Instruction Bulletin - 01.4IB.65090A
PowlVac 38™ CDS Electrically Operated
Ground & Test Device

per ConEd Specification EO-2022-15
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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”, “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.
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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 38™ CDS Electrically Operated Ground & Test Device:

- 38GT40CDSD - “Con Ed” Version
- 38GT40CDSE - Con Ed “Customer” Version

The information in this instruction bulletin is intended to provide details required to properly operate and maintain the PowlVac 38 CDS Ground & Test Device 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 ground & test device
3. Instructions for installation and placing the ground & 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 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 photos and illustrations are shown using deenergized equipment.

WARNING
Follow the appropriate safety precautions while handling any of the equipment. Failure to do so may result in death or serious injury.

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.

B. 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 Powell equipment.

For more information visit powellind.com. 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 IB number in the subject line.
Ch 2 Safety

A. Safe Work Condition

The information in Section A is quoted from NFPA 70E 2012 - 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.

Informational Note: See ANSI/ISA-61010-1 (82.02.01)/UL 61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements, for rating and design requirements for voltage measurement and test instruments intended for use on electrical systems 1000 V and below.

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.

The ground and test devices described in this instruction bulletin are operated by a high-energy, high-speed mechanism that is interlocked to provide specific operating sequences. 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 38™ CDS Electrically Operated Ground and Test Device.
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.

The following specific safety precautions must be observed:

1. Do not close the grounding switch on an energized circuit. The circuit to be grounded should always be treated as energized until proven otherwise.

2. Use great care when opening the test port shutters to gain access to the test receptacles. The test receptacles should always be treated as energized circuits until proven otherwise.

3. Any test device plugged into the test receptacles must be properly rated for the circuit voltage being tested and all connections must be properly insulated.

4. Use only the test probes (Figure 7) furnished with the device to plug anything into the test ports.

Use of other plugs may damage the test port or may result in a poor connection which could be dangerous to the operator and/or damaging to the equipment.

5. Even though insulated, the test probes must not be inserted or extracted from energized test ports. The test probe insulation is only one part of a complete line-to-ground insulation system and the surface of the test probe may be energized at a voltage above ground potential when connection to an energized test port.

It is important for the user to develop specific and safe operating procedures to be observed when using the ground and test device.
6. Do not attempt to force or bypass any interlocks. The interlocks are furnished for the safety of the operator and the protection of the equipment being tested and the test device.

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 ground and test device is handled, operated, or maintained.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forcing or bypassing the interlocks can result in a condition dangerous to the operator and/or damaging to the equipment.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning and Caution labels are located in various places. Do NOT remove or deface any of these warning/caution labels.</td>
</tr>
</tbody>
</table>

7. 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.

8. For service, the device must be in the OPEN position and all operating springs must be discharged. These conditions should be verified before removing any covers or attempting any service.

9. Store the electrically operated ground and test device in a clean, dry area free from dust, dirt, moisture, caustic atmosphere, and vermin.

10. Keep all insulating surfaces, which include primary support insulation and insulation barriers, clean and dry.

11. Check all primary circuit connections to make certain that they are clean and tight.

12. Take extreme care while using this device to avoid contacting “live” or “hot” (energized) terminals.
Ch 3 Equipment Description

A. GENERAL

The PowlVac 38™ CDS Electrically Operated Ground & Test Device (Figure 2) is a drawout element that can be inserted into the circuit breaker compartment in the same manner as a PowlVac 38 CDS circuit breaker.

The PowlVac 38 Electrically Operated Ground & Test Device provides a means for obtaining access to the primary disconnecting devices of the switchgear compartment for purposes of grounding the primary circuits or conducting certain high voltage test procedures such as conducting high voltage withstand (hipot) tests.

The grounding switch is operated by a stored energy mechanism. It is capable of applying the ground against a live circuit if operational errors have not cleared the circuit. However, in such a case, the relaying at the source of power is expected to cause the source interrupter to clear the circuit.

B. GROUND AND TEST DEVICE OPERATION

1) Closing

The ground and test device is closed by the remote control box at the end of a 50 foot long cable that is supplied with the device. Upon depressing the CLOSE pushbutton (Figure 1, b), the closing springs start to charge. After the springs are fully charged, the springs automatically discharge to close the switch contacts.

Once the ground and test device is closed, it can be locked into the CLOSED position by removing the power cord (Figure 1, c) from the remote control box plug receptacle (Figure 3, n) on the ground and test device.

2) Opening

The ground and test device can be opened electrically using the remote control box. The OPEN pushbutton must be depressed (Figure 1, d). For safety reasons, the switch is prevented from opening in less than 20 seconds after closing.

