38 kV Type VCP-WHD Simple Electrical Ground & Test Device (SEG&TD) upper terminal instruction booklet

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CAUTION

BECAUSE OF THE UNIQUE APPLICATION AND VAST VARIETY OF SYSTEM/USER REQUIREMENTS, SPECIFIC SAFE OPERATING PROCEDURES FOR THE USE OF THIS DEVICE MUST BE DEVELOPED BY THE USER.

1. Introduction

38 kV Type VCP-WHD Simple Electrical Ground & Test Device (SEG&TD) assemblies are designed with all the bus work completely insulated for safety.

Since the current carrying parts are not readily accessible, the type 38 kV SEG&TD is designed for insertion into the switchgear compartment to gain access to the primary stationary contacts. It provides a convenient means to:

- Ground the circuit for maintenance work and
- Apply potential for cable testing.

2. Description

The 38 kV SEG&TD (see Figure 1) is a draw-out element that can be inserted into a switchgear compartment in the same manner as a VCP-WHD circuit breaker. This device is equipped with a set of three upper terminals (stabs) (see Figure 2).

![Figure 1. 38 kV SEG&TD (front view).](image)

![Figure 2. 38 kV SEG&TD (rear view – showing stabs).](image)
This device is deeper than the standard VCP-WHD breaker. The stored energy closing mechanism for the power grounding breaker is the same as used in type VCP-WHD breakers. 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.

2.1 Power grounding breaker operation

2.1.1 Closing

The power grounding breaker is closed by the remote operating station at the end of a 50 ft. (15.24 m) long cable (supplied with the device) upon depressing and holding the “CHARGE/CLOSE” and “PERMIT” push-buttons (see Figure 3).

Figure 3. Push-buttons on the Remote Operating Control.

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

Once the grounding breaker is closed, it can be locked in the “Closed” position by removing the cable from the receptacle on the device and rotating key KB and removing key KD from Lock #4 (see Figure 4).

Figure 4. Key KD removed from Lock #4.

Note: The device can also be locked in the “Closed” position by the mechanical lift lock. Please see Section 2.3.3 for details.

2.1.2 Opening

The grounding breaker can be opened by manual operation of the “Push to Open” button. To activate the “Push to Open” button, insert key KD into the bottom cylinder of Lock #4 and rotate it in the cylinder then remove key KB (see Figure 5). Turn the selector switch to the “Open” position (see Figure 6). The “Push to Open” button is now functional.

Figure 5. Key KD inserted and key KB removed from Lock #4.

Figure 6. Selector Switch in the “Open” position.

The grounding breaker can also be opened electrically using the remote operating station (see Figure 3). The “OPEN” push-button must be depressed.

Note: For safety reasons, the breaker is prevented from opening in less than 20 seconds after closing.

2.2 38 kV SEG&TD interlocks and safety features

The 38 kV SEG&TD is designed to provide as many interlocks and safety features as practical for the personnel performing any of the operations described herein.

The device cannot be levered into or out of the “Connected” position unless the grounding breaker is “Open”.

• An indicator on the front panel shows the status of the grounding breaker contacts, “Open- Ungrounded” or “Closed-Grounded” (see Appendix A).
• The power to operate the grounding breaker in this device is obtained through the secondary disconnect in the switchgear compartment.
• The grounding breaker cannot be opened electrically in less than 20 seconds after closing. This feature permits the source interrupter to clear a fault if the grounding breaker is inadvertently closed on an energized circuit (see Appendix C).
• The control switch cable is connected to the device with a twist lock connector.

**WARNING**

**IMPROPER USE CAN RESULT IN DEATH, SERIOUS PERSONAL INJURY, OR PROPERTY DAMAGE.**

### 2.3 Interlocks - basic elements description

There are five interlocks located on the front of the 38 kV SEG&TD. They are labeled as Lock #1 through Lock #5. The labels also identify the key(s) to be used in the locks as KB, KC, KD, and KU. Locks #1, 2, and 4 are two cylinder locks while locks #3 and 5 are single cylinder locks (see Figure 7 and Table 1 for details).

