INSTRUCTIONS

IB-65060

PowlVac® PV38 Electrically Operated Ground and Test (G&T) Device

Instructions for the Consolidated Edison Electrically-Operated Ground and Test Device Per Con Edison Specification EO-2022

Installation **Maintenance** **Renewal Parts**

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Contents

WARNING

THIS EQUIPMENT MAY CONTAIN HIGH VOLTAGES AND CURRENTS WHICH CAN CAUSE SERIOUS INJURY OR DEATH.

THE EQUIPMENT IS DESIGNED FOR USE, INSTALLATION, AND MAINTENANCE BY KNOWLEDGEABLE USERS OF SUCH EQUIPMENT HAVING EXPERIENCE AND TRAINING IN THE FIELD OF HIGH VOLTAGE ELECTRICITY. THIS DOCUMENT, AND ALL OTHER DOCUMENTATION SHALL BE FULLY READ, UNDERSTOOD, AND ALL WARNINGS AND CAUTIONS SHALL BE ABIDED BY. IF THERE ARE ANY DISCREPANCIES OR QUESTIONS, THE USER SHALL CONTACT POWELL ELECTRICAL MANUFACTURING COMPANY IMMEDIATELY AT 1-800-480-7273.

CAUTION

BEFORE ANY ADJUSTMENT, SERVICING, PARTS REPLACEMENT, OR ANY OTHER ACT IS PERFORMED REQUIRING PHYSICAL CONTACT WITH THE ELECTRICAL WORKING COMPONENTS OR WIRING OF THIS EQUIPMENT, THE POWER SUPPLY MUST BE DISCONNECTED. FAILURE TO FOLLOW THIS CAUTION MAY RESULT IN INJURY OR DEATH.

IMPORTANT

THESE INSTRUCTIONS ARE NOT INTENDED TO EXPLAIN ALL DETAILS OR VARIATIONS OF THE ELECTRICAL GROUND AND TEST DEVICES, NOR TO PROVIDE FOR EVERY POSSIBLE CONTINGENCY OR HAZARD TO BE MET IN CONNECTION WITH USAGE, INSTALLATION, TESTING, OPERATION, AND MAINTENANCE OF THE EQUIPMENT. SHOULD FURTHER INFORMATION BE DESIRED OR SHOULD PARTICULAR PROBLEMS ARISE WHICH ARE NOT COVERED SUFFICIENTLY FOR THE USER'S PURPOSES, THE MATTER SHOULD BE REFERRED TO POWELL ELECTRICAL MANUFACTURING COMPANY, 1-800-480-7273.

I. INTRODUCTION

A. SCOPE

This instruction bulletin describes the following:

Electrically Operated Ground and Test Device (G&T) (CON EDISON and CUSTOMER interlocked versions)

B. PURPOSE

The information in this document is intended to provide instructions for users to properly operate and maintain the electrically operated ground and test device described in Section A. Scope.

The instruction bulletin contains details of the following topics:

1. Safety
2. Equipment Description
3. Installation
4. Operation of the Ground and Test device
   - Procedure for Applying Grounds - Con Edison Feeder
   - Procedure for Testing Feeder
   - Procedure for Removing Test Probes
   - Procedure for Removing Grounds
5. Maintenance
6. Recommended Renewal Parts

To the extent required, the products described herein meets applicable ANSI, IEEE, and NEMA Standards. No assurance for compliance is given for local codes and ordinances which vary greatly.

C. INSTRUCTION BULLETINS AVAILABLE ELECTRONICALLY

Many Powell Electrical Manufacturing Company Instruction Bulletins are posted on the company Web site at www.powellservice.com. For more information, contact Powell Apparatus Service Division (PASD) at 1-800-480-7273.

II. SAFETY

The user should study this instruction bulletin and all other associated documentation before uncrating the ground and test device.

Each user has the responsibility to instruct and implement thorough maintenance and safety procedures for each type of equipment used. The user shall train all personnel, who are associated with the equipment, on usage, installation, operation maintenance and safety procedures. All safety procedures must be observed.

A. GENERAL

1. The PowlVac® PV 38 Electrically Operated Ground and Test Device includes high-energy, fast-acting closing and tripping mechanisms. It is designed to allow access, under carefully controlled conditions, to energized high-voltage electrical circuits. Improper operation or servicing techniques can be dangerous to the operator. These devices should be operated and/or serviced only by persons who are skilled in operation and/or service of high-voltage electrical apparatus and who are thoroughly familiar with these instructions and any supplementary information contained in drawings furnished with the ground and test device and/or switchgear in which it is used.

2. The PowlVac® PV 38 Electrically Operated Ground and Test Device is designed for use in P-65000 PowlVac® Metal-Clad Switchgear manufactured by Powell Electrical Manufacturing Company. Do not attempt to use this device in any other class of electrical equipment manufactured by Powell or any other manufacturer. This device is designed to be inserted in a metal-clad switchgear unit in place of a vacuum circuit breaker for grounding and testing purposes.
3. Only supervised and qualified personnel who are trained in the usage, installation, operation, and maintenance of electrical ground and test device shall be allowed to work on this equipment. It is mandatory that this instruction bulletin, any supplements, and service advisories are studied, understood, and followed.
4. Maintenance programs must be consistent with the customer experience and the manufacturer's recommendations, including information available in service advisories and the instruction bulletin(s). A well-planned and executed routine maintenance program is essential for the electrical ground and test device reliability and safety.
5. Service conditions and electrical ground and test device applications shall be considered in the development of maintenance programs. Service conditions include variables such as ambient temperature, humidity, number of operations, and any adverse local conditions such as excessive dust, ash, corrosive atmosphere, vermin, and insect problems.

B. 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 PROPERTY**. 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 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 furnished with the device to plug anything into the test receptacles. Use of other plugs may damage the test receptacle or may result in a poor connection which could be dangerous to the operator and/or damaging to the equipment.
5. Even through insulated, the test probes must not be inserted or extracted from energized test jacks. 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 connected to an energized test jack.
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. Forcing or bypassing the interlocks can result in a condition dangerous to the operator and/or damaging to the equipment.
7. Do not attempt to service the device while it is installed in a switchgear cell 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 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.
13. Always **OPERATE** the grounding switch electrically from the farthest distance with the remote operating station control switch.

14. Check for dielectric integrity at 60kVAC across the terminals to ground with the grounding switch **OPEN**.

C. X-RAYS

When high voltage is applied across the contacts of a vacuum interrupter, there is the possibility of the generation of X-rays. The intensity of this radiation is dependent on the amount of the peak voltage and the distance of the contact gap. Radiation levels are negligible at the normal operating voltage for this type of equipment. At the voltages specified for testing, personnel must be located in front of the electrical ground and test device such that the two layers of steel used in the frame and front cover construction are between personnel and the vacuum interrupters. Personnel must be located no less than one meter from the front of the electrical ground and test device. **THE ELECTRICAL GROUND AND TEST DEVICE SHALL BE EITHER FULLY OPEN OR FULLY CLOSED DURING HIGH POTENTIAL TESTING. TEST SHALL NOT BE CONDUCTED WITH THE CONTACTS PARTIALLY OPEN.**

III. EQUIPMENT DESCRIPTION

A. GENERAL DESCRIPTION

The PowlVac® Electrically Operated Ground and Test Device (see Figures 1 and 2) is a drawout element that can be inserted into the circuit breaker compartment in the same manner as a Powl-Vac® circuit breaker.

