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## EntelliGuard™ Power Circuit Breakers 3200–5000 A Frames, 240–600 Vac

### Maintenance Manual





## DEH204

### ***WARNINGS, CAUTIONS, AND NOTES AS USED IN THIS PUBLICATION***

#### ***WARNINGS***

Warning notices are used in this publication to emphasize that hazardous voltages, currents, or other conditions that could cause personal injury are present in this equipment or may be associated with its use.

Warning notices are also used for situations in which inattention or lack of equipment knowledge could cause either personal injury or damage to equipment.

#### ***CAUTIONS***

Caution notices are used for situations in which equipment might be damaged if care is not taken.

#### ***NOTES***

Notes call attention to information that is especially significant to understanding and operating the equipment.

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### 1.1 Overview

These instructions describe the procedures for maintenance and operation of EntelliGuard 3,200-5,000 ampere low-voltage power circuit breakers. Figure 1 is a front view of the breaker, with key features indicated.

The proper use, care, and maintenance of these breakers is important both from the safety aspect of protecting personnel and for minimizing equipment damage when faults occur. Persons who apply, use, and service these breakers should be familiar with the information presented in this publication.



**WARNING:** Before inspecting or beginning any maintenance work on a circuit breaker, the breaker must be in the OPEN position and disconnected from all voltage sources, both power and control.



**AVERTISSEMENT:** Avant d'inspecter ou de débuter tout travail de maintenance d'un disjoncteur, celui-ci doit être en position OPEN et débranché de toutes les sources de voltage, à la fois de puissance et de contrôle.

### 1.2 Inspection and Maintenance

Circuit breakers should be maintained under a systematic program. Take each breaker out of service periodically for inspection and maintenance to help establish high reliability in service. This policy is facilitated by keeping one or more spare breakers to install in place of breakers requiring maintenance. Keeping a stock of recommended renewal parts ensures that maintenance work can be done quickly.

The frequency at which an individual breaker should be inspected depends on the circumstances of its use. The ANSI-recommended maintenance interval is every 250 operations. EntelliGuard breakers should be inspected after every short circuit interruption, after every 400 ON-OFF operations at any load up to the frame rating, or every two years, whichever comes first. EntelliGuard breakers have been built and tested to operate reliably with inspections at twice the ANSI interval, thus saving time and money by reducing breaker downtime.

If a breaker is installed in an area of high humidity or a dusty atmosphere, it should be inspected more often. Monthly inspections might be warranted for a breaker operated under severe conditions.

Always inspect the breaker after it has interrupted a short circuit or ground fault.

A standard inspection should consist of the following steps:

1. Visual Check – Look for dirt, grease, or other foreign material on all breaker parts. Check insulating surfaces for conditions that could

degrade insulating properties, such as cracks or evidence of overheating. Check for loose hardware and components on the bottom of the breaker compartment. Check for loose or damaged control wiring and for similar problems.

2. Operation – Observe a few close-open operations using the operating handle.
3. Interlocks – During the operational check, verify that the safety interlocks are working properly, as described in Section 4–3.
4. Arc Chutes and Contacts – Inspect the arc chutes and contacts for excessive burning or breakage. Check the amount of contact depression or wipe when the breaker is closed. See Chapter 6.
5. Accessories – Verify that the various accessories are working properly as described in Chapters 7 and 8.

### 1.3 Renewal Parts

Many of the parts and assemblies contained in EntelliGuard breakers are available as replacement parts. See DEF005 for a complete listing.

