Three-way cable interlock kit for Magnum drawout circuit breakers (Type 33 interlock)

**WARNING**

(1) ONLY QUALIFIED ELECTRICAL PERSONNEL SHOULD BE PERMITTED TO WORK ON THE EQUIPMENT.
(2) ALWAYS DE-ENERGIZE PRIMARY AND SECONDARY CIRCUITS IF A CIRCUIT BREAKER CANNOT BE REMOVED TO A SAFE WORK LOCATION.
(3) DRAWOUT CIRCUIT BREAKERS SHOULD BE LEVERED (RACKED) OUT TO THE DISCONNECT POSITION.
(4) ALL CIRCUIT BREAKERS SHOULD BE SWITCHED TO THE OFF POSITION AND MECHANISM SPRINGS DISCHARGED.
FAILURE TO FOLLOW THESE STEPS FOR ALL PROCEDURES DESCRIBED IN THIS INSTRUCTION LEAFLET COULD RESULT IN DEATH, BODILY INJURY, OR PROPERTY DAMAGE.

**WARNING**

THE INSTRUCTIONS CONTAINED IN THIS IL AND ON PRODUCT LABELS HAVE TO BE FOLLOWED. OBSERVE THE FIVE SAFETY RULES:
- DISCONNECTING
- ENSURE THAT DEVICES CANNOT BE ACCIDENTALLY RESTARTED
- VERIFY ISOLATION FROM THE SUPPLY
- EARTHING AND SHORT-CIRCUITING
- COVERING OR PROVIDING BARRIERS TO ADJACENT LIVE PARTS
DISCONNECT THE EQUIPMENT FROM THE SUPPLY. USE ONLY AUTHORIZED SPARE PARTS IN THE REPAIR OF EQUIPMENT. THE SPECIFIED MAINTENANCE INTERVALS AS WELL AS THE INSTRUCTIONS FOR REPAIR AND EXCHANGE MUST BE STRICTLY ADHERED TO IN ORDER TO PREVENT INJURY TO PERSONNEL AND DAMAGE TO THE SWITCHBOARD.

**Section 1: General information**

These instructions deal with the installation and operation of the Magnum three-way mechanical cable interlock (type 33). This mechanical interlock holds any two circuit breakers in the open (trippped) position and disables the closing mechanism when the other breaker is closed. A lever assembly is mounted on each breaker that interfaces with the pole shaft and the tripper bar. The lever assemblies are interconnected with cables. Cable can be used for any orientation of the breakers, and are available in 5, 6, 8, and 10-foot lengths (1.5; 1.8; 2.4; and 3.0 m). Individual cable kits are ordered separately.

**Required tools**

- 10 mm socket and 1/4-inch drive socket
- 10 mm open end wrench
- 11/16-inch open end wrench
- 3/8-inch open end wrench (2)
- 0.5 mm feeler gauge
- 4 mm Allen wrench
- Drive extension
- Pliers

**Kit parts identification**

Refer to Figure 1 and Figure 2 for visual identification of the parts listed below:

**Kit 1** (2A11857G07, shown in Figure 1): Interlock Assembly Kit
(A) M6 x 12 mm hex bolt (nine)
(B) M6 x 25 mm flat-head screw (three)
(C) M6 lock washer (ten)
(D) M6 x 16 mm hex bolt (six)
(E) Drive arm (three)
(F) M6 Square nuts (six)
(G) Interlock assembly (three)
(H) Grease tube (one)

**Kit 2** (2A11858G01-G04, shown in Figure 2): Interconnecting Kit (includes cables)
(I) Cable bracket (two)
(J) M6 x 10 mm thread-forming screws (four)
(K) Cable assembly (two) - in 5-, 6-, 8-, or 10-foot lengths (1.5; 1.8; 2.4; or 3.0 m)
Three-way cable interlock kit for Magnum drawout circuit breakers (Type 33 interlock)

Note: Three sets of kit 2A11858G01, G02, G03, or G04 (six cables total) are required for this installation.

Note: Parts (D) and (F) is not used for this installation.

Figure 1. Contents of Kit 1

Figure 2. Contents of Kit 2

Section 2: Installation of three-way cable interlock

Proceed with the following 12 steps:

Step 1: Remove the front cover by unscrewing the hex-head captive bolts (four for three-pole, six for four-pole) that join the cover to the breaker housing using a 10 mm 1/4-inch drive socket. Then hold the charge handle down approximately 45 degrees to pull off the cover.

Step 2: Remove the knockout (a U-shaped tab) from the right side of the front cover using pliers. Carefully file any excess material from the broken edge.

Step 3: Install drive arm (E) to the right end of the pole shaft using a M6 x 25 mm flat-head screw (B) and a 4 mm Allen wrench. The drive arm should be oriented as shown. Torque to 65-85 in-lbs (7.3-9.6 Nm).
Three-way cable interlock kit for
Magnum drawout circuit breakers
(Type 33 interlock)

Step 4: Reinstall front cover (removed in Step 1). Perform Steps 1 to 4 for each breaker.

