GEK-98000B-P Power/Vac® Electrically Operated 15kV Ground and Test Device

15kV Electrically Operated G&T per ConEd Specification EO-2022-14
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Signal Words

As stated in ANSI Z535.4-2002, § 4.13-4.13.3 the signal word is a word that calls attention to the safety sign and designates a degree or level of hazard seriousness. The signal words for product safety signs are “Danger”, “Warning”, and “Caution”. These words are defined as:

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

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

- **CAUTION**
  
  CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

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

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

Qualified Person

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

In addition to the above qualifications, one must also be:

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

Ch 1 General Information .................................................................................................................. 1
   A. Scope ................................................................................................................................. 2
   B. Instruction Bulletins Available Electronically ................................................................. 2

Ch 2 Safety ....................................................................................................................................... 3
   A. Safe Work Condition ....................................................................................................... 3
   B. Safety Guidelines ............................................................................................................. 3
   C. General ............................................................................................................................. 4
   D. Safety Labels .................................................................................................................. 5

Ch 3 Equipment Description ........................................................................................................... 6
   A. General ............................................................................................................................. 6
   B. Specific ............................................................................................................................. 6
   C. Interlocks ........................................................................................................................... 9
      1) ML-17 Operating Mechanism Interlocks ..................................................................... 9
      2) Ground and Test Devices ......................................................................................... 9
   D. Connection Bar Assembly ............................................................................................... 10

Ch 4 Installation ............................................................................................................................... 12
   A. Receiving .......................................................................................................................... 12
   B. Handling .......................................................................................................................... 12
   C. Storage ............................................................................................................................. 12
   D. Set Up Procedure ............................................................................................................ 13
   E. Description of Keyed Interlocks on Ground and Test Device ......................................... 13
      1) Key Lock #1 for Keys “KU” and “KB” ..................................................................... 13
      2) Key Lock #2 for Keys “KB” and “KC” ..................................................................... 13
      3) Key Lock #3 for Key “KC” ....................................................................................... 14
      4) Key Lock #4 for Keys “KB” and “KD” ..................................................................... 14
      5) Key Lock #5 for Key “KD” ....................................................................................... 14
      6) Selector Switch ......................................................................................................... 14

Ch 5 Operating Procedures ............................................................................................................. 15
   A. Setup and Application Procedure to Ground Incoming Line ........................................ 15
   B. Procedure to Remove the Ground from Incoming Feeder and Withdraw Ground and Test Device .................................................................................................................. 18
   C. Procedure to Use Probes for Testing Incoming Line Feeders ...................................... 19
   D. Procedure to Remove Test Probes and Ground and Test Device from Compartment After Testing .................................................................................................................. 20
   E. Control Circuit .................................................................................................................. 21
      1) Close Operation ......................................................................................................... 21
      2) Opening Operation ..................................................................................................... 21
   F. Hi-Potential Test .............................................................................................................. 21
Contents

Ch 6 Maintenance .................................................................................................................... 24
   A. GENERAL DESCRIPTION ................................................................................................. 24
      1) Introduction ............................................................................................................. 24
      2) Inspection and Cleaning ....................................................................................... 24
   B. PERIODIC MAINTENANCE ......................................................................................... 25
   C. SPECIAL MAINTENANCE ........................................................................................... 25

Ch 7 Recommended Renewal Parts and Replacement Procedures ................................. 26
   A. ORDERING INSTRUCTIONS ....................................................................................... 26
   B. RECOMMENDED RENEWAL PARTS ....................................................................... 26
   C. REPLACEMENT PROCEDURES .................................................................................. 26
Figures