# EntelliGuard™ 3200–5000 Ampere Power Circuit Breakers

## Chapter 1. Introduction

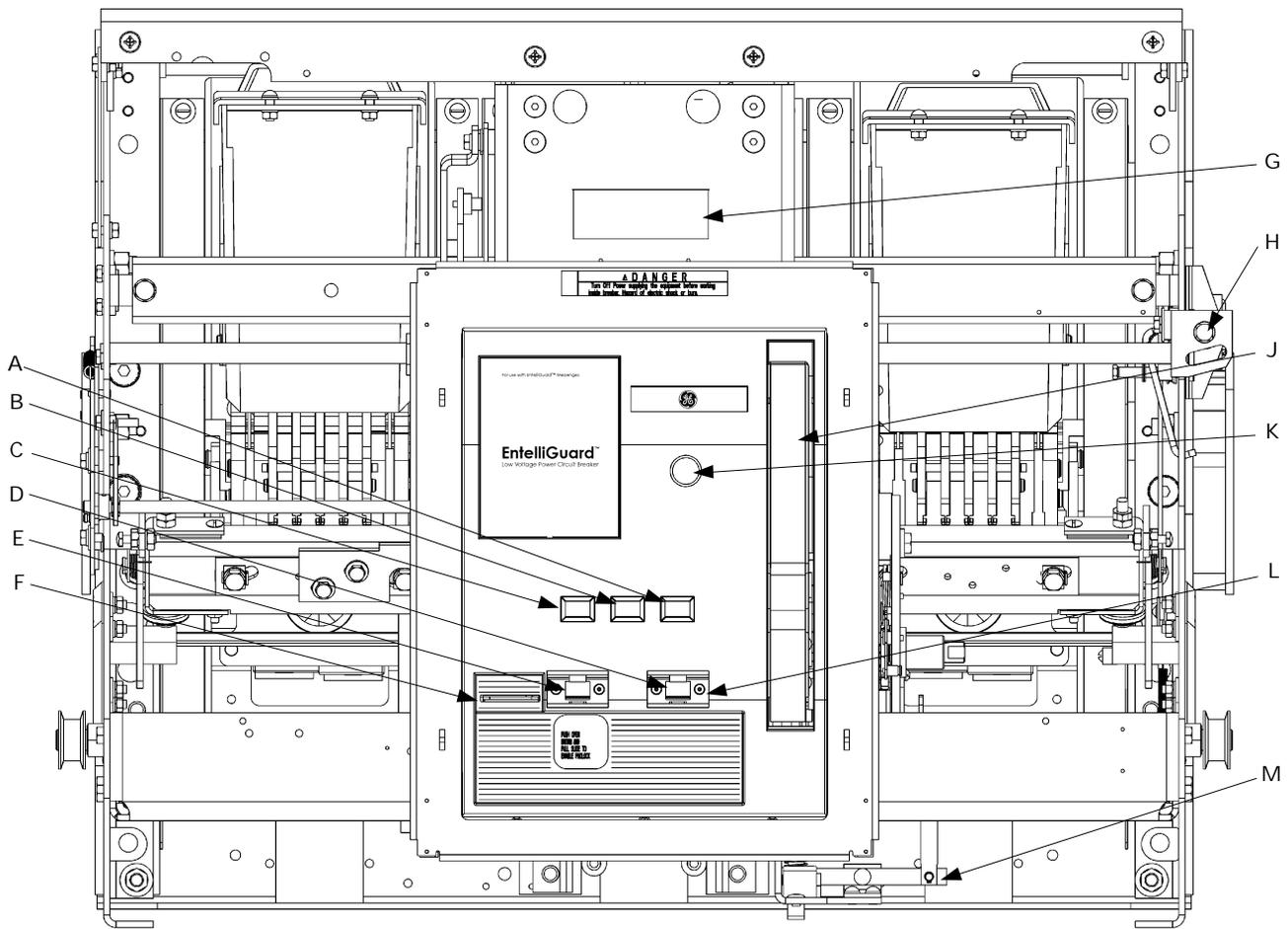


Figure 1. Front of the EntelliGuard circuit breaker, showing the locations of standard and optional features.

- |   |                      |  |   |   |
|---|----------------------|--|---|---|
| A | Indicator:           | DISC (white)<br>TEST (white)<br>CONN (white) | F | Padlock provision                               |
| B | Indicator:           | CHARGED (yellow)<br>DISCHARGED (white)       | G | Catalog number, rating, and date code nameplate |
| C | Indicator:           | CLOSED (red)<br>OPEN (green)                 | H | Draw-out racking screw                          |
| D | CLOSE button (black) |  | J | Manual charging handle                          |
| E | OPEN button (red)    |  | K | Bell Alarm with Lockout target/RESET button     |
|   |                      |  | L | Push button cover                               |
|   |                      |  | M | Spring discharge mechanism                      |

### 2.1 Introduction

EntelliGuard low-voltage power circuit breakers control and protect power circuits up to 600 volts. They will safely switch loads and automatically clear circuits during abnormal conditions when used with the EntelliGuard Messenger™. These include short circuits, sustained overloads, and ground faults.

EntelliGuard breakers contain a “quick-make, quick-break” mechanism, which stores energy in a closing spring for quick release. During closing, some energy is transferred to an opening spring to be used subsequently for fast tripping.

The three main functional components of the breaker are its mechanism, an assembly consisting of the conductive components, and the interrupter.

The mechanism is designed to receive energy, store it, and later deliver it to close the breaker contacts. It must be able to reverse the closing operation at any point upon receipt of a trip signal from the EntelliGuard Messenger™ (that is, it must be “trip-free”). Finally, it must also open a closed breaker quickly enough to minimize contact erosion and to effectively transfer the arc to the arc chutes.

The current-carrying components are assembled on the back frame, which provides the required mechanical support and insulating structure. The conductive components are the studs for external connections, the movable and stationary contact sets, and the pivots for the movable contacts.

The interrupter components are the arcing contacts, the arc runners mounted on the back base, and the removable arc chute assemblies.

In addition to these basic components, a breaker may be equipped with a combination of accessories and interlocking devices.

### 2.2 Frame Sizes

The EntelliGuard breakers covered in this manual are available in 3200 ampere, 4000 ampere, and 5000 ampere frame sizes. These values represent the maximum continuous-current rating of each frame. In addition, each breaker carries a specific rating that is determined by the current sensor ampere rating or the maximum setting of the EntelliGuard Messenger with which it is operated.

### 2.3 Operation

EntelliGuard breakers are available with either manual or electric operation. The mechanism closing springs of manually operated breakers are charged by operating the charging handle on the front of the breaker.

Electrically operated breakers contain an electric Charging Motor that charges the closing springs, a Remote Close accessory with antipump to close the

breaker, and a Shunt Trip to open the breaker. External control power is required to energize the motor and its control circuit. All breakers are equipped with a manual charging handle so that the closing springs can be charged without motor control power.

### 2.4 Mounting

EntelliGuard breakers are designed for draw-out mounting. Draw-out breakers are easily installed into or removed from their switchgear cubicle. They are equipped with a racking mechanism, which is used to insert or withdraw the breaker, and primary and secondary disconnects, which connect and disconnect automatically.

### 2.5 EntelliGuard Messenger™

EntelliGuard low-voltage power circuit breakers are intended for use in Entellisys™ Low-Voltage Switchgear only. The breaker frames do not contain trip units or current transformers. Thus, the EntelliGuard circuit breaker must be used in concert with the EntelliGuard Messenger and the current transformers mounted within the switchgear cubicle. For installation and operation of the EntelliGuard Messenger, see DEH231 and DEH234.

### 2.6 Interruption Ratings

Table 1 lists the short-circuit current that each breaker type is rated to interrupt for each maximum rated voltage.

