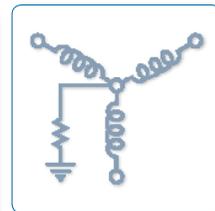
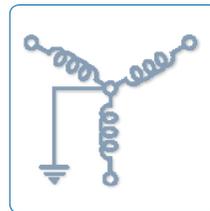
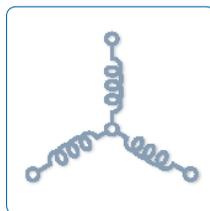
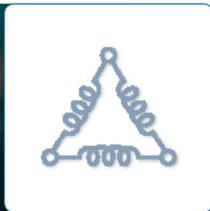
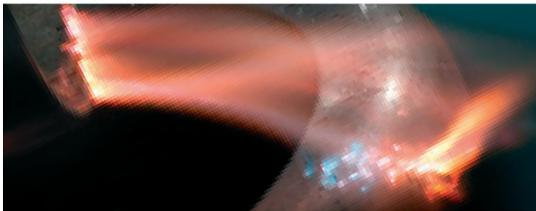




NGR

NEUTRAL GROUNDING RESISTOR

NGR



Installation and Maintenance
Instruction Manual C-100EM, September 2014

NEUTRAL GROUNDING RESISTORS



WARNING

Neutral Grounding (Earthing) resistors, like all high voltage electrical apparatus, can pose a danger to life or health if operated without adequate safety precautions. They should only be installed or maintained by personnel who are trained in high voltage electrical installations. All electrical equipment, including neutral grounding resistors, should be disconnected from the electrical supply, the disconnecting switch should be locked out and the equipment should be grounded during any service or maintenance operation.

TABLE OF CONTENTS

1. Shipping.....	3
2. Receiving.....	4
3. Installation.....	5
4. Inspection.....	6
5. Neutral Connection.....	7
6. Ground Connection.....	7
7. Maintenance.....	7
8. Figures.....	8

PHOTOS

Photo #1: I-Gard NGR (upright position)	3
Photo #2: I-Gard NGR being handles with a hand truck	3
Photo #3: Ceramic bushing packaged separately and secured inside the enclosure ..	3
Photo #4: Bushing Assembly step 1	3
Photo #5: Bushing Assembly step 2	4
Photo #6: Bushing Assembly step 3	4
Photo #7: Bushing Assembly step 4	4
Photo #8: Bushing Assembly step 5	4
Photo #9: Bushing Assembly step 6	4
Photo #10: 11/16" holes provided at each enclosure frame leg	

FIGURES

Figure A Neutral Connection Options	8
Figure B Neutral Connection Options	9
Figure C Neutral Connection Options	9
Figure D Ground Connection Options	10
Figure E Ground Connection Options	10
Figure F Ground Connection Options	11
Figure G Ground Connection Options	11

1. SHIPPING

I-Gard Neutral Grounding Resistors are shipped in their normal, upright position. The units are securely fastened to wooden skids.

In cases where additional support to the resistor banks is required during shipment, wooden or haysite bracing material is used inside the resistor enclosure. In such cases, a sign indicating the removal of these supports before energizing is placed outside the enclosure.



Photo #2: I-Gard NGR being handled with a hand truck

The Neutral Grounding (Earthing) Resistors have been properly tested prior to shipping. The test report is attached to the documentation accompanying the enclosure.

The neutral bushing could have been shipped in a separate package to avoid possible damage during shipping. In that case the ceramic bushing is, placed and secured inside the enclosure.



Photo #4: Bushing Assembly Step 1



Photo #1: I-Gard NGR (upright position)

All crated resistors are clearly marked with shipping information including customer's purchase number, tags and/or special instructions.

The finished crates are easily handled with a forklift or hand trucks and normally loaded into covered truck-vans by hand truck.



Photo #3: Ceramic bushing packaged separately and secured inside the enclosure

To install the Neutral Bushing, proceed to un-pack the bushing ensuring it is in good condition, should the ceramic be cracked the bushing will need to be replaced. The bushing assembly has four (4) main components, the Bushing itself, the top rubber gasket, the back bracket and the holding spring.

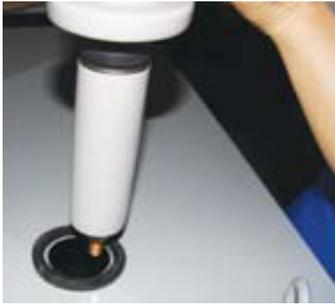


Photo #5: Bushing Assembly Step 2

Place the gasket on the top side of the enclosure prior to inserting the bushing.



