



**01.4IB.50024 PowlVac[®] PVAM Type M
Ground & Test Device Manually Operated**

15kV, 1200A, 36kA/750MVA

Contact Information

Powell Electrical Systems, Inc.

www.powellind.com

info@powellind.com

Service Division

PO Box 12818

Houston, Texas 77217-2818

Tel: 713.944.6900

Fax: 713.948.4569



Signal Words

As stated in ANSI Z535.4-2007, the signal word is a word that calls attention to the safety sign and designates a degree or level of hazard seriousness. The signal words for product safety signs are “**Danger**”, “**Warning**”, and “**Caution**”. These words are defined as:

**DANGER**

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING**

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION**

CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

**CAUTION**

CAUTION, used without the safety alert symbol, is used to address practices not related to personal injury.

**NOTICE**

NOTICE is used to address practices not related to personal injury.

Qualified Person

For the purposes of this manual, a qualified person, as stated in NFPA 70E®, is one who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved. In addition to the above qualifications, one must also be:

1. trained and authorized to energize, deenergize, clear, ground, and tag circuits and equipment in accordance with established safety practices.
2. trained in the proper care and use of personal protective equipment (PPE) such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.
3. trained in rendering first aid if necessary.

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Ch 1 General Information

WARNING

The equipment described in this document may contain high voltages and currents which can cause serious injury or death.

The equipment is designed for use, installation, and maintenance by qualified users of such equipment having experience and training in the field of high voltage electricity. This document and all other documentation shall be fully read, understood, and all warnings and cautions shall be abided by. If there are any discrepancies or questions, the user shall contact Powell immediately at 1.800.480.7273.

WARNING

Before any adjustment, servicing, part replacement, or any other act is performed requiring physical contact with the electrical working components or wiring of this equipment, the power supply must be disconnected. Failure to follow this warning may result in injury or death.

NOTICE

The information in this instruction bulletin is not intended to explain all details or variations of the Powell equipment, nor to provide for every possible contingency or hazard to be met in connection with installation, testing, operation, and maintenance of the equipment. For additional information and instructions for particular problems, which are not presented sufficiently for the user's purposes, contact Powell at 1.800.480.7273.

NOTICE

Powell reserves the right to discontinue and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

A. SCOPE

The information in this instruction bulletin describes the following PowlVac® PVAM Type M Ground & Test Devices Manually Operated:

- 15kV, 1200A, 36kA/750MVA
- 50680G90 - 3 Stab, Rear Stabs
 - 50680G91 - 3 Stab, Front Stabs

B. PURPOSE

The information in this instruction bulletin is intended to provide information required to properly operate and maintain the PowlVac PVAM Type M Ground & Test Device Manually Operated described in **Ch 1 General Information, A. SCOPE**.

This instruction bulletin provides:

1. Safety guidelines
2. General descriptions of the operation and maintenance of the PowlVac PVAM Type M Ground and Test Device
3. Instructions for installation and placing the ground and test device into service
4. Instructions for part replacement
5. Information for ordering renewal parts
6. Procedure for critical adjustments
7. Illustrations, photographs, and description of the ground and test device

The illustrations contained in this document may not represent the exact construction details of each particular type of ground and test device. The illustrations in this document are provided as general information to aid in showing component locations only.

All illustrations and photos are shown using deenergized equipment.

 **WARNING**

Be sure to follow the appropriate safety precaution while handling any of the equipment. Failure to do so may result in serious injury or death.

To the extent required, the products described herein meet the applicable ANSI, IEEE, and NEMA Standards; however, no such assurance is given with respect to local codes and ordinances which may vary greatly.

The PowlVac PVAM Type M Ground & Test Device provides a means for obtaining access to the primary disconnect devices of the switchgear compartment. The purpose of accessing the disconnects is to ground the primary circuits or conduct certain high voltage test procedures such as phasing out circuits or conducting high voltage withstand (hipot) tests.

C. INSTRUCTION BULLETINS AVAILABLE ELECTRONICALLY **NOTICE**

Changes to the instruction bulletin may be implemented at any time and without notice. Goto www.powellind.com to ensure use of the current instruction bulletin for the Powell equipment.

