



IB-50011 PowlVac[®] Type M 63kA Ground & Test Device Manually Operated

All Ratings Up To and Including
15kV, 63kA, 3000A

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 Z535.4-2002, § 4.13-4.13.3 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 indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Not stated in ANSI Z535.4-2002, § 4.13-4.13.3 as a signal word but used in this manual is “**IMPORTANT**”. This is defined as:



IMPORTANT

IMPORTANT indicates a section of the manual covering a non hazardous situation, but one where Powell feels proper attention is warranted.

Qualified Person

For the purposes of this manual, a qualified person, as stated in NFPA 70®, is one familiar with the construction and operation of the equipment and 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.

This page is intentionally left blank.



Contents

Ch 1	General Information	1
A.	SCOPE	2
B.	PURPOSE	2
C.	INSTRUCTION BULLETINS AVAILABLE ELECTRONICALLY	2
Ch 2	Safety	3
A.	SAFE WORK CONDITION	3
B.	SAFETY GUIDELINES	3
C.	GENERAL	4
D.	SPECIFIC	4
E.	SAFETY LABELS	5
Ch 3	Equipment Description	6
A.	GENERAL	6
B.	COMPARTMENT COMPATIBILITY (APPLICATION)	7
Ch 4	Installation	12
A.	RECEIVING	12
B.	HANDLING	12
C.	STORAGE AND MAINTENANCE BEFORE USE	12
Ch 5	Operation	14
A.	GROUNDING	14
B.	TESTING	15
1)	High Voltage Measurement	15
2)	High Voltage Testing	15
Ch 6	Maintenance	16
Ch 7	Recommended Renewal Parts and Replacement Procedures	17
A.	ORDERING INSTRUCTIONS	17
B.	RECOMMENDED RENEWAL PARTS	17

Figures

Figure 1	<i>PowlVac® Type M Ground & Test Device Front (doors closed)</i>	7
Figure 2	<i>PowlVac® Type M Ground & Test Device Rear View</i>	8
Figure 3	<i>PowlVac® Type M Ground & Test Device Front (doors open)</i>	9
Figure 4	<i>PowlVac® Type M Ground & Test Device, Lower Test Ports, Grounded</i>	10
Figure 5	<i>PowlVac® Type M Ground & Test Device, Upper Test Ports, Grounded</i>	11

Tables

Table A	<i>Equipment Ratings</i>	6
Table B	<i>Field Dielectric Test Values</i>	13
Table C	<i>Renewal Part Numbers</i>	17



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 knowledgeable 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.



IMPORTANT

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.



IMPORTANT

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® Type M 63kA Ground & Test Devices Manually Operated:

15kV, 63kA, 3000A,

- 50330G20 - 6 Stud Device
- 50330G21 - 3 Stud Device, Upper Studs Only
- 50330G22 - 3 Stud Device, Lower Studs Only

B. PURPOSE

The information in this instruction bulletin is intended to provide information required to properly operate and maintain the PowlVac Type M Ground & Test Devices 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 Type M 63kA Ground & Test Devices Manually Operated
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. Illustrations, photographs, and description of the ground and test device

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

All illustrations and photos are shown using deenergized equipment.



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 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

For more information visit www.powellind.com. To contact the Powell Service Division call 1.800.480.7273 or 713.944.6900, or email info@powellservice.com.



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 PowIVac® Type M 63kA Ground & Test Manually Operated devices.

C. GENERAL

1. Only supervised and qualified personnel trained in the usage, installation, operation, and maintenance of the PV-M 50330G20, G21, G22 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 ground and test devices' reliability and safety.
3. Service conditions and 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.

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.



IMPORTANT

Warning and Caution labels are located in various places in and on the switchgear and on the circuit breaker removable element. 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® Type M Ground & Test Device is similar to the PowlVac 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. Both six stab and three stab models are available.

The six stab ground and test device consists of a wheeled frame on which are mounted six primary disconnect stabs. The front of the device has two access doors, upper (Figure 1, b) and lower (Figure 1, e). Three test ports are mounted behind each door (Figure 3, b & c). Each test port is connected to one of the six primary disconnect stabs (Figure 2, b & d). The upper test ports are connected to the upper disconnect stabs and the lower test ports are connected to the lower disconnect stabs. In each 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 three stab ground and test device is similar to the six stab model except that only three primary disconnect stabs, three test ports, and one access door are furnished. Models are available with upper stabs or with lower stabs. If desired by the user, interference plates may be furnished to limit the usage of the ground and test device to specific breaker compartments.