Figure 1  Ground & Test Device with Probes & Remote Control Cable .......................... 7
Figure 2  Ground & Test Device Right View ................................................................. 8
Figure 3  Single Continuous Current Rating Interlock .................................................... 10
Figure 4  1200, 2000A Multiple Rating Interlock .......................................................... 10
Figure 5  1200, 2000, 3000A Multiple Rating Interlock ............................................... 10
Figure 6  Connection Bar Assembly 1200/2000A - 132kA peak / 78kA Total Momentary .......................................................... 11
Figure 7  Connection Bar Assembly 3000/3500/4000A - 132kA peak / 78kA Total Momentary .......................................................... 11
Figure 8  Removing Key “KB” from Lock #1 ................................................................. 15
Figure 9  Inserting Key “KB” into Lock #2 ................................................................. 16
Figure 10 Removing Key “KC” from Lock #2 ............................................................... 16
Figure 11 Key “KC” Inserted into Lock #3 ................................................................. 16
Figure 12 Selector Switch in Off Position ................................................................. 16
Figure 13 Inserting Plug into Receptacle ................................................................. 17
Figure 14 Selector Switch in Close Position ............................................................... 17
Figure 15 Close on Control Box ................................................................. 17
Figure 16 Inserting Key “KB” into Lock #1 ................................................................. 18
Figure 17 Selector Switch in Trip Position ............................................................... 18
Figure 18 Open on Control Box ................................................................. 18
Figure 19 Inserting Key “KB” into Lock #4 ................................................................. 19
Figure 20 Shutter Lock ................................................................. 19
Figure 21 Inserting Test Probes ................................................................. 19
Figure 22 Test Probes Locked In ................................................................. 20
Figure 23 Key Interlock Diagram ................................................................. 22
Figure 24 Typical Wiring Diagram ................................................................. 23
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Ch 1 General Information

**WARNING**

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

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

**WARNING**

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

**IMPORTANT**

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

**IMPORTANT**

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

The information in this instruction bulletin describes the following Power/Vac® Electrically Operated 15kV Ground & Test Device:

- GMV-1050 - 1200, 2000, & 3000A

The Electrical Ground and Test Devices utilize the ML-17 Operating Mechanism to operate the grounding contacts. The ML-17 Mechanism is described in Instruction GEK-8126, which must be used with this instruction for a complete description of the Electrical Ground and Test Device(s).

The information in this instruction bulletin is intended to provide information required to properly operate and maintain the Power/Vac 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 & test device

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

All illustrations are shown using deenergized equipment.

**WARNING**

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

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

B. Instruction Bulletins Available Electronically

For more information visit www.powellind.com. To contact the Powell Service Division call 1.800.480.7273 or 713.944.6900, or email info@powellservice.com.
**Ch 2  Safety**

**A. Safe Work Condition**

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

**120.1 Process of Achieving an Electrically Safe Work Condition**

1. Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags.

2. After properly interrupting the load current, OPEN the disconnecting device(s) for each source.

3. Wherever possible, visually verify that all blades of the disconnecting devices are fully OPEN or that drawout type circuit breakers are withdrawn to the fully disconnected position.

4. Apply lockout/tagout devices in accordance with a documented and established policy.

5. Use an adequately rated voltage detector to test each phase conductor or circuit part to verify they are deenergized. Test each phase conductor or circuit part both phase-to-phase, and phase-to-ground. Before and after each test, determine that the voltage detector is operating satisfactorily.

6. Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them. Where it could be reasonably anticipated that the conductors or circuit parts being deenergized could contact other exposed energized conductors or circuit parts, apply ground connecting devices rated for the available fault duty.

**B. Safety Guidelines**

Study this instruction bulletin and all other associated documentation before uncrating the circuit breakers.

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 device described in this instruction bulletin is 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 Power/Vac® Electrically Operated Ground and Test Device.*
C. General

The following safety requirements cover only the more important aspect of personal safety related to the Electrical Ground and Test Device(s). Powell neither condones nor assumes any responsibility for practices which deviate from the following:

1. All personnel associated with installation, operation and maintenance of power circuit breakers and ground and test devices should be thoroughly instructed and supervised regarding power equipment in general and also, the particular model of equipment with which they are working. Instruction bulletins should be closely studied and followed.

2. Maintenance programs must be well planned and carried out consistent with both customer experience and manufacturer’s recommendations. Good maintenance is essential to the ground and test device reliability and safety.

Local environment and Electrical Ground and Test Device application must be considered in such programs, including such variables as ambient temperatures, extreme moisture, number of operations, and any unusual local conditions such as corrosive atmosphere or major insect problems.

