

## SSIT-301 Ground Resistance

### Purpose

Each signal housing ground network shall be tested to ensure the ground rods, grids, wires, and connections provide a sufficiently low resistance path to ground. Ground resistance shall preferably not exceed 15 ohms at time of installation, and 25 ohms for ongoing maintenance testing.

### Test Intervals

Tests shall be performed when installed, as required, and at least once every ten (10) years. Refer to *SSIT-7 Signal System Inspection and Test Intervals* for all test intervals.

### Rail Safety

Employee shall ensure the site is safe for employees, the public, vehicular traffic and train operations as defined in *SSIT-8 Protecting Train Operations* prior to performing tests and inspections.

### Personal Safety



**CAUTION:** The grounding throughout a location where there is an AC power service should always be considered electrically live. Leakage through arrestors or transformers connected to AC power supply may cause the voltage on the disconnected grounding network to reach dangerous levels. Proper precautions must be taken whenever connecting or disconnecting a made ground or any part of the grounding network.

### Equipment Manuals

A copy of relevant ground metering equipment manufacturer's manual should be on hand for reference when performing tests.

### Visual Inspections

The following inspections are to be performed at each location prior to ground testing:

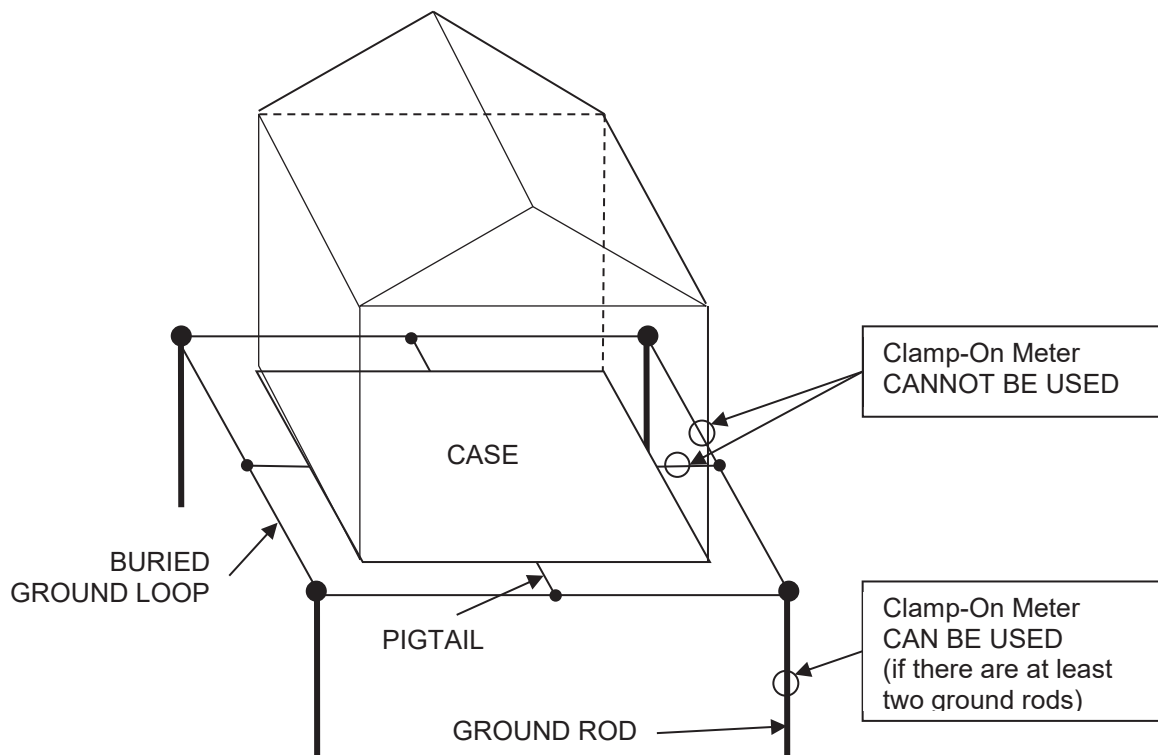
Step	Procedure
1. Inspect Ground Rod Wire Connections	→ Check wire connection(s) to rod(s) are secure. → Check connections for damage or corrosion. <b>If issues with ground connection(s):</b> Arrange for necessary modifications to ground network prior to ground testing.
2. Inspect Ground Wire Connections on Poles	→ Check terminations and/or connectors are tight. → Check connections for damage or corrosion. <b>If issues with ground connection(s):</b> Arrange for necessary modifications to ground network prior to ground testing.
3. Inspect Ground Wires	→ Check exposed ground wire for sharp bends or loops. → Check wire for damage and excessive corrosion. <b>If issues with ground wire(s):</b> Arrange for necessary modifications to ground network prior to ground testing.

