

How To: Do Med. Voltage Insulation Resistance Testing (MEG)

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1. Required Equipment:

A. Megger MIT525



1. Purchase at: <https://www.grainger.com/product/MEGGER-AC-and-BatteryMegohmmeter-40D467>

2. Safety Requirements Before Testing:

INSULATION	RESISTANCE	
Cable rating in volts	Minimum Test Voltage, DC	Minimum Insulation Resistance, Megohms
250-300	500	25
600	1,000	100
1,000	1,000	100
2,500	1,000	500
5,000	2,500	1,500
8,000	2,500	2,500
15,000	2,500	5,000
25,000	5,000	10,000
34,000	5,000	100,000
46,000+	5,000	100,000

NETA ATS Table 100.1

A. Before beginning testing, review the following items:

1. Become familiar with **area** to be tested. Review Inverter and CBX locations
2. Test will require two people. (Testing technician will be the **tester** and a laborer will be the **spotter**). Testing will not be performed unless there are two authorized employees.
3. Job Hazard Analysis (J.H.A.)
 - a. Ensure voltage exposures are listed on JHA.
 - b. Make note and have all required PPE.
 - c. Set up delineators to prevent outside personnel from entering area.
 - d. Get JHA reviewed by E Light's Director of Safety and Loss Prevention.
 - e. Create a step-by-step site-specific procedure on how task will be performed.

Note: This document is not site-specific and is only a general procedure on how to perform Meg testing.

Cable jacket integrity testing (megging) provides a measurable result to qualify the quality of the cable installation such that the jacket is free from damage or puncture. The test verifies the jacket integrity by applying voltage on the concentric neutrals of the cable and will check for evidence of insulation damage or contamination.

Test voltage will be applied until a stable insulation resistance value is obtained (60 second) and record results.

A conductor is suspect if test reveals a value less than shown on table 100.1 and should be investigated for corrective action.

B. Set up a red tape boundary.

1. Boundary/barricade must be with red danger tape, completely enclosing both ends of MV cable being tested.
2. Each end of cable must have a sign stating:
“Danger DO NOT ENTER / Authorized Personal Only”
Along with contact name and number: ex. _Mike Ivanco (303) 802-0962__
3. Inform all workers in affected area that testing is taking place.
4. Employee shall wear leather gloves while working on any cable that has not been grounded.

**Note: It shall be noted that under certain circumstances a voltage may be present on a conductor placed in a trench.
Voltage can be induced by static electricity, weather, previous testing or induction from other sources.**

C. Perform Continuity Test

1. On far end of MV cable, use a jumper to make a connection between bundled concentric neutrals and ground lead .
2. Tester, while communicating with spotter, will use a multi-meter from the bundled end of cable to perform a continuity test.
3. Test should be confirmed twice to verify proper cable is identified. Using commands “make, break, make” to verify correct feeder has been identified
4. Tester and laborer will then label MV cable with phase tape.

If continuity test fails, troubleshoot and retest. If it cannot pass, contact Commissioning Manager

3. Testing:

- A. The concentric end must be exposed and bundled.
 1. The other end of the cable must be sealed and isolated.
 2. The positive lead will be applied to the bundled concentric neutrals while the negative lead applied to ground (a running trench ground is best option, if available).
 3. Voltage intensity should be applied for a minimum of 30 seconds.
 - i. Apply voltage intensity of 2 kv to 2.5 kv for cable up to 4/0
 - ii. Apply voltage intensity of 5 kv for cable larger than 4/0
 4. Record the measurement.

4. Trouble Shooting:

A. Low reading

1. If reading is less than 1 mega ohm, it's likely the jacket has been penetrated during installation and further investigation is required.

It is recommended to verify test set up before any rework commences, as an inadvertent ground somewhere in the system could lead to a poor reading (such as cable at far end may have moisture or near to ground)

B. Clean up

1. Once testing is complete on the cables and before the test leads are removed, the conductor under test must have a ground applied to discharge / de energize any energy that may have built up during testing.

C. **Tester** to begin testing Negative DC Feeder, **Spotter** to ensure cables are isolated at combiner box end.

1. Connect negative test lead to GROUND and positive test lead to NEGATIVE feeder.
2. **Spotter** to communicate final command to start test with "ALL CLEAR"
3. **Tester** to set **Megger** to 1000 Volts. Set megger so test will automatically run for 60 seconds.
 - a. Record test results (Test results must be at 500 Mega ohms minimum)
 - b. Disconnect all test leads and drain residual by connecting tested feeder to ground.

D. **Tester** to begin testing Positive to Negative DC Feeder, **Spotter** to ensure cables are still isolated.

1. Connect negative test lead to NEGATIVE feeder and positive test lead to POSITIVE feeder.
2. **Spotter** to communicate final command to start test with "ALL CLEAR"
3. **Tester** to set **Megger** to 1000 Volts. Set megger so test will automatically run for 60 seconds.
 - a. Record test results (Test results must be at 500 Mega ohms minimum)
 - b. Disconnect all test leads and drain residual by connecting tested feeder to ground.

E. DENERGIZE feeders: CONFIRM

1. Disconnect all test leads and drain residual energy by connecting the feeder to ground.
2. Spotter to place tested feeders back in combiner box once all residual power has been drained.
3. Cover all ends with tape, Never leave bare ends exposed to weather
4. Clean up work area
5. Repeat steps above for all blocks.

F. Remove barricades as required.

G. Secure equipment and review data.

4. Trouble Shooting:

A. Low reading

1. If resistance reading is 10 K ohms or less, chances are the cables are touching
2. If resistance is below the minimum required resistance value (typically 500 meg ohms), chances are one set of ends are within 6" of ground, wet or dirty. A quick wipe with an alcohol pad should fix this.

B. High Reading

1. If reading is above "gig ohms", there may be an open circuit...check leads going into the megger.

5. Report:

A. Type Test Report and submit entire block in pdf format to E Light's Commissioning Manager

1. Blank Report



LVAC Cable -
Insulation Resistance.›

- a. Form
- b. Edit form to conform to site specific requirements.
- c. Only submit pdf format to customer/client