To contact the Powell Service Division call 1.800.480.7273 or 713.944.6900, or email info@powellservice.com.

For specific questions or comments pertaining to this instruction bulletin email documents@powellind.com with the Instruction Bulletin number in the subject line.



Ch 2 Safety

A. SAFE WORK CONDITION

The information in Section A is quoted from *NFPA 70E 2004 - Article 120, 120.1 Establishing an Electrically Safe Work Condition*.

120.1 Process of Achieving an Electrically Safe Work Condition

1. Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags.
2. After properly interrupting the load current, OPEN the disconnecting device(s) for each source.
3. Wherever possible, visually verify that all blades of the disconnecting devices are fully OPEN or that drawout type circuit breakers are withdrawn to the fully disconnected position.
4. Apply lockout/tagout devices in accordance with a documented and established policy.
5. Use an adequately rated voltage detector to test each phase conductor or circuit part to verify they are deenergized. Test each phase conductor or circuit part both phase-to-phase, and phase-to-ground. Before and after each test, determine that the voltage detector is operating satisfactorily.
6. Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them. Where it could be reasonably anticipated that the conductors or circuit parts being deenergized could contact other exposed energized conductors or circuit parts, apply ground connecting devices rated for the available fault duty.

B. SAFETY GUIDELINES

Study this instruction bulletin and all other associated documentation before uncrating the ground and test device.

Each user has the responsibility to instruct and supervise all personnel associated with usage, installation, operation, and maintenance of this equipment on all safety procedures. Furthermore, each user has the responsibility of establishing a safety program for each type of equipment encountered.

It is mandatory that the following rules be observed to ensure the safety of personnel associated with usage, installation, operation, and maintenance of these ground and test devices.

The safety rules in this instruction bulletin are not intended to be a complete safety program. The rules are intended to cover only some of the important aspects of personnel safety related to PowlVac® PVAM Type M Ground & Test Devices.

C. GENERAL

1. Only supervised and qualified personnel trained in the usage, installation, operation, and maintenance of the ground and test device shall be allowed to work on this equipment. It is mandatory that this instruction bulletin, any supplements, and service advisories be studied, understood, and followed.
2. Maintenance programs must be consistent with both customer experience and manufacturer's recommendations, including service advisories and instruction bulletin(s). A well planned and executed routine maintenance program is essential for the ground and test device's reliability and safety.

3. Service conditions and ground and test device applications shall also be considered in the development of safety programs. Variables include ambient temperature; humidity; and any adverse local conditions including excessive dust, ash, corrosive atmosphere, vermin and insect infestations.

D. SPECIFIC

When operating the ground and test device safety precautions must be observed.

 **WARNING**

Improper use can result in death, serious personal injury, or damage to the equipment.

It is important for the user to develop specific and safe operating procedures to be observed when using the ground and test device.

The following specific safety precautions must be observed:

1. Do not attempt to ground an energized circuit. The circuit to be grounded should always be treated as energized until proven otherwise.
2. Do not attempt to service the device while it is installed in a switchgear compartment or on a lift truck. For service, the device must be located either on the floor or on a sturdy, level work bench, and blocked from rolling.
3. Store the manually operated ground and test device in a clean, dry area free from dust, dirt, moisture, caustic atmosphere, and vermin.
4. Keep all insulating surfaces, which include primary support insulation and insulation barriers, clean and dry.

5. Check all primary circuit connections to make certain that they are clean and tight.
6. Take extreme care while using this device to avoid contacting “live” or “hot” (energized) terminals.

E. SAFETY LABELS

The equipment described in this document has **DANGER, WARNING, CAUTION**, and instruction labels attached to various locations. All equipment **DANGER, WARNING, CAUTION**, and instruction labels shall be observed when the circuit breaker is handled, operated, or maintained.

 **NOTICE**

Warning and Caution labels are located in various places in and on the switchgear and on the ground and test device. Always observe these warnings and caution labels. Do NOT remove or deface any of these warning/caution labels.



