Instruction Bulletin - 01.4IB.77011
PowlVac-ND® Manually Operated Ground and Test Device with Closed Door Racking Capability

- 5kV
- 50kA
- 2000A
- 26 inch wide design
Contact Information

Powell Electrical Systems, Inc.
powellind.com
info@powellind.com

Service Division
7232 Airport Blvd
Houston, Texas 77061

Tel: 1.800.480.7273
Signal Words

As stated in ANSI Z535.4-2011, 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”, “Caution” and “Notice”. 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.
This page is intentionally left blank.
Contents

Ch 1  General Information ........................................................................................................... 1
  A. SCOPE ......................................................................................................................................... 2
  B. PURPOSE ..................................................................................................................................... 2
  C. INSTRUCTION BULLETINS AVAILABLE ELECTRONICALLY .................................................. 2
  D. ASSOCIATED INSTRUCTION BULLETINS .............................................................................. 3

Ch 2  Safety ................................................................................................................................... 4
  A. SAFE WORK CONDITION ........................................................................................................ 4
  B. SAFETY GUIDELINES ................................................................................................................ 5
  C. GENERAL ................................................................................................................................... 6
  D. SPECIFIC ................................................................................................................................... 6
  E. SAFETY LABELS ........................................................................................................................ 6

Ch 3  Equipment Description ....................................................................................................... 7
  A. GENERAL .................................................................................................................................... 7
  B. COMPARTMENT COMPATIBILITY (APPLICATION) ................................................................. 7

Ch 4  Installation ............................................................................................................................ 11
  A. RECEIVING .............................................................................................................................. 11
  B. HANDLING ............................................................................................................................... 11
  C. STORAGE .................................................................................................................................. 11

Ch 5  Operation .............................................................................................................................. 14
  A. INSERTING THE GROUND AND TEST DEVICE INTO THE CIRCUIT BREAKER COMPARTMENT ............................................................................................................................... 14
     1) Inserting the Ground and Test Device to the Test/Disconnect Position ................................. 14
     2) Inserting the Ground and Test Device to the Connected Position ......................................... 14
  B. REMOVING THE GROUND AND TEST DEVICE FROM THE CIRCUIT BREAKER COMPARTMENT ................................................................................................................................. 15
     1) Removing the Ground and Test Device from the Connected to the Test/Disconnected Position ................................................................................................................................. 15
     2) Removing the Ground and Test Device from the Test/Disconnected Position out of the Circuit Breaker Compartment ........................................................................................................ 15
  C. TESTING .................................................................................................................................... 16
  D. GROUNDING ............................................................................................................................. 17

Ch 6  Maintenance .......................................................................................................................... 20
  A. GENERAL .................................................................................................................................... 20
     1) Lubrication ............................................................................................................................... 20
     2) Inspection and Cleaning ......................................................................................................... 20

Ch 7  Recommended Renewal Parts and Replacement Procedures .............................................. 21
  A. ORDERING INSTRUCTIONS ...................................................................................................... 21
  B. RECOMMENDED RENEWAL PARTS ...................................................................................... 21
Figures

Figure 1  PowlVac-ND® Manually Operated Ground & Test Device Front (doors closed) .................................................................................................................. 8
Figure 2  PowlVac-ND® Manually Operated Ground & Test Device Rear View ........ 9
Figure 3  PowlVac-ND® Manually Operated Ground & Test Device Front (doors open) .................................................................................................................. 10
Figure 4  Ground and Test Device in Shipping Carton ........................................ 11
Figure 5  Ground Stab Assembly ........................................................................ 16
Figure 6  Inserting Magnetic Handle Tool .......................................................... 17
Figure 7  Removing Access Door ........................................................................ 18
Figure 8  Ground Stab Assembly - Rear View ................................................... 18
Figure 9  Ground Stab Assembly - Front View .................................................... 18
Tables

Table A Equipment Ratings ............................................................................................... 7
Table B Field Dielectric Test Values ................................................................................. 13
Table C Renewal Part Numbers ....................................................................................... 21
This page is intentionally left blank.
Ch 1 General Information

⚠️ WARNING

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

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

Prior to adjustments, servicing, maintenance, or any act requiring the operator to make physical contact with the equipment, the power source must be disconnected and the equipment grounded. Failure to do so may result in death or serious injury.

