

IMPEDANCE NEUTRAL GROUNDING ASSEMBLY INSTALLATION AND MAINTENANCE INSTRUCTIONS



Post Glover
"The Resistor Specialists"

1369 Cox Avenue. • Erlanger, KY 41018 • USA
Phone: 800-537-6144 / 859-283-0778 • Fax: 859-283-2978
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FOREWORD

This manual covers the installation and maintenance for what are commonly referred to as neutral grounding resistors, step-down transformers with grounding resistors, and neutral deriving zig-zag transformers with grounding resistors. Refer to the appropriate section(s) depending on the product purchased. Customer requested options and/or physical configurations may require unique termination methods. Consult the factory drawings for job-specific details.

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Section 1 – Unpacking

1.1 Shipping

Post Glover neutral grounding resistors are placed in their normal mounting position onto a wooden skid and securely fastened to the skid with lag bolts. The units are then covered with plastic to protect the finish and to prevent dirt or moisture buildup that can occur during shipping or storage.

Wooden supports may be used inside the enclosure to support the resistor banks.

All units are loaded by forklift into the enclosed van of a common carrier. At that point, it is the responsibility of the carrier to provide proper care in shipping and handling.

1.2 Receiving

Once received, the skid-mounted unit should be unloaded and moved by forklift. At this point, a preliminary inspection of the unit should be made to ensure proper handling was practiced during shipment. It is recommended that the unit remain on the skid until it reaches the job site to prevent possible damage during transfer. Do not move the unit with covers uninstalled.

1.3 Storage

All Neutral Grounding Resistors are suitable for prolonged storage. The unit should sit horizontal (as shipped) and never on the sides or top.

NOTE: Do not stack.

Units designed for indoor use, must be stored indoors.

Removable shipping braces should not be removed until the unit reaches the final installation point. Plastic clear wrap should be removed to prevent the formation of mildew.

Where purchased with the optional heater and thermostat, the heater may be powered to prevent condensation.

Section 2 – Installation

WARNING: Install only in access restricted locations.

AVERTISSEMENT: Installer seulement dans des endroits auxquels l'accès est limité.

When the unit arrives at the job site, remove the lag bolts which fasten the resistor unit to the skid. Fork-lift channels may be provided to aid handling of the unit. Top-mounted eye-bolts may be provided for easy hoisting and placement by crane; it is important to use all eye-bolts when lifting the unit.

It is the responsibility of the user to utilize adequate mounting hardware. Post Glover seismic and high-wind rated units should be mounted on a concrete pad. Support stands up to 8 feet tall are available for some models.

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Non-seismic rated neutral grounding assemblies can be mounted on a concrete pad or support stand near the transformer if the unit's size and weight permit. It is important that the enclosure be mounted horizontally (as shipped). This keeps the unit drip-proof, allows for adequate cooling, and prevents unnecessary strain on the support insulators.

Seismic/wind rated NGR units should be bolted to the mounting surface using the holes provided in the bottom of each enclosure leg using Grade A325 bolts, A563-DH nuts, and Type A USS washers (or supplied washers). Additional holes for mounting are provided in the forklift channels. Support stands are attached to the mounting surface using all (8) legs. Shims used in shipping may be used under the outer (4) legs to make a level surface. Expansion-type anchors are recommended for concrete pad mounting.

NOTE: The enclosure should always be securely grounded to prevent a shock hazard to personnel or wildlife. A NEMA 2 hole connection point is available to connect to on all enclosure bottom corners.

NOTE: Outdoor duty rated devices shall be installed in a location that is inaccessible in accordance with local codes, such as Canadian Electrical Code, Part 1.

WARNING: When mounting on or over a combustible surface, a floor plate of at least 1.43 mm galvanized steel or 1.6 mm uncoated steel extending at least 150 mm beyond the equipment on all sides shall be installed.