The PowlVac® PV 38 Electrically Operated Ground and Test Device provides a means for obtaining access to the primary disconnect devices of the switchgear cell 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. POWER GROUNDING SWITCH OPERATION

1) Closing

The power grounding switch is closed by the remote operating station at the end of a 50 ft. long cable that is supplied with the device (Figure 9). Upon depressing the **CLOSE** push-button (note that the push-button does not have to be held depressed):

1. The closing springs start to charge.
2. After the springs are fully charged, the springs automatically discharge to close the switch contacts.

Once the ground switch is closed, it can be locked into the **CLOSED** position by removing the cable from the receptacle on the device.

2) Opening

The grounding switch can be opened electrically using the remote operating station. The **OPEN** push-button must be depressed. For safety reasons, the switch is prevented from opening in less that 20 seconds after closing.

C. KEY LOCKS

1) Key Lock K1 (Keys KU and KB)

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

Key lock K1 interlock is a two cylinder transfer lock equipped with an electrical switch element. The switch is closed when key KB is retained. When the switch is open, the ground and test device is electrically disabled and key KU is retained (see Figure 1, u and Figure 3).

NOTE: *When multiple electrical ground and test devices are supplied for an installation, the customer feeder ground and test devices are normally supplied with similar interlock functions as that of the Con Edison specification. In these cases, key KU is not present, but is instead supplied with a key KCF (Key, Customer Feeder) for Con Edison customer use. Key KU and key KCF are non-interchangeable.*

2) Key Lock K2 (Keys KB and KC)

Key lock K2 interlock is a two cylinder lock used to mechanically lock the ground and test device in the **OPEN** position (see Figure 1, k and Figure 4).

The key lock K2 interlock is equipped with an electrical switch element that electrically blocks a closing command. The key lock K2 switch is in series with the key lock K1 switch. Although the switch is not required for operational sequencing logic, it is applied for operational sequence protection redundancy.

The key lock K2 interlock is operable when key KB is inserted. When the key lock K2 interlock is operated with the locking bolt extended (by rotating key KC), the ground and test device is electrically locked open, key KB is retained, and key KC is released.

3) Key Lock K3 (Key KC)

The key lock K3 interlock is a single cylinder lock (see Figures 1, d and Figure 5). When key lock K3 interlock 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 key lock K3 interlock prevents the compartment-mounted racking device drive roller from entering the corresponding racking slot on the ground and test device, thereby preventing the insertion of the ground and test device into the connected position in the circuit breaker compartment.

When the ground and test device is in the connected position, the key lock K3 interlock captures the compartment-mounted racking device drive roller in the ground and test device racking slot, thus preventing the roller from further movement. This action prevents the removal of the ground and test device form the connected position.

With key KC inserted and the locking bolt retracted to enable racking of the ground and test device into or out of the connected position, key KC is retained.

4) Key Lock K4 (Keys KB and KD)

The key lock K4 interlock is a two cylinder lock used to mechanically lock the ground and test device in the **CLOSED** position (see Figure 1, v and Figure 6).

In the PowlVac® ground and test device design, the locking bolt of the key lock 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 key lock K4 switch is in series with the key lock K1 switch. Although the switch is not required for operational sequencing logic, it is applied for operational sequence protection redundancy.

The key lock K4 interlock is operable only when key KB is inserted and the ground and test device is **CLOSED**. When the key lock K4 interlock is operated with the locking bolt extended, the tripping function is electrically disabled, key KB is retained and key KD is released.

5) Key Lock K5 (Key KD)

The key lock K5 interlock is a single cylinder lock. The key lock K5 interlock is used to open and lock the test port shutters (see Figure 1, f and Figure 7).

Key KD, which normally resides in the key lock K4 interlock, is available only when the ground and test device is in the **CLOSED** and locked position. Key KD is then inserted into key lock K5. With the locking bolt retracted and the test port shutters unlocked, key KD 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 installed in the test ports and the shutter moved to the test probe locking position.

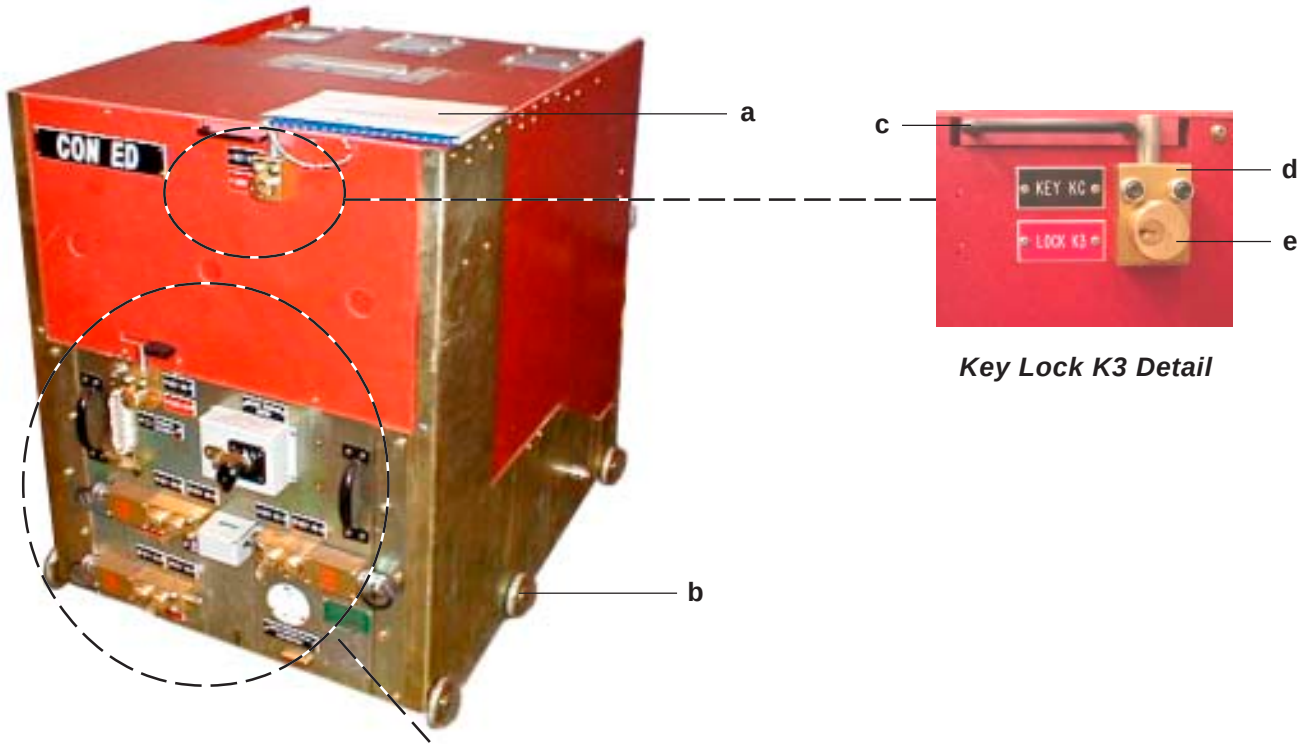
D. CONTROL SELECTOR SWITCH

A control selector switch is mounted on the front of the ground and test device. This selector switch enables and disables the closing function and the opening function (see Figure 1, i and Figure 8) of the ground and test device.