Ch 3 Equipment Description

A. GENERAL

The PowlVac® PVAM Type M Ground and Test Device is similar to the PowlVac PVAM replacement circuit breaker and can be temporarily inserted in place of a circuit breaker in a metal-clad switchgear compartment for the purpose of grounding and testing. Only three stab models are available.

The three stab ground and test device consists of a wheeled frame on which are mounted three primary disconnect stabs. The front of the device (Figure 1) has an upper access door. Three test ports are mounted behind the door. Each test port is connected to one of the three primary disconnect stabs (Figure 2, a). In the group of test ports, the left, center, and right test ports are connected to the left, center, and right disconnect stabs respectively.

Insulation/isolation barriers between phases and between phase and ground are also provided where required.

The ground and test device is equipped with a ground shoe (Figure 1, c) which engages the ground bus to the equipment. Three flexible grounding cables are supplied (Figure 1, d). One end of each cable is bolted to the ground bar. The other end may be bolted to the primary contact bar in the test ports. See **Ch 5 Operation, A. GROUNDING** of this instruction bulletin for proper use of these cables.

Refer to the instruction book provided with the original circuit breaker equipment for instructions covering insertion of the circuit breaker into the circuit breaker compartment.

Table A Equipment Ratings

G&T Device Number	Voltage (kV)	Amperes (kA/MVA)	Continuous Current (Amperes)
50680G90	15	36/750	1200
50680G91	15	36/750	1200

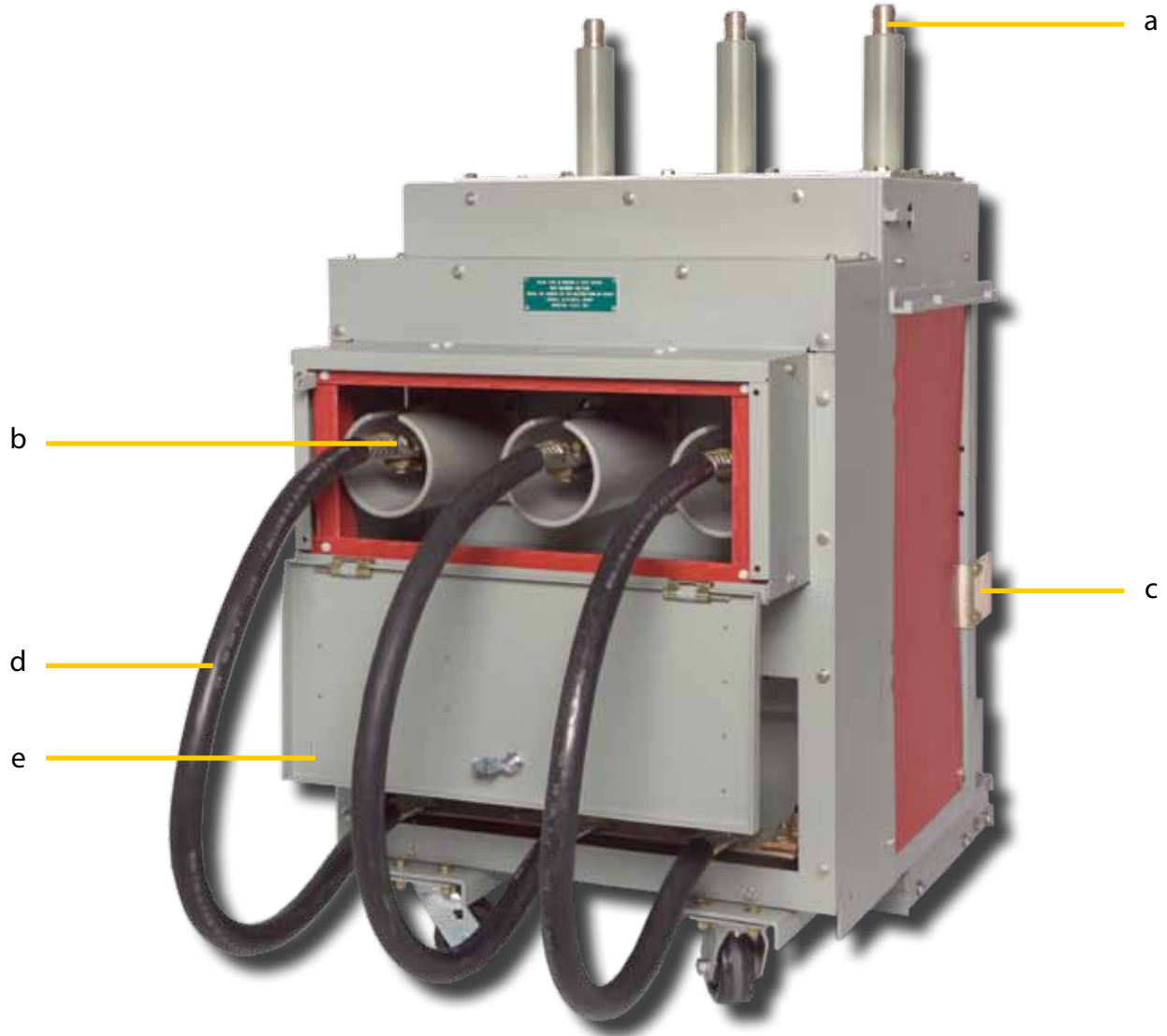
B. COMPARTMENT COMPATIBILITY (APPLICATION)