The ground and test device is equipped with two ground shoes (Figure 2, e) which engage the ground bus to the equipment. Three ground to riser bus connectors are provided and pre-installed to the ground bus

(Figure 1, h). Three test port to riser connectors are provided for either the lower or upper test ports (Figure 4, c or Figure 5, a). The test port to riser bus should be installed once you have established which test port will be grounded, upper or lower. The riser bus connectors (Figures 4 & 5, d) are then bolted to the ground riser and the test port to riser bus. Once that is complete, bolt the riser phase support to the riser.

 **WARNING**

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

The ground and test device is equipped with a racking mechanism to engage and disengage it in the compartment. This mechanism is operated by the hand crank used to operate the racking mechanism on the PowlVac circuit breakers. The ground and test device is also equipped with a rollout latch to prevent inadvertent removal from the compartment.

Table A Equipment Ratings			
G&T Device Number	Max Voltage (kV)	Max Amperes (kA)	Max Continuous Current (Amperes)
50330G20	15	63	3000
50330G21	15	63	3000
50330G22	15	63	3000



B. COMPARTMENT COMPATIBILITY (APPLICATION)

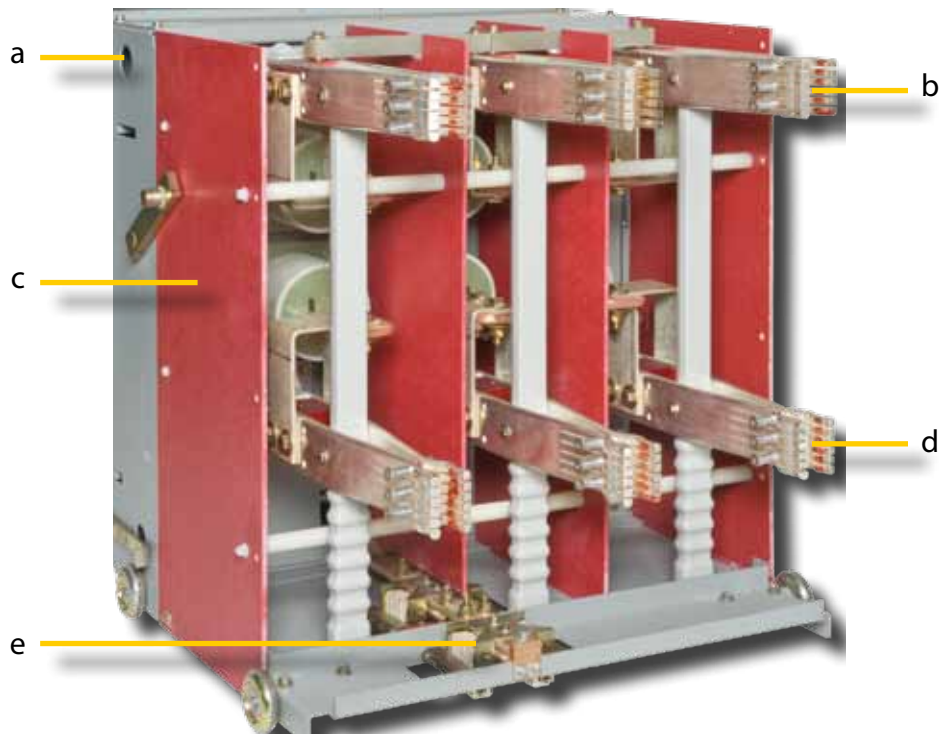
For grounding and testing purposes PowlVac Type M Ground and Test Devices can be temporarily applied in any PowlVac Switchgear circuit breaker compartment rated up to and including 15kV Rated Maximum Voltage, 63kA Rated Short Circuit Current and 3000A Rated Continuous Current.