![Figure 7. Interlock locations on the front of the 38 kV SEG&TD.](image)

**Table 1. 38 kV SEG&TD interlock details.**

<table>
<thead>
<tr>
<th>Lock</th>
<th># of Cylinders</th>
<th>Key(s) Required</th>
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<tbody>
<tr>
<td>Lock #1</td>
<td>2</td>
<td>KB, KU</td>
</tr>
<tr>
<td>Lock #2</td>
<td>2</td>
<td>KB, KC</td>
</tr>
<tr>
<td>Lock #3</td>
<td>1</td>
<td>KC</td>
</tr>
<tr>
<td>Lock #4</td>
<td>2</td>
<td>KB, KD</td>
</tr>
<tr>
<td>Lock #5</td>
<td>1</td>
<td>KD</td>
</tr>
</tbody>
</table>

In a single cylinder lock, when the key is inserted into the lock and turned to the “locked” position, the associated 38 kV SEG&TD function will be inoperable and the key can be removed. When the key is in the lock and turned to the “unlocked” position, the associated 38 kV SEG&TD function will be operable and the key is captive in the lock.

![Figure 8. Typical single cylinder lock (38 kV SEG&TD Lock #5 shown).](image)

![Figure 9. Typical single cylinder lock in the “Locked” position with the key ready for removal.](image)

**2.3.1 Single cylinder locks**

Single cylinder locks are used in two positions on the 38 kV SEG&TD: Locks #3 and 5. Single cylinder locks have two positions: locked or unlocked.

**2.3.2 Two cylinder locks**

Two cylinder locks are used in three positions on the 38 kV SEG&TD: Locks #1, 2, and 4. Two cylinder locks have four positions (two for each key): key 1 locked or unlocked and key 2 locked or unlocked.

There is also a mechanical lift lock that, when locked, prevents the operation of the “Push to Open” and “Push to Close” buttons.
In a two cylinder lock, one key must be inserted and turned to the "locked" position to enable the other key to be turned to the "unlocked" position. The key that is in the "locked" position can be removed from the lock. When one cylinder is in the "locked" position with the key removed, the key in the second cylinder cannot be turned or removed from the cylinder.

2.3.3 Mechanical lift lock

The mechanical lift lock prevents the operation of the "Push to Open" and "Push to Close" buttons. To activate the lift lock, slide the left lock plate up until the hole in the plate aligns with the hole in the right lock plate. Install a customer-supplied pad lock through the holes in the left and right lock plates to lock the plates together.

2.4 38 kV SEG&TD interlock functions

There are five interlocks located on the front of the 38 kV SEG&TD (see Figure 13).

2.4.1 Lock #1 (keys KU and KB)

The Lock #1 interlock is a two cylinder transfer lock associated with a switch that is used to electrically enable or disable the electrically operated (E.O.) 38 kV SEG&TD. The switch is electrically disabled when key KU is inserted, turned, and retained in the "Unlocked" position. The switch is electrically enabled when key KB is inserted, turned, and retained (see Figure 14).
2.4.2 Lock #2 (keys KB and KC)
The Lock #2 interlock is a two cylinder lock used to mechanically lock the 38 kV SEG&TD in the “Open” position. The device is locked in the “Open” position when key KB is in the “Unlocked” position and key KC has been rotated to the “Locked” position and removed from the lock (see Figure 15).

2.4.3 Lock #3 (key KC)
The Lock #3 interlock is a single cylinder lock that, when locked, prevents the 38 kV SEG&TD from insertion into, or removal from, the switchgear compartment.

In this design, the Lock #3 in the locked position (lock pin extended) blocks the 38 kV SEG&TD slide handles from being moved to allow insertion into or removal from the SEG&TD (see Figure 16). Key KC is removable from Lock #3 when the lock bolt is extended.

2.4.4 Lock #4 (keys KB and KD)
The Lock #4 interlock is a two cylinder lock used to mechanically lock the 38 kV SEG&TD in the “Closed-Grounded” position. In this design, the Lock #4 interlock is a two cylinder lock used with the “Closed Locking Device” to prevent the 38 kV SEG&TD from being opened. When the SEG&TD is in the “Open-Ungrounded” position, the “Closed Locking Device” is disabled. Key KD is retained when the lock pin is retracted. When the SEG&TD is “Closed-Grounded”, the “Closed Locking Device” is free to move to the right. The lock bolt can now be extended and the “Closed Locking Device” will be held in the secured “Closed-Grounded” position. Key KD is now removable from Lock #4.

In this secured position, the “Closed Locking Device” has blocked operator access to the manual “Open” button. Also, in this secured position, a Selector switch electrically disables the electrical “Open” function; and a mechanical interlock holds the main contacts in the closed position even if the mechanism is tripped. A padlock hasp is provided for securing the “CLOSED-Grounded” position with a customer-supplied padlock (see Figure 18).
3 Operation

3.1 Safe practices

⚠️ WARNING

THE 38 KV SEG&TD IS A SAFETY-RELATED DEVICE. IT MUST BE RECOGNIZED THAT IMPROPER USE CAN RESULT IN DEATH, SERIOUS PERSONAL INJURY, OR PROPERTY DAMAGE. THAT IS WHY IT IS IMPORTANT THAT THE USER DEVELOP SPECIFIC AND SAFE OPERATING PROCEDURES FOR ITS USE.