Figure 1 Remote Control Box

a. On/Off Switch
b. Close Pushbutton
c. Power Cord
d. Open Pushbutton
Figure 2  PowlVac 38™ CDS Ground & Test Device - "ConEd" Version

a. Primary Disconnecting Device
b. Test Probe Port
c. Racking Crank Arm
d. Test Port Shutter Operator
e. Handle
f. Wheel
g. Ground Connection
Figure 3  PowlVac 38™ CDS Ground & Test Device Front Close Up - "Customer" Version

a. Key Lock K5
b. Key KD
c. Control Selector Switch
d. Secondary Disconnect Receptacle
e. Ground Switch Indicator
f. Key Lock K2
g. Key Lock K4
h. Key KB
i. Key KB
j. Key KD
k. Key KC
l. Key Lock K3
m. Key KC
n. Remote Control Box Plug Receptacle
o. Key Lock K1
p. Nameplate
q. Key KCF
r. Key KB
C. Key Locks

PowlVac 38™ CDS Electrical Ground and Test Devices "Con Ed" version (41588G95) and Con Ed "Customer" version (41588G96) are provided with numerous key lock interlocks and include:

1) Key Lock “K1” (Keys KCF and KB)

The key lock “K1” interlock is a two cylinder lock used to electrically enable or disable the ground & test device.

The K1 interlock (Figure 3, o) is a two cylinder lock equipped with an electrical switch element. The switch is closed when the KB key is retained. When the switch is open, the ground and test device is electrically disabled and the KCF key is retained (Figure 3, q).

2) Key Lock “K2” (Keys KB and KC)

The key lock “K2” interlock is a two cylinder lock used to mechanically lock the ground and test device ground-making switch in the “OPEN” position.

The key lock “K2” interlock (Figure 3, f) is operable only when key “KB” is inserted and the ground and test device is "OPEN". When the K2 interlock is operated with the locking bolt extended, the ground-making switch is open, the KB key is retained and the KC key is released (Figure 3, i & k).

3) Key Lock “K3” (Key KC)

The key lock “K3” interlock is a single cylinder lock. When the K3 interlock (Figure 3, l) is locked, the ground and test device is prevented from being inserted into or removed from the connected position of the circuit breaker compartment.

When the ground and test device is in the disconnected position, the K3 interlock prevents the racking device handle from entering the corresponding racking hole on the ground and test device, thereby preventing the insertion of the ground and test device into the connected position.

When the ground and test device is in the connected position, the K3 interlock blocks the racking device drive shaft in the ground and test device, thus preventing the device from further movement. This action prevents the removal of the ground and test device from the connected position.

With the KC key inserted (Figure 3, m) and the locking bolt retracted to enable racking of the ground and test device in or out of the connected position, the KC key is retained.

NOTICE

The CON ED and CUSTOMER ground and test devices are supplied with similar interlock functions. However, the CON ED device uses Key KU for Key Lock K1 and the CUSTOMER device uses Key KCF for Key Lock K1. Key KU and Key KCF are NOT INTERCHANGEABLE.

Although these operating procedures contain illustrations of the CUSTOMER device, these procedures also apply to the CON ED device. For procedures that refer to Key KCF for the CUSTOMER device, the same procedures apply to Key KU for the CON ED device.
4) **Key Lock “K4” (Keys KB and KD)**

The key lock “K4” interlock (Figure 3, g) consists of a two cylinder lock used to mechanically lock the ground and test device in the “CLOSED” position.

In the PowlVac 38™ CDS ground and test design, the locking bolt of the K4 interlock cannot be extended unless the ground and test device is in the “CLOSED” position. The key lock K4 interlock is equipped with an electrical switch element that electrically blocks an opening command.

The K4 interlock is operable only when the KB key is inserted, the ground making switch is closed. When the K4 interlock is operated the KB key is retained and the KD key is released (Figure 3, h & j).

5) **Key Lock “K5” (Key KD)**

The key lock “K5” interlock (Figure 3, a) is a single cylinder lock and is used to open and lock the test port shutters.

The KD key, which normally resides in the K4 interlock, is available only when the ground making switch is in the closed and locked position. The KD key is then inserted into interlock K5 (Figure 3, b). With the locking bolt retracted and the test port shutters are unlocked, the KD key is retained. Key KD is removable only when the locking bolt is extended in either of two positions. One position is with the test port shutters closed, and the other position is with the test probes (Figure 7) installed in the test ports and the shutter moved to the probe locking position.

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**D. Control Selector Switch**

A control selector switch (Figure 3, c) is mounted on the front of the ground and test device. This selector switch enables and disables the closing and tripping function of the ground and test device.

The selector switch is a three position rotary switch that operates in association with the remote OPEN/CLOSE pushbutton control box (Figure 1). The snap action positions are OPEN, OFF, and CLOSE. The selector switch is padlockable in the OFF position.

**E. Interchangeability**

PowlVac 38 CDS ground and test devices are not interchangeable between the Con Edison and Customer compartments. The interference plate (Figure 4 & 5, e) will only allow a ground and test device labeled “Con Ed” into a Con Edison incoming feeder compartment. Additionally, a ground and test device labeled “Customer” can only be inserted into a customer feeder compartment.
Figure 4  PowlVac 38™ CDS Ground and Test Device (Rear View) - "ConEd" Version with Upper Primary Disconnecting Devices

- a. Racking Roller Plate
- b. View Port Windows
- c. Levering Arm
- d. Primary Disconnecting Device
- e. Interference Plate

Figure 5  PowlVac 38™ CDS Ground and Test Device (Rear View) - "Customer" Version with Lower Primary Disconnecting Devices

- a. Racking Roller Plate
- b. View Port Windows
- c. Levering Arm
- d. Primary Disconnecting Device
- e. Interference Plate
**Ch 4 Installation**

### A. Receiving

When the ground and test device is received check for any sign of damage. If damage is found or suspected, file all claims immediately with the transportation company and notify the nearest Powell representative.