The selector switch is a three position rotary switch that operates in association with the remote **OPEN/CLOSE** push-button control station. The snap-action detented positions are **OPEN**, **OFF**, and **CLOSE**. The selector switch is pad-lockable in the **OFF** position.

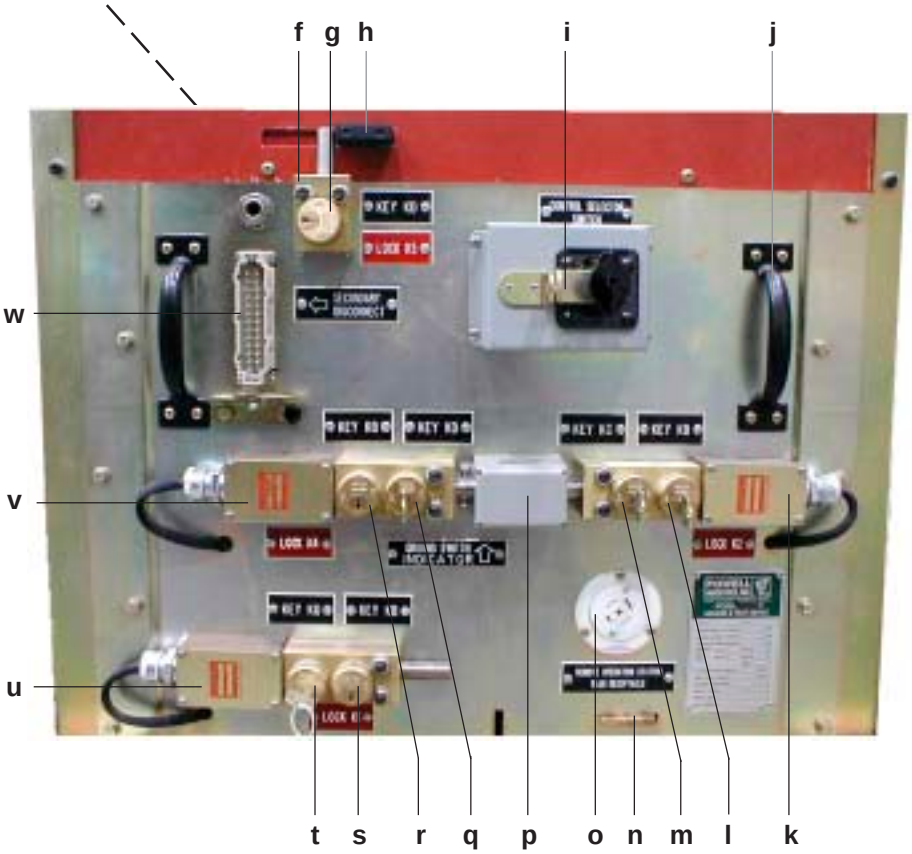
E. INTERCHANGEABILITY

The PowlVac® ground and test devices are non-interchangeable between the Con Edison and Customer compartments. The coding plates will allow a ground and test device labeled “Con Edison” into only Con Edison incoming feeder compartments. Likewise, a ground and test device labeled “Customer” can be inserted into only customer feeder compartments.



Key Lock K3 Detail

Figure 1. Electrical Ground and Test Device Front



Front Panel Detail

a. Instruction Book
b. Wheel
c. Racking Access Handle
d. Lock K3
e. Key KC
f. Lock K5
g. Key KD
h. Test Port Shutter Operator
i. Control Selection Switch
j. Front Handle
k. Lock K2
l. Key KB, Lock K2
m. Key KC
n. Ground Connection
o. Remote Operating Station Plug Receptacle
p. Position Indicator
q. Key KD
r. Key KB, Lock K4
s. Key KB, Lock K1
t. Key KU, Lock K1
u. Lock K1
v. Lock K4
w Secondary Disconnect

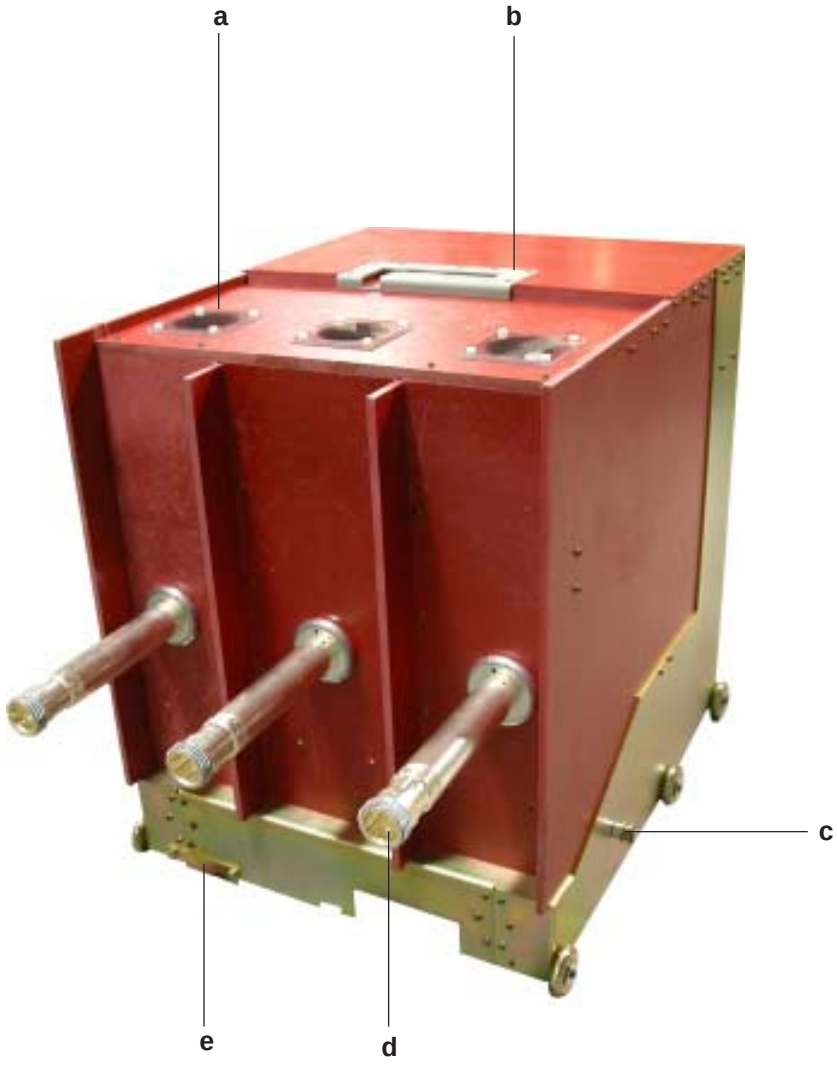


Figure 2. Electrical Ground and Test Device (Rear View)

a. View Port Windows
b. Racking Roller Plate
c. Shutter Operator
d. Primary Disconnect
e. Interference Plate

Figure 3. Key Lock K1 Interlock

Figure 4. Key Lock K2 Interlock

Figure 5. Key Lock K3 Interlock

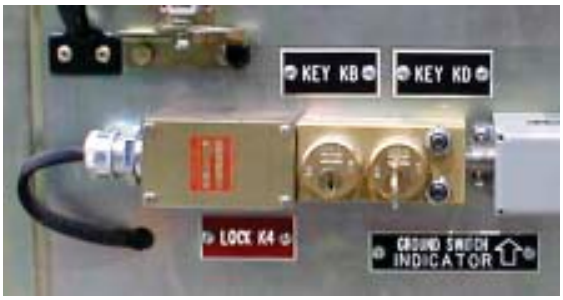


Figure 6. Key Lock K4 Interlock

Figure 7. Key Lock K5 Interlock

Figure 8. Control Selector Switch

Figure 9. Remote Operating Station

Figure 10. Test Probe Accessory

IV. INSTALLATION

A. RECEIVING

Inspect the electrically-operated ground and test device for any signs of damage when it is received. If damage is found or suspected, immediately file applicable claims with the transportation company and notify the nearest representative of Powell Electrical Manufacturing Company.

