3-way fixed cable interlock kit - RF

Instructions apply to

UL489 : PD-RF
IEC  : PD-RF, IZMX40

**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. 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 THE EQUIPMENT. THE SPECIFIED MAINTENANCE INTERVALS AS WELL AS THE INSTRUCTIONS FOR REPAIR AND EXCHANGE MUST BE STRICTLY ADHERED TO PREVENT INJURY TO PERSONNEL AND DAMAGE TO THE SWITCHBOARD.
Section 1: General Information

The mechanical interlock holds one or more of the breakers tripped (prevents closure) when one or more of the others is closed. A lever assembly is mounted on each breaker and interfaces with the pole shaft and tripper bar. The lever assemblies are interconnected with cables. Cables 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 drive socket
- 11/16-inch open-end wrench
- 3/8-inch open-end wrench
- 3/8-inch drive socket
- 4 mm feeler gauge
- 2 mm Allen wrench
- Drive extension
- Adjustable Wrench

Kit Parts Identification

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

(A) Trip Pin (3)
(B) M3 x 16 mm flat-head screw (3)
(C) M6 x 12 mm hex bolt (12)
(D) Lock washer (12)
(E) Drive arm (3)
(F) M6 x 30 mm flat-headed screw (3)
(G) Cable bracket - Type 31 (8) or Types 32 and 33 (12)
(H) M6 x 10 mm thread-forming screws - Type 31 (17) or Types 32 and 33 (21)
(I) Grease tube (1)
(Ja) Interlock assembly Types 31 and 33 (3)
(Jb) Interlock assembly Types 32 (3)
(K) Cable assembly - Type 31 (4) or Types 32 and 33 (8) - 5, 6, 8 and 10-foot lengths (1.5; 1.8; 2.4 and 3.0 m)
(L) Long Spacer Tube (3)
(M) Fixed mounting bracket (3)

Section 2: Installation of Three-Way Cable Interlock

Proceed with the following 9 steps:

Step 1. Remove the four screws (six for 4-pole breaker) holding the cover in place. Pull down on the charging handle and remove the front cover.

Step 2. Remove and retain the upper right M5 x 12 mm screw (N) from the Fixed Breaker Mounting feet (ref. IL01301076E).

Step 3: Install the drive arm (E) to the end of the pole shaft using an M6 x 30 mm flat-head screw (F). The drive arm should be oriented as shown (Figure 4). Torque to 65-85 in-lbs (7.3-9.6 Nm).

Step 4: Install the trip pin (A) to the trip arm using an M3 x 16 mm flat-head screw (B). Use a wrench to hold the trip lever during installation. Torque to 3-5 in-lbs (0.3 - 0.6 Nm). Replace fixed side plate (Figure 4).
Step 5: Before reattaching the cover, the drive arm window must be removed from the side of the cover (Figure 3). Either use a utility knife to cut the window from the cover, or use a punch and a small hammer to carefully punch out the window. Once the window is removed, use a small file to remove any burrs that remain. Make certain that all pieces and/or particles are cleaned up and removed before proceeding.

Step 6: Fasten the interlock assembly (J) to the fixed mounting bracket using four M6 x 12 mm hex bolts (C) and four lock washers (D). Torque to 40 – 50 in-lbs (4.5 – 5.6 Nm) (Figure 5).

Step 7: Fasten the fixed mounting bracket (M) to the right-side breaker mounting bracket using three M6 x 10 mm thread-forming screws (H). Torque to 65 – 85 in-lbs (7.3 – 9.6 Nm) (Figure 5).

Step 8: Re-install M5 x 12 mm screw (N). Torque to 20 in-lbs (2.2 Nm) (Figure 5).

Step 9: Fasten four cable brackets (G) to the fixed bracket side sheet just below the interlock assembly (mounted in Step 5) using two M6 x 10 mm thread-forming screws (H). Torque to 65 – 85 in-lbs (7.3 – 9.6 Nm) (Figure 6).

Step 10: This step offers cable routing and installation procedures. Make sure that cables move freely in their cable housings before installation.
**ATTENTION**

**Figure 8** shows the typical cable routing for Type 31 interlock and **Figure 9** shows the typical routing for both Types 32 and 33. The cable mounting on the drive side is the same for all types. Mounting for the driven side of Type 31 is shown in Figures 13-15. Mounting for the driven side of Types 32 and 33 is shown in Figures 16-19.

**Installation recommendations:**
- 4 inch (102 mm) minimum allowable cable housing bend radius
- Use plastic wire ties/clamps to attach cable housing to structure after installation and adjustment
- Do not compress cable housing
- Recheck to ensure cables move freely.

**Figure 8. Step 9.**

Example Type 31 Interlock Assembly Connection

**Figure 9. Step 11.**

Step 11: This step describes how to first attach the drive (short rod) end of a cable to its interlock assembly and cable bracket. See **Figures 9 to 13** for details:

1. Remove small nut, compression spring and spacer tube from end of rod.
2. Slide rubber boot toward tip of rod.
3. Unthread outer bulkhead nut and slide nut and lock washer toward tip.
4. Insert threaded end of rod into swivel fitting.
5. Slide smaller diameter portion of bulkhead fitting into cable bracket slot (see **Figure 12**).
6. Raise cable assembly until threaded portion of bulkhead fitting enters slotted hole in cable bracket (threads show above bracket).
7. Bring bulkhead washer and nut down to threads and hand tighten.
8. Adjust two bulkhead nuts to approximately center bulk head fitting on cable mounting bracket.
9. Hand tighten bulkhead nuts only at this time.
10. Slide rubber boot back into place over end of bulkhead fitting.
11. Replace spacer tube, compression spring and small nut on end of rod.
12. Lower nuts should be shouldered against end of thread and upper nut tightened against spacer tube (see **Figure 13**).
13. Hold lower nuts and torque upper nut to 30 – 40 in-lbs (3.3 – 4.5 Nm).
Step 11:

- Slide smaller diameter portion of bulkhead fitting into cable bracket slot.
- Raise cable assembly until threaded portion of bulkhead fitting enters slotted hole in cable bracket (threads show above bracket).

