User's Manual

EXTECH INSTRUMENTS

Ground Resistance Clamp On Tester

MODEL 382356



WARRANTY

EXTECH INSTRUMENTS CORPORATION warrants the basic instrument to be free of defects in parts and workmanship for one year from date of shipment (a six month limited warranty applies on sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 for authorization. **A Return Authorization (RA) number must be issued before any product is returned to Extech.** The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.

Introduction

Congratulations on your purchase of Extech's 382356 Ground Resistance Tester. This Clamp-on device allows the user to measure the ground resistance of a ground rod without the use of auxiliary ground rods. This device can only be used on multi-grounded systems. It is not necessary to disconnect the ground under test. Proper use and care of this meter will yield years of reliable service.

Safety

Safety is the responsibility of the operator. Only qualified technicians should operate this meter.

Use extreme caution when operating the meter near energized electrical equipment.

Do not attempt to use this meter to twist or pry the ground electrode or ground wire away from grounded equipment.

All metal objects or wires connected to the electrical system under test should be assumed to be lethal until tested. Grounded systems are no exception.

Ensure that the batteries are inserted correctly in the battery compartment.

Remove the batteries from the meter if the meter is to be stored for long periods.

WARNING: If the meter is used in a manner not specified by the manufacturer, the built in protections provided by the meter may be impaired.

International Safety Symbols



This symbol, adjacent to another symbol or terminal, indicates the user must refer to the manual for further information.



This symbol, adjacent to a terminal, indicates that, under normal use, hazardous voltages may be present

Meter Description

1. Jaw Assembly
2. Hold Button
3. Rotary Selector Switch
4. LCD Display
5. Measurement Trigger



Display Symbols

Ω	Ohms.
mA, A	milliamps, Amps.
•)))	Continuity.
NOISE	Annunciator for excessive noise on the ground conductor or rod.
	Indicates that the clamp jaws are not fully closed.
	Low Battery.

Specifications

General Specifications

Resistance Test Frequency:	1.667KHz (15mV rms approx.)
Max Conductor size	0.9" (23mm)
Display	4-digit (9999 count) display
Sampling rate	0.4 seconds
Power supply	One 9V battery
Power consumption	40mA
Temp. Coefficient	0.15 times the specified accuracy per degree centigrade (from 39 to 64ºF (4 to 18°C) and 82 to 122ºF (28 to 50°C))
Current Overload	Protected to 100A Continuous; 200A for less than 60 seconds (50/60Hz)
Continuity check	Audible tone if reading is less than approx. 40Ω
Range selection	Automatic ranging
Safety	Meets the requirements for IEC1010-1 Category III 300V and Category II 600 V
Operating conditions	4 to 122°F (-20 to 50°C) with < 85% RH
Storage conditions	-20 to 140°F (-28 to 60°C) with < 75% RH
Dimensions	10.2 x 4.4 x 1.9" (258 x 110 x 47mm)
Weight	24.7oz (700g)
Accessories	Resistance check plate, 9V battery, carrying case

Ground Resistance (Autorange) Specifications

Range	Resolution	Accuracy (of reading)
0.03 to 9.99Ω	0.02 Ω	± (1.5% + 0.1 Ω)
10.0 to 99.9 Ω	0.1 Ω	± (2.0% + 0.3 Ω)
100.0 to 199.9 Ω	0.4 Ω	± (3.0% + 1 Ω) typical
200.0 to 399.9 Ω	2 Ω	± (5.0% + 5 Ω) typical
400.0 to 599.9 Ω	5 Ω	± (10% + 10 Ω) typical
600.0 to 999.9 Ω	10 Ω	Not specified
1000 to 1500 Ω	30 Ω	Not specified
Accuracy Note: Loop resistance non-inductive, external field < 50A/m, external electrical field <1 V/m, conductor centered		

