C-461EM

Ground Fault Protection

Medium Voltage Artificial Neutrals

Installation and Maintenance Instruction Manual

GARD

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WARNING

Artificial Neutrals with Grounding resistors, like all high voltage electrical apparatus, can pose a danger to life or health if operated without adequate safety precautions.

These assemblies should only be installed or maintained by qualified personnel, adequately trained in high voltage electrical installations.

Please note that the Grounding Transformer and Grounding Resistors may not be necessarily inside the same enclosure, however, the instructions and recommendations still apply.

All electrical equipment, including Artificial Neutrals, Grounding Transformers and/or Grounding Resistors, should be disconnected from the electrical supply, locked out and grounded before and during any service or maintenance operation in addition to following strict adherence to safety procedures either internally dictated or dictated by local safety authorities.

The installation of the Artificial Neutral, like any other electrical equipment, should meet local electrical codes or standards and be approved for its use by the local authority having jurisdiction.

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GENERAL

The successful and safe operation of Artificial Neutrals which include dry type transformers with Neutral Grounding Resistors is dependent upon proper handling, installation, and maintenance. Neglecting certain fundamental installation and maintenance requirements may lead to personnel injury and the failure of the equipment as well as damage to other property.

Warning - DANGER, There is a hazard of electric shock or burn whenever working in or around electrical equipment. Power must be off before working inside the Artificial Neutral Enclosure.

Each Artificial Neutral is assembled and given complete tests at the factory after which it is inspected and packed for shipment.

SHIPPING

I-Gard Medium and High Voltage Artificial Neutrals with Grounding Resistors are shipped in their normal, upright position. The Grounding Transformer and the Resistor assembly are securely fastened to treated wooden skids.

In cases where additional support to the grounding transformer and resistor banks is required during shipment, wooden or GP-03(glastic) bracing material is used inside the enclosure. The bracing should be removed before energizing the equipment. On seismic rated assemblies the bracing is exclusively made with non conductive GP-03 and in such cases the bracing should not be removed. Please review the specific drawing for the assembly and the bracing label (“Remove Bracing”) on the enclosure before removing the bracing.

All enclosures are clearly marked with shipping information including customer’s purchase number, tags or special instructions.

The Artificial Neutrals are mounted and bolted on a wooden skid to be easily handled with forklift or hand trucks and normally loaded into covered truck-vans by hand truck. If hoisting the crated equipment please make sure to use spreaders to avoid damage to the equipment.

Unless otherwise specified I-Gard’s responsibility ends at our docks and at this point it is the responsibility of the carrier to provide proper handling until the equipment is delivered at its final destination.

All the equipment has been properly tested prior to shipping.

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In certain cases the High Voltage, Neutral or Ground Bushings may ship loose to avoid possible damage during shipping or to allow for adequate crating. In such cases additional instructions for remounting the bushings are provided.

INSPECTION UPON RECEIPT:

Immediately upon receipt of the shipment, identify all units and check them against the shipping list. At this point, a visual inspection of the crate should be made to ensure that it was properly handled during shipment and to detect any damage which may have been incurred during transit.

If any damage is discovered, file a claim immediately with the carrier. A notice of the extent of damage should be immediately sent to the carrier, I-Gard and to the local sales office, indicating complete identification, carrier's name and details of the extent of the damage. The information will enable the customer and I-Gard to supply necessary data in support of claim.

It is strongly recommended that the unit remains on the skid or crated until reaching its final installation location at the jobsite.

HANDLING

The Artificial Neutrals are mounted and bolted on a wooden skid to be easily handled with forklift or hand trucks. The skid is designed to allow easy handling and to provide protection during shipment. All Artificial Neutrals may be dragged or skidded into position. It is recommended that the skid be left underneath the Artificial Neutral until it is installed unless it is to be moved by rolling. Lifting eye-bolts are provided on the top frame. The eyes are designed to allow hoisting or overhead lifts with a crane. Proper care should be taken when lifting to prevent cables or slings from damaging the enclosures or other parts of the Artificial Neutral. The use of a spreader is recommended. Also, four-point lifts should always be used.

CAUTION - Never attempt to lift an Artificial Neutral from points other than the lifting eye-bolts provided on the top of the frame. No Artificial Neutral, Grounding Transformer or Neutral Grounding Resistor should be laid on its side or end for any reason. The windings, structure, Fastening bolts and vibration isolators are designed to handle the normal weight on an upright position and stress from shipment and usage. These parts are

not designed to accept stresses from tipping, excessive tilting or similar actions. Damage beyond repair can occur if the Artificial neutral is turned on its side.

STORAGE:

Any Artificial Neutral which is not installed and energized immediately should be stored in a dry clean space having a uniform temperature to prevent condensation. Preferably, it should be stored in a heated building having adequate air circulation and protected from cement, plaster, paint, dirt, moisture and water. In locations where moisture and condensation can exist, it is recommended that heat lamps or space heaters be installed. Areas which can flood or retain water should be avoided. The protective plastic wrapping should be left in place during storage. This provides protection from moisture and falling dirt.

INSTALLATION

Upon receipt at the final installation position at the job site, unpack the Artificial Neutral and remove the skid fasteners.

Extra care should be exercised while unpacking in order not to damage the internal components (grounding transformer, insulators, current or voltage transformers and or protection relays) which may be part of the assembly and or the enclosure.

Once all packing and covering material has been removed, proceed to remove the walls of the enclosure chosen for access. The four side walls of the enclosure are removable unless other means of access to the inside of the equipment were specified. The Artificial Neutral is ready for installation.