For grounding and testing purposed PowlVac Type M Ground and Test Devices can be temporarily applied in GE MagneBlast circuit breaker compartments rated 15kV Rated Maximum Voltage, 36kA/750MVA Rated Short Circuit Current, and 1200A Rated Continuous Current.

WARNING

Use the cables that are provided with the device to satisfactorily withstand the effect of the current. Other cables may not withstand the forces and heat generated by fault currents and cause severe injury to personnel.

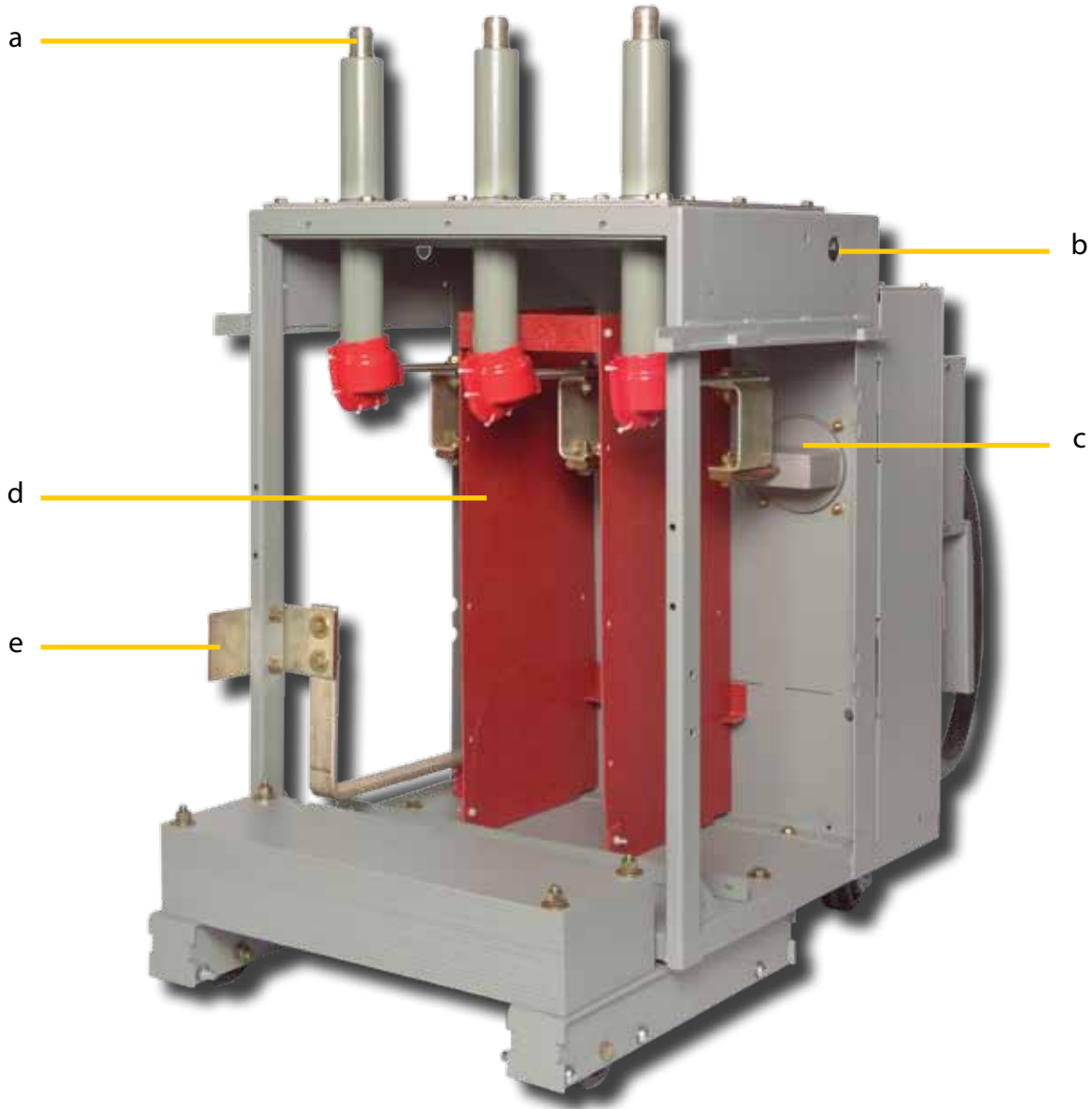
Figure 1 *PowlVac® PVAM Type M
Ground & Test Device - Front View*



