

OPERATING INSTRUCTIONS
GENERAL DEVICES
MODEL EIM 105-TI
PREP-CHECK ELECTRODE IMPEDANCE METER

1 OVERVIEW

The EIM 105-TI 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 5 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 1Meg (1,000 K ohms) precision test impedance, which is used to verify operation and accuracy of the instrument.

2 CONTROLS AND INDICATORS

2.1 “ON” BUTTON

The ON button turns the Prep-Check on. The Prep-Check automatically turns itself off after approximately ten (10) minutes.

2.2 “GOOD” LIGHT

The green GOOD light flashes at impedances BELOW 30K ohms, indicating acceptable electrode impedance.

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

2.3 “POOR” LIGHT

The red POOR light flashes at impedances ABOVE 500K 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.

2.4 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.

2.5 “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 20K Ohms, the “C” electrode an impedance of 30K Ohms, and the “-” electrode an impedance of 1,500K Ohms (a bad electrode), the meter would read (approximately) 20K Ohms for both the “+” and the “C” positions. When the switch is moved to the “-” position however, the reading would be 1,500K Ohms.

The “T” (TEST) position introduces an impedance of 1,000,000 ohms (1,000k ohms). In the TEST mode, the digital display must read between 970 and 1030 and the red “POOR” light must be ON.

2.6 CONTACT IMPEDANCE DIGITAL DISPLAY

The CONTACT IMPEDANCE display indicates contact impedance in thousands of ohms (K ohms). For example, a reading of “500” indicates 500,000 (500 K) ohms. The highest reading is “1999” (1,900k ohms). Impedances above 1,999,000 ohms (1,999K Ohms) read “1 ”.

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

3 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 30K ohms. Poor contact impedance is indicated by the red “POOR” light (impedance GREATER than 500k ohms.)

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.

4 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:

4.1 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 5.2). 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.

4.2 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 □, using the adapter.

Defective adapters should be immediately discarded to avoid future difficulties.

4.3 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 □.

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

4.4 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 electrodes 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.

4.5 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.

5 MAINTENANCE

The PREP-CHECK needs no maintenance other than routine battery replacement and periodic calibration. Zero and 1,000 K ohm controls, located on the side (near wrist strap ring) are provided for calibration.

5.1 BATTERY REPLACEMENT

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

5.2 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 3,000 Ohms (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 000. Do not force the control, as this will cause damage.

5.3 1,000K 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 970 and 1,030 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 1,000. Do not force the control, as this will cause damage.

5.4 "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 30,000 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 topside of the instrument. Adjust such that the GOOD light just begins to blink. Do not force the control as this will cause damage.

5.5 "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 500,000 ohms or to some other desired impedance value.

6 TECHNICAL SPECIFICATIONS

Measurement Range:	100 to 2,000k ohms
Accuracy:	+/- 3% of reading, +/-3,000 ohms
Test Current:	9.0 uA(RMS), +/-10%, @ 5Hz, +/-10%
Direct Current:	0.0 uA DC
Displays:	3 1/2 digit LCD readout
GOOD LED (factory set to Z<30K)	
POOR LED (factory set to Z>500K)	
Self Test:	Internal 1,000K ohm 1% resistor
# Electrodes Tested:	3 (each measured with respect to the 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.