Photo #6: Bushing Assembly Step 3

Insert the bushing from the top.



Photo #7: Bushing Assembly Step 4

From inside the enclosure, insert the back bracket from the lower end of the bushing.



Photo #8: Bushing Assembly Step 5

Followed by the holding spring. Ensure to set the holding spring in the groove prior to tightening the bolts on the back bracket.



Photo #9: Bushing Assembly Step 6

Prior to tightening the back bracket, ensure that the gasket is well positioned and that the bushing sits exactly on top of it, then tighten the bracket.

2. RECEIVING

Once delivered, the crated resistor should be unloaded and moved by forklift. Heavier and bulkier units may also be unloaded with a crane. Four lifting eyebolts are provided in each top corner of the equipment. At this point, a visual inspection of the crate should be made to ensure proper handling has been practiced during shipment.

It is recommended that the unit remains crated until it reaches the job site. I-Gard crated Neutral Grounding (Earthing) Resistors are suitable for prolonged storage. They should however be stored upright as shipped.

3. INSTALLATION

Upon receipt of the equipment at the job site, proceed to uncrate the resistor and remove the skid fasteners. Extra care should be taken while uncrating in order not to damage the ceramic insulation bushings or the enclosure.

Once all the crating and covering material have been removed, the resistor is ready for installation. It is recommended that a hoisting device is used to lift the unit with the aid of the eyebolts provided on top of the enclosure. If a hoisting device is not available, a forklift may be used, provided the forks rest against the steel angles and not the screen.

I-Gard Neutral Grounding (Earthing) Resistor may be mounted on a concrete pad, support brackets, support stands or directly on top of the transformer. In all cases the resistor must be mounted horizontally.



PHOTO #10: 11/16" holes provided at each enclosure frame leg

The unit should be bolted to the mounting surface using the 11/16" holes provided at each enclosure frame leg.

NOTES:

- It is recommended that all the bracing material inside the enclosure remain intact until the unit is installed
- Ensure that the enclosure is securely bonded to ground through the 9/16" hole provided on one of the enclosure legs.
- Should you require a special dimension or a different mounting arrangement I-Gard may customize the equipment to suit your specific needs.

4. INSPECTION

Once the unit has been mounted and grounded, proceed to remove any of the side covers (except covers supporting an entrance bushing) for inspection and wiring.



All the bracing material inside the resistor bank (if used) and other packing material, such as envelopes containing drawings and test reports, must be removed.

With all the packing material and envelopes removed, carefully proceed to inspect for insulators, bushings and other parts that may have been damaged in transit. Should the resistor show damage during transportation, a claim should be processed with the transportation company immediately. I-Gard should be advised to rush and order for substitute parts.

Ensure that all the electrical connections are torqued as follows:

SOCKET SIZE (across flats, in torque)		TIGHTENING NEWTON (metres)	
inches	mm	Foot-Pound	Newton-Metres
5/32"	3.97mm	0.96 ft-lb	1.3 N-m
3/16"	4.76mm	10.03 ft-lb	13.6 N-m
7/32"	5.56mm	12.54 ft-lb	17.0 N-m
1/4"	6.35mm	14.60 ft-lb	19.8 N-m
5/16"	7.94mm	20.87 ft-lb	28.3 N-m
3/8"	9.52mm	29.13 ft-lb	39.5 N-m
1/2"	12.7mm	37.47 ft-lb	50.8 N-m
9/16"	14.29mm	50 ft-lb	67.8 N-m

If the neutral bushing was shipped in a separate packaged, it should be installed at this point.

NOTE: Do not energize the unit if damaged parts are found, in order not to damage the resistor and cause shock hazard to personnel.

5. NEUTRAL CONNECTION

Ensure that the unit is disconnected, according to local safety procedures.

The neutral wire from the transformer or generator may be connected to the resistor as follows:

- A. By way of entrance bushing mounted on top or side of resistor enclosure. The bushing may have an eyebolt connector or a two hole or four hole NEMA pad type connector. (See Fig. "A")
- B. By way of tin plated copper bus mounted on standoff placed on the resistor bank frame or enclosure bottom. (See Fig. "B")
- C. Through a current transformer primary. With the other primary connected at the factory to the resistor "N". The Current Transformer could be mounted inside the enclosure housing the resistor or in a separate connection box. (See Fig. "C")

All connections are to be labeled accordingly "N" Neutral, "G" Ground (Earth).