The estimated size and weight of the electrical ground and test device, when it is crated and placed on a pallet is:

Size: 42" width x 42" depth x 47" height
Weight: 750 lbs

The ground and test device is shipped enclosed in a carton and strapped to a shipping pallet. The carton, which contains the ground and test device, is attached to the pallet by two metal bands. Remove the metal bands and lift the carton to remove it from the ground and test device. With the carton removed, there are two more metal bands that attach the ground and test device to the pallet. Remove the two metal bands from the ground and test device and the pallet, and remove the ground and test device from the shipping pallet.

B. HANDLING

To avoid personal injury while handling the ground and test device, personnel should not stand under the raised ground and test device nor place hands or feet under the ground and test device frame as it is being lowered.

After the ground and test device has been removed from its shipping pallet, the preferred method for moving and handling a ground and test device is to roll it on its own wheels on a level surface. When rolling the ground and test device, it should be pushed and steered by the device frame or by the handles on the front cover. **DO NOT HANDLE OR MOVE THE DEVICE BY THE PRIMARY DISCONNECTING STABS, AS DAMAGE TO THE GROUND AND TEST DEVICE MAY OCCUR.**

An overhead crane (Figure 11) can be used to move the ground and test device. When using an overhead crane to move the ground and test device use a lifting harness and a single crane hook. Place the ground and test device securely on the harness as shown in Figure 11. 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 11. Crane with Electrical ground and test Device in Harness

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. **THE GROUND AND TEST DEVICE MUST NOT BE STORED IN A CIRCUIT BREAKER COMPARTMENT. IT CAN ONLY BE STORED IN A STORAGE COMPARTMENT.**
2. The ground and test device should be carefully protected against condensation, preferably by storing it in a warm, dry room of moderate temperature, such as 40°-100°F, since dampness has an adverse effect on the insulating parts.
3. The ground and test device should be stored in a clean location, free from corrosive gasses or fumes. Particular care should be taken to protect the device from moisture and cement dust, as this combination has a very corrosive effect on many parts.
4. Unplated surfaces, such as, rollers, latches, etc., should be coated with grease or oil to prevent rusting.

5. If the ground and test device is stored for any length of time, it should be inspected periodically for rust and to ensure it is in good mechanical condition. Should the ground and test device be stored under adverse conditions, it should be cleaned and dried before performing the commissioning tests and before placing the ground and test device into an energized circuit breaker compartment.

D. PREPARING THE ELECTRICAL GROUND AND TEST DEVICE FOR USE

Before shipment from the factory, all functions of the ground and test device are thoroughly checked. Powell Electrical Manufacturing Company recommends that prior to each use, the ground and test device should be thoroughly checked and the following tests be performed in the sequence listed below:

1. High Voltage Insulation Integrity
2. Vacuum Integrity
3. Control Voltage Insulation Integrity
4. Electrical Operation Check

1) High Voltage Insulation Integrity

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 records 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.

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. This test should check all primary phase-to-ground and phase-to-phase insulation.

The tests described in this section are the only tests required to determine the insulation integrity. Because of the design of the PowlVac® insulation system, no valid data can be obtained using other types of high-voltage insulation tests.

2) Vacuum Integrity

Powell recommends AC testing and reliable verification of vacuum integrity. PowlVac® 38kV ground and test devices shall be tested with a minimum of 60kVAC applied across fully open contacts for 10 seconds. No dielectric breakdown during the test period constitutes a successful test.

NOTE: *This test does not replace the AC high potential testing (HIPOT) used to determine "High Voltage Insulation Integrity."*

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

Powell recognizes the widespread use of DC hipot equipment to verify vacuum 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.

It is not necessary to record the leakage readings because 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. Only when the vacuum interrupter has failed both tests should the operation condition be questioned.

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.

3) Control Voltage Insulation Integrity

If the user wants to check the insulation integrity of the control circuit, it may be done with a 500-volt or 1000-volt insulation resistance tester or with an AC high potential tester. The AC high potential test should be made at 1125 volts, 50 to 60 Hz 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 675 volts, 50 to 60 Hz. Be sure to remove any test jumpers and reconnect the charging motor when the tests are complete.

4) Electrical Operation Check

To check the basic electrical operation of the ground and test device, it must be placed near a circuit breaker test cabinet. To close the device, connect the secondary disconnect from the test cabinet to the ground and test device to be tested. The test cabinet provides control voltage via a secondary disconnect plug to the ground and test device and the appropriate control switches to verify the **CLOSE** and **OPEN** functions of the ground and test device. With the Secondary Disconnect plug installed in the ground and test device being tested, and with key KB captive, perform the following steps.

To CLOSE the Device

1. Connect the Remote Operating Station to the ground and test device and rotate the plug clockwise to lock (Figure 23).
2. Turn the Test Cabinet power **ON**. Verify that the Control Selector Switch is in the **OFF** position (Figure 22).
4. Move the Control Selector Switch to the **CLOSE** position (Figure 25).
5. Turn the Remote Operating Station to the **ON** position and depress the **CLOSE** push button (Figure 26).
6. Move the Control Selector Switch to the **OFF** position (Figure 27).

To OPEN the Device

7. Move the Control Selector Switch to the **OPEN** position (Figure 56).
8. Turn the Remote Operating Station to the **ON** position and depress the **OPEN** push button on the Remote Operating Station to open the ground and test device (Figure 57).
9. Move the Control Selector Switch to the **OFF** position (Figure 58) and turn the Test Cabinet power **OFF**.
10. Disconnect the Remote Operating Station umbilical cord from the ground and test device (Figure 59).

When the electrical check is completed, disconnect the Secondary Disconnect of the test cabinet from the ground and test device.

E. INSERTING THE ELECTRICAL GROUND AND TEST DEVICE INTO THE METAL-CLAD SWITCHGEAR

Inserting the ground and test device into the metal-clad switchgear is similar to inserting a circuit breaker into the switchgear. Refer to instruction book, IB-65000, for general information about inserting circuit breakers into metal-clad switchgear. Study instructions and cautions before attempting to insert a ground and test device into the switchgear equipment.

NOTE: *Access information bulletins on line at the Powell Industries Web site: info@powellservice.com. To order instruction bulletins by telephone, call Powell Electrical Manufacturing Company: 1-800-480-7273.*

Each ground and test device and metal-clad switchgear cell are provided with interference plates (see Figure 2, e). The interference plates are designed to ensure that the ground and test device is not placed in an incorrect circuit breaker compartment. If an attempt is made to insert an improper ground and test device into a cell, the coding plates will interfere with each other and deter the insertion. The interference occurs before the device reaches the **DISCONNECT** position. **DO NOT** attempt to force the device past the coded interference plate nor remove the plate from either the cell or the device. Remove the incorrect device and insert the proper one.

