

## Insulation & Low Resistance Tester

### User Guide



#### SAFETY WARNINGS

- ★ **Safety Warnings** and **Precautions** must be **read and understood** before the instrument is used. They must be **observed** during use.
- ★ The circuit under test **must** be switched off, de - energized and isolated **before** Insulation or Continuity tests are made.
- ★ Circuit connections **must not** be touched during a test.
- ★ The test button **must not** be pressed while connecting the test leads or while changing ranges.
- ★ The 'Test' button must **not** be pressed when making a voltage test.
- ★ The **Default Voltmeter**, and **Automatic discharge** are additional safety features and **should not** be regarded as a substitute for normal safe working practice.
- ★ The **210170** is protected for connection to Power distribution systems up to 300 V **Line - Ground**, and 500 V **Line - Line** for Installation Category III\*.
- ★ It is recommended that fused test leads are used when measuring voltage on high energy systems.
- ★ After insulation tests, capacitive circuits **must** be allowed to discharge **before** disconnecting the test leads.
- ★ Test leads, prods and alligator clips **must be** in good order; clean, and with no broken or cracked insulation.
- ★ Replacement fuses **must be** of the correct size, type and rating.

#### NOTE

THE INSTRUMENT MUST ONLY BE USED BY SUITABLY TRAINED AND COMPETENT PERSONS.

#### Symbols used on the instrument



Caution: risk of electric shock

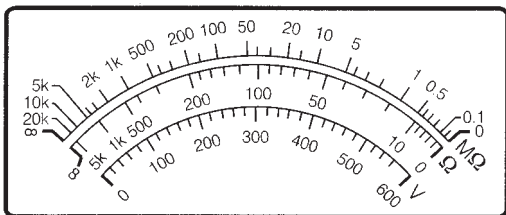


Caution: refer to accompanying notes



Equipment protected throughout by Double Insulation (Class II)

## MEASUREMENT SCALES



## OPERATION

**⚠ Refer to Safety Warnings before using the instrument**

### Default Voltage measurement

The **210170** will act as a default voltmeter (0 to 600 V a.c.) with any of the Insulation test positions selected. The 'Test' push **must not** be pressed when making a voltage test. **Note:-** The **210170** is internally fuse protected to 500 V. For fuse protection with supplies above 500 V, use Fuse Probe Kit **FPK5**.

1. Select any Insulation test position with the rotary selector switch.
2. Carefully connect the test leads to the circuit under test. **Do not press the 'Test' push.**
3. Read the voltage measurement from the voltmeter scale.
4. Carefully disconnect the test leads.

### Low Resistance measurement ( $\Omega$ )

1. Select  $\Omega$  with the rotary selector switch.
2. Ensure that all test leads are clean and in good condition, and connect them to the **isolated** circuit under test.
3. **⚠** Any pointer deflection indicates a live circuit, and testing should be **aborted**.
4. Press the 'Test' push, and keep it pressed while turning the generator handle.
5. Read the measurement from the **k $\Omega$**  scale.
6. Disconnect the test leads.

### Insulation Testing (**M $\Omega$** )

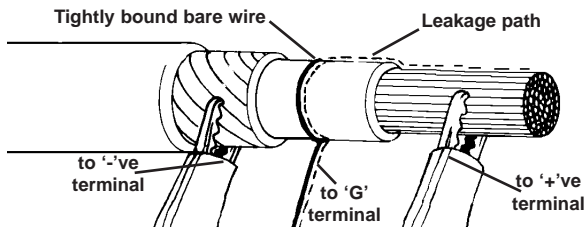
Automatic circuit discharge is effective when the test button is released, and decaying voltage is indicated by the scale needle until the circuit is discharged.

1. Select **M $\Omega$**  with the rotary selector switch.
2. Ensure that all test leads are clean and in good condition, and connect them to the **isolated** circuit under test.
3. **⚠** Any pointer deflection indicates a live circuit, and testing should be **aborted**.
4. Press the 'Test' button, and keep it pressed while turning the generator handle.
5. Read the measurement from the **M $\Omega$**  scale.
6. Release the 'Test' push and monitor any scale needle movement to confirm when any discharging voltage decays to zero.
7. When the circuit has discharged, disconnect the test leads.

## Using the Guard Terminal

For basic insulation tests and where there is little possibility of surface leakage affecting the measurement, it is unnecessary to use the guard terminal.