Figure 1 PowlVac® Type M Ground & Test Device Front (doors closed)



- a. Nameplate
- b. Upper Access Door
- c. Warning Label
- d. Racking Crank Access Port
- e. Lower Access Door
- f. Door Handle
- g. Ground Bar
- h. Ground to Riser Connector

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



- a. Lifting Hole
- b. Upper Primary Disconnect Stab
- c. Barrier
- d. Lower Primary Disconnect Stab
- e. Ground Shoe

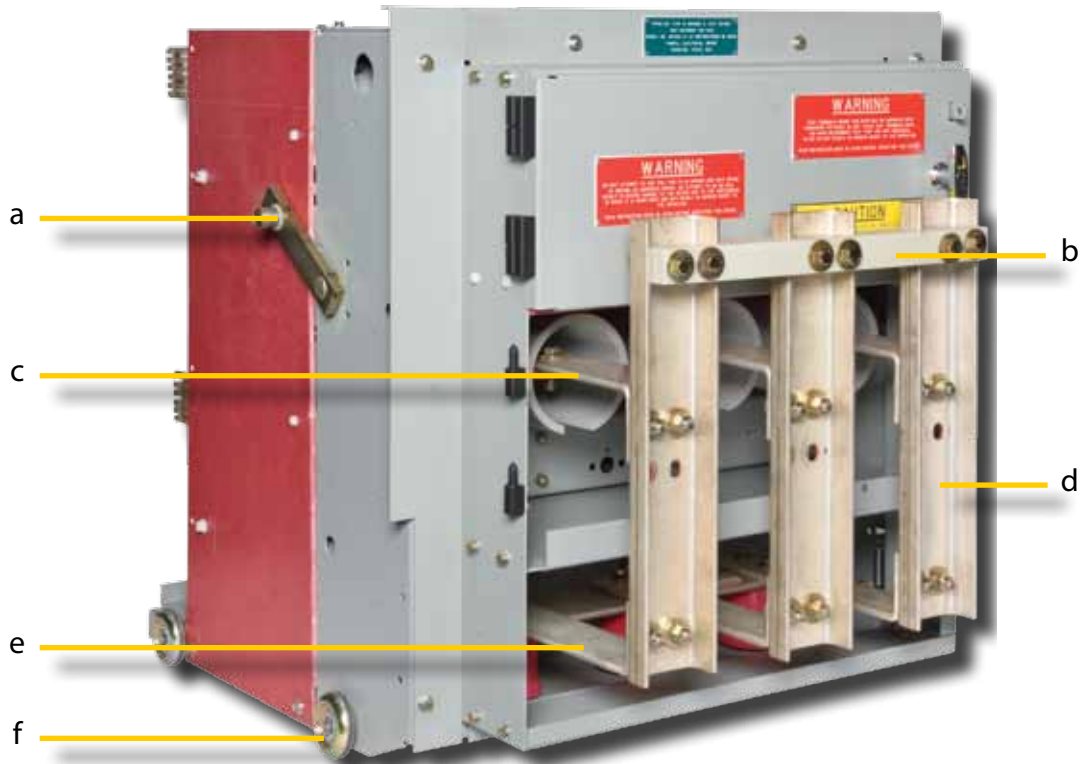


Figure 3 PowlVac® Type M Ground & Test Device Front (doors open)



- a. Nameplate
- b. Test Ports - Upper
- c. Test Ports - Lower
- d. Boot
- e. Anti-Rollout Arm

Figure 4 PowlVac® Type M Ground & Test Device, Lower Test Ports, Grounded



- a. Racking Arm
- b. Phase Support
- c. Test Port to Riser Connector
- d. Riser Connector
- e. Ground to Riser Connector
- f. Wheel



Figure 5 PowlVac® Type M Ground & Test Device, Upper Test Ports, Grounded



- a. Test Port to Riser Connector
- b. Racking Arm
- c. Phase Support
- d. Riser Connector
- e. Ground to Riser Connector
- f. Wheel

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 ground and test device. When rolling the device it should be pushed and steered by the steel frame or the front cover.



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 a fork lift truck or an overhead crane. When using a fork lift truck take care to avoid components located under the circuit breaker floor plan. The forks on the truck should be set for a dimension over the forks of 28 inches. The forks should then ride under the wheel axles. The device can also be lifted by an overhead crane using the two lifting points which have been provided for hooks at the top of the frame side sheets (Figure 2, a)

C. STORAGE AND MAINTENANCE BEFORE USE

Since the ground and test device is an accessory not normally in continuous use, proper storage between uses is essential to maintain the quality and usefulness of the device. The following precautions must be taken to assure the proper storage of the device:

1. The ground and test device should be carefully protected against condensation, preferably by storing it in a warm dry room of moderate temperature (40°F - 100°F). Devices for outdoor metal-clad switchgear should be stored in the equipment only when power is available and the heaters are in operation to prevent condensation.
2. The device should be stored in a clean location, free from corrosive gases or fumes. Particular care should be taken to protect the equipment from moisture and cement dust, as this combination has a very corrosive effect on many parts. For long storage periods a dust cover is recommended regardless of the atmosphere.
3. Unplated surfaces of rollers, latches, etc., of the racking mechanism should be coated with grease to prevent rusting.