Operational tests and checks should be made on the Electrical Ground and Test Device after maintenance, before it is returned to service, to ensure that is capable of operating properly. The extent of such tests and checks should be consistent with the maintenance performed.

3. All spring-charged mechanisms related to the ground and test device must be serviced only by skilled and knowledgeable personnel capable of releasing each spring load in a controlled manner. Particular care must be exercised to keep personnel clear of mechanisms which are operated as their springs are released. Information on construction of such mechanisms is provided in Instruction Bulletin GEK-86126.

4. Before each use of the electrical ground and test device, perform the vacuum interrupter (ground switch) integrity test per Section 3.8 of Instruction Bulletin GEK-86126.

5. If a fault current is carried by the electrical ground and test device, remove the device from the switchgear compartment and perform the Wipe and Gap check and vacuum interrupter (ground switch) integrity test per Section 3.4 and 3.8 of Instruction Bulletin GEK-86126.

Note: See Ch 6 Maintenance, C. Special Maintenance of this instruction bulletin.

6. Interlocks are provided for operator safety. If an interlock does not function as described in paragraph 4, DO NOT make any adjustments or force the device into position. Contact the Powell Service Division for instructions.

7. DO NOT work on an energized device. If work has to be performed on the ground and test device, remove it from the switchgear compartment.

8. DO NOT work on any part of the ground and test device with the power cord attached.

9. When lifting the electrical ground and test device, use the specifically designed lift truck, model GE6, Serial Numbers 1280-725 and above only.
D. Safety Labels

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

⚠️ IMPORTANT

Warning and Caution labels are located in various places in and on the switchgear and on the circuit breaker removable element. Always observe these warnings and caution labels. Do NOT remove or deface any of these warning/caution labels.
Ch 3  Equipment Description

A. GENERAL

The grounding switch function is provided by vacuum interrupters similar to those used in the Power/Vac® circuit breaker. The three (3) ground switches are operated by the ML-17 operating mechanism. The mechanism similar to the mechanism used on the Power/Vac breaker is described in Instruction Bulletin GEK-86126.

A set of three (3) probes is provided. These probes may be inserted into test ports, which connect to the primary connectors. The test ports are covered by movable shutters, which may be locked in the closed position or locked to hold the test probes in place.

Control power for the ground switch is from the secondary disconnect in the switchgear compartment. Electrical control to open or close the ground switch is from a control cable, which can be attached to the front of the device (See Ch 5 Operating Procedures, E. Control Circuit of this instruction bulletin for a more complete description).

The ground switch does not have a provision for manually closing or opening the ground switch when the device is installed in the switchgear compartment. (The device can be manually closed, either at normal speed or slow closed for maintenance when the device is outside the switchgear compartment).

B. SPECIFIC

The GMV-1050 is a three-stud device for grounding and testing the three upper primary studs (incoming line or feeders) of the lower metal-clad compartment only.
Figure 1  Ground & Test Device with Probes & Remote Control Cable
Figure 2  Ground & Test Device Right View

a. Nameplate “Incoming Line (3)
b. Caution Nameplate
c. Lock #5 Key “KD”
d. Lock #1 Keys “KU & KB”
e. Compartment Elevation Label
f. Manual Charge Access
g. Lock #2 Keys “KB & KC”
h. OPEN/CLOSE Indicator
i. Selector Switch
j. Lock #3 Key “KC”
k. Lock #4 Keys “KB & KD”
l. Remote Control Cable Receptacle
m. Operations Counter
n. Manufacturing Nameplate
C. INTERLOCKS

There are two types of interlocks on each device:

1. Interlocks associated with the ML-17 Operating Mechanism
2. Ground and Test Device Interlocks

1) ML-17 Operating Mechanism Interlocks

The following interlocks are provided:

a. Closing Spring Discharge Interlock: This interlock prevents racking in a ground and test device with the closing spring charged.

b. Closing Spring Gag Interlock: This interlock prevents inserting a ground and test device into the switchgear if the closing spring is charged and gagged.

c. Negative Trip Interlock: This interlock opens the ground switch if an attempt is made to rack a ground and test device with the ground switch closed.

d. Positive Interlock: This interlock prevents racking a ground and test device when the ground switch is closed.