AVERTISSEMENT: Lorsque l'appareil est installé sur ou au-dessus d'une surface combustible, on doit prévoir une plaque d'acier galvanisé d'au moins 1.43 mm ou une plaque d'acier sans revêtement de 1.6 mm

Section 3 – Inspection

After the unit has been securely mounted and the enclosure grounded, the interior of the unit shall be inspected. On a seismic unit, remove the access panels and louvers (do NOT remove the sides of the unit). On non-seismic units, remove the front panel to allow inspection and wiring. The front panel can be identified by the Post Glover nameplate.

NOTE: Remove all packing material, is any, used to protect the insulators, resistor banks and/or transformers during shipment. Failure to remove this material may result in fire hazard.

With all packing material removed, carefully inspect the inside of the unit for broken insulators, bushings and other parts that may have been damaged during shipment.

NOTE: If any damaged parts are found, contact the carrier immediately. Energizing the unit with defective parts may damage the resistor and create a shock hazard to personnel.

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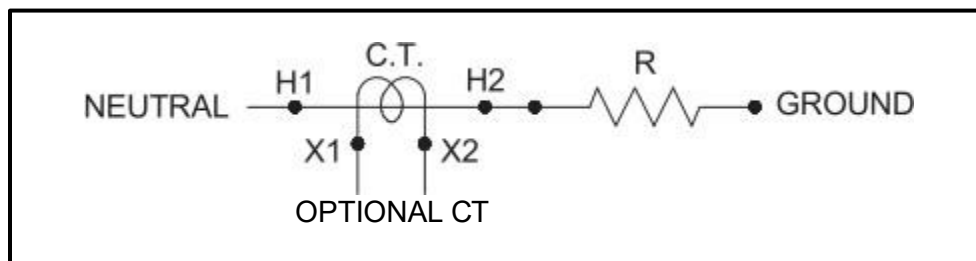
Section 4 – Connection

NOTE: It is possible for the electrical connections to loosen during transit. Check all electrical connections to ensure they are firmly tightened.

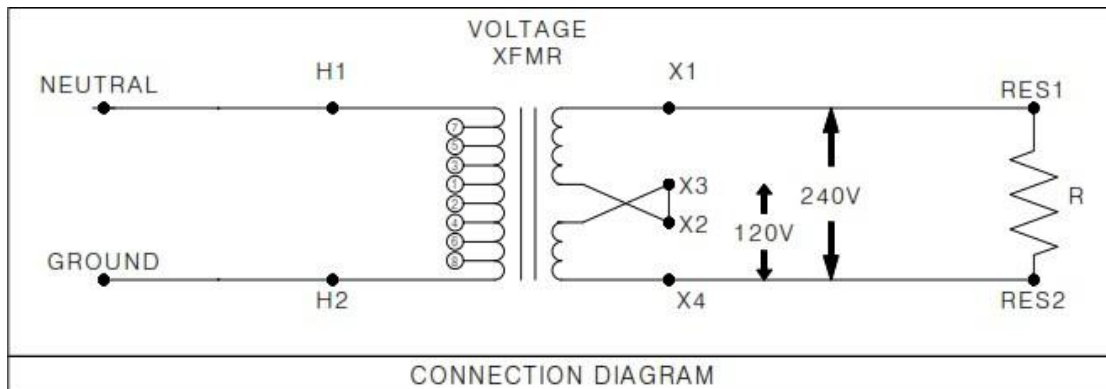
NOTE: Consult local and NEC codes for proper cable sizing.

4.1 Neutral Lead – Resistor only or Step-down transformer with Resistor

TYPICAL CONNECTION DIAGRAM – GROUNDING RESISTOR



TYPICAL CONNECTION DIAGRAM – STEP DOWN TRANSFORMER



The neutral lead from the transformer or generator may be connected one of five ways depending upon the specific design:

1. The connection is made directly to a top or side-mounted entrance bushing. The bushing has a NEMA two-hole pad-type connector. (See Figure 1.) Optional 4-hole pad-type are available.
2. For some grid type resistors, the connection is made directly to the resistive element inside the enclosure via rigid conduit entering from the bottom. The neutral terminal is tagged for easy

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identification. A compression type lug is recommended for terminal connection. Location of the conduit is the customer's responsibility. (See Figure 2.)