For normal insertion of the ground and test device into the switchgear, the maximum force required on the levering-in crank will not exceed 35 foot-pounds. Excessive force may damage the device or the switchgear equipment.

1) Electrical Ground and Test Device Inspection

1. Inspect the primary disconnecting devices for proper lubrication, damage, debris, and dirt. Ensure that disconnecting devices are in alignment and are not bent. If damage or dirt are

present, see Section V. MAINTENANCE, A. INSPECTION AND CLEANING.

IMPORTANT: *If the primary disconnecting devices are damaged, make no attempt to repair them. Contact Powell Electrical Manufacturing Company for further information.*

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

V. OPERATING PROCEDURES

A. PROCEDURE FOR APPLYING GROUNDS

The **CON EDISON** and **CUSTOMER** ground and test devices are supplied with similar interlock functions. However, the **CON EDISON** 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 **CON EDISON** device, these procedures also apply to the **CUSTOMER** device. For procedures that refer to key **KU** for the **CON EDISON** device, the same procedures apply to key **KCF** for the **CUSTOMER** device.

1. Verify the correct ground and test device is being inserted in the compartment of the feeder to be grounded.
   - The ground and test devices are prominently marked **CON EDISON** or **CUSTOMER**.
   - Interference plates (Figure 2, e) prevent either of the ground and test devices from being inserted into an unauthorized compartment.
2. Obtain key KU from the Con Edison lock box.
3. Insert key KU into key lock K1 and rotate key KB. Key KU is captive and has electrically locked the ground and test device in the **OPEN** position (Figure 12). Key KB is available (Figure 13).
4. Insert key KB into key lock K2 and rotate key KC (Figure 14). The ground and test device is now mechanically locked **OPEN**. Key KB is captive and key KC is available (Figure 15).
5. Insert key KC into key lock K3 and rotate. Key KC key is now captive. Pull the racking access interlock handle out fully (Figure 16).
6. Insert the ground and test device into the compartment until a “stop” is encountered (no figure provided).
7. Depress the manual trip operator on the switchgear compartment front panel and open the racking access shutter (Figure 17).
8. Rack the ground and test device into the **CONNECT** position using the supplied torque limiting racking handle. A mechanical position indicator indicates the **CONNECT** position (no figure provided).
9. Push the Racking Access Interlock handle in fully and rotate key KC to lock the ground and test device in the **CONNECT** position. Key KC is available (Figure 18).
10. Transfer key KC to key lock K2 and rotate. Key KC is captive and key KB is available. The ground and test is now mechanically unlocked (Figure 19).
11. Transfer key KB to key lock K1 and rotate (Figure 20). The ground and test device control circuit is now enabled. Key KB is captive and key KU is available (Figure 21).
12. Verify that the Control Selector Switch is in the **OFF** position (Figure 22).
13. Connect the Remote Operating Station to the ground and test device and rotate the plug clockwise to lock (Figure 23).
14. Connect the compartment secondary disconnect to the receptacle on the ground and test device (Figure 24).
15. Move the Control Selector Switch to the **CLOSE** position (Figure 25).
16. Turn the Remote Operating Station **ON** and depress the **CLOSE** push button (Figure 26).
17. Move the Control Selector Switch to the **OFF** position (Figure 27).
18. Turn the Remote Operating Station **OFF** and disconnect the Remote Operating Station umbilical cord from the ground and test device (Figure 28).
19. Rotate key KU in key lock K1 electrically disabling the ground and test device (Figure 29). Remove key KB from key lock K1 (Figure 30).
20. Secure key KB in the Con Edison lock box.

Figure 12. Insert Key KU into Key Lock K1 and Rotate Key KB

Figure 13. Key KB is Available

Figure 14. Insert Key KB in Key Lock K2 and rotate Key KC

Figure 15. Rotate Key KC

Figure 16. Insert Key KC in Key Lock K3 and Rotate

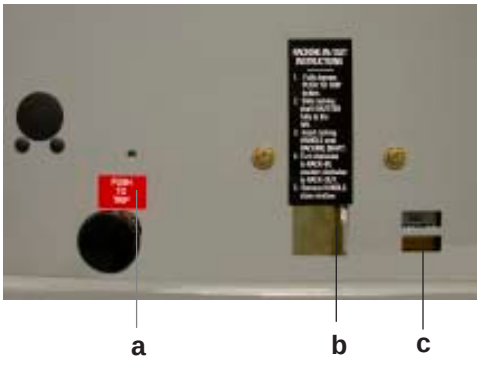


Figure 17. Depress the Manual Trip Operator on the Switchgear Compartment Front Panel

a. Manual Trip Operator (Does not trip the ground and test Device)
b. Racking Access Shutter
c. Position Indicator

Figure 18. Rotate Key KC to Lock the Ground and Test device in the CONNECT position

Figure 19. Transfer Key KC to Key Lock K2 and Rotate

Figure 20. Transfer Key KB to Key Lock K1 and Rotate

Figure 21. Key KB is Captive and Key KU is available

Figure 22. Verify the Control Selector Switch is in the OFF Position

Figure 23. Connect the Remote Operating Station Cord to the Ground and Test Device and Rotate to Lock

Figure 24. Connect the Compartment Secondary Disconnect

Figure 25. Move the Control Selector Switch to the CLOSE Position

Figure 26. Depress the CLOSE Push Button on the Remote Operating Station

Figure 27. Move the Control Selector Switch to the OFF Position

Figure 28. Disconnect the Remote Operating Station Umbilical Cord

Figure 29. Rotate Key KU in Key Lock K1

Figure 30. Remove Key KB from Key Lock K1

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B. PROCEDURE FOR TESTING FEEDER

The **CON EDISON** and **CUSTOMER** ground and test devices are supplied with similar interlock functions. However, the **CON EDISON** 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 **CON EDISON** device, these procedures also apply to the **CUSTOMER** device. For procedures that refer to key **KU** for the **CON EDISON** device, the same procedures apply to key **KCF** for the **CUSTOMER** device.

