of these elements has to be addressed separately, as described below.

To most quickly identify the source of a problem, the following steps and the order they should be performed in are as follows:

### **METER VERIFICATION**

The meter is easily checked using the built-in test feature. If the meter reads as expected (see Section 0), it is probably operating properly. An additional verification may be made (ZERO, see Section 0). If the meter indicates good in BOTH the TEST and ZERO checks, the meter is then known to be good.

Should the meter fail either of these tests, contact General Devices or the dealer the meter was purchased from to arrange for service. There are no user serviceable elements in the meter.

### **CONNECTOR ADAPTERS CHECKS**

Connector adapters are KNOWN to be a prime source of intermittent problems!

In particular, small purple colored adapters should NEVER be used as they are KNOWN to be particularly troublesome.

To check adapters, perform the LEAD WIRE test described in Section 0, using the adapter.

Defective adapters should be immediately discarded to avoid future difficulties.

### **LEAD WIRE CHECKS**

Lead wires are frequent sources of problems, particularly intermittent ones.

To check lead wires, perform the LEAD WIRE test described in Section 0.

Defective lead wires should be immediately discarded to avoid future difficulties.

### **ELECTRODE CHECKS**

Electrodes which are NOT dried out or out-of-date are normally NOT a common source of trouble.

To check the impedance of the electrode itself, place two electrode together (both contact sides together) and perform an impedance measurement. The reading should be VERY low, not more than a few hundred ohms.

Should the readings be higher than expected, discuss the problem with your electrode supplier.

### **ELECTRODE SITE PREPARATION**

Improper electrode site preparation will result in unnecessarily high impedances. To perform a good site preparation, use only material specifically intended for this purpose. Non-conductive materials, such as Vaseline should NEVER be used.

If all proceeding potential problem sources have been ruled out, the most likely source of the problem is the prep procedure or the materials used.

Discuss the problem with your supplier of prepping agents or electrodes.

## **MAINTENANCE**

The PREP-CHECK needs no maintenance other than routine battery replacement and periodic calibration. Zero and 100 K ohm controls, located on the side (near wrist strap ring) are provided for calibration.

### **BATTERY REPLACEMENT**

Replace the battery (standard 9 Volt alkaline battery when the "BAT" legend appears in the digital display. The battery is located beneath a sliding panel on the underside of the instrument.

### **ZERO CHECK AND ADJUSTMENT**

To check the ZERO setting, place a wire between the "+" and the "-" jacks and set the LEAD switch to the "+" position. The meter must read between 0 and 300 Ohms (0.3 KOhms).

To adjust the ZERO setting (selector switch and wire as above), using a fine screwdriver adjust the ZERO control through the RIGHTMOST hole on the

LOWER side of the meter for a reading of 00.0. Do not force the control as this will cause damage.

### **100K OHM CALIBRATE CHECK AND ADJUSTMENT**

To check the meter's calibration, place the LEAD SELECTOR switch in the "T" (TEST) position. The meter must read between 97 and 103 KOhms.

To adjust the CAL setting (selector switch as above), using a fine screwdriver adjust the CAL control through the LEFTMOST hole on the LOWER side of the meter for a reading of 100.0. Do not force the control as this will cause damage.

### **"GOOD" IMPEDANCE LEVEL ADJUSTMENT**

Connect a resistance decade box to the "+" and "C" jacks. Set the LEAD SELECTOR switch to the "+" position. Adjust the decade box to 5,000 ohms or to the desired GOOD impedance value. Using a screwdriver, adjust the GOOD impedance level control through the small RIGHTMOST hole on the left of the top side of the instrument. Adjust such that the GOOD light just begins to blink. Do not force the control as this will cause damage.

### **"POOR" IMPEDANCE LEVEL ADJUSTMENT**

Repeat above instructions for the GOOD level adjust using desired POOR impedance level and LEFTMOST hole on the left of the top side of the instrument. Do not force the control as this will cause damage. Adjust for 15,000 ohms or to some other desired impedance value.

## **TECHNICAL SPECIFICATIONS**

Measurement Range: ..... 100 to 199,900 ohms  
Accuracy: ..... +/- 3% of reading, +/-300 ohms  
Test Current: ..... 9.0 uA(RMS), +/-10%, @ 10Hz, +/-10%  
Direct Current: ..... 0.0 uA DC  
Displays: ..... 3 1/2 digit LCD readout  
GOOD LED (factory set to Z<5K)  
POOR LED (factory set to Z>15K)  
Self Test: ..... Internal 100K ohm 1% resistor  
# Electrodes Tested: ..... 3 (each measured with respect to other two)  
Electrode Selection: ..... 4 Position Lead Selector Switch  
Electrode Connections: ..... Three safety DIN (0.060" shrouded pins)  
User Available Adjustments: ... Zero, Cal, Good and Poor Levels  
Power: ..... 9 Volt alkaline battery, type MN1604  
Operating Current: ..... 21 mA  
Battery Test: ..... Continuous, LO-BATT indication on LCD  
Battery Access: ..... Slide-off cover  
Cabinet: ..... ABS Plastic, 3.6" x 6" x 1.9"

Note: Specifications subject to change without notice.