- For wirewound or edgewound type (and some grid type) resistors, the connection is made to a terminal point separate from the resistor. This configuration prevents undue stress on the actual elements. The neutral terminal is tagged for easy identification. Location of the conduit is the customer's responsibility. (See Figure 3.)
- The connection is made directly to the primary terminal of the bar-type current transformer which is mounted inside the enclosure. This terminal will be tagged "NEUTRAL" and requires a customer-supplied lug and bolt. The other primary terminal of the current transformer has been factory wired to the resistive element. The neutral lead usually enters from the bottom through conduit. (See Figure 4.) Sometimes the current transformer is factory wired to a top-mounted entrance bushing, in which case the connection is the same as the first example above. (See Figure 1.)
- On low voltage applications the connection will typically be made to a terminal block inside the enclosure.

In all cases, the neutral terminal is tagged for easy identification and the proper connection is shown schematically on the drawing.

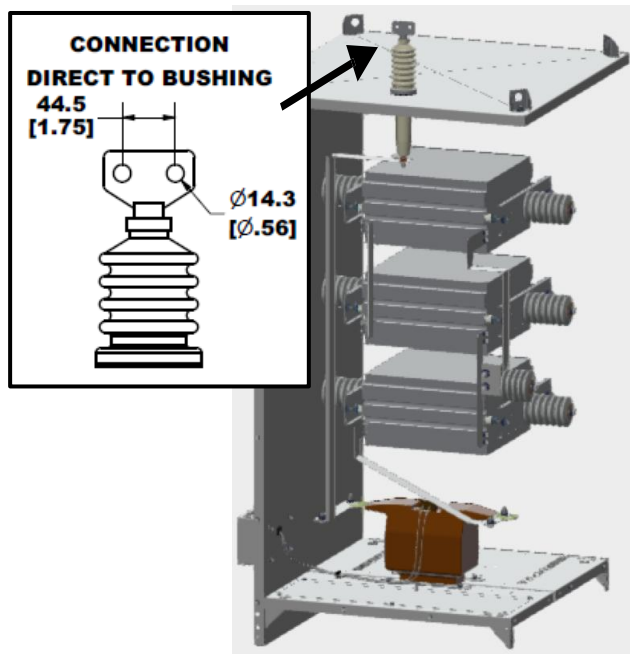


Figure 1: NEMA two-hole pad

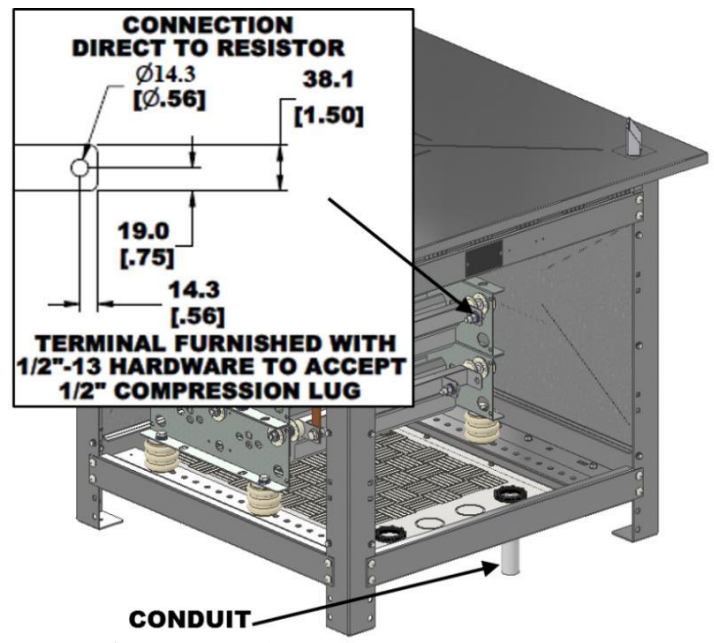


Figure 2: Grid resistors

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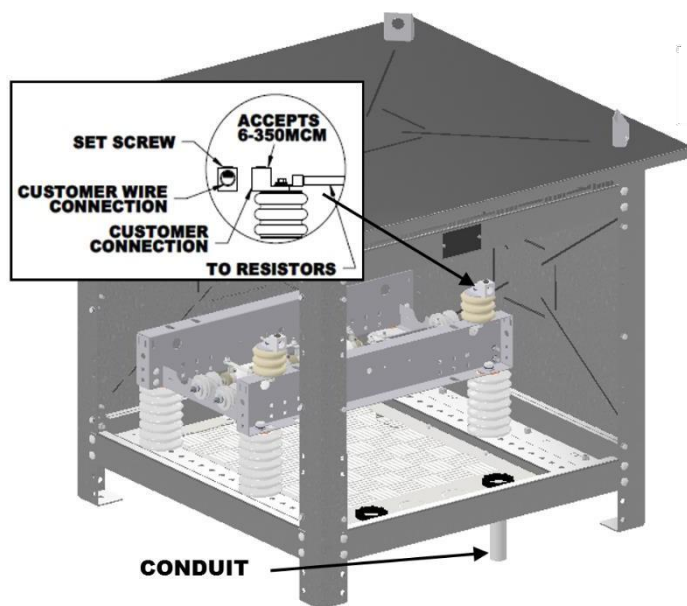