# EntelliGuard™ 3200–5000 A Power Circuit Breakers

## Chapter 2. Description

Rated AC Voltage, Nominal (max)	Breaker Type	Frame Size (Amps)	Short-Circuit RMS Symmetrical kA		
			Short-Time Withstand	With Inst. Trip	Without Inst. Trip
600 (635)	EGS-32	3200	65	65	65
	EGH-32	3200	85	85	85
	EGX-32	3200	85	85	85
	EGS-40	4000	85	85	85
	EGX-40	4000	85	85	85
	EGS-50	5000	85	85	85
	EGX-50	5000	85	85	85
480 (508)	EGS-32	3200	65	65	65
	EGH-32	3200	85	85	85
	EGX-32	3200	100	100	100
	EGS-40	4000	85	85	85
	EGX-40	4000	100	100	100
	EGS-50	5000	85	85	85
	EGX-50	5000	100	100	100
240 (254)	EGS-32	3200	65	85	65
	EGH-32	3200	85	130	85
	EGX-32	3200	100	130	100
	EGS-40	4000	85	130	85
	EGX-40	4000	100	130	100
	EGS-50	5000	85	130	85
	EGX-50	5000	100	130	100

*Table 1. Breaker interruption ratings (EGF-32/40/50 rated at 200kA when used with a fuse roll-out element).*

### 3.1 Storage

The breaker should be put into service immediately in its permanent location. If this is not possible, the following precautions must be taken to ensure proper storage of the breaker

- Protect the breaker against condensation, preferably by storing it in a warm, dry room, since water absorption has an adverse effect on the insulating parts.
- Store the breaker in a clean location free from corrosive gases or fumes. It is particularly important to protect the equipment from moisture and cement dust, as this combination is corrosive to many parts.



**CAUTION:** If the breaker is stored for any length of time, inspect it periodically to ensure that steel parts have not begun to rust and to ensure good mechanical condition. If the breaker has been stored under unfavorable atmospheric conditions, it must be cleaned and dried before being placed in service.



**ATTENTION:** Si le disjoncteur est remisé pour peu importe la période de temps, inspectez-le périodiquement afin de vous assurer que les pièces d'acier n'ont pas commencé à rouiller et de vous assurer de leur bonne condition mécanique. Si le disjoncteur a été remisé à des conditions atmosphériques défavorables, il doit être nettoyé et séché avant d'être mis en service.

### 3.2 Safety

Each facility must maintain a safety program for the protection of personnel, as well as other equipment, from the hazards associated with electrical equipment.

The following requirements are intended to augment a facility's safety program, *not* to supplant local responsibility for devising a complete safety program. The following basic industry-accepted safety requirements are applicable to all major electrical equipment, such as switchgear and switchboards. General Electric neither condones nor assumes any responsibility for practices that deviate from these requirements.

1. All conductors must be assumed to be energized unless their potential has been measured as ground and suitable grounding conductors have been applied to prevent energizing.
2. Although interlocks are provided to reduce some of the risks, each individual's actions are essential to prevent accidents when performing service or maintenance. Each person's knowledge, mental awareness, and planned and executed actions often determine if an accident will occur. The most important principle for avoiding accidents is that all associated personnel carefully apply a thorough

understanding of the specific equipment with regard to its purpose, its construction, its operation, and situations that could be dangerous.

3. All personnel associated with installation, operation, and maintenance of electrical equipment, such as power circuit breakers and other power-handling equipment, must be thoroughly instructed, with periodic retraining, about power equipment in general and the specific equipment with which they will be working in particular. Instruction books, actual devices, and appropriate safety and maintenance procedures, such as OSHA publications, the National Electrical Safety Code (ANSI C2), the National Electrical Code, and NFPA 70B Electrical Equipment Maintenance, must be closely studied and followed. During actual work, supervisors should audit procedures to ensure conformance.
4. Excellent maintenance is essential for reliability and safety of all electrical equipment. Industry publications of recommended maintenance practices, such as ANSI/NFPA 70B, *Electrical Equipment Maintenance*, are readily available.

### 3.3 Maintenance

Both long- and short-term maintenance of all electrical equipment is essential for reliability and safety. Maintenance programs must be well-planned and carried out consistently with both industry experience and the manufacturer's recommendations. The local environment must always be considered in such programs, including such variables as ambient temperature, extreme moisture, number of operations, corrosive atmosphere, significant insect and small-animal problems, and any other unusual or abusive condition of the application.

One of the critical service activities, sometimes neglected, is the calibration of various control devices. These monitor conditions in the primary and secondary circuits, sometimes initiating emergency corrective action, such as opening or closing circuit breakers. In view of the vital roles of these devices, it is important to follow a periodic test program.

General Electric recognizes that the interval between periodic checks will vary, depending on the environment, the type of device, and the customer's experience. GE recommends that, until the customer has accumulated sufficient experience to select a test interval best suited to the local requirements, all significant calibrations be checked at one- to two-year intervals.

Operation and maintenance guides supplied by manufacturers normally address components that require service or maintenance during the useful life of the equipment. However, they can not include every possible part that could require attention, particularly over a long service period or under adverse conditions. Maintenance personnel must be alert to deterioration of any part of the

## **EntelliGuard™ 3200–5000 A Power Circuit Breakers**

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### *Chapter 3. Storage, Safety, and Maintenance*

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electrical system, taking such action as necessary to restore it to serviceable status.

If additional assistance is required in the planning and performance of maintenance, contact GE Installation and Field Service (1-888-434SERV / 1-888-434-7378) to undertake the maintenance or to provide technical assistance, such as the latest publications.

The performance and safety of this equipment may be compromised by the modification of supplied parts or their replacement by non-identical substitutes. All such design changes must be qualified to ANSI/IEEE Standard C37.59.