The ML-17 Operating Mechanism Interlocks are more fully described in Instruction Bulletin GEK-86126.

2) Ground and Test Devices

a. Current Rating Interlock

Each ground and test device is equipped with an interference plate mounted on the rear of the device. This interlock is a comb type plate with tabs removed at specific locations to coordinate with a corresponding plate mounted in the metal-clad switchgear compartment. The combination of tabs removed provides interference when an attempt is made to insert a device into a compartment for which it is not intended.

Devices with short circuit current momentary and close-latch ratings of 132kA peak/78kA rms total are interlocked so they may be inserted into switchgear compartments of equal or lower ratings.

For devices with a single continuous current compartment rating of 3000A a single fixed interference plate is mounted on the device (Figure 3).

For devices with multiple continuous current ratings of 1200/2000A or 1200/2000/3000A, a fixed plate and an adjustable sliding plate are provided. The fixed plate serves for short circuit rating interlock while the sliding plate is used for selecting the continuous current rating of the compartment. A manual setting of the adjustable sliding plate is required to match the switchgear compartment continuous current rating. The adjustable sliding continuous current rating interference plate has two positions for devices rated 1200/2000A (Figure 4) and three positions for devices rated 1200/2000/3000A (Figure 5). The current setting is accomplished by loosening the Positioning Bolt (Figure 4, 1) on the plate and positioning the plate to where the edge aligns with the current indication arrow. The bolt should then be tightened to 20-25 ft/lbs.
D. **Connection Bar Assembly**

Ground and test devices may be limited to a single continuous current rating connection bar assembly or it may be capable of accepting multiple continuous current ratings of connection bar assemblies. The assemblies that may be utilized on a particular device may be determined by referring to the device nameplate. Connection bar assemblies available for this device are as follows:

Up to and including 132kA peak/78kA rms total momentary

- 1200/2000A (multi rated)
- 3000/3500/4000A (multi rated)

The rating of the connection bar assembly may be identified by the rating stamped on the extension bar and by a combination of the extension bar size and number of finger pairs or fingers on the bar. See Figures 6 and 7.

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**CAUTION**

*Only use connection bar assemblies that meet or exceed the momentary rating of the ground and test device. Momentary current ratings of the device can be found on the device nameplate. Any attempt to install this device with connection bar assemblies that have a lower momentary current rating than the metal-clad compartment could result in serious injury to the operators.*

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**CAUTION**

*Do not force a device into a compartment or remove the rating interference plate.*
**Figure 6**  Connection Bar Assembly  1200/2000A - 132kA peak / 78kA rms Total Momentary

8 Pair of Opposing Fingers

**Figure 7**  Connection Bar Assembly  3000/3500/4000A - 132kA peak / 78kA Total Momentary
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 Power/Vac® Ground & Test Device on a pallet:

- Size: 42” width x 42” depth x 47” height
- Weight: 500 lbs.

The ground and test device is shipped on a pallet covered with a carton. The carton is attached to the shipping pallet by two 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 three metal shipping brackets. When these are removed the ground and test device may be removed from the shipping pallet. Refer to Ch 4 Installation, B. HANDLING, for more information.

B. HANDLING

When lifting the ground and test device, use the specifically designed lift truck, Model GE6, Serial Numbers 1280-725 and above. The lift truck must be used for placing the device into or removing it from switchgear compartments.

A front swivel wheel and two rear wheels are provided for ease of movement on flat, level floors. When the device is unattended or when a lift truck is used, block both rear wheels in both directions to prevent any accidental movement.

CAUTION

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

C. STORAGE

When the ground and test device is not in use it should be stored in a clean, dry room and the following precautions should be observed:

1. 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. If it becomes necessary to store the device temporarily in outdoor metal-clad equipment, power should be available and the heaters in operation to prevent condensation.
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 very corrosive effect on many parts.
3. Unplated surfaces of rollers, latches, etc. of the operating mechanism should be coated with 0282A2048P009 grease to prevent corrosion. If the device is stored for any length of time, it should be inspected periodically to verify that corrosion has not started and to insure good mechanical condition.
D. **Set Up Procedure**

Prior to each use of the ground and test device, it should be visually inspected to check that it has not been damaged since its last use and there is no loose or missing hardware. If it is dirty or dusty, it should be wiped off using clean rags or industrial type non-linting wipes.