6. GROUND CONNECTION

The ground wire from the resistor to ground may be connected as follows:

- D. By way of tin plated copper bus mounted on standoffs placed on the resistor frame or enclosure bottom. (See Fig. "D")
- E. By way of two hole NEMA pad mounted on one leg of the resistor enclosure with one side connected to the resistor element at factory. (See Fig. "E")
- F. By way of entrance bushing mounted on top or side of resistor enclosure. (See Fig. "F")

All connections are to be labeled accordingly "N" Neutral, "G" Ground (Earth).

7. MAINTENANCE

Periodic inspections for cleaning and detecting any damage are needed to ensure that the resistor will perform to protect the electrical system. Damage may occur from lightning, storms, earthquakes, wildlife, overloads or extended service life.

I. The following procedure is recommended for periodic inspection:

1. Disconnect and Isolate the electrical system being grounded through the Neutral Grounding (Earthing) Resistors and open the connection between the system neutral and Neutral Grounding Resistor.
2. Remove all the side covers (except covers supporting an entrance bushing) to allow a visual inspection of all the parts.
3. Check for cracked insulators or bushings. A Megger or Hi-Pot Test is the most reliable method of ensuring the integrity of electrical insulation.

I-Gard standard Hi-Pot test is performed at two times the rated voltage plus 1000 volts during 60 seconds.

4. Check the resistive element for continuity. An ohmmeter reading between the neutral and ground side of the resistor should be within 10% of nameplate value. If reading found to be higher or lower than 10%, the resistor must be changed.
5. Check all the internal connections for tightness.
6. Check the wiring for signs of damage from heat or overloads.
7. Check the enclosure for signs of damage from weather or rodents.
8. In environments where there may be excessive or metallic dust, a yearly power wash is recommended.

IF THE UNIT IS POWER WASHED, THE UNIT MUST BE DISCONNECTED FROM THE POWER SOURCE FIRST. Safety glasses should be worn while cleaning . In addition the unit must be completely dry before reconnecting to the power source.

9. For replacement or further information, call I-Gard Corp. toll free at 1 888 737-4787, or visit our web site www.i-gard.com to find your closest I-Gard representative.

8. FIGURES

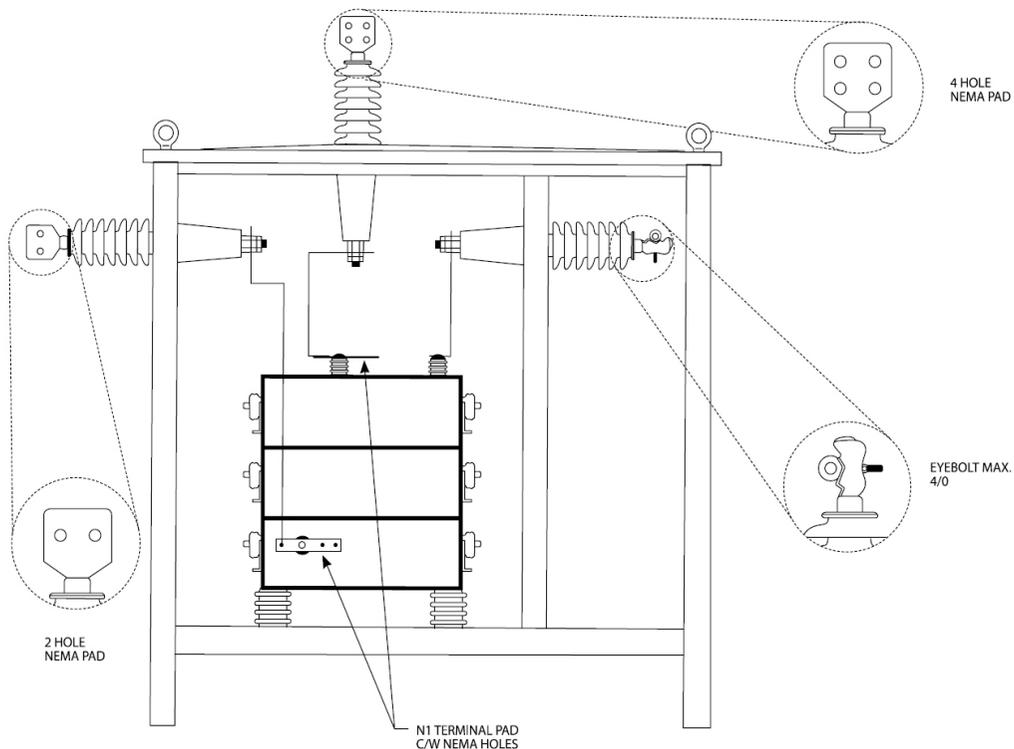


Figure A. Neutral Grounding Resistor to Transformer Neutral Connection Using Entrance Bushing