Figure 12. Step 11 - Mounting Cable Assembly in Cable Bracket.

Step 12:

- This step describes how to attach the driven (long rod) end of a cable to its interlock assembly and cable bracket on another breaker. This is accomplished by repeating Step 9, except the driven end does not utilize a compression spring between the swivel and outer nut.
- Replace short spacer tube on cable with the long spacer tube from this kit.
- Install the second cable.

Figure 14. Step 12.
Step 13: This step describes how to adjust Type 31 and 33 cables. Cable adjustments are made with the large bulkhead nuts only. Smaller nuts on the rod ends should not be moved. Adjustments are made with all breakers OPEN.

Ensure all bulkhead fittings still approximately centered on cable mounting bracket, allowing for adjustment room in either direction.

Repeat Items 8 and 9 of Step 11 if any bulkhead fitting requires centering.

Perform initial adjustments on driven (long rod) end of cable (refer to Figure 14).

There should be little to no clearance between upper rod nut and face of swivel on which it pulls (refer to Figure 16).

Too much clearance – adjust both bulkhead nuts to retract cable housing.

No clearance or interference – advance cable housing in a similar manner.

For additional adjustment length – bulkhead nuts on other end of cable can be used.

Torque cable bulkhead nuts on both ends to 100 – 120 in-lbs (11 – 13 Nm) when proper clearance is attained on driven end.

Step 14: This step describes how to adjust Type 32 only cables. Cable adjustments are made with the large bulkhead nuts only. Smaller nuts on the rod ends should not be moved. Adjustments are made to the connected breakers in various OPEN and CLOSED conditions. Refer to Figures 17-20.

Ensure all bulkhead fittings are still approximately centered on the cable mounting brackets, allowing for adjustment room in either direction.

Repeat Items 8 and 9 of Step 11 if any bulkhead fittings require centering.

Perform initial adjustments on driven (long rod) end of cable (refer to Figure 15). As adjustments are made with the connected breakers in different states of OPEN and CLOSED, make certain that gaps between the swivel fittings and the nuts are as indicated in the applicable figure (Figures 17-20). In addition, the lever plate should not rotate except when the connected breakers are CLOSED. In that case, the lever plate will rotate approximately 60 degrees clockwise.

Torque cable bulkhead nuts on both ends to 100 – 120 in-lbs (11 - 13 Nm) when proper clearance is attained on driven end.
Section 3: Functional Test of Interlock Assembly

Type 33 – Six-cable interlock assembly test. Refer to Table 1 for logic details.

1. CHARGE and CLOSE Breaker A – Breakers B and C should be held in OPEN condition. Charge Breakers B and C and attempt to CLOSE them - they should not respond to the CLOSE attempt. OPEN Breaker A – the interlock should release.

2. CLOSE Breaker B – verify it closes with the OPEN/CLOSED indicator. Breakers A and C should be held in OPEN condition. Charge Breakers A and C and attempt to CLOSE them - they should not respond to the CLOSE attempt. OPEN Breaker B – the interlock should release.

3. CLOSE Breaker C – verify it closes with the OPEN/CLOSED indicator. Breakers A and B should be held in OPEN condition. Charge Breakers A and B and attempt to CLOSE them - they should not respond to the CLOSE attempt. OPEN Breaker C – the interlock should release.

Type 31 – Four-cable interlock assembly test. Refer to Table 1 for logic details

1. CLOSE Breaker A. Attempt to CLOSE Breaker B – it should not respond to the CLOSE attempt.

2. CLOSE Breaker C – verify Breaker A remains CLOSED. Again verify Breaker B will not respond to CLOSE attempt.

3. OPEN Breaker A – verify Breaker B will not respond to CLOSE attempt.

4. OPEN Breaker C – all breakers are now OPEN. CLOSE Breaker B – verify Breakers A and C will not respond to CLOSE attempt.

Type 32 – Six-cable interlock assembly test. Refer to Table 2 for logic details.

1. OPEN all breakers

2. Charge and CLOSE Breaker A – Breakers B and C should not be held OPEN – OPEN Breaker A.

3. Charge and CLOSE Breaker B – Breakers A and C should not be held OPEN – OPEN Breaker B.

4. Charge and CLOSE Breaker C – Breakers A and B should not be held OPEN – OPEN Breaker C.

5. Charge and CLOSE Breakers A and B – Breaker C should be held OPEN – OPEN Breakers A and B.

6. Charge and CLOSE Breakers B and C – Breaker A should be held OPEN – OPEN Breakers B and C.

7. Charge and CLOSE Breaker A and C – Breaker B should be held OPEN – OPEN Breakers A and C.

The mechanical interlocks are now properly installed with the successful completion of the appropriate tests. Utilize a light amount of the supplied lubricant grease (G) if any interlock parts are sticky. This is only recommended if needed.

Table 1. Types 33 and 31 Logic.

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Table 2. Types 32 Logic.

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