**CAUTION**

*Insertion of the wrong device (or of the correct device into the wrong compartment) could result in serious injury to the operating personnel.*

Check to be sure that the correct device is available for the grounding or testing to be performed.

**CAUTION**

*Do not use the device if any of the ground switches fail the vacuum interrupter (ground switch) integrity test.*

Perform the vacuum interrupter (ground switch) integrity test on the ground switches per Section 3.8 of Instruction Bulletin GEK-86126.

Check to ensure primary disconnects on the device match the current rating of the switchgear compartment that the device is to be inserted.

Set the control transfer switch to “TRIP”. Check that the ground switch is open by observing the OPEN/CLOSE indicator (Figure 2, h).

**Note:** If the control transfer switch is not turned to “OFF”, the device mechanism may be damaged when inserting.

Turn the control transfer switch to “OFF”.

If grounding is to be performed, insert the umbilical cord with the remote operating station to the ground and test device receptacle (Figure 2, l).

E. **Description of Keyed Interlocks on Ground and Test Device**

1) **Key Lock #1 for Keys “KU” and “KB”**

Key lock #1 (Figure 2, d) is a two-cylinder lock located on the front left panel of the ground and test device. Lock #1 accepts keys “KU” and “KB” to electrically enable/disable the ground and test device. Key “KB” is held captive by the lock when the lock’s bolt is retracted. Key “KU” is removable when the bolt is retracted and stored in a lock box located near the switchgear. The lock has electrical contacts that are closed when key “KU” is removed and open when key “KB” is removed.

2) **Key Lock #2 for Keys “KB” and “KC”**

Key lock #2 (Figure 2, g) is a two-cylinder lock located on the front lower left side of the ground and test device. Lock #2 accepts keys “KB” and “KC”. Keys “KB” and “KC” may be rotated to extend the bolt only when the device is in the open position. With the bolt extended, the ground and test device is held trip-free. In this position key “KB” is captive and key “KC” is removable. When the bolt is retracted key “KB” is removable and key “KC” is captive.
3) **Key Lock #3 for Key “KC”**

Key Lock #3 (Figure 2, j) is a single-cylinder lock located on the front lower left side of the ground and test device. Lock #3 accepts key “KC” to lock the ground and test device in or out of the connected position. The #3 key lock will also prevent the ground and test device from being removed or inserted into the breaker compartment. Key “KC” is held captive by the lock when the lock’s bolt is retracted.

4) **Key Lock #4 for Keys “KB” and KD”**

Key lock #4 (Figure 2, k) is a two-cylinder lock located on the front lower side of the ground and test device. The key “KB” is inserted in key lock #4 and lock cylinder may be extended only when the device is in closed position, allowing key “KD” to be removed. Key “KB” is removable and key “KD” is captive when the ground and test device is open (bolt retracted). Key “KB” is captive and key “KD” is removable when the ground and test device is closed, system grounded (bolt extended).

5) **Key Lock #5 for Key “KD”**

Key lock #5 (Figure 2, c) is a single-cylinder lock located on the front right side of the ground and test device. Lock #5 accepts key “KD” to mechanically prevent the shutter from being opened. The same lock is also used to lock the test probes. Key “KD” is removable when the bolt is extended.

6) **Selector Switch**

The ground and test device is equipped with a three-position oval handle selector switch (Figure 2, i), with removable handle in the off position. The switch has a “TRIP”, “OFF”, and “CLOSE” position and operates in association with the “OPEN/CLOSE” push button station. The push button is attached to a removable 25-foot power cord.
Ch 5 Operating Procedures

The Power/Vac® Electrically Operated Ground and Test Device is designed to provide access to the primary disconnect stabs 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. Setup and Application Procedure to Ground Incoming Line

**CAUTION**

Although the Power/Vac Electrically Operated Ground & Test Device is designed and rated to close safely against a short-circuit current within its rating, it should not be used deliberately to 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.