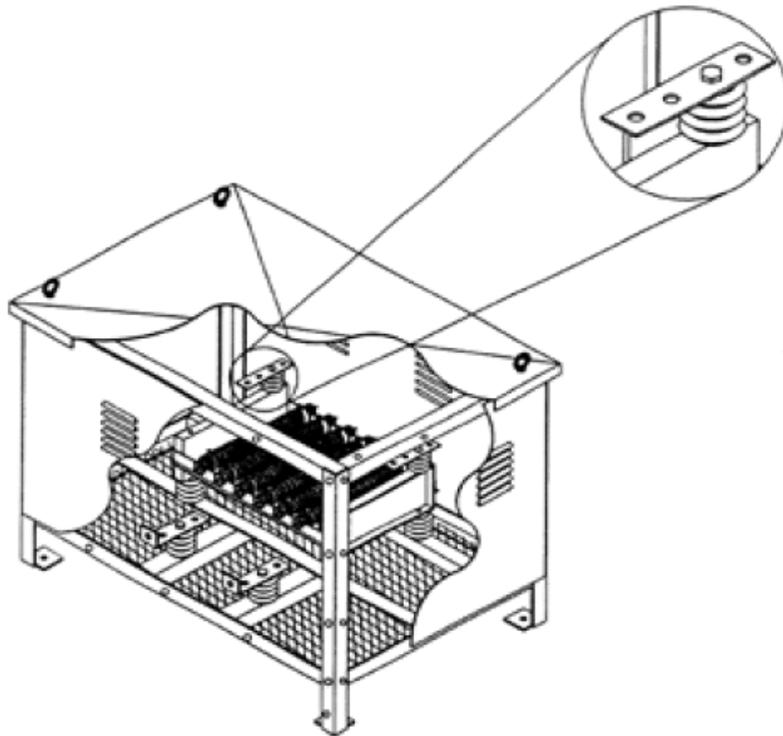


Figure B. Neutral Grounding Resistor to Transformer Neutral Connection Using Internally Mounted Copper Bus