Each customer should methodically keep written maintenance records as an aid in future service planning and equipment reliability improvement. Unusual experiences should be promptly reported to General Electric (1-888-GER-ESOLve).

## 4.1 Operating Instructions

### Sequence of Operations

The sequence of operations that may be performed on the circuit breaker are listed in Table 2.

### Operation of the Breaker

#### Manually Charging the Mechanism Springs

Pull the charging handle down about 90° (until it stops) eight times to fully charge the springs. This will not close the breaker contacts. The charge indicator will show CHARGED on a yellow background.



**NOTE:** The breaker cannot be closed unless the springs are fully charged and the handle is stored fully in.



**NOTE:** Le disjoncteur ne peut être fermé à moins que les ressorts ne soient pleinement chargés et que la poignée ne soit pleinement rentrée.

#### Electrically Charging the Closing Springs

If the breaker is equipped with the (optional) Charging Motor, the closing springs may also be charged with any of the following methods:

- With the breaker in the TEST position, install the motor fuse in the fuse holder in the upper left corner of the breaker compartment.
- Operate the Charging Motor by applying the rated voltage to secondary disconnect terminals 8 and 17. Power to the motor is removed automatically by a cutoff switch when the springs are fully charged.
- If power is lost during the charging cycle, finish charging the springs by cycling the charging handle until the indicator shows CHARGED on a yellow background.

The closing springs will automatically recharge after closing if control power is maintained at terminals 8 and 17.

### Closing the Breaker

Close the breaker contacts with any of the following methods:

- Depress the CLOSE button on the front of the breaker.
- Close the breaker using the Entellisys™ HMI.
- Energize the (optional) Remote Close accessory by applying the rated voltage to secondary disconnect terminals 9 and 18.

If the breaker is closed electrically and the closing voltage is maintained, an antipump device prevents a second closing operation on the breaker in the event it is tripped OPEN. The closing impulse must be released for 1 to 2.5 seconds and reapplied before a second closing operation can occur.

If the closing voltage is applied while the closing springs are not fully charged, the Remote Close coil energizes, but operation of the closing mechanism is blocked. The closing voltage must be removed and reapplied when the springs are fully charged to close the breaker.

A mechanical interlock prevents the closing springs from discharging if an attempt is made to close an already CLOSED breaker.



**NOTE:** The main breaker contacts cannot be closed if any of the following conditions apply:

- The draw-out mechanism is in any position other than TEST or CONN, as displayed on the breaker position indicator.
- The (optional) Bell Alarm with Lockout was not reset after an overcurrent lockout and the breaker is in the CONN position.
- The (optional) Open-Fuse Lockout was not reset after replacement of a blown fuse.
- The (optional) Network Interlock was not reset after a set operation.

These conditions must be corrected before the breaker can be closed. Attempts to close the breaker before these conditions are corrected may result in discharge of the closing springs without closing the main contacts.

Open/Closed Indicator	Main Breaker Contacts	Charge Indicator	Condition of Closing Springs	Next Permissible Operating Function
OPEN	Open	DISCHARGED	Discharged	Mechanism may be charged
OPEN	Open	CHARGED	Charged	Contacts may be closed
CLOSED	Closed	DISCHARGED	Discharged	Mechanism may be recharged or Contacts may be opened
CLOSED	Closed	CHARGED	Charged	Contacts may be opened

Table 2. Sequence of operations that may be performed with the EntelliGuard circuit breaker.



**NOTE:** Les contacts principaux du disjoncteur ne peuvent être fermés si l'une ou l'autre des conditions suivantes s'appliquent:

- Le mécanisme de retrait du ressort est en tout autre position que: TEST ou CONN, tel que montré à la position indicatrice du disjoncteur.
- L'alarme optionnelle avec cloche n'a pas été remise en place après un blocage par surintensité de courant.
- Le mécanisme optionnel de déclenchement par sous voltage n'a pas été enclenché.
- Le verrouillage réciproque optionnel de réseau n'était pas réenclenché après une opération d'enclenchement.

Il faut que ces situations soient corrigées avant de procéder à la fermeture du disjoncteur. Toute tentative de fermer le disjoncteur avant que ces conditions ne soient corrigées pourra résulter en une décharge des ressorts de fermeture sans fermer les contacts principaux.

### Opening the Breaker

Open the breaker contacts with any of the following methods:

- Depress the OPEN button on the front of the breaker.
- Open or trip the breaker using the Entellisys™ HMI.
- Energize the (optional) Shunt Trip accessory by applying the rated voltage to secondary disconnect terminals 5 and 7.

### Padlock Operation

The padlock provision prevents the breaker from closing by holding the trip latch in the tripped position. Up to three padlocks with 1/4" or 3/8" diameter shanks, or scissor-type safety lockout hasps may be inserted at one time. To install a padlock, use the following procedure:



**WARNING:** Be sure to test for proper operation of the mechanism, as described in step 1, before using it to secure the breaker.



**AVERTISSEMENT:** Assurez-vous de tester que le mécanisme opère correctement, tel que décrit à l'étape 1, avant de l'utiliser pour fixer le disjoncteur.

1. To check for proper installation of the padlock mechanism, hold in the OPEN button, pull out the padlock slide, insert a 1/8" rod or #10 gage solid wire, and attempt to close the breaker.  
*The breaker must not close.*

2. While holding the OPEN button in, slide the padlock plate out and hold it in place.
3. Put the padlock or safety lockout hasp into one of the three holes in the padlock plate; this will prevent the plate from returning to its unlocked position and prevent the breaker from closing.

### 4.2 Control Wiring

Figure 2 is the wiring diagram for the breaker control circuit. Table 3 lists the secondary disconnect terminals and the items connected to each. The locations of the secondary disconnect is illustrated in Figure 3.