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-ND® Manually Operated Ground and Test Devices:

5kV, 50kA, 2000A;

<table>
<thead>
<tr>
<th>Type</th>
<th>Assembly No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>05NGT50M6CX</td>
<td>77006G20</td>
<td>6 Stab</td>
</tr>
<tr>
<td>05NGT50MLCX</td>
<td>77006G22</td>
<td>3 Stab, Lower Only</td>
</tr>
<tr>
<td>05NGT50MUCX</td>
<td>77006G24</td>
<td>3 Stab, Upper Only</td>
</tr>
</tbody>
</table>

B. Purpose

The information in this instruction bulletin is intended to provide details required to properly operate and maintain the PowlVac-ND Manually Operated Ground and 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-ND Manually Operated Ground and Test Devices
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.

C. Instruction Bulletins Available Electronically

Changes to the instruction bulletin may be implemented at any time and without notice. Go to 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 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.

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-ND Manually Operated Ground and 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.
D. **Associated Instruction Bulletins**

- 01.4IB.77000B PowlVac-ND® Vacuum Circuit Breaker, 5kV, 1200A & 2000A, 36kA & 50kA
- 01.4IB.77020 PowlVac-ND® and PowlVac-NDA Series 4 Vacuum Circuit Breakers, 5kV, 1200A & 2000A, 36kA & 50kA
- 01.4IB.78000A PowlVac-ND® Metal-Clad Switchgear, 5kV, 1200A & 2000A
- 01.4IB.78200 PowlVac-NDAR® Arc Resistant Switchgear, 5kV, 1200A & 2000A, 26” Wide Design
Ch 2  Safety

A.  Safe Work Condition

The information in Section A is quoted from NFPA 70E 2018 - Article 120, 120.5 Establishing an Electrically Safe Work Condition.

120.5 Process or Establishing and Verifying an Electrically Safe Work Condition. Establishing and verifying an electrically safe condition shall include all of the following steps, which shall be performed in the order presented, if feasible:

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. Release stored electrical energy.

5. Release or block stored mechanical energy.

6. Apply lockout/tagout devices in accordance with a documented and established procedure.

7. Use an adequately rated portable test instrument to test each phase conductor or circuit part to verify it is de-energized. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test, determine that the test instrument is operating satisfactorily through verification on any known voltage source.

N Exception No. 1: An adequately rated permanently mounted test device shall be permitted to be used to verify the absence of voltage of the conductors or circuit parts at the work location, provided it meets the all following requirements: (1) It is permanently mounted and installed in accordance with the manufacturer’s instructions and tests the conductors and circuit parts at the point of work; (2) It is listed and labeled for the purpose of verifying the absence of voltage; (3) It tests each phase conductor or circuit part both phase-to-phase and phase-to-ground; (4) The test device is verified as operating satisfactorily on any known voltage source before and after verifying the absence of voltage.

N Exception No. 2: On electrical systems over 1000 volts, noncontact test instruments shall be permitted to be used to test each phase conductor.

Informational Note No. 1: See UL 61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements, for rating, overvoltage category, and design requirements for voltage measurement and test instruments intended for use on electrical system 1000 volts and below.

N Informational Note No. 2: For additional information on rating and design requirements for voltage detectors, refer to IEC 61243-1, Live Working - Voltage Detectors - Part 1: Capacitive type to be used for voltages exceeding 1kV a.c., or IEC 61243-2, Live Working - Voltage Detectors - Part 2: Resistive type to be used for voltages of 1kV to 36kV a.c., or IEC 61243-3, Live Working - Voltage Detectors - Part 3: Two-pole voltage type.
8. 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 de-energized could contact other exposed energized conductors or circuit parts, apply temporary protective grounding equipment in accordance with the following:

a. **Placement.** Temporary protective grounding equipment shall be placed at such locations and arranged in such a manner as to prevent each employee from being exposed to a shock hazard (i.e., hazardous differences in electrical potential). The location, sizing, and application of temporary protective grounding equipment shall be identified as part of the employer’s job planning.

b. **Capacity.** Temporary protective grounding equipment shall be capable of conducting the maximum fault current that could flow at the point of grounding for the time necessary to clear the fault.

---

**N** Informational Note: ATSM F855, *Standard Specification for Temporary Protective Grounds to be Used on De-energized Electric Power Lines and Equipment*, is an example of a standard that contains information on capacity of temporary protective grounding equipment.

c. **Impedance.** Temporary protective grounding equipment and connections shall have an impedance low enough to cause immediate operation of protective devices in case of unintentional energizing of the electric conductors or circuit parts.