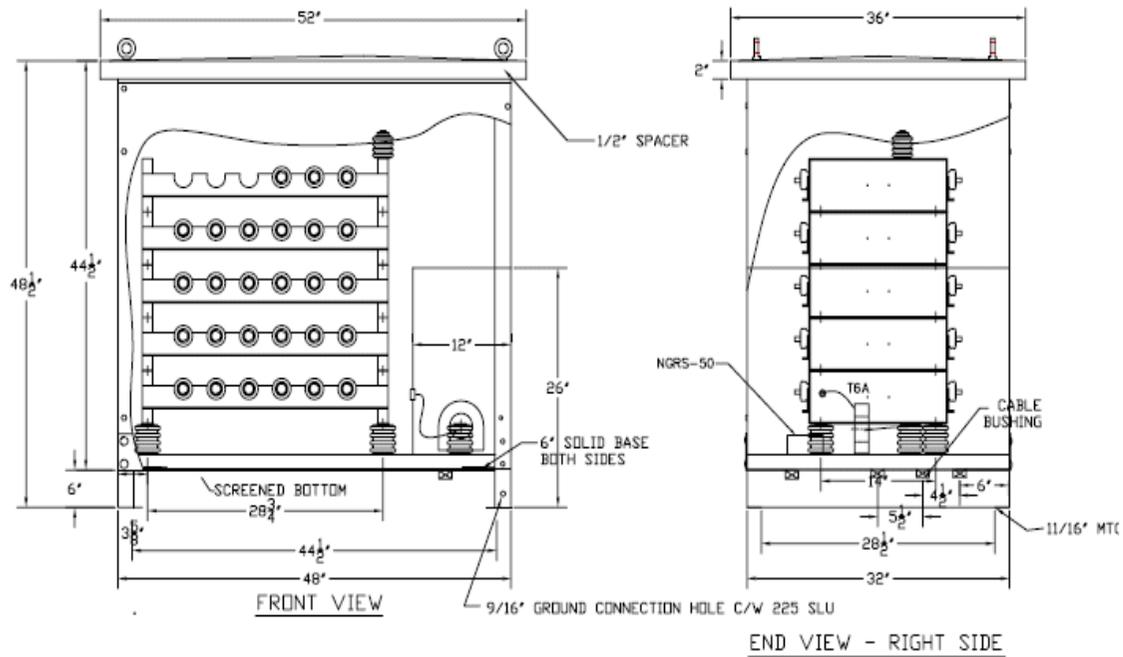


Figure C. Neutral Grounding Resistor to T6A sensor

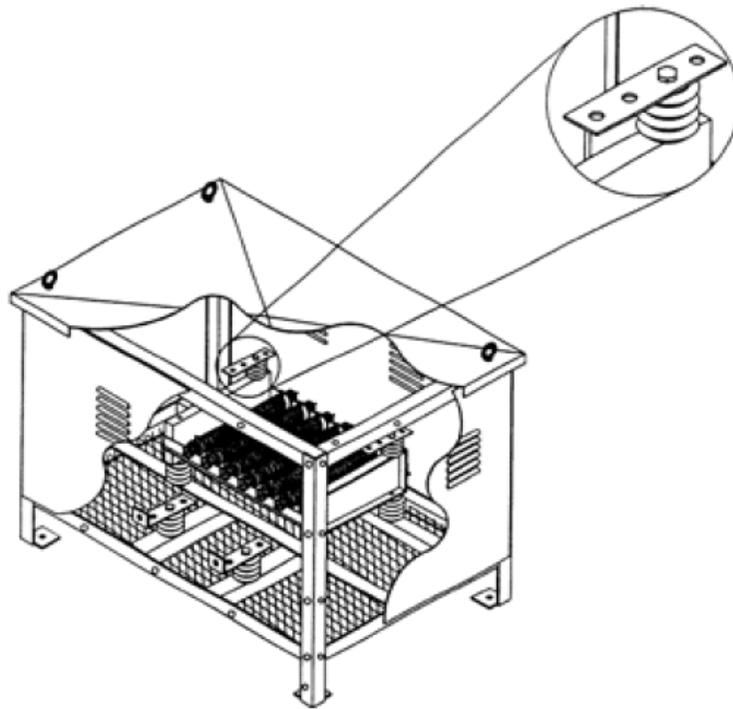


Figure D. Neutral Grounding Resistor to Ground Connection Using Internally Mounted Copper Bus