### 4.3 Breaker Interlocks

EntelliGuard breakers are equipped with a number of safety interlocks to prevent improper operation of the breaker.

#### Draw-Out Interlock

The draw-out interlock prevents the breaker from being closed when the breaker is in neither the CONN nor TEST position, but is between these positions. A pin on the side of the breaker engages a ramped cam in the switchgear cubicle. When the pin is lifted 3/8" the breaker is held trip-free.

An additional interlock holds the breaker trip-free whenever the racking handle is engaged with the draw-out mechanism racking screw.

#### Contact Interlock

The contact interlock prevents the racking handle from engaging the draw-out mechanism racking screw whenever the breaker contacts are CLOSED. The racking handle (catalog number 0324B4721G001) has a recess that prevents the tool from engaging the square drive on the racking screw when the interlock is active. This prevents changes to the breaker's position with the main contacts CLOSED.



**CAUTION:** Use of a tool other than the GE racking handle 0324B4721G001 may render the contact interlock ineffective.



**ATTENTION:** L'utilisation d'un outil autre que le GE racking handle 0324B4721G001 peut rendre le mécanisme de verrouillage des contacts inefficace.

### ***Spring Discharge Interlock***

The spring discharge interlock functions in conjunction with the circuit breaker's draw-out interlock and a compartment-mounted cam to discharge the closing and opening springs before the breaker can be withdrawn from the compartment. It includes an inverted "T" rod beneath the circuit breaker, which has two functions.

In the DISC position, the inverted "T" rod prevents the breaker from being further withdrawn from the compartment until the closing and opening springs are discharged. In the CONN position, the inverted "T" rod aligns beneath a stop bracket in the compartment which blocks lifting of the "T" rod and prevents the spring discharge interlock lever from being used to close the circuit breaker.

When the circuit breaker is racked to the DISC position, the draw-out interlock pin is lifted by the compartment cam. This holds the circuit breaker trip shaft & latch in a trip-free position. The breaker cannot be closed. Depressing the spring discharge lever releases the closing spring energy and the mechanism crashes (closing springs discharge but breaker does not close). Depressing the lever also lifts the "T" rod beneath the breaker, lifting it above the ramped interlock beneath the breaker, thus releasing the breaker to rollout to the fully withdrawn position.

Note: If the breaker is out of the switchgear compartment, the spring discharge interlock will act as a closing lever since no other interlocks will be holding the trip shaft in a trip-free position as the closing spring energy is released.

### ***4.4 Equipment Interlocks***

Additional optional interlocks may be furnished with the breaker enclosure. The Key Interlock prevents the breaker from closing when the interlock is engaged and requires one or more keys to operate. The Door Interlock prevents opening of the enclosure door when the breaker is in the CONN position. It can be defeated for authorized access. The door can be opened by racking the breaker to the TEST or DISC position.

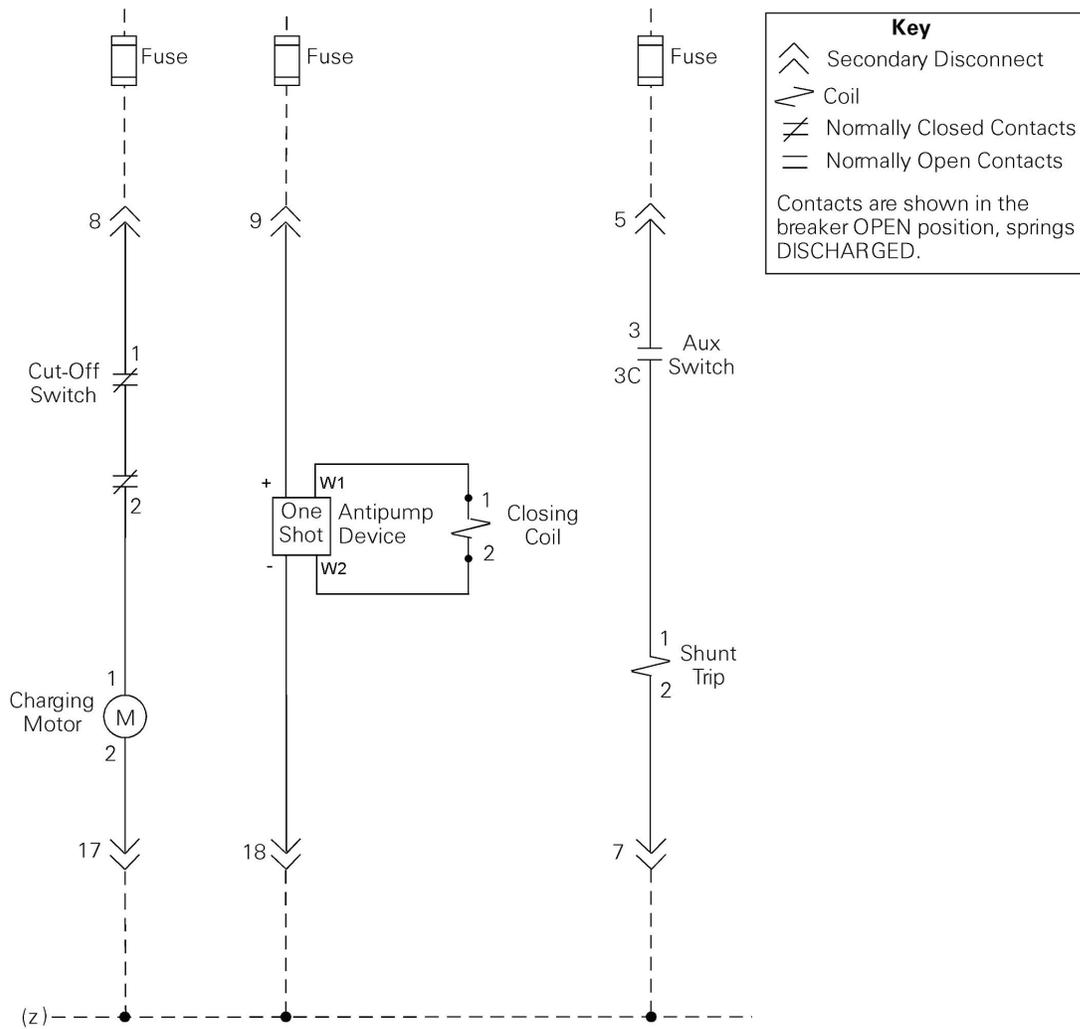


Figure 2. Elementary diagram of the breaker control circuits.