Figure 3: Wirewound or edgewound resistors

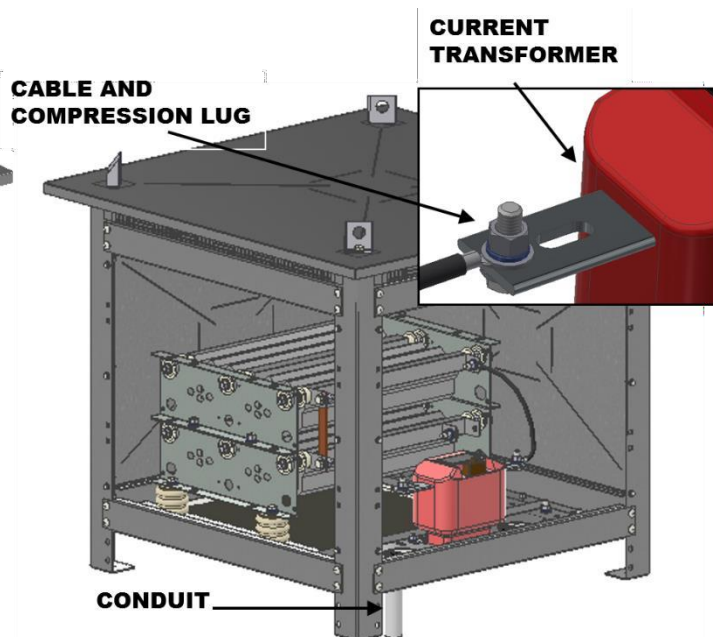


Figure 4: Primary of current transformer

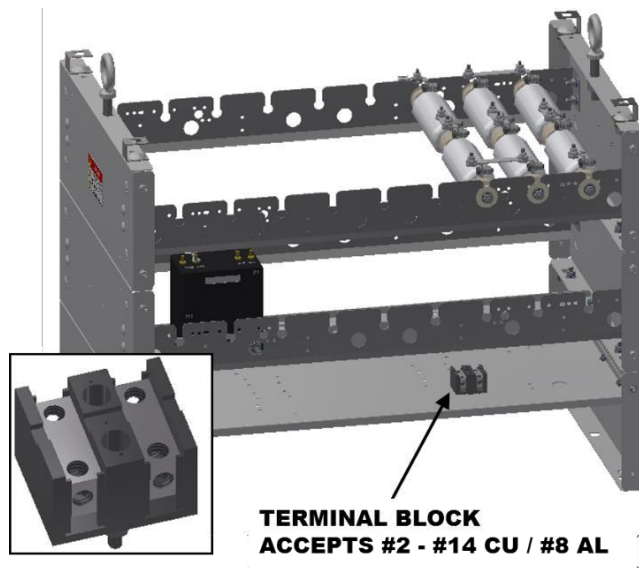


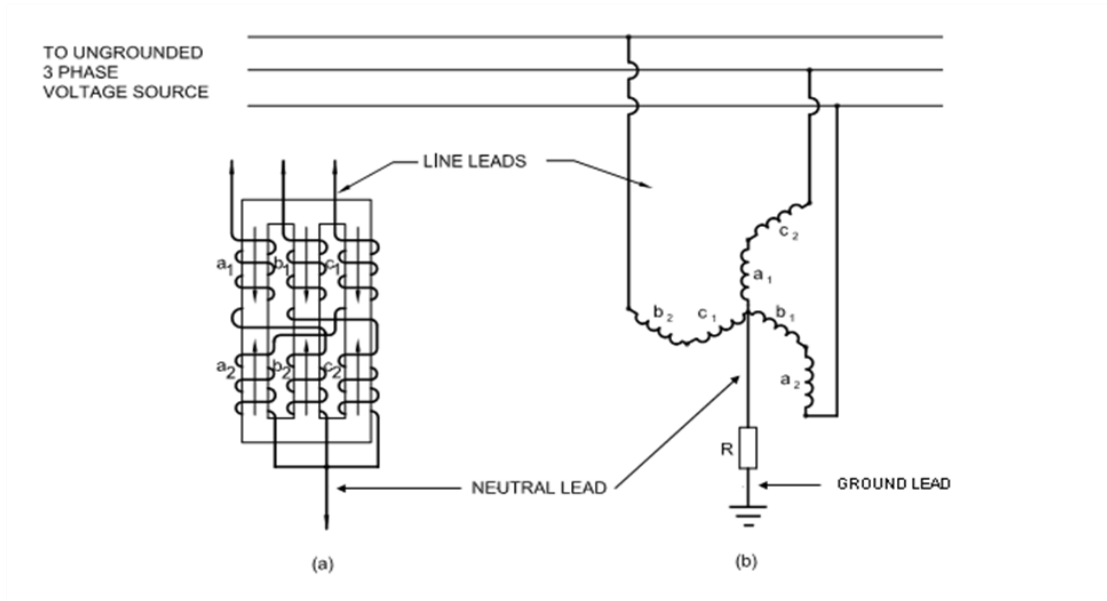
Figure 5: Terminal block (low voltage)

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4.2 Phase Leads – Zig-Zag Transformer with Resistor

TYPICAL CONNECTION DIAGRAM – ZIG-ZAG TRANSFORMER



The phase or line leads from the transformer or generator may be connected one of two ways depending upon the specific design:

1. The connection is made directly to top-mounted entrance bushings. The bushings have a NEMA two-hole pad-type connector. (See Figure 1)
2. With the cables entering via rigid conduit from the bottom of the enclosure, the phase connections are made directly on the X1, X2, and X3 terminals of the grounding transformer. A compression type lug or NEMA 2/4 hole pad is used for terminal connection. Alternately, the lug or terminal may be mounted on a stand-off insulator to simplify installation. Location of the conduit is the customer's responsibility. (See Figure 3)

Customer requested options and/or physical configurations may require unique termination methods, Consult the factory drawings for job-specific details.

One terminal from the resistor assembly is shorted to the transformer's X0 terminal. Check this connection for tightness and integrity before energization.

In all cases, the neutral terminal is tagged for easy identification and the proper connection is shown schematically on the drawing.

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4.3 Ground Lead

The ground lead from the resistive element to ground may be connected one of three ways:

For some grid type resistors, the connection is made directly to the resistive element inside the enclosure via rigid conduit entering from the bottom. The ground terminal is tagged for easy identification. A compression-type lug is used for the terminal connection. Location of conduit is the customer's responsibility. (See Figure 2.)

For wirewound or edgewound type resistors, the connection is made to a terminal point separate from the resistor. This configuration prevents undue stress on the actual elements. The ground terminal is tagged for easy identification. Location of the conduit is the customer's responsibility. (See Figure 3.)