Ground / Leakage mA Current Specifications

Range	**Accuracy (% of reading)**
0.200 to 0.999mA	± (2.5% ± 0.05mA)
1.00 to 9.99mA	± (2.5% ± 0.05mA)
10.0 to 99.99mA	± (2.0% ± 0.3mA)
100.0 to 750.0mA	± (2.5% ± 3mA)
(Autorange, 50/60Hz, True RMS, Crest Factor <3.0)	

Ground/Leakage A Current Specifications

Range	**Accuracy (% of reading)**
0.20 to 15A	±(2.0% ±0.05A)
Max Current 100A Continuous; 200A for less than 60 seconds (50/60Hz, True RMS, Crest Factor <2.0)	

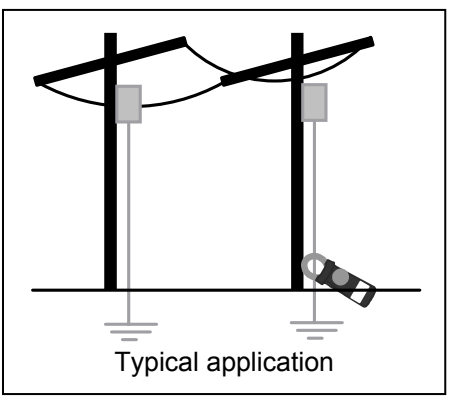
Operating Instructions

Note: The accuracy of measured readings will be affected if the clamp jaws are not fully closed. Pay special attention to ensure that the jaws are fully closed before testing begins.

Note: DO NOT clamp on to any conductor or open the clamp jaws during the start-up self-calibration (display counts down from CAL 7 to CAL 0).

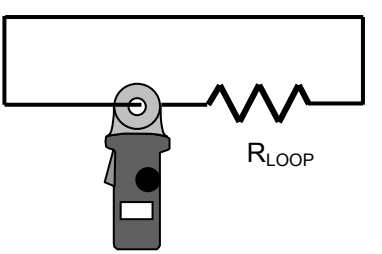
Ground Resistance Measurements

1. Open the clamp jaws and check that all surfaces are clean and free of dust, dirt, or any foreign substances. Clean if necessary.
2. Snap the Jaws open and closed a few times so that they seat properly.
3. Turn the meter on by moving the rotary switch to the ohms **Ω** position. DO NOT interrupt the start up procedure by opening the clamp jaws or clamping around a conductor.
4. Once the start-up calibration procedure is completed, clamp on to an electrode or ground rod and read the value of ground resistance on the display.


Typical application

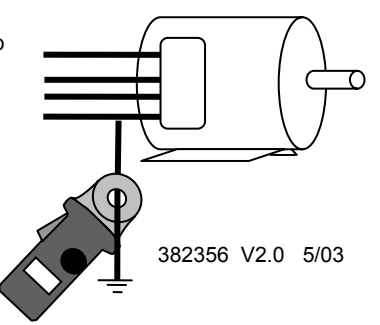
Continuity Loop Test

The testing procedures are the same as for Ground Resistance measurements except that the rotary switch is set to the **•)))** position and an audible tone will sound if the measured resistance is below approximately 40Ω.



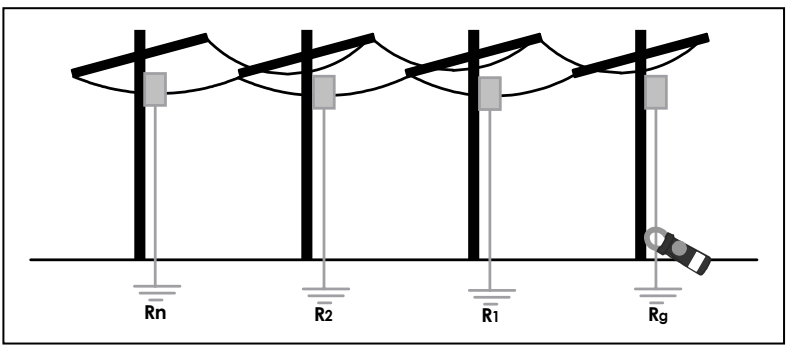
Ground / Leakage Current Measurement

1. Turn the meter on by moving the rotary switch to the **mA** or **A** position.
2. Clamp on to the electrode or conductor
3. Read the value of leakage current displayed on the display.