---

**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-ND® Manually Operated Ground and 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 ground and test devices’ 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; actual continuous current; thermal cycling; number of operations; 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.

Warning and Caution labels are located in various places. Do NOT remove or deface any of these warning/caution labels.
Ch 3 Equipment Description

A. General

The PowlVac-ND® Manually Operated Ground and Test Device is similar to the PowlVac-ND 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 primary circuits. Both six stab and three stab models are available.

The ground and test device consists of a wheeled frame on which are mounted two terminal sets. Each terminal set consists of three primary disconnecting devices, commonly referred to as “stabs”, for a total of 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 & d). Each test port is connected to one of the six stabs (Figure 2, b & e). The upper test ports are connected to the upper stabs and the lower test ports are connected to the lower 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 and three test ports 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 connections (Figure 2, f) which engage to the ground bus of the equipment. Two factory installed ground connection points are provided, one for the upper stabs (Figure 3, a) and one for the lower stabs (Figure 3, c), which are connected to the ground bar of the device.

**WARNING**

Use only the grounding conductors that are provided with the device. The use of any other conductors may lower the short circuit rating of the device and may not withstand the forces and heat generated by fault currents causing severe injury to operating 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-ND ground and test device. The ground and test device is also equipped with an anti-rollout latch (Figure 1, g) to prevent inadvertent removal from the compartment.

<table>
<thead>
<tr>
<th>Table A Equipment Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>G&amp;T Device Type Number</td>
</tr>
<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>05NGT50M6CX</td>
</tr>
<tr>
<td>05NGT50MLCX</td>
</tr>
<tr>
<td>05NGT50MUCX</td>
</tr>
</tbody>
</table>

B. Compartment Compatibility (Application)

For grounding and testing purposes PowlVac-ND Manually Operated Ground and Test Devices can be temporarily applied in any PowlVac-ND switchgear circuit breaker compartment rated up to and including 5kV rated maximum voltage, 50kA rated short circuit current and 2000A rated continuous current.
Figure 1  *PowlVac-ND®* Manually Operated Ground & Test Device Front (doors closed)

- a. Padlock Hasp
- b. Upper Access Door
- c. Door Latch
- d. Racking Drive Shaft
- e. Lower Access Door
- f. Ground Bar
- g. Anti-Rollout Latch
Figure 2  PowlVac-ND® Manually Operated Ground & Test Device Rear View

a. Lifting Hole  
b. Upper Primary Disconnect Stab  
c. Racking Crank Arm  
d. Barrier  
e. Lower Primary Disconnect Stab  
f. Ground Connection
Figure 3  PowlVac-ND® Manually Operated Ground & Test Device Front (doors open)

- **a.** Upper Stab Ground Connection Point
- **b.** Test Port(s) - Upper
- **c.** Lower Stab Ground Connection Point
- **d.** Test Port(s) - Lower
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.

Approximate size and weight for shipping a PowlVac-ND Manually Operated Ground and Test Device on a pallet:

- Size: 42” width x 42” depth x 47” height
- Weight: 300lbs.

Figure 4 shows the ground and test device enclosed in the carton used for shipment. The carton is attached to the shipping pallet by metal bands. Remove these bands and lift the carton from the pallet so that the ground and test device is visible. The ground and test device is attached to the pallet by metal shipping brackets. When these are removed the ground and test device may be removed from the shipping pallet. Refer to Ch 4 Installation, B. Handling for more information.

Figure 4  Ground and Test Device in Shipping Carton

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.

![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 using the two lifting points which have been provided for hooks at the top of the frame side sheets (Figure 2, a).

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 contaminates 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°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 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.

If the device is stored for any length of time, it should be inspected periodically to see that rusting has not occurred 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 into service.

As stated in IEEE C37.20.6-2015, §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.

1. All insulating surfaces, including but not limited to the primary support insulation, test ports, 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 in accordance with Table B, Field Dielectric Test 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 C37.20.2-2015.”

<table>
<thead>
<tr>
<th>Voltage (kV rms)</th>
<th>Power Frequency Withstand (kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.76</td>
<td>14.25</td>
</tr>
</tbody>
</table>
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.

**NOTICE**

The following Sections A and B describe the general operation of inserting and removing the ground and test device to and from the compartment and are intended to be used in conjunction with Sections C and D as applicable for the procedure to be performed.