Estimated size and weight for shipping a PowlVac 38™ CDS ground and test device on a pallet:

- Size: 42” width x 42” depth x 47” height
- Weight: 750 lbs.

The ground and test device is enclosed in a carton 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 bands. 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.

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

![CAUTION](image)

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

An overhead crane can be used to move the ground and test device. When using an overhead crane to move the ground and test device use a harness and a single crane hook. Place the ground and test device securely on the harness as shown in Figure 6. Place the crane hook in the harness lifting link on the top of the harness. Lift the ground and test device and move it to the required location.

![Figure 6 Ground and Test Device on Overhead Crane](image)

### C. Storage

Since the ground and test device is an accessory device not normally in continuous service, it is very important that it be stored carefully so that it will be available when needed. The following precautions must be taken to assure proper storage of the ground and test device:
1. Since moisture has an adverse effect on the insulating parts, the device should be carefully protected against condensation, preferably by storing it in a warm dry room of moderate temperature, such as 40°-100°F. Ground and test devices used in outdoor metal-clad switchgear should be stored in the equipment only when power is available and the anti-condensation heaters are in operation.

2. The ground and test 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 corrosive effect on many parts.

3. Unplated surfaces, such as, rollers, latches, etc., of the operating mechanism should be coated with grease/oil to prevent rusting. If the ground and test 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. If the ground and test device is stored under unfavorable atmospheric conditions, it should be cleaned and dried before being placed into service.

4. The device should be covered with a cloth or plastic cover to prevent dust accumulation on the device during long term storage. This cover must not cut off air flow to the device or condensation may occur under the cover.

D. PLACING THE GROUND AND TEST DEVICE INTO SERVICE

Before shipment from the factory, all ground and test device functions are thoroughly checked. The user must verify functions after receipt. Powell recommends that the tests be performed in the sequence listed below:

1) High Voltage Insulation Integrity

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High voltages across the open gaps of the vacuum interrupter can produce radiation. When conducting high voltage test, personnel should stand at least one meter (3') away from the ground and test device with the covers in place. Test voltage should not exceed 60kVAC (80kVDC) for a ground and test device with a rated maximum voltage of 38kV.</strong></td>
</tr>
</tbody>
</table>

The primary circuit insulation on the ground and test device may be checked phase-to-phase and phase-to-ground using a 2500V insulation resistance tester. Since definite limits cannot be given for satisfactory insulation values when testing with an insulation resistance tester, a record should be kept of the insulation resistance tester readings as well as the temperature and humidity readings. The record should be used to detect any weakening of the insulation system from one check period to the next.

To check insulation integrity, the AC high potential test described below is strongly recommended. DC testing is not the preferred method, however, values are provided due to the availability of DC test sets.
If DC high potential testing is performed, the DC high potential test machine must NOT produce instantaneous peak voltages exceeding 85kV.

The ground and test device insulation should be tested with the ground and test device vacuum interrupter contacts in the CLOSED position.

Test each pole of the ground and test device separately, with the other 2 poles and the frame grounded. Perform the field dielectric test described in ANSI Standard C37.20.2, at the voltage level appropriate for the equipment (Table A Field Dielectric Test Values).

<table>
<thead>
<tr>
<th>Rated Maximum Voltage (kV rms)</th>
<th>Power Frequency Withstand (kV rms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>60</td>
</tr>
</tbody>
</table>

This test will have checked all of the primary phase-to-ground and phase-to-phase insulation.

After the high potential is removed, an electrical charge may be retained by the vacuum interrupters. Failure to discharge this residual electrostatic charge could result in an electrical shock. All primary disconnecting devices of the grounding device and the metallic mid-band ring, if present, should be grounded and remain grounded for at least one minute to reduce this electrical charge before coming into contact with the primary circuit.

Remove all grounding conductors applied for this test before placing the grounding device back into service.

The tests described above are the only tests required to ascertain insulation integrity. Because of the design of the PowlVac 38™ insulation system, no valid data can be obtained using other types of high voltage insulation tests.

2) Vacuum Integrity

Applying abnormally high voltage across a pair of contacts in the vacuum may produce x-radiation. The radiation may increase with increased voltage and/or decreased contact spacing.

The x-radiation, produced during this test with the voltage specified in Table A and normal contact spacing, is extremely low and well below the maximum permitted by standards.

Do NOT apply voltage that is higher than the recommended value. Do NOT use contact separation that is less than the normal open position separation of the ground and test device contacts.