The following general safe practices are recommended.

1. The 38 kV SEG&TD cannot be stored in a switchgear compartment. It can only be stored in its storage compartment.

⚠️ CAUTION

DO NOT STORE THE 38 KV SEG&TD IN THE SWITCHGEAR COMPARTMENT.

2. Store the 38 kV SEG&TD in a clean, dry area free from dust, dirt, moisture, etc.

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

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

5. Permit only authorized trained personnel to use this device.

6. Take extreme care while using this device to avoid contacting “Live” or “Hot” (energized) terminals.

7. Do not remove the 38 kV SEG&TD front panel while using this device.

8. Always “Close” the grounding breaker electrically from the farthest distance with the remote control switch.

9. Check for dielectric integrity at 60 kV AC across the terminals to ground with the grounding breaker “Open”.

3.2 Operating the 38 kV SEG&TD using the five interlocks

3.2.1 Initial 38 kV SEG&TD condition and interlock positions

When delivered, the following should be true of the 38 kV SEG&TD.

Note: If any of these initial conditions and/or interlock positions is incorrect, contact your Eaton Representative.

1. The 38 kV SEG&TD is in the “Open” position.

2. The Selector switch is set to “Off”.

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Figure 18. Selector switch and the padlock provisions.

2.4.5 Lock #5 (key KD)

The Lock #5 interlock is a single cylinder lock used to open and lock the test port shutters. When rotated, key KD moves the lock pin into the locked and unlocked positions. Key KD is normally in Lock #4 and is available for use in Lock #5 only when the 38 kV SEG&TD is locked “Closed-Grounded”.

Key KD is removable from Lock #5 in two extended bolt positions. One position is when the Test Port shutters are closed (see Figure 19). The second position is when the Test Probes are inserted in the Test Ports and they are being retained by the “detent” position of the shutter (see Figure 20).

Figure 19. Test port shutters in the closed position.

Figure 20. Test port shutters retaining the test probes.

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Figure 21. “Open” indicator and the selector switch in the “Off” position.
3. Lock #1: No key “KU” is present and key “KB” is held captive.

Note: Initially, key “KU” is delivered locked in a Utility lockbox.

Figure 22. Key KB in Lock #1 without key KU.

4. Lock #2: No key “KB” is present and key “KC” is held captive.

Figure 23. Key KC in Lock #2 without key KB.

5. Lock #3: No key “KC” is present and the lock pin is extended locking the slide handles in the extended position so the 38 kV SEG&TD cannot be inserted or removed from the switchgear compartment.

Figure 24. No key in Lock #3 and lock pin extended to lock the slide handles.

6. Lock #4: No key “KB” is present and key “KD” is held captive.

Figure 25. Key KD in Lock #4 without key KB.

7. Lock #5: No key “KD” is present and the lock pin is extended locking the Test Port Shutter in the "Closed" position.
3.3 Grounding the incoming feeder

To ground the incoming feeder, proceed with the steps that follow.

**Note:** The steps that follow assume that the interlock conditions and key positions are as detailed in Section 3.2.1.

1. Obtain key “KU” from the Utility lockbox.
2. Insert key “KU” into the bottom cylinder of Lock #1. Rotate key “KU” to release key “KB” and to move the associated switch to electrically disable the 38 kV SEG&TD.
3. Move key “KB” to Lock #2 and insert it into the top cylinder. Rotate existing key “KC” in the bottom cylinder of Lock #2 to lock key “KB” and release key “KC.” This action mechanically locks the SEG&TD in the “Open” condition.
4. Move key “KC” to Lock #3 and insert it into the cylinder. Rotate key “KC” to retract the locking pin to release the slide handles to allow the 38 kV SEG&TD to be inserted into the breaker cell.
5. Align the 38 kV SEG&TD with the breaker cell to be tested. Move and hold the slide handles towards the center of the 38 kV SEG&TD then insert the SEG&TD into the breaker cell to be tested. For detailed information, refer to I.B. 73D2551H03, Figures 4-2 through 4-4.

Note: It may prove beneficial to have an assistant to help with inserting the 38 kV SEG&TD into the breaker cell due to the weight of the device and the location of the slide handles.

6. Once fully inserted into the breaker cell, release the slide handles and rotate key “KC” to the “Locked” position. This will extend the locking pin for Lock #3 to lock the slide handles and the SEG&TD within the breaker cell. At this point, key “KC” can be removed from Lock #3. At this point, the 38 kV SEG&TD has two available positions: “Disconnect” or “Test”. If in the disconnect position, the SEG&TD cannot be racked in (see I.B. 73D2551H03, Figure 4-4).