### A. Inserting the Ground and Test Device Into the Circuit Breaker Compartment

#### Prior to inserting the ground and test device into the circuit breaker compartment, make sure that the control circuits are deenergized.

1) Inserting the Ground and Test Device to the Test/Disconnect Position

   a. To insert the ground and test device into the circuit breaker compartment, open the compartment door and align the wheels with the floor pan channels of the compartment. Verify that the floor pan channels are free of debris prior to inserting the ground and test device.

   b. Roll the ground and test device into the compartment until the racking crank arm (Figure 2, c) makes contact with the vertical slots in the compartment. The anti-rollout latch (Figure 1, g) on the lower right side of the ground and test device will engage the block in the compartment, preventing accidental removal of the ground and test device from the compartment.

   c. Close and latch the switchgear compartment door.

2) Inserting the Ground and Test Device to the Connected Position

   a. Rotate the racking access cover (Figure 6, a) on the compartment door to gain access to the racking drive shaft extension.

   b. Insert the racking handle onto the racking drive shaft extension (Figure 1, d).
c. Turning the racking handle clockwise will begin to rack the ground and test device into the compartment. When the ground and test device is racked into the compartment, the force needed to rotate the racking handle will be low at the beginning of motion as the movement of the racking crank arm is only opening the shutters. Once the shutters are open, the ground and test device begins to move toward the stationary primary disconnecting devices. When the movable primary disconnecting devices of the ground and test device engage with the stationary primary disconnecting devices of the compartment, the force required to rotate the racking handle will increase appreciably. This force will decrease as the primary disconnecting devices spread and engage fully. Continuing rotation of the racking handle will cause the ground and test device to travel further into the compartment ensuring wipe or overlap of the primary disconnecting devices. When the ground and test device reaches the end of the racking travel, approximately 22 rotations from the starting point, the operator will notice an increased amount of force. If the user continues to apply force, a torque limiter on the racking handle will produce a sharp clicking sound indicating the torque limit is reached at 35-ft-lbs. At this point the operator should stop racking the ground and test device.

d. Once the ground and test device has reached the connected position, remove the racking handle, and operate the ground and test device as required.

B. REMOVING THE GROUND AND TEST DEVICE FROM THE CIRCUIT BREAKER COMPARTMENT

Prior to inserting the ground and test device into the circuit breaker compartment, make sure that the control circuits are deenergized.

1) Removing the Ground and Test Device from the Connected to the Test/Disconnected Position

   a. Rotate the racking access cover (Figure 6, a) on the compartment door to gain access to the racking drive shaft extension.
   b. Insert the racking handle onto the racking drive shaft extension (Figure 1, d).
   c. Turn the racking handle counterclockwise approximately 22 rotations until the ground and test device reaches the test/disconnected position.
   d. Remove the racking handle.

2) Removing the Ground and Test Device from the Test/Disconnected Position out of the Circuit Breaker Compartment

   a. Open the circuit breaker compartment door.
   b. Press the anti-rollout latch (Figure 1, g) to release the ground and test device and pull the ground and test device out of the circuit breaker compartment.
C. TESTING

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

**NOTICE**

Prior to inserting or removing the circuit breaker, refer to the latest version of the appropriate circuit breaker and switchgear bulletins and any site specific work instructions.

**CAUTION**

Prior to removing the circuit breaker from the circuit breaker compartment, make sure that the control circuits are deenergized.

1. Remove the circuit breaker from the compartment to be tested.
2. Remove the access door (Figure 7) from the ground and test device to the terminal set to be tested by opening the door and lifting it up off of the two hinges (Figure 7, b). In a six stab application, the appropriate access door to the energized ports which will not be grounded shall be locked or tagged out for safety.
3. If present, remove the ground stab assembly (Figure 5) from the ground and test device prior to testing by removing the three bolts connecting the ground stab prongs (Figure 5, a) to the upper or lower primary disconnect stabs (Figure 2, b & e), and one bolt connecting either the upper or lower stab ground connection point (Figure 3, a & c) to the upper or lower ground stab assembly ground connection point (Figure 5, b & c). Save all hardware for re-installation of the ground stab assembly.
4. Insert the ground and test device into the test/disconnected position in the breaker compartment. Refer to Ch 5 Operation, A. Inserting the Ground and Test Device into the Circuit Breaker Compartment, 1) Inserting the Ground and Test Device to the Test/Disconnected Position.
5. Close and latch the breaker compartment door.
6. Rack the ground and test device into the connected position. Refer to Ch 5 Operation, A. Inserting the Ground and Test Device Into the Circuit Breaker Compartment, 2) Inserting the Ground and Test Device to the Connected Position.
7. Open the breaker compartment door. If testing is to be done on arc resistant switchgear, the shutter position interlock will need to be defeated in order to open the compartment door. Refer to the latest version of the PowIVac-NDAR® Arc Resistant Switchgear Instruction Bulletin for information on defeating this interlock.
8. 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 by inserting the test probe all the way into each of the appropriate 3” diameter test ports.