For its final positioning it is recommended that a hoisting device is used to lift the unit with the aid of the eyebolts provided on top of the frame, if a hoisting device is not available, a forklift may be used, provided the forks rest against the steel angles supports and not the bottom screen of the enclosure.

Grounding transformers, Instrument transformers installed inside the Artificial Neutral Enclosure are Dry type transformers and like other components (relays) which may be installed inside the enclosure are rated for indoor use unless inside the enclosure which is specifically designed for outdoor weather-proof service.

All the components inside the Artificial Neutral are cooled by means of free circulation of air, the maximum ambient temperature should not exceed 40^{o}C unless the Grounding transformer was built for a higher temperature rating. Damage may result if the air flow is restricted, or the grounding transformer is loaded beyond its rated capacity.

Due to various building and room constructions, it is recommended that applicable codes be followed. Factors which should be kept in mind when locating Artificial Neutrals are: Personnel safety, accessibility, ventilation, locations affecting sound level, and environmental conditions.

Installations should be made in an area reasonably free from dust, moisture, chemicals, and corrosive vapors or fumes. Artificial Neutrals, Grounding Transformers and Neutral Grounding Resistors must be installed in an upright position.

NOTES :

- It is recommended that all the bracing material inside the enclosure remains intact until the unit is completely installed.
- Ensure that the enclosure is securely grounded using the 9/16” hole provided on one of the enclosure legs.

ELECTRICAL CONNECTION

High Voltage Connection: A gland plate or a cable bushing is supplied on the bottom of the enclosure for bottom cable entry on the High Voltage side of the enclosure (Grounding Transformer side). The installation of additional cable supports is always recommended to prevent damaging the transformer terminals. Some special enclosures are supplied with wall bushings for external connection points.

Additional space inside the enclosure is provided to allow for the installation of cable supports and stress cones at cable terminations.

Ground Connection: The ground wire from the Neutral Grounding Resistor to ground may be connected as follows:

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

All joints suitable for field connection of cable or bus have tin-plated contact surfaces. The lug or bus used for connection should be tin-plated, or silver-plated. When plated parts are joined, no surface preparation other than insuring clean surfaces is required. Simply bolt the parts together with the hardware supplied. Once the contact areas have been abraded, assemble the parts and tighten securely. Always use two wrenches when breaking or making joints to prevent damage to parts.

CAUTION - Make only those connections shown on the nameplate or connection diagram. Before energizing, check all jumpers for proper locations, and all bolted connection for tightness.

To ensure good electrical connections, the following torque values are recommended:
1/4-20 Bolt - 7 Foot pounds
3/8-16 Bolt - 20 Foot pounds
1/2-13 Bolt - 30 Foot pounds

BEFORE ENERGIZATION

Once the Artificial Neutral has been installed and connected, remove any side cover (except the cover supporting an entrance bushing) for a final inspection before energizing.

All bracing (if used for shipping) and other packing material must be removed as envelopes containing drawings and test reports. With all packing material and envelopes removed, carefully inspect all insulators, bushings and other parts that may have been damaged in transit and / or installation If damaged parts are found, contact the carrier immediately and advice I-Gard.

Ensure that all electrical connections were performed according to the wiring instructions of the equipment drawing and verify that connection is bolted tight as recommended.

Every Artificial Neutral is supplied with a ground connection to the enclosure which ensures

that all dead metal parts have the same potential. The Artificial Neutral enclosure should be solidly grounded so that no danger will exist for operating or maintenance personnel.

The grounding conductor for the transformer should have a current-carrying capacity in accordance with the National Electric Code.

NOTE : Do not energize the unit if damaged parts are found inside the enclosure. This will prevent further damage to the Grounding Transformer, The Neutral Grounding Resistor or any other component and will prevent shock hazard to the operating personnel.

MAINTENANCE

I-Gard Neutral Artificial Neutrals require no maintenance unless installed in a dirty environment. However, periodic inspections for cleanliness or damage are needed to ensure that the Artificial Neutral will perform to protect the Electrical System on which it is installed.

Damage may occur from lightning, storms, earthquakes, wildlife, overloads or extended service life.

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The following procedure is recommended for periodic inspection:

1. De-energize the system being grounded through the Artificial Neutral and break the connection between the system neutral and neutral grounding resistor.

2. Remove all side covers (except for the cover supporting an entrance bushing) to allow for a visual inspection of all parts.

Points for inspection:

2.a) Dirt, especially accumulations on insulating surfaces or areas which tend to restrict air flow.
2.b) Loose connections.
2.c) Signs of overheating and of voltage creepage over insulating surfaces as evidenced by electrical tracking or carbonization.
2.d) Evidence of rusting, or corrosion of the paint should be corrected.

3. Pay particular attention for cracked insulators or bushings. A Megger or Hi-Pot Test is the most reliable method of ensuring the integrity of electrical insulation.

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 wiring for signs of damage from heat or overloads.

6. Check the enclosure for signs of damage from weather or rodents.

7. For replacement or further information, call I-Gard at 905-673-1553 in Canada.

8. If excessive accumulations of dirt are found on the grounding transformer windings or insulators, the dirt should be removed to permit free air circulation and to guard against the possibility of insulation breakdowns.
The windings may be cleaned with a vacuum cleaner, a blower, or with compressed air. The use of a vacuum cleaner is preferred as the first step in cleaning, followed by the use of compressed dry air or nitrogen.

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