Powell recommends AC testing for reliable verification of vacuum integrity. All PowlVac 38™ CDS ground and test devices shall be tested with a minimum of 60kVAC applied directly across fully open contacts for 10 seconds. No dielectric breakdown during the test period constitutes a successful test.
**Note:** The AC test does not replace the AC high potential testing (HIPOT) used to determine “High Voltage Insulation Integrity”. For more details, see Ch 4 Installation, D. Placing Ground and Test Device Into Service, 1) High Voltage Insulation Integrity.

Powell offers a compact and lightweight PowlVac Vacuum Integrity Tester designed specifically for PowlVac ground and test devices. If this device is used, refer to the instruction bulletin provided with the vacuum integrity tester.

Powell recognizes the widespread use of DC hipot equipment in the field and the desire to use this equipment to verify integrity. However, the capacitive component of the vacuum interrupter during DC testing may yield false negative test results, which are often misinterpreted as vacuum interrupter failure. When DC testing is performed, a test set providing a full wave rectified 60kVDC hipot voltage can be applied for 5 seconds as a “go - no go” test.

Recording the leakage readings is not necessary, as a dielectric breakdown will trip all portable DC hipot test sets. If a DC test breakdown occurs, the test must be repeated after reversing the DC high voltage test supply connection across the vacuum interrupter. The working condition of a vacuum interrupter should be questioned only if it has failed both tests.

---

**CAUTION**

When testing with DC, use a DC high potential test (HIPOT) set with FULL WAVE rectification. Do NOT use half-wave rectifiers. The capacitance of the vacuum interrupter in combination with the leakage currents in the rectifiers and its DC voltage measuring equipment may result in applying peak voltages as much as three times the measured voltage. These abnormally high voltages may give a false indication of a defective vacuum interrupter, and may produce abnormal x-radiation.

---

**CAUTION**

If DC high potential testing is performed, the DC high potential test machine must NOT produce instantaneous peak voltages exceeding 85kV.

No attempt should be made to try to compare the condition of one vacuum interrupter with another, nor to correlate the condition of any vacuum interrupter with low values to DC leakage current. There is no significant correlation.

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**WARNING**

After the high potential is removed, an electrical charge may be retained by the vacuum interrupters. Failure to discharge this residual electrostatic charge could result in an electrical shock. All primary disconnecting devices of the grounding device and the metallic mid-band ring, if present, should be grounded and remain grounded for at least one minute to reduce this electrical charge before coming into contact with the primary circuit.
3) Control Voltage Insulation Integrity

If the user wants to check the insulation integrity of the control circuit, it may be done with a 500V or 1000V insulation resistance tester or with an AC high potential tester. The AC high potential test should be made at 1125V, 50 to 60Hz for one minute. The charging motor must be disconnected prior to testing the control circuit. The charging motor itself may be similarly tested at a voltage not to exceed 675V, 50 to 60Hz. Be sure to remove any test jumpers and reconnect the charging motor when the tests are complete.

Remove all grounding conductors applied for this test before placing the grounding device back into service.

4) Electrical Operation Check

To check the basic electrical operation check connect the secondary disconnect plug to the ground and test device secondary disconnect receptacle to be tested (Figure 3, d). The secondary disconnect provides control voltage to the ground and test device. The appropriate control switches to verify the CLOSE and OPEN functions of the ground and test device are part of the ground and test device remote control box. With the secondary disconnect plug inserted in the ground and test device being tested, and with key KB captive, perform the following steps:

a. Test the Closing Operation of the Ground and Test Device

Perform the following to test the closing operation of the ground and test device:

a. Connect the power cord of the remote control box to the ground and test device (Figure 3, n). Ensure the cord is locked into the connected position by turning the plug clockwise.

b. Verify that the control selector switch on the front of the ground and test device is in the “OFF” (center) position (Figure 3, c).

c. Move the control selector switch from “OFF” position to “CLOSE” position (Figure 3, c).

d. Turn the remote control box to the "ON" position (Figure 1, a) and depress the “CLOSE” pushbutton switch on the control box (Figure 1, b) to close the ground and test device ground making switch.

e. Move the control selector switch from the “CLOSE” position to the “OFF” position (Figure 3, c).

b. Test the Opening Operation of the Ground and Test Device

Perform the following to test the opening operation of the ground and test device:

a. Move the control selector switch to the “OPEN” position (Figure 3, c).

b. Turn the remote control box to the "ON" position (Figure 1, a) and depress the "OPEN" pushbutton (Figure 1, d) to open the ground and test device.

c. Move the control selector switch to the "OFF" position (Figure 3, c).
d. Disconnect the remote control box from the ground and test device.

When the electrical checks are completed disconnect the secondary disconnect plug from the ground and test device (Figure 3, d).

E. INSERTING GROUND AND TEST DEVICE INTO SWITCHGEAR EQUIPMENT

Refer to the appropriate instruction bulletin for information and cautions before attempting to insert a ground and test device into the metal-clad switchgear equipment. The information and cautions found in 01.4IB.65071 also apply to the ground and test device. Ensure that the levering-in crank arms at the sides of the device point in the direction of the main disconnects.