In cable testing, there may be surface leakage paths across the insulation between the bare cable and the external sheathing due to the presence of moisture or dirt. Where it is required to remove the effect of this leakage, particularly at high testing voltages, a bare wire may be bound tightly around the insulation and connected via the third test lead to the guard terminal 'G'.



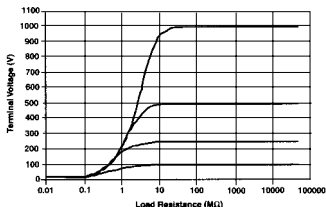
The guard terminal is at the same potential as the negative terminal. Since the leakage resistance is effectively in parallel with the resistance to be measured, the use of the guard causes the current flowing through surface leakage to be diverted from the measuring circuit. The instrument therefore reads the leakage of the insulator, ignoring leakage across its surface.

## SPECIFICATION

### Insulation Ranges

- Measuring Ranges:** 0 - 20,000 M $\Omega$  at all test voltages  
**Test Voltages (d.c.):** 100 V; 250 V; 500 V; 1kV on open circuit  
**Test V. Accuracy:**  $\pm 5\%$   
**Short Cct. Current:** 220  $\mu$ A nominal on all ranges

Terminal Characteristics



- Accuracy:**  $\pm 3\%$  of scale length on a 3.08 inch arc length

### Low resistance Range

- Measuring Range:** 0 - 5000  $\Omega$   
**Open Cct. Voltage:** 3 V  $\pm 5\%$   
**Short Cct. Current:** 30 mA  $\pm 10\%$   
**Accuracy:**  $\pm 3\%$  of scale length on a 3.08 inch arc length

### Default Voltage measurement

- Range:** 0 - 600 V a.c.  
**Accuracy:**  $\pm 2.5\%$  of scale length

### General Specifications

- Overload rating:** The **210170** is protected for connection to Power distribution systems up to 300 V **Line - Ground**, and 500 V **Line - Line** for Installation Category III\*.

**Temp. Range:**

Operating: 14°F to 122°F  
 Storage: 4°F to 158°F

**Humidity:**

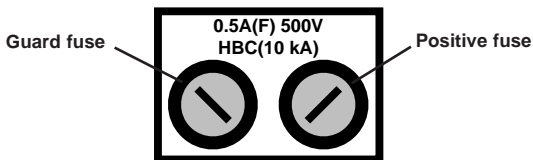
Operating: 70% RH at 68°F, 50% RH at 104°F  
 Storage: 95% RH at 95°F

**Automatic Discharge:** Capacitive circuits are automatically discharged when the 'Test' push is released following an insulation test.

**Power Supply:** Low voltage brushless a.c. generator

**Fuses:** 2 x 500 mA (F) 500 V H.B.C. 10 kA min 1¼" x ¼"

To check these fuses, short all three test leads together and set the rotary selector switch on any Insulation test position. Press the 'Test' push and keep it pressed while turning the generator handle. The needle should register approximately 2 MΩ. A zero reading indicates that the 'G' fuse has ruptured. An Infinity reading indicates that the +ve fuse has ruptured.



**Fuse Replacement:** Held in a screw type holder located in the base of the instrument. Use a flat blade screwdriver to release the center part of the holder, and remove the ruptured fuse. Replace with fuse(s) of the correct type, size and rating.

**Weight:** 2.2 lb

**Dimensions:** 8¼" (including generator handle) x 5" x 5"

**Cleaning:** Wipe disconnected instrument with a clean cloth dampened with soapy water or Isopropyl Alcohol IPA)

\*Relates to transient overvoltage likely to be found in fixed installation wiring.

**ACCESSORIES**

| Supplied  | Part Number |
|---|-------------|
| User Guide  | 6172-382    |
| Test lead set comprising:-                              |             |
| 1 black, 1 red, 1 green test lead, with alligator clips | 6220-436    |
| Test Record Card (5 supplied)                           | 6172-111    |
| <b>Optional</b>   |             |
| Carrying case   | 217740      |
| Fuses (500mA) x 5                                       | 6121-289    |
| Fused probe kit <b>FPK8</b>                             | 6111-287    |
| Test lead set   | 6220-436    |
| Test Record cards (Pack of 20)                          | 6111-216    |
| Publication - 'A Stitch in Time'                        | AVTM21-P8B  |