1. Key “KU” and the selector switch handle are required to start the setup procedure for the grounding and testing operation. The key and handle are obtained from a lock box, which is under ConEd supervision.
2. Insert key “KU” into Lock #1 and rotate keys. The bolt on lock #1 is retracted when keys are rotated. This allows electrical contacts to open and disable electrical power to the ground and test device's mechanism. Key “KU” is now held captive and key “KB” can be removed (Figure 8).

Figure 8 Removing Key “KB” from Lock #1
3. Remove key “KB” from lock #1 and insert into lock #2 (Figure 9). Rotate the keys to extend the bolt and lock the ground and test device in “trip-free” position. Key “KB” becomes captive and key “KC” is now available for use in lock #3 (Figure 10).

Figure 9  Inserting Key “KB” into Lock #2

4. With the ground and test device open, key “KC” is removed from lock #2 and inserted into lock #3 and rotated (Figure 11). This will withdraw the bolt and allow the ground and test device to be placed into the compartment and racked to the “connected position”. Inspect ground and test device to ensure it is “OPEN”, proceed to rack the device into the “connected position”.  

Figure 11  Key “KC” Inserted into Lock #3

5. With the ground and test device racked into the “connect position” rotate key “KC” in lock #3 to extend the bolt and lock the device in the “connect position”. Key “KC” is then removed from lock #3 and returned to lock #2. Rotate the keys to retract the bolt and unlock the ground and test device from “trip-free” position. Key “KC” is captive and “KB” is available.

6. Key “KB” is removed from lock #2 and inserted into lock #1 and keys rotated. The micro switch, which is associated with lock #1, closes. The ground and test device “CLOSE” circuit is electrically enabled.

7. Insert the selector switch handle into the selector switch. Verify that the three- position selector switch is in the “OFF” position (Figure 12).

Figure 12  Selector Switch in Off Position
8. Attach the umbilical cord with the remote operating station to the ground and test device. The remote station consists of an OPEN and CLOSE push button and a 25-foot power cord (Figure 13).

9. Turn the selector switch from the “OFF” position to the “CLOSE” position (Figure 14).

10. Using the remote operating station, stand away from the front of the ground and test device by full length of cord and push “CLOSE” (Figure 15).

   **Note:** Ground and test motor will charge closing spring and ground and test device will close. Ground is now applied to incoming line.

11. Turn the selector switch from the “CLOSE” position to the “OFF” position (Figure 12).

12. Remove “OPEN/CLOSE” cable from receptacle.

13. Rotate keys in lock #1. Remove key “KB” and selector switch handle. Return key “KB” and selector switch handle to lock box.
B. Procedure to Remove the Ground from Incoming Feeder and Withdraw Ground and Test Device

Continue from step 13 from Ch 5 Operating Procedures, A. Setup and Application Procedure to Ground Incoming Line.

1. Obtain key “KB” and selector switch handle from lock box. Insert key “KB” in lock #1 and rotate keys (Figure 16).

2. Turn selector switch to “TRIP” position (Figure 17).

3. Attach “OPEN/CLOSE remote control cable to receptacle on front of ground and test device (Figure 13). Move away from the ground and test device by full length of cord and push “OPEN” on the control box (Figure 18). The ground and test device will trip and ground will be removed from incoming line.

4. Remove remote cable from receptacle.
5. Insert key “KB” into lock #2 (Figure 9). Rotate keys to extend the bolt and lock ground and test device in “trip-free” position. Key “KB” becomes captive and key “KC” is available for use in lock #3.
6. Move key “KC” to lock #3 and rotate (Figure 11). This will withdraw the bolt and allow the ground and test device to be racked from the “connect position” and removed from the compartment.
7. Rotate key “KC” in lock #3 and move key to lock #2.
8. Rotate keys “KC” and “KB”. Key “KC” is held captive and “KB” is released.
9. Move key “KB” to lock #1 and rotate keys. Key “KB” is held captive and “KU” is released.
10. Remove key “KU” and selector switch handle. Return key “KU” and selector switch handle to lock box.
11. Return the ground and test device to storage compartment.