Step 5: Fasten the interlock assembly (G) to the drawout cassette’s right-side sheet as shown, using three M6 x 12 mm hex bolts (A) and lock washers (C). Torque to 40–50 in-lbs (4,5–5,6 Nm).

Figure 6. Step 5

Step 6: Fasten the cable bracket (I) to the drawout cassette’s right-side sheet (below the interlock assembly installed in Step 5) as shown, using two M6 x 10 mm thread-forming screws (J). Torque to 65 – 85 in-lbs (7,3 – 9,6 Nm). Perform Steps 5 to 6 for each breaker.

Figure 7. Step 6

Step 7: Check the functionality of the interlock assemblies by performing the following two checks. Refer to Figure 8:

Check 1:
- Fully insert the breaker into its cassette to the CONNECTED position.
- Make sure the drive arm (E) and the interlock assembly’s inner trip arm pass clearance. The teardrop-shaped follower arm of the interlock assembly should engage with the pin on the drive arm. The inner trip arm of the interlock assembly should engage with the tripper bar of the breaker.

Check 2:
- With the breaker still CONNECTED and OPEN, observe the position of the DRIVE (LOWER) LEVER. The gap between the lower right-hand corner of the drive lever and interlock assembly flange should be 0 – 4 mm (see Figure 8, Breaker OPEN).
- Now CHARGE and CLOSE the breaker, and the drive lever should rotate 60 degrees counterclockwise. The gap between the lower left-hand corner of the drive lever and the interlock assembly flange should be 1 – 7 mm (see Figure 8, Breaker CLOSED).
- If either of these gaps is out of specification, DO NOT CONTINUE THE INSTALLATION. Consult Eaton for additional instructions. To reach an EatonCare representative, call (877) 386-2273.

Check 3:
- This check is for the function of the DRIVEN (UPPER) LEVER and the TRIPPER BAR on each breaker. With the breaker OPEN, the upper left-hand corner of the driven lever should be held in contact with the interlock assembly flange by the return spring, and the inner trip arm that operates the tripper bar should protrude a few millimeters beyond the right edge of the interlock assembly.
- With the breaker CLOSED, grasp and slowly rotate the driven lever counterclockwise. After about 30 degrees of rotation (lever approximately horizontal), the breaker should trip. If the breaker does NOT trip before the upper right-hand corner of the driven lever is within 3 mm of the interlock assembly flange (see Figure 8 Breaker TRIPPED), the driven lever and/or tripper bar are out of specification. If this is the case, DO NOT CONTINUE THE INSTALLATION. Consult Eaton for additional instructions. To reach an EatonCare representative, call (877) 386-2273.

- Perform this check for each breaker.
Step 8: This step will prep the cables before they are attached to the interlock assembly. Check to be sure that all cables move freely in their cable housing. Each cable should have a long rod end and a short rod end. To perform the cable prep:

1. Remove the upper lock nut and spacer tube from both rod ends.
2. Remove the compression spring from the short rod.
3. Two loose nuts should be positioned on the threads of each rod. Shoulder the lower nut against the end of the rod threads until the nut stops. Using two 3/8-inch wrenches, tighten the upper nut against the lower nut (see Figure 10).

Repeat the above process on both long and short rods on any given cable.
Step 9: This step describes how to route the cables between breakers. Each breaker should be in the OPEN and DISCHARGED position. When routing cables, adhere to the following recommendations:

- 4 inch (102 mm) minimum allowable cable housing bend radius and minimal number of total bends
- Use plastic wire ties/clamps to attach cable housing to the structure after installation and adjustment
- Do not compress cable housing
- Recheck to ensure cables move freely

Refer to Table 1 and Figure 11 for installation details.

<table>
<thead>
<tr>
<th>From Cassette/Fitting</th>
<th>To Breaker/Fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>3D</td>
</tr>
<tr>
<td>1C</td>
<td>2B</td>
</tr>
<tr>
<td>2A</td>
<td>1D</td>
</tr>
<tr>
<td>2C</td>
<td>3B</td>
</tr>
<tr>
<td>3A</td>
<td>2D</td>
</tr>
<tr>
<td>3C</td>
<td>1B</td>
</tr>
</tbody>
</table>

Step 10: This step describes how to attach the cables to the interlock assemblies. Each breaker needs two long rods and two short rods attached. The short (drive) rods will be attached first.