- a. *Primary Disconnect Stab*
- b. *Test Port*
- c. *Ground Shoe*
- d. *Grounding Cables*
- e. *Access Door*



Figure 2 PowlVac® PVAM Type M
Ground & Test Device - Rear View



- a. Primary Disconnect Stab
- b. Lifting Hole
- c. Rear Side of Test Port
- d. Barrier
- e. Ground Shoe

Ch 4 Installation

A. RECEIVING

Check the shipping container for signs of damage which could indicate possible damage to the ground and test device. If damage is found or suspected, file claims as soon as possible with the transportation company and notify the nearest Powell Representative.

B. HANDLING

After the ground and test device has been removed from its shipping pallet it may be rolled on its own wheels on a level surface. This is the preferred way of handling the device. When rolling the device, it should be pushed and steered by the steel frame or the front cover.

**⚠ CAUTION**

Do NOT handle or move the ground and test device by the primary disconnecting devices, as damage may occur.

If necessary, the ground and test device can be moved by an overhead crane. To lift the ground and test device with an overhead crane, use the two lifting points which have been provided for hooks at the top of the frame (Figure 2, b).

**⚠ CAUTION**

Lifting by crane may cause damage to the primary disconnecting devices. Ensure there is space between the chain and the primary disconnecting devices.

C. STORAGE

Shipping and storage of electrical equipment requires measures to prevent the deterioration of the apparatus over a long unused period. The mechanical and dielectric integrity must be protected. Electrical equipment is designed for use in a variety of environments. When the equipment is in transit and storage, these design considerations are not fully functional. In general, the following measures must be considered.

1. Equipment designed for indoor installation must be stored indoors in a climate controlled environment to prevent condensation of moisture. Exposure to rain and the elements, even for a short period, can permanently damage the equipment. Space heaters within the equipment should be energized, if so equipped. Humidity controlling desiccant materials should be utilized when space heaters are not provided or cannot be energized. The temperature should be kept above 33°F/1°C and below 140°F/60°C. The relative humidity should be kept below 60% or a dew point of 15°C/59°F. The equipment should be stored in such a manner as to leave all doors and panels accessible for inspection. The equipment must be inspected on a routine basis to assure operational integrity.