Perform the following steps:

1. Verify the Con Edison ground and test device is being inserted in the compartment of the feeder to be grounded.
   - The ground and test devices are prominently marked “Con Edison” or “Customer.”
   - Interference plants (Figure 2, e) prevent either of the ground and test devices from being inserted into an unauthorized compartment.
2. Obtain key KU from the Con Edison lock box.
3. Insert key KU into key lock K1 and rotate key KB. (Figure 31). Key KU is captive and has electrically disabled the ground and test device while in the **OPEN** position. Key KB is now available (Figure 32).
4. Insert key KB into key lock K2 and rotate key KC (Figure 33). The ground and test device is now mechanically locked **OPEN**. Key KB is now captive and key KC is available.
5. Insert key KC into key lock K3 and rotate. Key KC key is now captive (Figure 34). Pull the racking access interlock handle out fully.
6. Insert the ground and test device into the compartment until a “stop” is encountered (no figure provided).
7. Depress the manual trip operator on the switchgear compartment front panel and open the racking access shutter (Figure 35).
8. Rack the ground and test device into the **CONNECTED** position using the supplied torque limiting racking handle. A mechanical position indicator indicates the **CONNECTED** position (no figure provided).
9. Push the Racking Access Interlock handle in fully and rotate key KC to lock the ground and test device in the **CONNECTED** position. Key KC is now available (Figure 36).
10. Transfer key KC to key lock K2 and rotate (see Figure 37). The key KC is now captive and key KB is available. The ground and test is now mechanically unlocked.
11. Transfer key KB to key lock K1 and rotate (Figure 38). The ground and test device control circuit is now enabled. Key KB is captive and key KU is available.
12. Verify that the Control Selector Switch is in the **OFF** position (Figure 39).
13. Connect the Remote Operating Station to the ground and test device and rotate the plug clockwise to lock (Figure 40).
14. Connect the compartment secondary disconnect to the receptacle on the ground and test device (Figure 41).
15. Move the Control Selector Switch to the **CLOSE** position (Figure 42).
16. Turn the Remote Operating Station **ON** and depress the **CLOSE** push button switch on the Remote Operating Station to close the ground and test device (Figure 43).
17. Move the Control Selector Switch to the **OFF** position (Figure 44).
18. Turn the Remote Operating Station **OFF** and disconnect the Remote Operating Station umbilical cord from the ground and test device (Figure 45).
19. Rotate key KB in key lock K1 electrically disabling the ground and test device. Remove key KB from key lock K1 (Figure 46).
20. Transfer key KB to key lock K4 and rotate key KD (Figure 47). The ground and test device is now electrically and mechanically locked in the **CLOSED** position. Key KB is captive and key KD is available.
21. Transfer key KD to key lock K5 and rotate (Figure 48). Key KD unlocks the test port shutters.
22. Open the test port shutters using the slide handle (Figure 49). With the test ports, 2/3 open, key KD remains captive.
23. Install the test probes into the test ports (Figure 50). Move the test port shutter to the left to capture the test probes in the test probe shutter.

24. Rotate key KD to lock the test probes in the test ports. Key KD is now available (Figure 51).
25. Transfer key KD to key lock K4 and rotate (Figure 52). Key KD is now captive and key KB is available.
26. Transfer key KB to key lock K1 and rotate (Figure 53). The ground and test device control circuit is now enabled. Key KB is captive and key KU is available.
27. Verify that the Control Selector Switch is in the **OFF** position (Figure 54).
28. Connect the umbilical cord of the Remote Operating Station to the ground and test device and lock it by turning the plug clockwise (Figure 55).
29. Move the Control Selector Switch to the **OPEN** position (Figure 56).
30. Turn the Remote Operating Station **ON** and depress the **OPEN** push button on the Remote Operating Station to open the ground and test device (Figure 57).
31. Move the Control Selector Switch to the **OFF** position (Figure 58).
32. Turn the Remote Operating Station **OFF** and disconnect the Remote Operating Station umbilical cord from the ground and test device (Figure 59).
33. Rotate key KB in key lock K1 electrically locking the ground and test device in the **OPEN** position. Remove key KB from K1 (Figure 60).
34. Lock key KB in the Con Edison lock box.
35. The ground and test device is now prepared for testing.

Figure 31. Insert Key KU into Key Lock K1 and Rotate Key KB

Figure 32. Key KB is Available

Figure 33. Insert Key KB in Key Lock K2 and Rotate Key KC

Figure 34. Insert Key KC in Key Lock K3 and Rotate

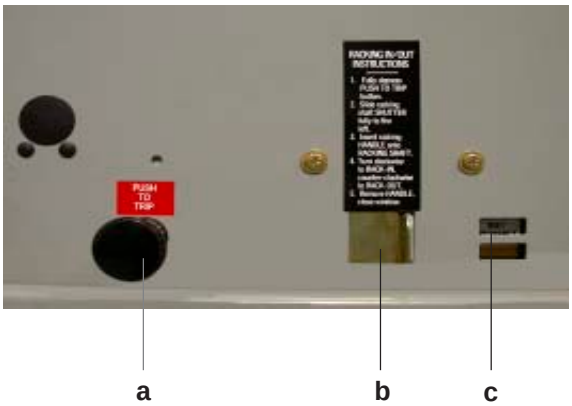

Figure 35. Depress the Manual Trip Operator on the Switchgear Compartment Front Panel

a. Manual Trip Operator
b. Racking Access Shutter
c. Position Indicator

Figure 36. Rotate Key KC to Lock the Ground and Test Device in the CONNECT position

Figure 37. Transfer Key KC to Key Lock K2 and Rotate

Figure 38. Transfer Key KB to Key Lock K1 and Rotate

Figure 39. Verify that the Control Selector Switch is in the OFF Position

Figure 40. Connect the Remote Operating Station Cord to the Ground and Test Device and Rotate

Figure 41. Connect the Compartment Secondary Disconnect to the Receptacle

Figure 42. Move the Control Selector Switch to the CLOSE position.

Figure 43. Depress the CLOSE Push Button on the Remote Operating Station

Figure 44. Move the Control Selector Switch to the OFF position

Figure 45. Disconnect the Remote Operating Station Umbilical Cord

Figure 46. Rotate Key KB in Key Lock K1

Figure 47. Transfer Key KB to Key Lock K4 and Rotate Key KD

Figure 48. Transfer Key KD to Key Lock K5 and Rotate

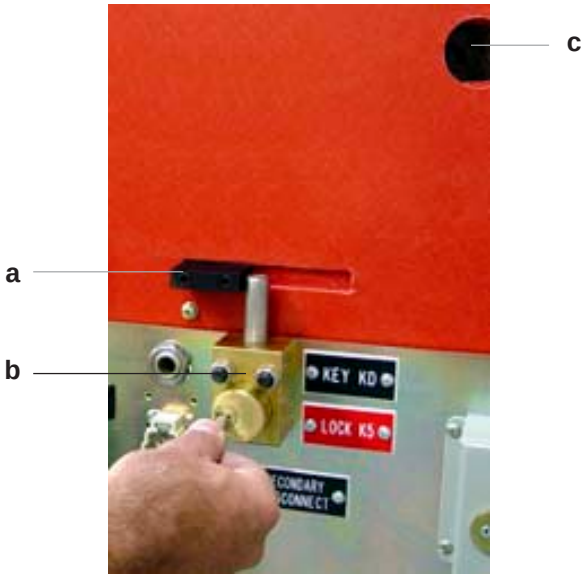

Figure 49. Open the Test Port Shutters Using the Slide Handle

a. Test Port Shutter Operator
b. Lock K5
c. Test Port (open position)

Figure 50. Install the Test Probes in the Test Ports

Figure 51. Rotate Key KD to Lock the Test Probes

Figure 52. Transfer Key KD to Key Lock K4 and Rotate

Figure 53. Transfer Key KB to Key Lock K1 and Rotate

Figure 54. Verify the Control Selector Switch is in the OFF Position

Figure 55. Connect the Umbilical Cord of the Remote Operating Station to the Ground and Test Device

Figure 56. Move the Control Selector Switch to OPEN

Figure 57. Depress the OPEN Push Button on the Remote Operation Station

Figure 58. Move the Control Selector Switch to the OFF Position

Figure 59. Disconnect the Remote Operating Station Umbilical Cord from the Ground and Test Device

Figure 60. Rotate Key KU in Key Lock K1 Electrically Locking the Ground and Test Device OPEN

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C. PROCEDURE FOR REMOVING TEST PROBES

The **CON EDISON** and **CUSTOMER** ground and test devices are supplied with similar interlock functions. However, the **CON EDISON** 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 **CON EDISON** device, these procedures also apply to the **CUSTOMER** device. For procedures that refer to key **KU** for the **CON EDISON** device, the same procedures apply to key **KCF** for the **CUSTOMER** device.