1. Slide the rubber boot toward the tip of the rod.
2. Unthread the outer bulkhead nut and slide the nut and lock washer upwards.
3. Slide the smaller diameter portion of bulkhead fitting in to the slot on the cable bracket (see Figure 12).
4. Raise cable assembly until threads of the bulkhead fitting show above the slotted hole in the bracket (See Figure 12).
5. Insert threaded end of rod into its swivel fitting.
6. Bring the bulkhead washer and nut down to the threads and hand-tighten.
7. Adjust the two bulkhead nuts to approximately center the fitting on the slot. Hand-tighten
8. Replace the rubber boot over end of fitting.
9. If short rod is in Position A (see Figure 11):
   a. Lower threaded rod tip back through swivel.
   b. Replace spacer tube and compression spring on rod end before sliding the rod tip through the swivel fitting of the lower lever as shown. To aid in sliding the rod tip, grip the nuts that were tightened in Step 8.
10. If short rod is in Position C (see Figure 11):
   a. Replace spacer tube on rod end.
   b. Replace compression spring on rod end.
   c. Manually compress the compression spring to replace the lock nut.
11. Replace the lock nut on the rod end.
12. Hold the nuts that were tightened in Step 8 with pliers and use a 3/8-inch socket or a 3/8-inch open-ended wrench to tighten the lock nut until it touches the spacer tube. Torque to 30-40 in-lbs (3,3-4,5 Nm).

Next, the long (driven) rods will be attached. The long rods are attached in the same way as the short rods except they do not use compression springs.

Repeat the above processes for all cable ends. At the end of cable installation, the breakers should still be in the OPEN position.

Figure 11. Step 9

Figure 12. Step 10
Three-way cable interlock kit for 
Magnum drawout circuit breakers 
(Type 33 interlock)

Too much clearance: adjust both bulkhead nuts to retract cable housing 
No clearance: advance cable housing in a similar manner 
For additional adjustment length: use bulkhead nuts on other end of cable 

When the proper clearance is attained on the driven end, tighten the cable bulkhead nuts on both ends to a torque of 100 – 120 in-lbs (11 – 13 Nm).

Note: If experiencing difficulty or operating in a confined space, consider using an 11/16-inch flare nut crowfoot wrench drive to perform adjustments.

Step 11: This step describes how to adjust the cables. Adjustment should be performed with the large bulkhead nuts ONLY and with all breakers OPEN. Ensure bulkhead fittings are still approximately centered on their slot. Secure cables by snugly tightening bulkhead nuts with an 11/16-inch wrench.

Perform initial adjustments on driven (long rod) end of cable.

For driven (long) rods in Position B (see Figure 15): There should be a small (0.0 – 0.5 mm) clearance between the rod nut and the face of the swivel on which it pulls.

For driven (long) rods in Position D (see Figure 15): There should be a small (0.0 – 0.5 mm) clearance between the upper nut that was tightened in Step 8 and the bottom of the swivel on which they push.

Step 12: The final step is to test the interlock assembly to verify that it conforms to all states in Table 2. Perform the following functional tests:

a. CHARGE and CLOSE Breaker A. Breakers B and C should be held in the OPEN condition. Inspect the driven lever on Breakers B and C. The upper right-hand corner of the driven lever should be within 5 mm of its stop (the interlock assembly flange). CHARGE Breakers B and C and attempt to CLOSE them. They should not respond to the CLOSE attempt (no noise, no spring discharge, no contact motion). If the breakers do not respond as described, review Steps 3 through 12.

b. OPEN Breaker A. The interlock should release. CLOSE Breaker B. Verify that it closes with the OPEN/CLOSED indicator. Breakers A and C should now be held in the OPEN condition. Repeat the above checks on Breakers A and C (driven lever position, attempt to CLOSE).

c. OPEN Breaker B. The interlock should release. CLOSE Breaker C. Verify that it closes with the OPEN/CLOSED indicator. Breakers A and B should now be held in the OPEN condition. Repeat the above checks on Breakers A and B (driven lever position, attempt to CLOSE).
The mechanical interlock is now installed and is functioning properly.

If some interlock parts are sticky, use a light amount of the lubricant grease (H) to reduce the friction. This is ONLY recommended if needed.

**Table 2. Step 12 Logic**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Disclaimer of warranties and limitation of liability

The information, recommendations, descriptions, and safety notations in this document are based on Eaton Corporation's ("Eaton") experience and judgment, and may not cover all contingencies. If further information is required, an Eaton sales office should be consulted.

Sale of the product shown in this literature is subject to the terms and conditions outlined in appropriate Eaton selling policies or other contractual agreement between Eaton and the purchaser.

THERE ARE NO UNDERSTANDINGS, AGREEMENTS, WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, OTHER THAN THOSE SPECIFICALLY SET OUT IN ANY EXISTING CONTRACT BETWEEN THE PARTIES. ANY SUCH CONTRACT STATES THE ENTIRE OBLIGATION OF EATON. THE CONTENTS OF THIS DOCUMENT SHALL NOT BECOME PART OF OR MODIFY ANY CONTRACT BETWEEN THE PARTIES.

In no event will Eaton be responsible to the purchaser or user in contract, in tort (including negligence), strict liability, or otherwise for any special, indirect, incidental, or consequential damage or loss whatsoever, including but not limited to damage or loss of use of equipment, plant or power system, cost of capital, loss of power, additional expenses in the use of existing power facilities, or claims against the purchaser or user by its customers resulting from the use of the information, recommendations, and descriptions contained herein.

The information contained in this manual is subject to change without notice.