Each ground and test device and each compartment is provided, when required, with an interference plate designed to ensure that no device with less than the required voltage or momentary current rating is placed in any compartment. If attempting to insert an improperly rated device into the switchgear, these interference plates will interfere with each other and deter the insertion of the device. The interference occurs before the device reaches the “DISCONNECT” position.

CAUTION
Verify the correct ground and test device is being inserted in the compartment of the feeder to be grounded. Also, verify all associated incoming and tie breakers are open before inserting the ground & test device. Failure to do so may result in damage to equipment and/or injury to personnel.

1) Electrical Ground and Test Device Inspection

a. Inspect the primary disconnecting devices for proper lubrication, damage, debris, and dirt. Ensure that the disconnecting devices are in alignment and are not bent. If damage or dirt is present, refer to Ch 6 Maintenance, A. General Description, 2) Inspection and Cleaning.

NOTICE
If the primary disconnecting devices are damaged, make no attempt to repair them. Contact Powell for further information.

b. Inspect the switchgear compartment to ensure that it is clean and clear of debris that might interfere with ground and test device travel.

CAUTION
Do not force the device past the interference plate or remove the interference plate from the compartment or the ground and test device.
Ch 5 Operating Procedures

The PowlVac 38™ CDS Electrically Operated Ground and Test Device is designed to provide access to the stationary primary disconnecting devices of metal-clad switchgear compartments to ground those terminals or to perform tests on either energized or deenergized circuits. Because this device gives access to switchgear components that are normally energized with dangerous voltages, great care must be exercised when using this device. All primary circuits should be considered to be energized until proven otherwise.

The operational instructions given in this instruction bulletin cover the basic operations required to use the ground and test device. In addition, many users will have operational and interlocking procedures of their own that must be followed. The operator must be knowledgeable of any procedures required by the user of the equipment and should also examine the drawings furnished with the particular switchgear equipment being grounded or tested, as these drawings may include additional information or instructions.

A. Applying Ground

Although the PowlVac 38™ CDS Electrically Operated Ground & Test Device is designed and rated to close against a short circuit current within its rating, it should not be used to deliberately apply a ground to an energized line or bus. The operator should ensure that the circuit to be grounded is deenergized before closing the grounding switch.

Determine the circuit to be grounded and carefully examine the drawings provided with the switchgear equipment to determine in which compartment this circuit is located and whether it is connected to the upper or lower disconnect stabs. Once this is known, perform the following:

1. With the ground and test device out of the breaker compartment, verify the correct compartment compatibility of the ground and test device. The ground and test devices supplied per installation are prominently marked “CUSTOMER” across the front for ease of identification.
2. Obtain the KCF key through proper control procedures.
3. Insert the KCF key into key lock K1 (Figure 3, q) and rotate the key. The switch associated with K1 opens. The “Close” control circuit of the ground and test device is now electrically disabled. The KCF key is now captive and has electrically locked the ground and test device in the “Open” position. The KB key is now removable (Figure 3, r).
4. Transfer key KB to key lock K2 (Figure 3, i). The ground and test device is now mechanically locked in the “Open” position. The KB key is now captive and the KC key is removable (Figure 3, k).
5. Insert the ground and test device into the correct compartment. The ground and test device is rolled into the compartment, in the same manner as the circuit breaker it temporarily replaces, until the ground and test device encounters a positive “stop”.

6. Transfer key KC to key lock K3 and rotate the key (Figure 3, m). The KC key is now captive. The ground and test device racking shaft is now accessible.

7. Insert the racking handle and rotate the handle clockwise to move the ground and test device into the “Connected” position. The racking handle is also equipped with an input torque limiter that will indicate limit to the operator by a mechanical ratcheting mechanism for positive operator feedback. Remove the racking handle.

8. Rotate key KC to lock the ground and test device in the connected position. The KC key is now released.

9. Transfer key KC to key lock K2 (Figure 3, k) and rotate key KC. The key KC is now captive and the KB key is released (Figure 3, i).

10. Transfer key KB to key lock K1 (Figure 3, r). Rotate key KB. The ground and test device control circuit is now enabled. The KB key is now captive and the KCF key is released (Figure 3, q).

11. Verify that the control selector switch on the front of the ground and test device is in the “OFF” (center) position (Figure 3, c).

12. Connect the power cord of the remote control box to the ground and test device (Figure 3, n). Ensure the cord is locked into the connected position by turning the plug clockwise.

13. Connect the secondary disconnect plug to the receptacle on the ground and test device (Figure 3, d).

14. Move to control selector switch from “OFF” position to “CLOSE” position (Figure 3, c).

15. Turn the remote control box “ON” (Figure 1, a) and depress the “CLOSE” pushbutton (Figure 1, b) to close the ground and test device.

16. Move the control selector switch from the “CLOSE” position to the “OFF” position (Figure 3, c).

17. Turn the remote control box “OFF” and disconnect the power cord of the remote control box from the ground and test device (Figure 3, n).

18. Rotate key KCF in key lock K1 to electrically lock the ground and test device in the “CLOSED” position. Remove key KB from key lock K1 (Figure 3, r).