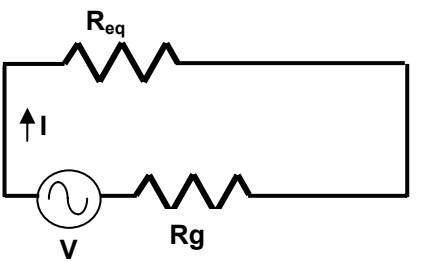


Principle of Operation

Typical multi-grounded distribution system.



If the parallel ground resistances, R_1, R_2, R_3,etc, up to R_n are combined as R_{eq}, then only R_g and R_{eq} are left in the circuit



If a constant voltage is applied to the circuit, the following equation applies:

$$\frac{V}{I} = R_g + R_{eq} \qquad \text{where:} \quad R_{eq} = \frac{1}{\sum \frac{1}{R_i}}, i = 1,2,...n$$

If R_g and R_1, R_2, R_3…R_n, are approximately the same, and n is large (200, for example), then R_{eq} will be much less then R_g and may possibly approach zero.

Example:

If R_g and R_1, R_2, R_3…R_n are all 10Ω respectively and n = 200, then R_{eq} by calculation equals:

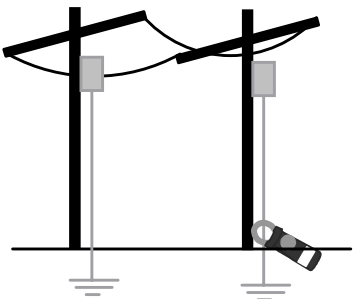
$$R_{eq} = \frac{1}{\frac{1}{10} + \frac{1}{10} + ... \frac{1}{10}} = 0.05\Omega$$

$$\frac{V}{I} = R_g + R_{eq} = 10 + 0.05 = 10.05 \rightarrow R_g$$

Applications

Telephone/Electrical Ground Rods

1. Remove any protective coverings from the ground conductor
2. Turn the meter to the Ohm Ω function.
3. Once the start-up calibration procedure is completed clamp on to an electrode or ground rod.
4. Allow several seconds for the meter to settle and note the reading.

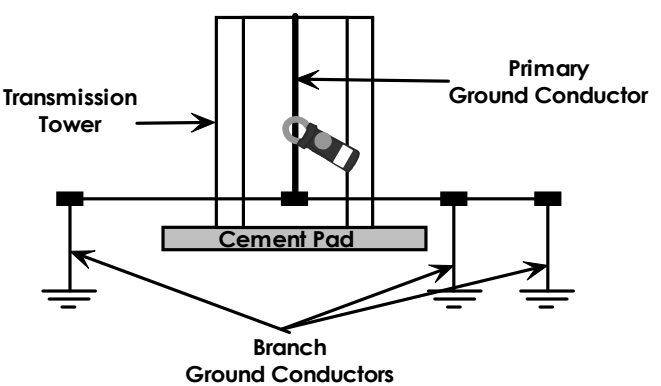


Cellular Transmission Towers

WARNING: Use extreme care when making measurements around transmission towers. High Voltage may be present.