Perform the following steps:

1. Obtain key KB from the Con Edison lock box on premises.
2. Transfer key KB to key lock K1 and rotate (Figure 61). The ground and test device control circuit is enabled. Key KB is captive and key KU is available (Figure 62).
3. Verify that the Control Selector Switch is in the **OFF** position (Figure 63).
4. Connect the umbilical cord of the Remote Operating Station to the ground and test device (Figure 64). Lock the plug into the connected position by turning the plug clockwise.
5. Move the Control Selector Switch to the **CLOSE** position (Figure 65).
6. Turn the Remote Operating Station **ON** and depress the **CLOSE** push button switch on the Remote Operating Station to close the ground and test device (Figure 66).
7. Move the Control Selector Switch to the **OFF** position (Figure 67).
8. Turn the Remote Operating Station **OFF** and disconnect the Remote Operating Station umbilical cord from the ground and test device (Figure 68).
9. Rotate key KU in key lock K1 electrically locking the ground and test device in the **CLOSED** position; key KB is available (Figure 69).
10. Transfer key KB to key lock K4 (Figure 70). Rotate key KB, electrically and mechanically locking the ground and test device in the **CLOSED** position. Key KB is captive and key KD is available.
11. Transfer key KD to key lock K5 (Figure 71). Rotate the key KD to unlock the test port shutters. Key KD is now captive.
12. Open the test port shutters (Figure 72).
13. Remove the test probes from the test ports (Figure 73). Close the test port shutters.
14. Rotate key KD to lock the test port shutters. Key KD is now available (Figure 74).
15. Transfer key KD to key lock K4 and rotate (Figure 75). Key KD is now captive and key KB is available.
16. Transfer key KB to key lock K1 and rotate (Figure 76). The ground and test device control circuit is enabled. Key KB is captive and key KU is available.
17. Verify that the Control Selector Switch is in the **OFF** position (Figure 77).
18. Connect the umbilical cord of the Remote Operating Station to the ground and test device. Lock the plug into the connected position by turning the plug clockwise (Figure 78).
19. Move the Control Selector Switch to the **OPEN** position (Figure 79).
20. Turn the Remote Operating Station **ON** and depress the **OPEN** push button to open the ground and test device (Figure 80).
21. Move the Control Selector Switch to the **OFF** position (Figure 81).
22. Turn the Remote Operating Station **OFF** and disconnect the Remote Operating Station umbilical cord from the ground and test device (Figure 82).
23. Rotate key KU in key lock K1 (Figure 83). The ground and test device is now electrically disabled. Key KU is captive and key KB is available.
24. Disconnect the compartment secondary disconnects from the ground and test device. (Figure 84).
25. Transfer key KB to key lock K2 and rotate Key KC (Figure 85). The ground and test device is now mechanically locked **OPEN**. Key KB is captive and key KC is available.

26. Transfer key KC to key lock K3 and rotate (Figure 86). Pull the Racking Access Interlock handle fully. Install the racking handle, and rotate the handle counter clockwise to move the ground and test device into the **DISCONNECT** position. The disconnect position is indicated on the position indicator. Remove the racking handle.
27. Push the Racking Access Interlock handle fully. Rotate key KC to lock the ground and test device in the **DISCONNECT** position. Key KC is now available (no figure provided).
28. Transfer key KC to key lock K2 and rotate (Figure 87). Key KC is captive and key KB is available.
29. Transfer key KB to key lock K1 and rotate (Figure 88). Key KB is captive and key KU is available.
30. Remove the ground and test device from the compartment (no figure provided).
31. Remove key KU from key lock K1 (Figure 89).
32. Secure key KU in the Con Edison lock box.

Figure 61. Transfer Key KB to Key Lock K1 and Rotate

Figure 62. Key KB is Captive and Key KU is available

Figure 63. Verify the Control Selector Switch is in the OFF Position

Figure 64. Connect the Umbilical Cord of the Remote Operating Station to the Ground and Test Device

Figure 65. Move the Control Selector Switch to the CLOSE Position

Figure 66. Depress the CLOSE Push Button Switch on the Remote Operating Station

Figure 67. Move the Control Selector Switch to the OFF Position

Figure 68. Disconnect the Remote Operating Station Umbilical Cord from the Ground and Test Device

Figure 69. Rotate Key KU in Key Lock K1 Electrically Locking the Ground and Test Device CLOSED

Figure 70. Transfer Key KB to Key Lock K4

Figure 71. Transfer Key KD to Key Lock K5

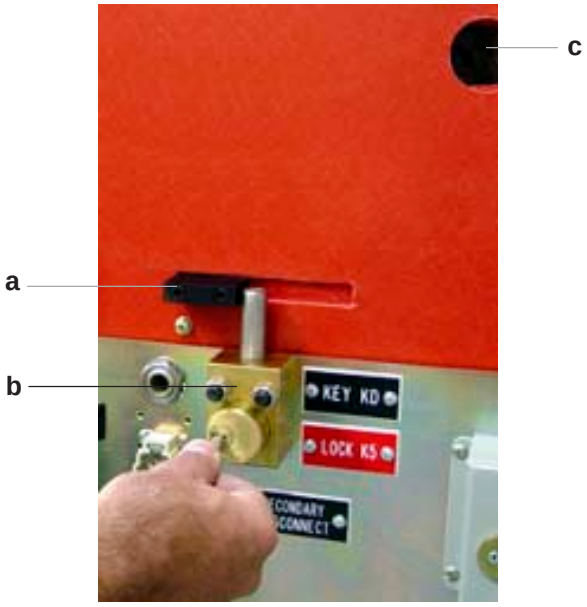

Figure 72. Open the Test Port Shutters

a. Test Port Shutter Operator
b. Lock K5
c. Test Port (open position)

Figure 73. Remove the Test Probes from the Test Ports

Figure 74. Rotate the Key KD to Unlock the Test Port Shutters

Figure 75. Transfer the Key KD to Key Lock K4 and Rotate

Figure 76. Transfer Key KB to Key Lock K1 and Rotate

Figure 77. Verify that the Control Selector Switch is in the OFF position

Figure 78. Connect the Umbilical Cord of the Remote Operating Station to the Ground and Test Device

Figure 79. Move the Control Selector Switch to the OPEN position

Figure 80. Depress the Remote Operating Station OPEN Push Button

Figure 81. Move the Control Selector Switch to OFF

Figure 82. Disconnect the Remote Operating Station Umbilical Cord from the Ground and Test Device

Figure 83. Rotate Key KU in Key Lock K1

Figure 84. Disconnect the Compartment Secondary Disconnects from the Ground and Test Device

Figure 85. Transfer Key KB to Key Lock K2 and Rotate

Figure 86. Transfer Key KC to Key Lock K3 and Rotate

Figure 87. Transfer Key KC to Key Lock K2 and Rotate

Figure 88. Transfer Key KB to Key Lock K1 and Rotate

Figure 89. Remove Key KU from Key Lock K1

D. PROCEDURE FOR REMOVING GROUNDS

The **CON EDISON** and **CUSTOMER** ground and test devices are supplied with similar interlock functions. However, the **CON EDISON** 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 **CON EDISON** device, these procedures also apply to the **CUSTOMER** device. For procedures that refer to key **KU** for the **CON EDISON** device, the same procedures apply to key **KCF** for the **CUSTOMER** device.