C. Procedure to Use Probes for Testing Incoming Line Feeders

1. Follow steps 1-11 from Ch 5 Operating Procedures, A. Setup and Application Procedure to Ground Incoming Line.
2. Rotate keys “KU” and “KB” in lock #1 (Figure 16). The bolt in lock #1 will retract, micro switch contacts will open and prevent electrical operation of the ground and test device. Key “KB” can be removed.
3. Insert key “KB” into lock #4 and rotate keys (Figure 19). The bolt in lock #4 will extend only when the ground and test device is closed. Key “KB” becomes captive and key “KD” may be removed.
4. Insert key “KD” into lock #5 to unlock the shutter (Figure 20).
5. Open the shutter and insert test probes (Figure 21).
6. With probes in place and shutter in the “LOCK PROBES” position (Figure 22), key “KD” in lock #5 can be rotated to extend the bolt and lock the test probes. Move key “KD” to lock #4.

Figure 22  Test Probes Locked In

7. Rotate keys “KD” and “KB” into lock #4. This will withdraw the bolt and release key “KB”.
8. Return key “KB” to lock #1 and rotate keys. This will extend the bolt, close the electrical contacts and enable electrical operation.
9. Turn the selector switch to “TRIP” position (Figure 17).
10. With the “OPEN/CLOSE” remote control cable still attached to receptacle on the ground and test device, stand away from the device by full length of cord and push “OPEN” (Figure 18).
11. With the ground and test device open, test can be now performed on the incoming line.

D. Procedure to Remove Test Probes and Ground and Test Device from Compartment after Testing

1. Turn the selector switch to “CLOSE” position (Figure 14).
2. With “OPEN/CLOSE” remote control cable attached to receptacle on the ground and test device, stand away from the device by full length of cord and push “CLOSE” (Figure 15).

Note: Ground and Test Device motor will charge closing spring and the device will close.

3. Rotate keys “KB” and “KU” in lock #1 (Figure 16). This will retract the bolt, release key “KB” and open auxiliary switch contacts, preventing an electrical operation.
4. Insert key “KB” into lock #4 and rotate keys (Figure 19). The bolt in lock #4 will extend only when the ground and test device is closed. Key “KB” becomes captive and key “KD” may be removed.
5. Insert key “KD” into lock #5 and unlock the shutter and remove the test probes (Figure 22).
6. Close the shutter and lock closed. Remove key “KD” and return the key to lock #4.
7. Rotate keys “KB” and “KD” in lock #4. The bolt in lock #4 will retract, releasing key “KB”.
8. Return key “KB” to lock #1 and rotate keys. This will extend the bolt, close the electrical contacts and enable electrical operation.
9. Turn the selector switch to “TRIP” position (Figure 17).
10. With “OPEN/CLOSE” remote control cable attached to receptacle on ground and test device, stand away from device by full length of cord and push “OPEN” (Figure 18).
11. Turn the selector switch to “OFF” position.
12. Rotate keys in lock #1. Remove key “KB” from lock #1, insert into lock #2 and rotate keys (Figure 9).
13. Remove key “KC” from lock #2 and insert into lock #3 (Figure 11).
14. Rotate key “KC” in lock #3, this retracts bolt and the ground and test device is released.
15. Remove remote control cable from receptacle.
16. Rack the ground and test device from the “connect position” and remove from compartment.
17. Rotate key “KC” in lock #3 and move key to lock #2.
18. Rotate keys “KC” and “KB”. Key “KC” is held captive and “KB” is released.
19. Move key “KB” to lock #1 and rotate keys. Key “KB” is held captive and “KU” is released.
20. Remove key “KU” and selector switch handle. Return key “KU” and selector switch handle to lock box.
21. Return ground and test device to storage compartment.

2) **Opening Operation**

With the control cable installed (AD Connector in Figure 24) and the Open (TRIP) button pushed, the trip coil is energized via two 43C (Control Transfer Switch) and two 57 contacts (auxiliary switch). When the device opens, current to the trip coil is interrupted by the two auxiliary switch contacts as the mechanism moves from the close to the open (tripped) position.