2. Equipment designed for outdoor exposure may be stored either in indoor or outdoor storage locations. The equipment must be protected from airborne external contaminants if stored outdoors. Outdoor storage will also require additional care to maintain temporary covers over the openings and shipping splits. The equipment must be provided with control power to facilitate the energization of space heaters, as well as other temperature and humidity controlling equipment. The temperature should be kept above freezing ($>33^{\circ}\text{F}/1^{\circ}\text{C}$) and below ($<140^{\circ}\text{F}/60^{\circ}\text{C}$). The relative humidity should be kept below 60% or a dew point of $15^{\circ}\text{C}/59^{\circ}\text{F}$. The equipment should be stored in such a manner as to leave all doors and panels accessible for inspection. The equipment must be inspected on a routine basis to assure its integrity.
3. The auxiliary control devices, ship loose material and protective relays must also be protected. This includes items such as battery chargers, UPS systems, lighting, installation hardware and air conditioning. If prolonged storage is anticipated, humidity controlling desiccant materials should be utilized. Desiccant packets should be installed in all compartments and packing containers.

Ch 5 Operation

As stated in *IEEE C37.20.6-1997, §9.5*, "Ground and test devices are used infrequently and therefore are stored for long periods of time. They should be stored in a clean, dry area, free from dust, dirt, moisture, and the like. However, even though it is assumed that the G&T device was stored properly, it should be carefully inspected and maintained before each use.

The following procedure is recommended before each use of the G&T device.

- a) All insulating surfaces, including but not limited to the primary support insulation, voltage probes, and isolation barriers, should be clean and dry.
- b) All primary circuits, including cables and connections, should be clean and tight.
- c) All primary and ground disconnect contacts (including terminal selector switch, if provided) should be clean, with the correct contacts in place and properly lubricated.
- d) All locks and interlocks should be fully functional in accordance with the instruction manual of the G&T device.
- e) A 1 min power frequency voltage withstand test should be conducted on the complete G&T device in accordance with 7.4.2, except at 75% of the rated values.

Note: *Field tests may be conducted with dc voltage sources provided that the instantaneous dc voltage is no more than 1.414 times 75% of the normal frequency withstand ac rms voltage listed in Table 1 of IEEE Std C37.20.2-1993."*

Table B Field Dielectric Test Values

Rated Maximum Voltages (kV rms)	Power Frequency Withstand (kV)
15	27kVAC (preferred) 38kVDC (optional)

DO NOT DIELECTRIC TEST THE CABLE ASSEMBLY!

The ground and test device may be used for both grounding and testing functions. The procedures for these two types of operations differ, and are described separately below.

CAUTION

Because of the construction of bus sectionalizing units, upper units in two-high equipment and other special types of construction, it is NOT possible to make a general statement about which set of primary disconnects is connected to the switchgear main bus and which is connected to the outgoing conductors. Before using the ground and test device, the operator must determine the physical location of the primary disconnects to be grounded or tested. This can be determined by referencing the equipment drawings or by examining the equipment.

**A. GROUNDING** **WARNING**

Do NOT attempt to use the PowlVac® Type M Ground & Test Device to ground an energized circuit. An attempt to do so will result in severe damage to the device and the switchgear in which it is being used, and may result in serious injury to operating personnel.

To ground a circuit, follow these steps:

1. Deenergize the circuit to be grounded. If there are power sources to this circuit other than the circuit breaker where the ground and test device is to be used, the switching devices at these alternate sources shall be locked or tagged open in accordance with the user's standard safety procedures to ensure that they will not be closed during the grounding operation.
2. Remove the circuit breaker from the switchgear compartment.
3. With the upper ends of the grounding cables disconnected and the grounding cables stored, and with the access door or doors closed, insert the ground and test device into the breaker compartment, leaving the compartment door open and rack it into the connected position.

Note: Powell recommends using an electric remote racking device for racking in and racking out the ground and test device. Contact Powell for more information.
4. Open the access door over the test ports connected to the terminals to be grounded. Using a high voltage voltmeter and test probe rated for the system voltage, or another safe voltage measuring method, verify that the three terminals to be grounded are not energized.