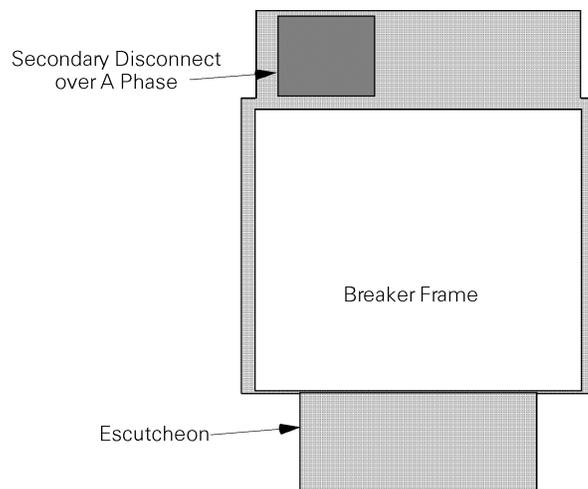


Figure 3. Location of the secondary disconnect (top view of the breaker).

10	Aux Switch (NO contact)	
1	Aux Switch	
2	Aux Switch	
11	Aux Switch (NC contact)	
13	Flux Shifter	
12	Flux Shifter common	
5	Shunt Trip	
7	Shunt Trip common	
9	Close Circuit	
18	Close Circuit common	
8	Closing Spring Charging Motor	
17	Closing Spring Charging Motor common	
3	Remote Charge Indicator	
4	Remote Charge Indicator	
14	Bell Alarm Trip	
6	Bell Alarm Trip Common	
16	Bell Alarm Status	
19	Bell Alarm Status Comon	
OR		
15	Network Interlock SET	
20	Network Interlock RESET	
21	Network Interlock SET/RESET common	
16	Network Interlock Status	
19	Network Interlock Status common	
22	OFLO (phase A)	
23	OFLO (phase A)	
24	OFLO (phase B)	
25	OFLO (phase B)	
26	OFLO (phase C)	
27	OFLO (phase C)	
28	Spare	
29	Spare	
30	Spare	
31	Spare	
32	Spare	
33	Spare	
34	Spare	
35	Cooling Fan	
36	Cooling Fan Common	

Table 3. Secondary disconnect terminals and standard connections.



**WARNING:** Before inspecting a breaker or beginning any maintenance, the breaker must be disconnected from all voltage sources, both power and control, and the breaker must be in the OFF position.



**AVERTISSEMENT:** Avant d'inspecter ou de débiter tout travail de maintenance d'un disjoncteur, celui-ci doit être en position OPEN et débranché de toutes les sources de voltage, à la fois de puissance et de contrôle.

### 5.1 Lubrication

Bearing points and sliding surfaces should be lubricated with a thin film of GE Lubricant D6A15A1 (MobilGrease 28, catalog number 193A1751P1). Clean the surfaces to be lubricated with an industry-approved solvent.

**Note:** Remove all excess lubricant with a clean, lint-free cloth to avoid accumulation of dirt or dust.

The contact surfaces of the primary disconnect fingers should be cleaned and lubricated with GE Lubricant D6A15A1.

**Note:** Do not lubricate the breaker main, intermediate, or arcing contacts or the outside diameters of rollers. Also do not lubricate the ground radius on the closing prop or trip latch, as this will cause accumulation of dirt and dust.

### 5.2 Removing and Reinstalling the Breaker

Maintenance or inspection should be performed with the breaker removed from the compartment and placed on a workbench. Figure 4 illustrates these procedures.

#### Removing the Breaker

Use the following procedure to remove the draw-out breaker from its cubicle:

1. With the switchgear door closed and latched, open the breaker.
2. Engage the Remote Racker accessory (WPEGRRLV) or the Racking Handle (catalog number 0324B4721G001) with the racking screw. Rotate the screw counterclockwise using either the Remote Racker or the Racking Handle until the breaker travels from the Connected position through the Test position (as indicated by the legends CONN and TEST, respectively, on the draw-out position indicator) and comes to a solid stop in the Disconnected position (as indicated by the legend

DISC on the position indicator). At this point, the primary and secondary disconnects are disengaged.