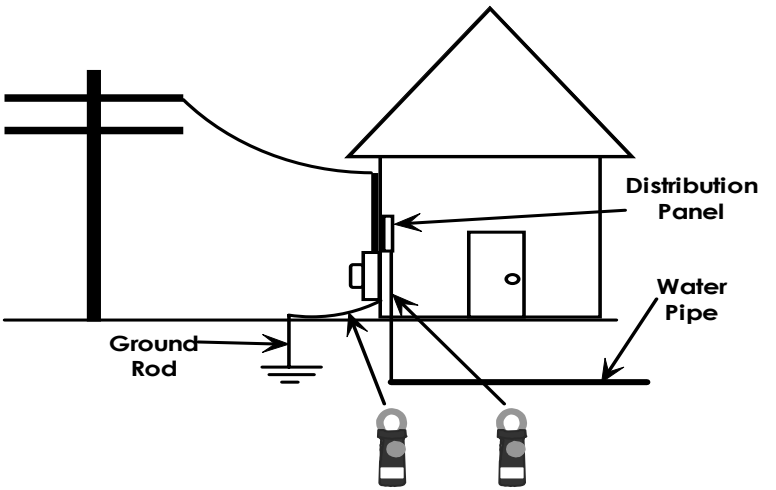
The ground conductor should be located at the base of the tower, but your configuration may be different.

1. Locate the ground conductor
2. Clamp around the ground conductor. You should place the clamp before any splices, bonds or other splits in the ground system.
3. Read the measured reading.



Service Entrance

Note: Multiple ground rods, multiple grounds i.e. ground rod(s) and water pipe grounds, or a combination may be present depending on the particular situation. In these situations it is necessary to make your measurements between the service-entrance neutral and all subsequent ground points.



Trouble Shooting

1. Snap the jaws open and closed two or three times before turning the meter on
2. Do not clamp on to any device during the power-up initialization sequence.
3. Snap the jaws two or three times after clamping on to the ground electrode or rod.
4. Slight amounts of drift may occur at high resistance measurements. This is normal, and should not be cause for concern.

Blank display or any failure mode

Replace the battery before proceeding.

Start-up Initialization Failure

The start-up calibration will continue indefinitely if the jaws are open or dirty. Check that the jaws' mating surfaces are clean. Do not open the jaws while the initialization sequence is running.

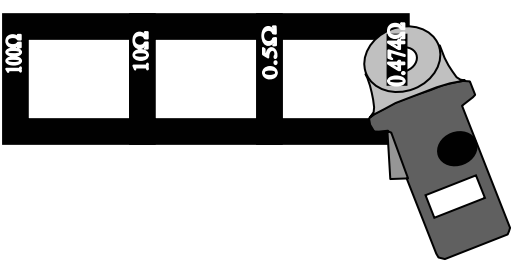
Noise on the Ground Electrode or Rod

If noise is present (over 3A or 30V) on the ground electrode or rod, the word "**NOISE**" will appear on the display and readings can no longer be considered accurate. Before the meter can be used accurately, the noise problem must be addressed.

Reference Test Loop

The reference test loop is a set of resistors that provides a means to check the performance of the meter.

1. Open the measurement jaws and check that the mating surfaces are clean and free of dust, dirt, or any foreign substances. Clean if necessary.
2. Clamp the meter around the reference loop as shown in the diagram.
3. Give the meter a few seconds to settle and read the measurement. The meter should display approximately the same value as marked on the reference loop, taking into consideration the accuracy listed in the specification chart. If the readings are not similar to what is marked on the reference loop, consult the **Trouble Shooting** and **Maintenance** sections of this manual.



Maintenance

General Care

You should store your ground resistance tester and reference loop in its case when not in use. A damp cloth may be used to clean any surface dirt from the meter. Never use any harsh detergents or cleaners to clean your meter.

Battery Replacement

When the low battery symbol appears on the display, replace the meter's 9V battery. Use a high quality alkaline battery whenever replacement becomes necessary.

1. Remove the two rear screws and open the meter housing.
2. Replace the battery, close the meter housing, and affix the two rear screws.

Jaw Maintenance

The jaws may be brushed clean with a toothbrush or similar soft-bristled brush. Care must be taken to ensure that the contact fins are not bent or deformed, as this will affect the operation of the meter.

CALIBRATION AND REPAIR SERVICES

Extech offers complete repair and calibration services for all of the products we sell. For periodic calibration, NIST certification or repair of any Extech product, call customer service for details on services available. Extech recommends that calibration be performed on an annual basis to insure calibration integrity.

☎
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