7. Using the racking crank provided, engage the end of the racking crank with the racking mechanism of the 38 kV SEG&TD (see Figure 32). Turn the racking crank clock-wise until the SEG&TD is fully racked into the breaker cell.

8. Visually check to make sure the 38 kV SEG&TD is open and racked into the connected position.

9. Once the 38 kV SEG&TD is fully racked into the connected position, place key “KC” into Lock #2 and rotate key “KC” to mechanically unlock the SEG&TD from being closed and to release key “KB”.

10. Place key “KB” into Lock #1 and rotate it to electrically enable the 38 kV SEG&TD.

11. Make sure selector switch is in the “OFF” position.
12. Plug in the remote operator to the receptacle in the front of the 38 kV SEG&TD.

13. Rotate the selector switch to the “Close” position.

14. On the remote operator, depress the “Permit” and “Charge/Close” buttons simultaneously until the 38 kV SEG&TD is closed (the incoming feeder is grounded).

15. Insert key “KU” into Lock #1 and rotate to release key “KB”. This electrically disables the 38 kV SEG&TD.

16. Insert key “KB” into Lock #4 and rotate key “KD” to release it. This mechanically locks the 38 kV SEG&TD in the “Close” condition.
3.4 Test probes and testing the feeder

3.4.1 Preparing the test probes and cables.

The test probes should be connected to the supplied cables using the procedure that follows.

1. Using the appropriate ratchet and socket and wrench, remove the 0.250” x 20 nylon hardware from the cable boot.
2. Slide the boot down the cable to expose the probe connecting lug.

3. Insert the threaded stud on the probe into the cable connection. Secure the test probe to the connecting lug using the 0.375 x 16 hardware supplied.
4. Slide the cable boot back up the cable and over the end of the test probe. Using the original nylon hardware, secure the cable boot to the test probe.

3.4.2 Inserting the test probes and testing the feeder

IMPORTANT

BEFORE THE PROCESS OF INSERTING THE TEST PROBES AND TESTING THE FEEDER CAN BEGIN, THE INCOMING FEEDER MUST BE GROUNDED. THIS IS ACHIEVED BY COMPLETING STEPS 1 THROUGH 16 IN SECTION 3.2 - “GROUNding THE INCOMING FeEDER”.

Before the feeder can be tested, the operator MUST follow all steps detailed in this section. The 38 kV SEG&TD MUST be in the “Open” position to test the feeder.

1. Complete Steps 1 through 16 in Section 3.2 - “Grounding the Incoming Feeder”.
2. Insert key “KB” into Lock #4 and rotate key “KD” to release it. This mechanically locks the 38 kV SEG&TD “Closed”.
3. Insert key ‘KD’ into Lock #5 and rotate it to retract the lock pin and allow the test port shutters to be opened.
4. Move the test port shutter knob to the right until the test probe ports open to form a full circle (see Figure 42). While holding the shutter in this position, install the test probes.

**Note:** The shutter is spring loaded to return to its closed position so it will need to be held in the open position for test probe installation. Due to the spring loading, and the physical size and length of the test probes and cables, an assistant should be used to help in this process.

5. To install the test probes, uncoil each test probe and cable. Insert a test probe into a test probe port until completely seated in the test probe port. Follow the same procedure to install the other two test probes.

6. Move and hold the shutter knob all the way to the right and rotate key “KD,” extending lock pin and locking the test probes in place. Check to make sure the probes cannot be removed.

7. Remove key “KD” from Lock #5 and insert key “KD” into Lock #4. Rotate key “KD” to release key “KB.”

8. Insert key “KB” into Lock #1 and rotate key “KU.” This electrically enables the 38 kV SEG&TD.

9. Turn the selector switch to the “OPEN” position.

10. On the remote operator depress the “Permit” and “Open” buttons simultaneously until the 38 kV SEG&TD is opened.
11. Return the selector switch to the “OFF” position and unplug the remote operator.
12. Rotate key “KU” in Lock #1 and remove key “KB.” Lock key “KB” in the Utility lockbox.
13. The feeder(s) can now be tested.

3.5 Removing the test probes
1. Obtain key “KB” from the Utility lockbox.
2. Insert key “KB” into Lock #1 and rotate key “KU.” This electrically enables the 38 kV SEG&TD.
3. Make sure the selector switch is in the “Off” position.