5. Rack the ground and test device to the disconnected position.
6. Bolt the free ends of the three grounding cables to the studs in the three test ports to be grounded.
7. Rack the ground and test device into the fully engaged position. The circuit is now grounded.
8. To remove the ground, rack the device to the disconnect position and remove it from the compartment.

B. TESTING

The ground and test device may be used to gain access to switchgear connections for high voltage testing. Follow these steps:

1. Remove the circuit breaker from the cell to be tested.
2. With the upper ends of the grounding cables disconnected and the grounding cables stored, and with the access door or doors closed, insert the ground and test device into the breaker cell, leaving the cell door open and rack it into the connected position.
3. If the testing to be done involves measurement of system voltages:
 - a. Open the access door.
 - b. Using proper high voltage instrumentation and observing all safety rules, make the desired measurements.

4. If the testing to be done involves application of test voltages, such as for high potential testing (hipot):
 - a. Insure that the circuit to be tested is deenergized. If there are power sources to this circuit other than the circuit breaker where the ground and test device is to be used, the switching devices at these alternate sources shall be locked or tagged open in accordance with the user's standard safety procedures to ensure that they will not be closed during the grounding operation.
 - b. Verify that the circuit is deenergized. Open the access door over the test ports connected to the terminals to be tested. Using a high voltage voltmeter and test probe rated for the system voltage, or another safe voltage measuring method, verify that the three terminals to be tested are not energized.
 - c. Attach the test power leads to the appropriate test studs and conduct tests.
5. When testing is completed:
 - a. Remove the ground and test device from the CONNECTED position to the TEST position.
 - b. Remove the grounding cables.
 - c. Close access door or doors.



Ch 6 Maintenance

The ground and test device requires little routine maintenance. Proper storage when the device is not in use is essential. See **Ch 4 Installation, C. STORAGE** for storage procedures.

The contact surfaces of the primary disconnect stabs and the fingers of the ground shoe should be lubricated with a thin film of Mobilgrease 28. Before use, particularly if the device has been in storage for a long period of time, wipe these surfaces clean and apply fresh lubricant.

Ch 7 Recommended Renewal Parts and Repair Procedures

A. ORDERING INSTRUCTIONS

1. Order Renewal Parts from the Powell Service Division at www.powellservice.com or call 1.800.480.7273.
2. Always specify complete nameplate information, including:
 - a. Ground and Test Device Type
 - b. Serial Number
 - c. Rated Voltage
 - d. Rated Amps
 - e. Impulse Withstand
3. Specify the quantity and description of the part and the instruction bulletin number. If the part is in any of the recommended renewal parts tables, specify the catalog number. If the part is not in any of the tables, a description should be accompanied by a marked illustration from this instruction bulletin or photo.

Numbers in this instruction bulletin for the recommended spare parts to be carried in stock by the user. This must be determined by the user based on the application. As a minimum, it is recommended that one set of parts be stocked per ten ground and test devices or fraction thereof.

Powell recommends that only qualified technicians perform maintenance on these units. If these ground and test devices are installed in a location where they are not maintained by a qualified technician, a spare ground and test device should be on site ready for replacement. The malfunctioning unit can then be returned to the factory for reconditioning.

Table C Renewal Part Numbers

Quantity	Description	Part Number
3	Ground Cable Assembly	50326G03
3	Primary Contact Assembly	61900G01
1	Ground Shoe	50031P02

B. RECOMMENDED RENEWAL PARTS

A sufficient amount of renewal parts should be stored to enable the prompt replacement of any worn, broken or damaged part. A sufficient amount of stocked parts minimizes service interruptions caused by breakdowns and saves time and expense. When continuous operation is a primary consideration, a greater amount of renewal parts should be stocked, the quantity depending on the severity of the service and the time required to secure replacements.

Spare or replacement parts which are furnished may not be identical to the original parts since improvements are made from time to time. The parts which are furnished, however, will be interchangeable. See *Table C, Renewal Part*



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PowIVac® PVAM Type M
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15kV, 1200A, 36kA/750MVA

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