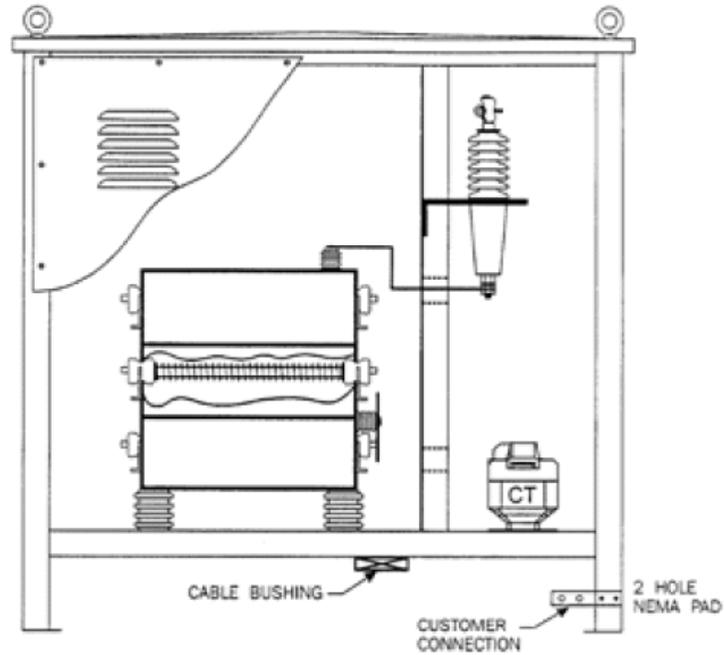


Figure E. Neutral Grounding Resistor to Ground Connection

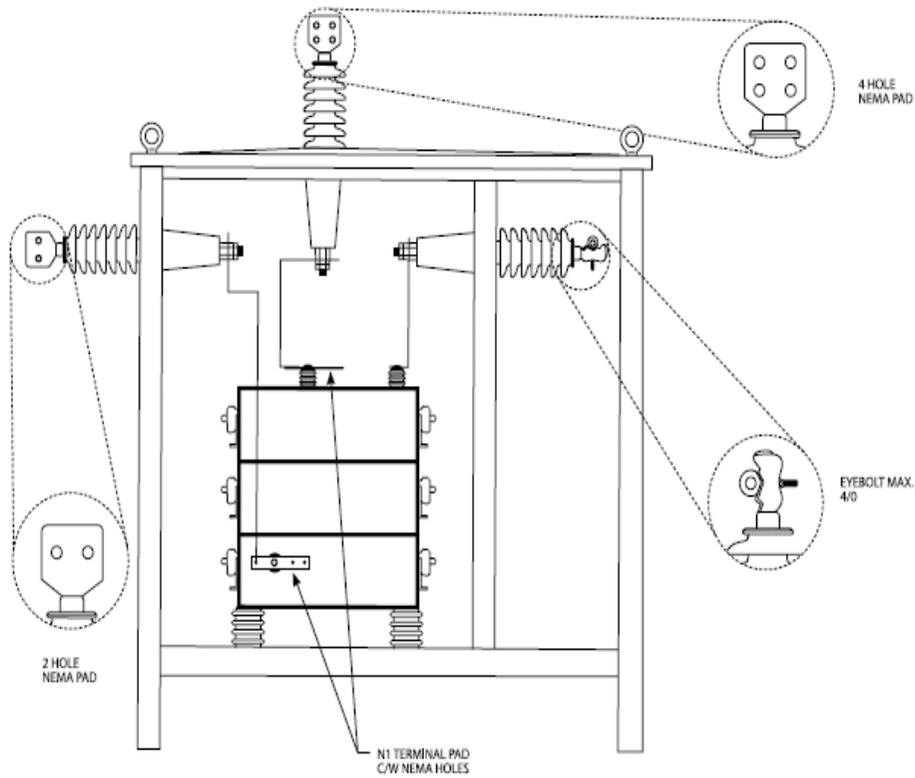


Figure F. Neutral Grounding Resistor to Ground Connection Using Entrance Bushing

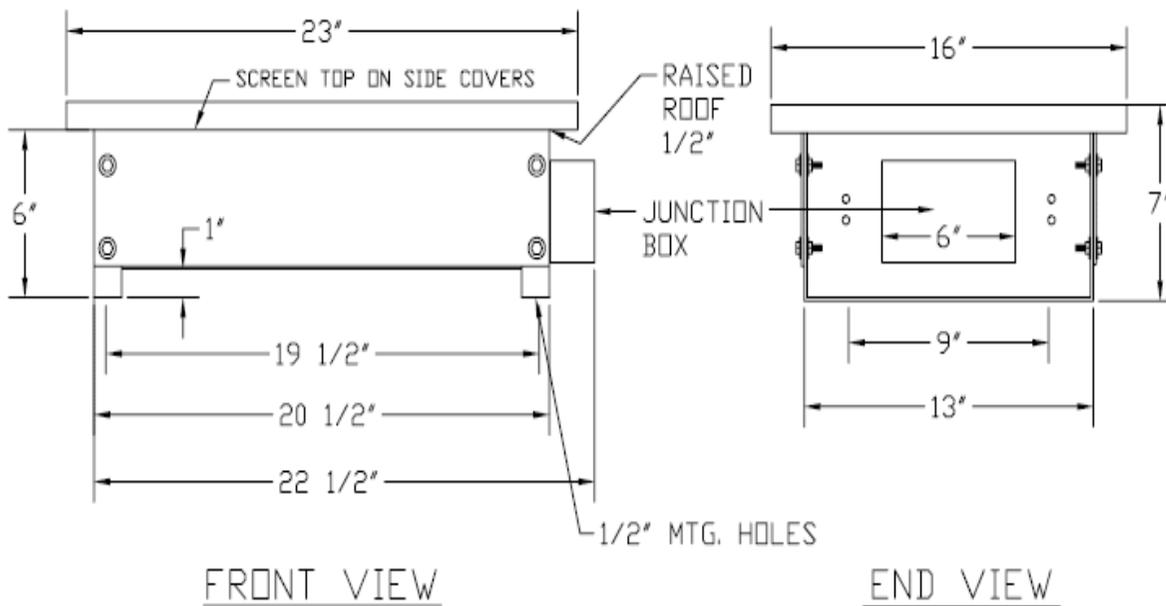


Figure G. Standard Low Voltage, Neutral Grounding resistor drawing (sample)



Unparalleled Protection

Phone: 905-673-1553
Toll Free: 1-888-737-4787

Fax: 905-673-8472
sales@i-gard.com



www.i-gard.com