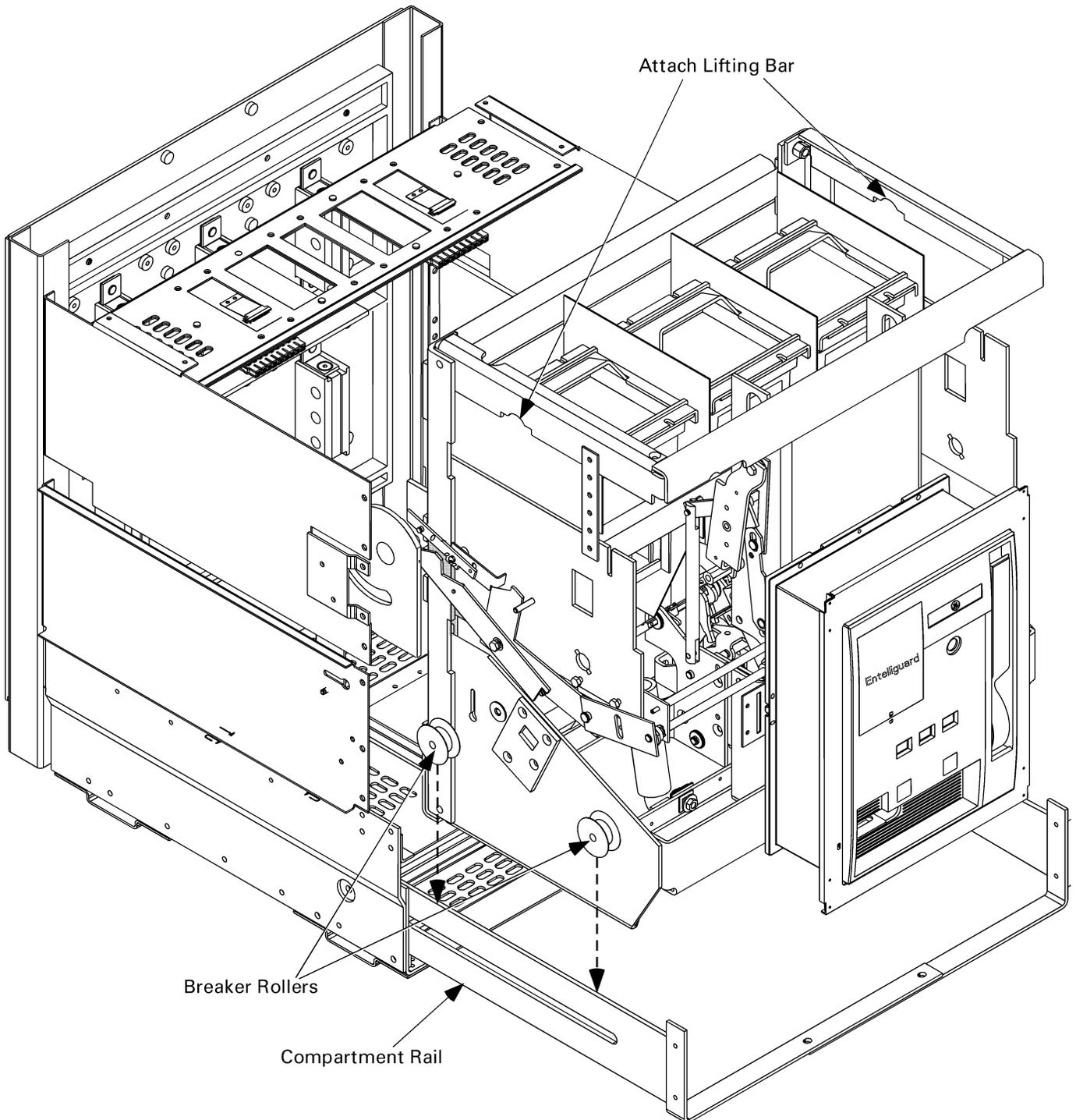
3. Open the compartment door and pull out the rails. Depress the spring discharge lever, indicated in Figure 1, to discharge the breaker's closing springs. Continue to depress this lever while pulling the breaker out to its Withdrawn position.
4. Verify that the indicators on the front of the breaker show that the springs are DISCHARGED and the breaker is OPEN.
5. Attach the lifting bracket by locating the hooks at the cutout notches in the top frame of the breaker. Be careful to avoid damage to the control wiring behind the frame.
6. Lift the breaker off the rails.
7. Push the rails back into the compartment, then move the breaker forward until the primary disconnects clear the compartment. Lower the breaker onto a flat surface free of protrusions that could damage the breaker's internal parts. Close the compartment door.
8. Place the draw-out mechanism in the Connect position to deactivate the interlocks that would otherwise prevent the breaker mechanism or contacts from closing. Engage the Racking Handle to the racking screw and turn it clockwise until it stops, as indicated by the legend CONN on the position indicator.

#### Installing the Breaker

Before reinstalling the breaker in its compartment, the draw-out mechanism must be returned to the DISCONNECT position.

1. Before lifting a breaker to its intended compartment location, observe the following precautions:
  - Check the compartment to ensure that it is free of foreign objects.
  - Ensure that the breaker is OPEN.
  - Insert the racking handle and rotate it fully counterclockwise to ensure that the racking cams on the breaker are correctly positioned for initial engagement with the pins in the breaker cubicle. The position indicator on the front of the breaker should show DISC.
2. Attach the lifting bracket by locating the hooks at the cutout notches in the top frame of the breaker. Be careful to avoid damage to the control wiring behind the frame.
3. Open the compartment door. With the roll-out rails positioned inside the compartment, raise the breaker higher than the rails.
4. Pull the rails all the way out to their withdrawn position.

5. Slowly lower the breaker onto the rails so that the grooves in the rollers on the side of the breaker align with the rails.



*Figure 4. Circuit breaker during installation into or removal from its compartment.*

6. Push the breaker into the compartment until the spring discharge stop engages. This is the DISCONNECT position. At this point the racking cams are positioned to engage the fixed racking pins in the compartment, ready to begin the racking motion. Push the rails back into the compartment.
7. Close the compartment door. Install the Remote Racker accessory or the Racking Handle through the opening at the upper right of the door and onto the racking screw. Rotate the screw clockwise using either the Remote Racker or the Racking Handle through the Test position, until the racking screw comes to a solid stop. The breaker is now in the Connected position, as shown by the legend CONN on the position indicator flag. Note that a loud click will be heard as the spring-loaded secondary disconnect detent releases as the breaker moves beyond the TEST position.