19. Secure key KB in lock box on premises.

B. REMOVING GROUND

**NOTICE**

The CON ED and CUSTOMER ground and test devices are supplied with similar interlock functions. However, the CON ED device uses Key KU for Key Lock K1 and the CUSTOMER device uses Key KCF for Key Lock K1. Key KU and Key KCF are NOT INTERCHANGEABLE.

Although these operating procedures contain illustrations of the CUSTOMER device, these procedures also apply to the CON ED device. For procedures that refer to Key KCF for the CUSTOMER device, the same procedures apply to Key KU for the CON ED device.

1. Obtain the KB key through proper control procedures.

2. Transfer key KB to key lock K1 (Figure 3, r) and rotate key. Key KB is now captive and key KCF is released (Figure 3, q). The control circuit for the ground and test device is now enabled.

3. Verify that the control selector switch on the front of the ground and test device is in the “OFF” (center) position (Figure 3, c).
4. Connect the power cord of the remote control box to the ground and test device (Figure 3, n). Ensure the cord is locked into the connected position by turning the plug clockwise.

5. Connect the secondary disconnect to the receptacle on the ground and test device (Figure 3, d).

6. Move the selector switch from the “OFF” position to the “OPEN” position (Figure 3, c).

7. Turn the remote control box “ON” (Figure 1, a) and depress the “OPEN” pushbutton (Figure 1, d) on the control box to open the ground and test device.

8. Move the control selector switch from “OPEN” to the “OFF” position (Figure 3, c).

9. Turn the remote control box “OFF” and disconnect the remote control box power cord from the ground and test device (Figure 3, n).

10. Rotate key KCF in key lock K1 (Figure 3, q). The switch associated with K1 opens. The “CLOSE” control circuit of the ground and test device now electrically disabled. The KCF key is now captive and key KB is now removable (Figure 3, r).

11. Transfer key KB to key lock K2 and rotate key KB (Figure 3, i). The ground and test device is now mechanically locked in the “OPEN” position. Key KB is now captive and key KC is now removable (Figure 3, k).

12. Transfer key KC to key lock K3 and rotate (Figure 3, m). The key KC is now captive. The ground and test device racking access shaft is now accessible.

13. Insert the racking handle, and rotate the handle counterclockwise to move the ground and test device into the “Disconnected” position. The “Disconnected” position is indicated by the racking mechanism encountering a positive stop. The racking handle is also equipped with an input torque limiter that will indicate limit to the operator by a mechanical ratcheting mechanism for positive operator feedback. Remove the racking handle.

14. Rotate key KC to lock the ground and test device in the disconnected position. Key KC is now released.

15. Transfer key KC to key lock K2 and rotate key KC (Figure 3, k). The key KC is now captive and key KB is released.

16. Transfer key KB to key lock K1 (Figure 3, r) and rotate. Key KB is now captive and key KCF is now released.

17. Disconnect the secondary disconnect plug from the ground and test device secondary disconnect receptacle (Figure 3, d).

18. Remove the ground and test device from the compartment.

19. Remove key KCF from key lock K1 (Figure 3, q).

20. Secure key KCF in lock box on premises.
C. Procedure for Testing Feeder

NOTICE

The CON ED and CUSTOMER ground and test devices are supplied with similar interlock functions. However, the CON ED device uses Key KU for Key Lock K1 and the CUSTOMER device uses Key KCF for Key Lock K1. Key KU and Key KCF are NOT INTERCHANGEABLE.

Although these operating procedures contain illustrations of the CUSTOMER device, these procedures also apply to the CON ED device. For procedures that refer to Key KCF for the CUSTOMER device, the same procedures apply to Key KU for the CON ED device.

Perform steps 1 through 10 of Ch 5 Operating Procedures, A. Applying Ground prior to the following:

1. Verify that the control selector switch on the front of the ground and test device is in the “OFF” (center) position (Figure 3, c).
2. Connect the power cord of the remote control box to the ground and test device (Figure 3, n). Ensure the cord is locked into the connected position by turning the plug clockwise.
3. Connect the secondary disconnect plug to the receptacle on the ground and test device (Figure 3, d).
4. Move the control selector switch from the “OFF” position to the “CLOSE” position (Figure 3, c).
5. Turn the remote control box “ON” (Figure 1, a) and depress the “CLOSE” pushbutton (Figure 1, b) on the control box to close the ground and test device.
6. Move the control selector switch to the “OFF” position (Figure 3, c) and turn the remote control box “OFF” (Figure 1, a).
7. Disconnect the remote control box power cord from the ground and test device (Figure 3, d).
8. Rotate key KB in key lock K1 to electrically disable the ground and test device.
9. Transfer key KB to key lock K4. Rotate key KD (Figure 3, j). The ground and test device is now electrically and mechanically locked in the “CLOSED” position. The KB key is now captive and key KD is released.
10. Transfer key KD key to key lock K5. Rotate key KD to unlock the test port shutters (Figure 3, b).
11. Open the test port shutters using the slide handle (Figure 2, d). With the test ports fully open, the key lock K5 interlock is blocked from operating and the key remains captive.