**E. CONTROL CIRCUIT**

The device must be racked into the connect position in the metal-clad switchgear to engage the secondary coupler and provide control power to the unit via pins 5 and 6. The device will not operate in the “DISCONNECT/TEST” position. Refer to Figure 24 for the following discussion.

1) **Close Operation**

With the control cable installed (AD connection in Figure 24) and the close button pushed, the 57Y relay is energized if the Control Transfer Switch, 43C, is in the close position. The Y relay is sealed in by a Y relay contact in parallel with the Control Transfer Switch. A second 57Y relay contact picks up the supplies current to the spring charging motor via the 57 SM/LS (Spring Motor Limit Switch), the 57 auxiliary switch and the 43C close (control transfer switch). After the gear motor charges the closing spring, the current to it is interrupted by the opening of the 57SM/LS (Spring Motor Limit Switch). The 57-charge switch is then made which energizes the close coil causing the mechanism to close. When the mechanism closes the contacts in the 57 auxiliary switch are opened to interrupt the power to the 57Y relay and the 57X close coil.

**F. HI-POTENTIAL TEST**

If the ground and test device has been stored a long period of time or exposed to high humidity conditions, it is recommended that the insulation be checked before it is placed in service.

A high-potential test of 36kVAC will normally indicate whether the device is satisfactory for service. Apply the voltage to each phase individually for one minute with the other two phases and the frame grounded. After the high-potential test is made, inspect the primary stud support for leakage paths. Clean surfaces and retest if leakage paths are visible or replace the support.
Figure 23  Key Interlock Diagram
Figure 24   Typical Wiring Diagram
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.

IMPORTANT

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.

Actual inspection and maintenance will depend upon individual application conditions such as number of operations, time between uses, and storage conditions.

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 device, 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. The actual reading of the operations counter should be recorded when the device is first used and whenever any maintenance is performed.

2) Inspection and Cleaning

Give the ground and test device a visual 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. This inspection will be much easier if the horizontal portion of the front cover is removed.

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

CAUTION

Do NOT use an air hose to blow the device out; 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 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.

B. Periodic Maintenance

Periodic maintenance of the electrical ground and test device is essential for safe and dependable operation. The following maintenance should be performed at least once each year (or prior to each use of the device if it is not used and maintenance not performed during the preceding year).

1. Perform each of the maintenance items listed in Section 3.1 of Instruction Bulletin GEK-86126.

C. Special Maintenance

If a fault current has been carried by the ground and test device, the device should be removed from the switchgear compartment for the examination to determine if any damage was sustained. The following items should be performed.

1. Check the wipe and gap per Section 3.4 of Instruction Bulletin GEK-86126.
2. Perform a visual inspection of the device to determine if damage occurred, paying particular attention to the ground circuit.
3. Perform the vacuum interrupter (ground switch) integrity test as described in Section 3.8 of Instruction Bulletin GEK-86126.
Ch 7 Recommended Renewal Parts and Replacement Procedures

A. Ordering Instructions

1. Order Renewal Parts from Powell at www.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. If the part is in any of the recommended renewal parts tables, specify the catalog number. If the part is not in any of the tables, a description should be accompanied by a marked illustration from this instruction bulletin, a photo or simply submit a sketch showing the part needed.

B. Recommended Renewal Parts

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

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 and ready for replacement. The malfunctioning unit can then be returned to the factory for reconditioning.

C. Replacement Procedures

Contact Powell Service Division prior to performing any replacement procedures.

Caution

Ensure that the control circuits are deenergized and the ground and test device is resting securely outside the switchgear housing. Do NOT start to work on a closed ground and test device or a device with the main closing spring charged. When any maintenance procedure requires the opening or closing of the ground and test device or the charging of any of the stored energy mechanism springs, exercise extreme caution to ensure that all personnel, tools, and other miscellaneous objects are kept clear of the moving parts of the charged springs.
GEK-98000B-P
Power/Vac® Electrically Operated
15kV Ground & Test Device

15kV Electrically Operated G&T per
ConEd Specification EO-2022-14

June 09