If the device is stored for any length of time, it should be inspected periodically to see that rusting has not started and to ensure good mechanical condition. Should the device be stored under unfavorable atmospheric conditions, it should be cleaned and dried out before being placed in service.



As stated in *IEEE C37.20.6-2007, §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. The manufactures' instruction manual must be followed for specific guidance.

1. All insulating surfaces, including but not limited to the primary support insulation, voltage probes, and isolation barriers, should be clean and dry.
2. All primary circuits, including riser connections, should be clean and tight.
3. All primary and ground disconnect contacts should be clean, with the correct contacts in place and properly lubricated.
4. All locks and interlocks should be fully functional in accordance with the instruction manual of the G&T device.
5. 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 C37.20.2-1999."*

Table B Field Dielectric Test Values	
Rated Maximum Voltages (kV rms)	Power Frequency Withstand (kV)
15	27kVAC (preferred) 38kVDC (optional)

Ch 5 Operation

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.


WARNING

Do NOT remove the test port boots while the device is in the "CONNECTED" position. This may cause serious injury or death.

3. Remove the test port boot from the test port that will be tested.
4. With the grounding bus disconnected 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.
5. 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. In a six stud application, the appropriate top or bottom access door to the energized ports which will not be grounded shall be locked or tagged for safety.
6. Rack the ground and test device to the disconnected position.
7. Bolt the "riser connector" (Figure 4, d) to the "ground to riser connector" (Figure 4, e) and the "test port to riser connector" (Figure 4, c) using hardware provided. Using the hardware provided, bolt the "phase support" (Figure 4, b) to the "riser connector" (Figure 4, d) to 50 ft.-lbs.
8. Rack the ground and test device into the connected position. The circuit is now grounded.



9. To remove the ground, rack the device to the disconnect position and remove it from the compartment.

B. TESTING

1) High Voltage Measurement

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

- a. Remove the circuit breaker from the compartment to be tested.
- b. Remove the test port boot from the test port that will be tested.



Do NOT remove the test port boots while the device is in the "CONNECTED" position. This may cause serious injury or death.

- c. With the riser bus disconnected and removed, 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.
- d. If the testing to be done involves measurement of system voltages, such as verifying the proper phase relationship between circuits on the two sides of the device:
 1. Open the necessary access doors.
 2. Using proper high voltage instrumentation and observing all safety rules, make the desired measurements.

2) High Voltage Testing

- a. If the testing to be done involves application of test voltages, such as for high potential testing (hipot):
- b. Ensure 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 testing operation.
- c. 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. In a six stud application, the appropriate top or bottom access door to the energized ports which will not be grounded shall be locked or tagged for safety.
- d. Attach the test power leads to the appropriate test studs and conduct tests.
- e. When testing is completed:
 1. Remove the ground and test device from the CONNECTED position to the TEST position.
 2. Remove the test power leads.
 3. Reinstall the test port boots.
 4. 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.

The levering-in device and wheels require the same lubrication as on the circuit breakers. See IB-60301 or IB-60302 for details.



Ch 7 Recommended Renewal Parts and Replacement 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.

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 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
2	Ground Shoe Finger Assembly	50952G04P
9	Primary Contact Spring Assembly (3 Stab device)	50740G02
18	Primary Contact Spring Assembly (6 Stab device)	50740G02
1	Riser Support	50608P04
3	Riser Connection	50316P06
3	Connector, Ground to Riser	50316P05
3	Connector, Test Port to Riser	50316P04
6	Slip Sleeve Boot	1825B
1	Hardware Kit 63kA M G&T	50399G30

This page is intentionally left blank.



IB-50011 PowlVac® Type M 63kA Ground & Test Device Manually Operated

*All Ratings Up To and Including
15kV, 63kA, 3000A*

December 2010