Figure 7 Test Probe and Cable

12. Install test probes (Figure 7) into the test ports (Figure 2, b). Move the test port shutter to the left to capture the test probes in the test probe shutter.
13. Rotate key KD to lock the test probes in the test ports. Key KD is now released.
14. Transfer key KD to key lock K4 (Figure 3, j). Rotate key KD. Key KD is now captive and key KB is released.
15. Transfer key KB to key lock K1 (Figure 3, r). Rotate key KB. The ground and test device control circuit is now enabled. Key KB is now captive and key KCF is now released.
16. Verify that the control selector switch on the front of the ground and test device is in the “OFF” (center) position (Figure 3, c).
17. Connect the power cord of the remote control box to the ground and test device (Figure 3, n). Ensure the cord is locked into the connected position by turning the plug clockwise.
18. Move the control selector switch from the “OFF” position to the “OPEN” position.
19. Turn the remote control box “ON” (Figure 1, a) and depress the “OPEN” pushbutton (Figure 1, d) on the remote control box to open the ground and test device.
20. Move the control selector switch to the “OFF” position (Figure 3, c) and turn the remote control box “OFF” (Figure 1, a).
21. Disconnect the remote control box power cord from the ground and test device (Figure 3, n).
22. Rotate key KB in key lock K1 to electrically lock the ground and test device in the “OPEN” position. Remove key KB from key lock K1.
23. Lock key KB in a lock box on premises.
24. The ground and test device is now prepared for testing.

D. REMOVING TEST PROBES

**NOTICE**

The CON ED and CUSTOMER ground and test devices are supplied with similar interlock functions. However, the CON ED device uses Key KU for Key Lock K1 and the CUSTOMER device uses Key KCF for Key Lock K1. Key KU and Key KCF are NOT INTERCHANGEABLE.

Although these operating procedures contain illustrations of the CUSTOMER device, these procedures also apply to the CON ED device. For procedures that refer to Key KCF for the CUSTOMER device, the same procedures apply to Key KU for the CON ED device.

Perform the following steps to remove the test probes from the ground and test device:

1. Obtain the KB key through proper control procedures.
2. Transfer key KB to key lock K1 and rotate key. The ground and test device control circuit is now enabled. The KB key is now captive and key KCF is released (Figure 3, q).
3. Verify that the control selector switch on the front of the ground and test device is in the “OFF” (center) position (Figure 3, c).
4. Connect the power cord of the remote control box to the ground and test device (Figure 3, n). Ensure the cord is locked into the connected position by turning the plug clockwise.
5. Move the control selector switch from the “OFF” position to the “CLOSE” position (Figure 3, c).
6. Turn the remote control box “ON” (Figure 1, a) and depress the “CLOSE” pushbutton (Figure 1, b) on the control box to close the ground and test device.
7. Move the control selector switch to the “OFF” position and turn the remote control box “OFF”.
8. Disconnect the control box power cord from the ground and test device (Figure 3, n).
9. Rotate key KCF in key lock K1 to electrically lock the ground and test device in the “CLOSED” position. Key KCF is now captive and key KB is released (Figure 3, r).
10. Transfer key KB to key lock K4 (Figure 3, h). Rotate key KB, electrically and mechanically locking the ground and test device in the “CLOSED” position. Key KB is now captive and key KD is released.
11. Transfer key KD to key lock K5 (Figure 3, b). Rotate the KD key to unlock the test port shutters. Key KD is now captive.
12. Open the test port shutters using the slide handle (Figure 2, d). With the test ports fully open, the K5 interlock is blocked from operating and the key remains captive.
13. Remove the test probes (Figure 7) from the test ports. Close the test port shutters.
14. Rotate key KD to lock the test port shutter. Key KD is now released.
15. Transfer key KD to key lock K4. Rotate key KD. Key KD is now captive and key KB is released.
16. Transfer key KB to key lock K1 and rotate the key. The ground and test device control circuit is now enabled. Key KB is now captive and key KCF is released.
17. Verify that the control selector switch on the front of the ground and test device is in the “OFF” (center) position (Figure 3, c).
18. Connect the power cord of the remote control box to the ground and test device (Figure 3, n). Ensure the cord is locked into the connected position by turning the plug clockwise.
19. Move the control selector switch from the “OFF” position to the “OPEN” position (Figure 3, c).
20. Turn the remote control box “ON” (Figure 1, a) and depress the “OPEN” pushbutton (Figure 1, d) on the remote control box to open the ground and test device.
21. Move the control selector switch to the “OFF” position (Figure 3, c) and turn the remote control box “OFF” (Figure 1, a).
22. Disconnect the remote control box power cord from the ground and test device (Figure 3, n).
23. Rotate key KCF in key lock K1 (Figure 3, q). The ground and test device is now electrically disabled. The KCF key is now captive and key KB is now removable.
24. Disconnect the secondary disconnect plug from the ground and test device secondary disconnect receptacle (Figure 3, d).
25. Transfer key KB to key lock K2 (Figure 3, i) and rotate key KB. The ground and test device is now mechanically locked in the “OPEN” position. The KB key is now captive and key KC is removable (Figure 3, k).
26. Transfer key KC to key lock K3 (Figure 3, m) and rotate the key. Key KC is now captive. The ground and test device racking access shaft is now accessible.
27. Insert the racking handle and rotate the handle counterclockwise to move the ground and test device into the “Disconnected” position. The racking handle is also equipped with an input torque limiter that will indicate limit to the operator by a mechanical ratcheting mechanism for positive operator feedback. Remove the racking handle.
28. Rotate key KC to lock the ground and test device in the “Disconnected” position. Key KC is now released.
29. Transfer key KC to key lock K2 (Figure 3, k) and rotate key KC. Key KC is now captive and key KB is now released.
30. Transfer key KB to key lock K1 (Figure 3, r) and rotate key KB. Key KB is now captive and the KCF key is released.
31. Remove the ground and test device from the compartment.
32. Remove key KCF from key lock K1 (Figure 3, q).
33. Secure key KCF in a lock box on premises.
Ch 6  Maintenance