The connection is made directly to a top-mounted exit bushing. The bushing has a NEMA two-hole pad-type connector. The bushing will be factory wired to the resistive element. (See Figure 1.)

In all cases, the ground terminal is tagged for easy identification and the proper connection is shown schematically on the drawing.

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Section 5 – Maintenance/Inspection

Normally, no maintenance is necessary on a neutral grounding resistor. However, periodic inspections for damage are needed to ensure that the resistor is still capable of protecting the system.

Potential damage may occur from lightning, storms, earthquakes, wildlife, overloads or extended service life. Basically, it is necessary to ensure that the resistive element has not burned open and that the element (including the incoming bushing) is still properly isolated from ground.

The following procedure is recommended for periodic field inspections:

1. De-energize the system being grounded and break the connection between the system, the neutral, and the grounding resistor. An isolation switch is sometimes available to break this connection. These precautions are recommended to prevent a shock hazard to maintenance personnel and to prevent the system from being operated without proper grounding.

WARNING: *Danger: High Voltage*

AVERTISSEMENT: *Danger: Haute Tension*

2. Remove the front and rear access panels/louvers. This will allow for a visual inspection of all internal components.
3. Carefully check for cracked insulators or bushings. A MEGGER or HI-POT test is the most reliable method of ensuring that the porcelain insulation is still providing the necessary electrical isolation.

NOTE: Do not pressure wash step-down or zig-zag transformers.

4. Check the resistive elements for continuity. An ohmmeter reading made between the neutral and the ground side of the resistor should be within 10% of the nameplate value. If the resistance of the element is more than 15% off from the nameplate value, the resistors should be replaced. Any open resistors should be replaced. **COMPLETE NAMEPLATE DATA WILL BE NECESSARY TO OBTAIN REPLACEMENT PARTS.**

For units with a step-down or zig-zag transformer, the connection between the transformer and resistor shall be temporarily disconnected to get an accurate reading.

5. Check all internal connections for tightness. Check wiring for signs of damage from heat or overloads.
6. Vacuum any dirt or debris from the inside of the enclosure.
7. Check the enclosure for signs of damage from weather or rodents. Replace all access panels/louvers removed during inspection and check the mounting bolts for tightness.

**FOR MORE INFORMATION ABOUT POST GLOVER RESISTORS,
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Appendix A – Torque and Cabling Requirements

A.1 Torque Recommendations for Customer Connections

The following table provides the torque required when tightening customer connection hardware unless superseded by documentation provided with the sales order:

SAE				
304, 316, or 18/8 Stainless Steel, Lubricated	Size-Pitch	Torque Value Inch-Lbs.	Torque Value Foot-Lbs.	Torque Value N-m
	#8-32	14.4	1.2	1.6
	#10-32	24	2.0	2.7
	¼"-20	72	6	8
	5/16"-20	120	10	14
	3/8"-16	240	20	27
	½"-13	540	45	61
Zinc Plated #2 Grade Higher, Dry	Size-Pitch	Torque Value Inch-Lbs.	Torque Value Foot-Lbs.	Torque Value N-m
	#8-32	18	1.5	1.6
	#10-32	24	2.0	2.7
	¼"-20	72	6	8
	5/16"-20	120	10	14
	3/8"-16	240	20	27
	½"-13	540	45	61
METRIC				
304, 316, or 18/8 Stainless Steel, Lubricated	Size-Pitch	Torque Value Inch-Lbs.	Torque Value Foot-Lbs.	Torque Value N-m
	M4-0.7	24	2.0	2.7
	M5-0.8	48	4.0	5.4
	M6-1	72	6	8
	M8-1.25	120	10	14
	M10-1.5	240	20	27
	M12-1.75	540	45	61
	M14-2	-	75	102
	M16-2	-	120	163

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A.2 Cable Recommendations Based on Published Requirements

Ampacity of Neutral Grounding Assembly	Minimum Size of Copper Conductor (AWG)
100 A	8
200 A	6
400 A	3
600 A	1
800 A	0
Over 800 A	00

Excerpt from C22.2 No 295-15 Table 3