Perform the following steps:

1. Obtain key KB from the Con Edison lock box on premises.
2. Insert key KB to key lock K1 and rotate (Figure 90). The ground and test device control circuit is now enabled. Key KB is captive and key KU is available (Figure 91).
3. Verify that the Control Selector Switch is in the **OFF** position (Figure 92).
4. Connect the umbilical cord of the Remote Operating Station to the ground and test device (Figure 93). Turn the plug clockwise to lock.
5. Connect the compartment secondary disconnect to the receptacle on the ground and test device umbilical cord (Figure 94).
6. Move the Control Selector Switch to the **OPEN** position (Figure 95).
7. Turn the Remote Operating Station **ON** and depress the **OPEN** push button switch on the Remote Operating Station to open the ground and test device (Figure 96).
8. Move the Control Selector Switch to the **OFF** position (Figure 97).
9. Turn the Remote Operating Station **OFF** and disconnect the Remote Operating Station umbilical cord from the ground and test device (Figure 98).
10. Rotate key KU in key lock K1; the ground and test device is now electrically disabled (Figure 99). Key KU is captive and key KB is available.
11. Insert key KB into key lock K2 and rotate key KC (Figure 100). The ground and test device is now mechanically locked in the **OPEN** position. Key KB is captive and key KC is available.
12. Transfer key KC to key lock K3 and rotate. Pull the racking access interlock handle fully out (Figure 101). The ground and test device racking slot is now unlocked.
13. Depress the manual trip operator on the switchgear compartment front panel and open the racking access shutter (no figure provided).
14. Install the racking handle into the compartment, and rotate the handle counterclockwise to move the ground and test device into the **DISCONNECT** position as indicated on the position indicator. Remove racking handle (no figure provided).
15. Push the racking access interlock handle in fully. Rotate key KC to lock the ground and test device in the **DISCONNECT** position. Key KC is now available (Figure 102).
16. Transfer key KC to key lock K2 and rotate. The key KC is now captive and key KB is available (Figure 103).
17. Transfer key KB to key lock K1 and rotate (Figure 104). Key KB is captive and key KU key is available.
18. Remove the ground and test device from the compartment (no figure provided).
19. Remove key KU from key lock K1 (Figure 105).
20. Secure key KU in the Con Edison lock box.

Figure 90. Insert key KB to Key Lock K1 and Rotate

Figure 91. Key KB is Captive and Key KU is available

Figure 92. Verify the Control Selector Switch is in the OFF Position

Figure 93. Connect the Umbilical Cord of the Remote Operating Station to the Ground and Test Device

Figure 94. Connect the Compartment Secondary Disconnect to the Receptacle on the Ground and Test Device

Figure 95. Move the Control Selector Switch to the OPEN Position

Figure 96. Depress the OPEN Push Button Switch on the Remote Operating Station

Figure 97. Move the Control Selector Switch to the OFF position

Figure 98. Disconnect the Remote Operating Station Umbilical Cord from the Ground and Test Device

Figure 99. Rotate the Key KU in Key Lock K1 Key KU is captive and KB is available

Figure 100. Insert Key KB into Key Lock K2 and Rotate

Figure 101. Transfer Key KC to Key Lock K3 and Rotate

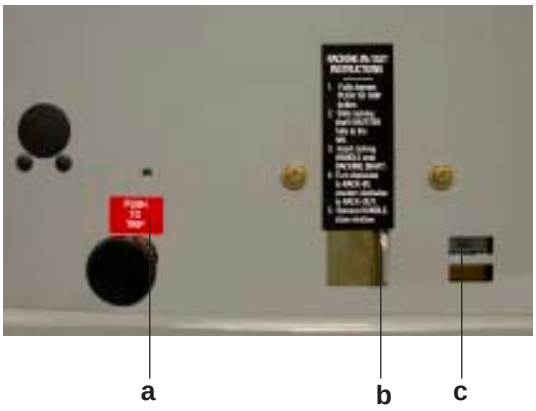

Figure 102. Depress the Manual Trip Operator on the Compartment Front Panel and Open the Racking Shutter

a. Manual Trip Operator
(Does not trip the Ground and Test Device)
b. Racking Access Shutter
c. Position Indicator

Figure 103. Push the Racking Access Interlock Handle in Fully

Figure 104. Transfer Key KC to Key Lock K2 and Rotate

Figure 105. Transfer Key KB to Key Lock K1 and rotate

Figure 106. Remove key KU from Key Lock K1

VI. MAINTENANCE

A. GENERAL

A regular maintenance schedule should be established to obtain the best service and reliability from the ground and test device. The ground and test device is designed to require maintenance every 1000 operations or once a year, whichever occurs first.

Actual inspection and maintenance will depend on individual application conditions such as number of operations, time between uses, and storage conditions. When the ground and test device has been in storage for an extended period of time, it must be inspected and cleaned before being used. See Section IV. INSTALLATION, C. STORAGE, D. PREPARING THE ELECTRICAL GROUND AND TEST DEVICE FOR USE.

A permanent record of maintenance work and inspections should be kept. The degree of record detail depends on the operating conditions. The record should include the dates and results starting from the date the device is first put into service. Dates and results of inspections and routine maintenance activities should be recorded.

B. INSPECTION AND CLEANING

Inspect the ground and test device for loose or damaged hardware or parts. Tighten any loose hardware, and replace missing or damaged hardware or parts.

When necessary, remove loose dust and dirt from the ground and test device with a vacuum cleaner, a clean, dry cloth, or an industrial-type wiper. DO NOT use an air hose to clean the ground and test device. Dirt or grit may be blown into critical parts, including bearings, which will cause excessive wear of the parts.

Primary insulation should be cleaned if needed. Wipe insulation parts 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. Ensure that the ground and test device is dry before use. 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.

C. LUBRICATION

The contact surfaces of the primary disconnect stabs and the fingers of the ground shoe should be lubricated with a thin film of Mobilgrease 28. Before use, particularly if the 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.

VII. RENEWAL PARTS

A. ORDERING

Should any part require replacement due to wear or damage, order renewal parts from Powell Apparatus Service Division (PASD).

When ordering parts, provide the following information from the ground and test device name plate:

- Name of the ultimate user
- Location of the installation
- Type of device including rated voltage and rated amps
- Serial number of the device (see device name plate)
- Description of the part
- Photo of the device with the needed part marked will be helpful in assuring that the proper part is furnished

To order parts, visit the Powell Web site at **www.powellservice.com** or call **1-800-480-7273**.

Notes

Notes

POWELL ELECTRICAL MANUFACTURING COMPANY
8550 MOSLEY DRIVE • HOUSTON, TEXAS 77075 • USA
PHONE (713) 944-6900 • FAX (713) 947-4453
http://www.powellelectric.com
http://www.powellservice.com