A. General Description

**CAUTION**

Prior to beginning any maintenance procedures, make certain that the control circuits are deenergized and the ground and test device is resting securely outside the circuit breaker compartment. Do not work on a closed ground and test device or a ground and test device with the main closing spring charged.

**NOTICE**

Before attempting any maintenance work, it is important to study and fully understand the safety practices outlined in Chapter 2 of this instruction bulletin. If there is any reason to believe there are any discrepancies in the descriptions contained in this instruction bulletin, or if they are deemed to be confusing and/or not fully understood, contact Powell immediately.

1) Introduction

A regular maintenance schedule must be established to obtain the best service and reliability from the ground and test device. The ground and test device is designed to comply with industry standards requiring maintenance every 1000 operations or once a year.

Actual inspection and maintenance will depend upon individual application conditions such as number of operations, time between uses, and storage conditions. If the ground and test device is used relatively infrequently, the interval between inspections may be longer than a year, but may include only a few operations. When the ground and test device has been in storage for an extended period of time, it is recommended that it be inspected and cleaned before being used. See Ch 4 Installation, C. Storage for storage recommendations. Follow those recommendations to minimize the need for maintenance before using the device after prolonged storage.

A permanent record of all maintenance work should be kept, the degree of detail depending upon the operating conditions. The record will be a valuable reference for subsequent maintenance work and for station operation. It is also recommended that the record include reports of tests performed, the condition of ground and test devices, and any repairs or adjustments that were performed. This record should begin with tests performed at the time of installation and energization, and all data should be graphed as a function of time to ensure a proper maintenance cycle is being scheduled.

2) Inspection and Cleaning

Visually check for loose or damaged parts. Tighten or replace loose or missing hardware. Any part damaged so as to interfere with the normal operation of the device should be replaced.

Clean the ground and test device, removing loose dust and dirt.
CAUTION

Do NOT use compressed air to clean the device. This may result in loose dirt or grit being blown into bearings or other critical parts and causing excessive wear.

Either use a vacuum cleaner or wipe with a dry lint-free cloth or industrial-type wiper.

Primary insulation, including the insulating support plates on which the selector switch and grounding switch contacts are mounted and the operating rods, should also be cleaned. Wipe clean with a dry lint-free cloth or an industrial-type wiper. If dirt adheres and will not come off by wiping, remove it with distilled water or a mild solvent such as denatured alcohol. Be sure that the ground and test device is dry before returning it to service. Do not use any type of detergent to wash the surface of the insulators, as the detergent may leave an electrical conducting residue on the surface as it dries.

3) Lubrication

Powell offer a complete lubrication kit (Powlube-104) which contains all the lubricants required for maintaining the equipment. Powlube-104 consists of (1) A-grease, (1) B-grease, and (1) C-oil. Prior to March 2014, Powell provided Powlube-101 and Powlube-102 which contained (1) tube of Anderol 757 or Rheolube 368A, (1) tube of Mobilgrease 28 and (1) bottle of Anderol A456 oil.

A - Grease should be lightly applied to those bearing surfaces that are accessible. Inaccessible surfaces, such as bearings, may be lubricated with a light synthetic machine oil such as C- Oil. B - Grease should be applied to the electrical contact surfaces.

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. Prior to use, particularly if the ground and test device has been in storage for a long period of time, wipe these surfaces with a clean, dry cloth, and apply fresh lubricant.
Ch 7  Recommended Renewal Parts and Replacement Procedures

A. Ordering Instructions

1. Order Renewal Parts from Powell at powellind.com or call 1.800.480.7273.

2. Always specify complete nameplate information, including:
   - Ground and Test Device Type
   - Serial Number
   - Rated Voltage
   - Rated Amps
   - Impulse Withstand
   - Control Voltage (for control devices and coils)

3. Specify the quantity and description of the part and the instruction bulletin number. A description should be accompanied by a marked illustration from this instruction bulletin, a photo or simply submit a sketch showing the part needed.

B. Replacement Procedures

Powell recommends that only qualified technicians perform maintenance on these units. Refer to the Qualified Person section in the front of this instruction bulletin. 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.