## Procedure (Direct Reading Test Meter)

The following tests are to be performed at each location when a direct reading ground resistance test meter is used (such as Three Point Vibroground or equivalent):

Step	Procedure
1. Isolate Ground Network	<ul style="list-style-type: none"> <li>Disconnect the ground wire(s) at the prime ground bus.</li> </ul> <b>If no ground bus present:</b> Isolate the AC supply by opening and locking out the first upstream control device from case's load centre. Disconnect ground wire(s) from load centre.
2. Take Ground Readings	<ul style="list-style-type: none"> <li>Connect the test instrument to the ground wire(s).</li> <li>Perform ground tests following meter manufacturer's manual.</li> </ul> <b>If procedure requires test at pole:</b> Connect the test instrument to ground wire on side of pole.
3. Reconnect Ground network	<ul style="list-style-type: none"> <li>Reconnect all ground terminations.</li> <li>Double check all ground connections are reconnected.</li> </ul>
4. Reconnect AC Power (if applicable)	<ul style="list-style-type: none"> <li>Remove lock from upstream control device.</li> <li>Reconnect AC power.</li> </ul>

## Clamp-On Meter Diagram



### Procedure (Clamp-On Meter)

The following tests are to be performed at each location when a clamp-on meter is used. **Clamp-on meter cannot be used if network has single ground rod, or ground network contains a buried ground loop unless a reading can be obtained from earth side of buried loop (refer to diagram on previous page):**

Step	Procedure
1. Check for Clamping Point	→ Check there is more than one ground rod for ground network. → Check there are no bonding loops connecting rod/conductor back to housing. → Check there are not multiple conductors at clamp point. <b>If criteria are not met:</b> Direct reading test meter must be used for test.
2. Take Ground Readings	<ul style="list-style-type: none"> <li>Clamp instrument around any ground rod (refer to diagram on previous page).</li> <li>Perform ground tests following meter manufacturer's manual</li> </ul> <b>If value is less than allowable resistance:</b> Proceed to step 3.
3. Take Additional Readings (if applicable)	If first reading exceeds allowable resistance, and ground network contains more than 2 ground rods: <ul style="list-style-type: none"> <li>Clamp instrument around furthest ground rod from previous test point.</li> <li>Perform ground tests following meter manufacturer's manual</li> </ul> <b>If only 2 ground rods:</b> Direct reading test meter must be used for test.
4. Calculate Parallel Resistance (if applicable)	<ul style="list-style-type: none"> <li>Find the value of <math>R_T</math>:  <math display="block">1/R_T = 1/R_1 + 1/R_2</math> </li> </ul> <b>If value is less than allowable resistance:</b> Direct reading test meter must be used for test.

### Record Test Results

Record the test results for each ground test performed:

Step	Procedures
1. Update Log Book	<ul style="list-style-type: none"> <li>Add any notes of issues observed, or adjustments made.</li> </ul>
2. Complete Test Form	<ul style="list-style-type: none"> <li>Record the test as completed on SSIT test form.</li> </ul>