9. Push the door closed while rotating the racking access cover (Figure 6, a) and insert the magnetic handle tool (Figure 6, b) to capture the racking driveshaft. Once engaged, pull the racking driveshaft into the interlock tube.

10. The door may then be latched closed and the shutter interlock will reset automatically.

Figure 6    Inserting Magnetic Handle Tool

---

D. GROUNDING

**WARNING**

Do NOT attempt to use the PowlVac-ND® Manually Operated 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. Remove the access door to the terminal set that will be grounded by opening the door and lifting it up off of the two hinges (Figure 7, b).

11. Rack the ground and test device out to the test/disconnected position and remove the ground and test device from the compartment. Refer to Ch 5 Operation, B. Removing the Ground and Test Device from the Circuit Breaker Compartment.
4. Install the ground stab assembly onto the appropriate terminal set by inserting the three prongs (Figure 5, a) from the front of the ground and test device through the open access door into either the upper or lower cutouts (Figure 8, a & c). Bolt the ground stab prongs to the primary disconnect stabs (Figure 8, b), and then bolt the ground stab assembly to the ground connection point using the hardware previously removed (Figure 9, a).

5. Make sure that all bolts are properly tightened. Torque the 1/2" bolts to 50-ft-lbs when re-installing the ground stab assembly.

6. The remaining access door should be tagged or locked closed even if no voltage is present.
7. Insert the ground and test device into the test/disconnected position in the breaker compartment. Refer to *Ch 5 Operation, A. Inserting the Ground and Test Device Into the Circuit Breaker Compartment, 1) Inserting the Ground and Test Device to the Test/Disconnected Position*.

8. Close the circuit breaker compartment door.

9. Rack the ground and test device into the connected position, refer to *Ch 5 Operation, A. Inserting the Ground and Test Device Into the Circuit Breaker Compartment, 2) Inserting the Ground and Test Device to the Connected Position*. The circuit is now grounded and can be visually verified to be grounded by looking at the racking crank arm (*Figure 2, c*) on the right side of the ground and test device through the view window in the breaker compartment door (*Figure 6, b*).

10. The compartment must be tagged or locked out to prevent access.

11. To remove the ground and test device, rack the device out to the test/disconnected position and remove the ground and test device from the compartment. Refer to *Ch 5 Operation, B. Removing the Ground and Test Device from the Circuit Breaker Compartment*.
Ch 6 Maintenance

A. General

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.

1) Lubrication

Powell offers a complete lubrication kit (Powlube-104) which contains all the lubricants required for maintaining the ground and test devices. Powlube-104 consists of (1) A-grease, (1) B-grease, (1) C-oil.

The contact surfaces of the primary disconnect stabs and the fingers of the ground shoe should be lubricated with a thin film of B-Grease. 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 racking-in device and wheels require the same lubrication as on the circuit breakers. Refer to the latest version of the appropriate circuit breaker instruction bulletin for more information.

2) Inspection and Cleaning

Visually check the ground and test device for loose or damaged parts. Tighten or replace loose or missing hardware. Any damaged parts that will interfere with the normal operation of the ground and test device should be replaced.

Clean the test device by removing any loose dust and dirt. Use a vacuum cleaner or wipe with a dry lint-free cloth or an industrial-type wiper to clean the ground and test device.
A. Ordering Instructions

1. Order Renewal Parts from the Powell Service Division at 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.

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.

**Table C Renewal Part Numbers**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground Connection</td>
<td>69433G01</td>
</tr>
<tr>
<td>1</td>
<td>Ground Stab Assy</td>
<td>77240G05</td>
</tr>
<tr>
<td>1</td>
<td>Magnetic Handle</td>
<td>77550G02</td>
</tr>
</tbody>
</table>
01.4IB.77011
PowlVac-ND® Manually Operated Ground and Test Device with Closed Door Racking Capability

5kV, 50kA, 2000A

September 2020