![Selector switch in the “Off” position.](image)

4. Plug the remote operator into the receptacle on the front of the 38 kV SEG&TD.

![Remote operator connected to the receptacle.](image)

5. Rotate the selector switch to the “Close” position.

![Selector switch in the “Close” position.](image)

6. On the remote operator, depress the “Charge/Close” and “Permit” buttons simultaneously until the 38 kV SEG&TD is “Closed”. 

![Depressing the “Charge/Close” and “Permit” buttons.](image)

7. Return the selector switch to the “Off” position.
8. Unplug the remote operator from the receptacle on the front of the 38 kV SEG&TD.
9. Rotate key “KU” in Lock #1 and remove key “KB.” This electrically disables the 38 kV SEG&TD.
10. Insert key “KB” into Lock #4 and rotate key “KD” to release it. This mechanically locks the 38 kV SEG&TD “Closed”.
11. Insert key “KD” into Lock #5 and rotate it to allow the test port shutters to be opened.

Note: Because the test port shutter is spring loaded, it will move to the left from the locking position.

12. Move the test probe shutter knob slightly to the right so the test probes are free. Remove the test probes.
13. Move the test port shutter knob all the way to the left and rotate key “KD” locking the shutters closed. Remove key “KD”.
14. Insert key “KD” into Lock #4 and rotate it to release key “KB”.
15. Insert key “KB” into Lock #1 and rotate key “KU.” This electrically enables the 38 kV SEG&TD.
16. Plug in the remote operator connector into the receptacle on the front of the 38 kV SEG&TD.
17. Rotate the selector switch to the “Open” position.
18. On the remote operator, depress the “Open” and “Permit” buttons simultaneously until the 38 kV SEG&TD is opened (see Figure 50).
19. Return the selector switch to the “OFF” position.
20. Unplug the remote operator from the receptacle.
21. Rotate and remove key “KU” from Lock #1. This electrically disables the 38 kV SEG&TD.
22. Place key “KU” in the Utility lockbox.

3.6 Un-grounding the incoming feeder
1. Obtain key “KU” from the Utility lockbox
2. Insert key “KU” into Lock #1 and rotate it. This electrically enables the 39 kV SEG&TD.
3. Make sure the selector switch is in the “Off” position (see Figure 47).
4. Insert the remote operator connector into the receptacle in the front of the 38 kV SEG&TD.
5. Rotate the selector switch to the “Open” position.
6. On the remote operator, depress the “Open” and “Permit” buttons simultaneously until the 38 kV SEG&TD is opened.
7. Return the selector switch to the “Off” position.
8. Unplug the remote operator connector from the receptacle on the front of the 38 kV SEG&TD.
9. Rotate key “KU” in Lock #1 and remove it. This electrically disables the SEG&TD.
10. Place key “KU” in the Utility lockbox.

### 3.7 Removing the SEG&TD from breaker cell

1. Verify the 38 kV SEG&TD is in the open position.
2. Remove key “KU” from the Utility lockbox and insert it into Lock #1.
3. Rotate key “KU” in Lock #1 and remove key “KB”. This electrically disables the 38 kV SEG&TD.
4. Insert key “KB” into Lock #2 and rotate then remove key “KC”.
5. Using the slide handles, withdraw the 38 kV SEG&TD to the disconnected position.

![Figure 51. Slide handles.](image)

6. Once the 38 kV SEG&TD is in the disconnected position, insert key “KC” into Lock #3 and rotate allowing the SEG&TD to be removed from the breaker cell.
7. Remove the 38 kV SEG&TD from the switchgear compartment.
8. Rotate key “KC” in Lock #3 and remove it.
9. Insert key “KC” into Lock #2 and rotate it to release key “KB”.
10. Insert key “KB” into Lock #1 then rotate and remove key “KU”.
11. Return key “KU” to the Utility lockbox.
12. Store the 38 kV SEG&TD in an environment that meets specifications.

**Note:** The 38 kV SEG&TD should be in the open position with the test port shutters locked closed and keys held captive as detailed in Table 2.

### 4 Maintenance

The 38 kV SEG&TD is very similar to the VCPW-HD/HDR Vacuum Circuit Breaker. For maintenance information for the 38 kV SEG&TD, please refer to the “Instructions for the Use, Operation, and Maintenance of Type VCPW-HD/HDR Vacuum Circuit Breakers” instruction manual (IB131011EN) supplied with the breaker.

### 5 Utility approvals

- Con Edison
The instructions for installation, testing, maintenance, or repair herein are provided for the use of the product in general commercial applications and may not be appropriate for use in nuclear applications. Additional instructions may be available upon specific request to replace, amend, or supplement these instructions to qualify them for use with the product in safety-related applications in a nuclear facility.

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