### 5.3 Slow Closing the Breaker

Closing the breaker slowly, while observing the action of the mechanism and contacts, is a good way to judge the correctness of mechanical and contact relationships. Some of the maintenance procedures described later involve slow closing the breaker. Use the following procedure to slow close the breaker:

1. Use the manual charging handle to fully charge the closing springs.
2. Remove the safety pins from their storage clips and insert them into the holes in the guide rods, as illustrated in Figure 5.
3. Release the prop by pressing the CLOSE button. The safety pins now take the full force of the closing springs and restrain them.
4. Rotate the breaker main shaft as needed with the maintenance handle (catalog number 568B386P1) to slow close the contacts.
5. To return to normal operation, recharge the closing springs with the manual charging handle.
6. Remove the safety pins from the closing spring guide rods and return them to their storage clips.



**CAUTION:** Do not allow the Charging Motor to operate while the safety pins are inserted in the closing spring guide rods.



**ATTENTION:** Ne laissez pas le moteur de charge opérer lorsque les tiges de sûreté sont insérées dans les tiges guides des ressorts de fermeture.

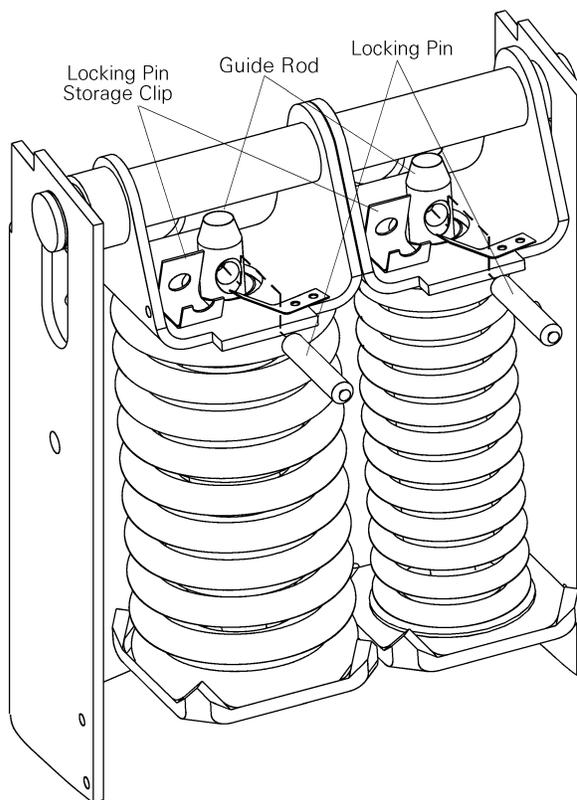


Figure 5. Inserting the safety pins into the closing spring guide rods.

## 5.4 Separation and Reconnection of Front and Back Frames

Some repair operations require separation of the front and back frames, per the following procedure. The breaker must be first removed from its compartment, as described in Section 5.2, and placed on a suitable work surface.

### Separation of Front and Back Frames

1. Verify that the breaker contacts are open and the safety pins are seated in the spring guide rods, as shown in Figure 5.
2. Remove the two screws and standoffs securing the secondary disconnect to the mounting plate, taking care to retain the spring washer from the pin on the underside of the disconnect, as shown in Figure 6. Cut the wire ties securing the secondary disconnect leads to the mounting plate and to the breaker back frame. Slide the secondary disconnect off the support bracket. Secure the secondary disconnect to the front frame assembly.
3. Remove the six screws securing the secondary disconnect mounting plate to the back frame, then remove the mounting plate, as illustrated in Figure 7.
4. Remove the four screws securing the arc chute retainer bar and remove the bar, as illustrated in Figure 7. Lift out the four interphase barriers, then lift out the three arc chutes.
5. Compress the closing springs with the manual charging handle. Remove the safety pins from their storage clips and insert them into the holes in the guide rods, as illustrated in Figure 5. Push the CLOSE button to relieve the pressure on the closing springs.

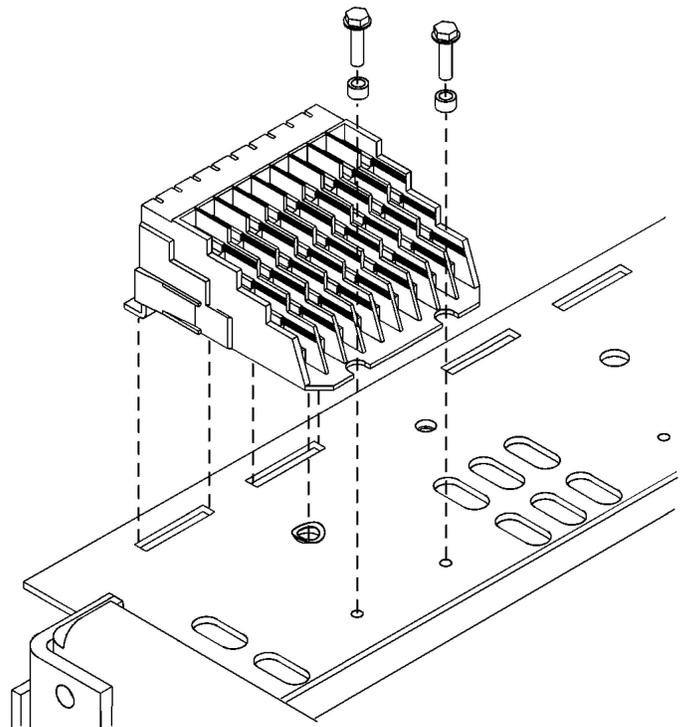


Figure 6. Removing the secondary disconnect.

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## Chapter 5. Breaker Maintenance

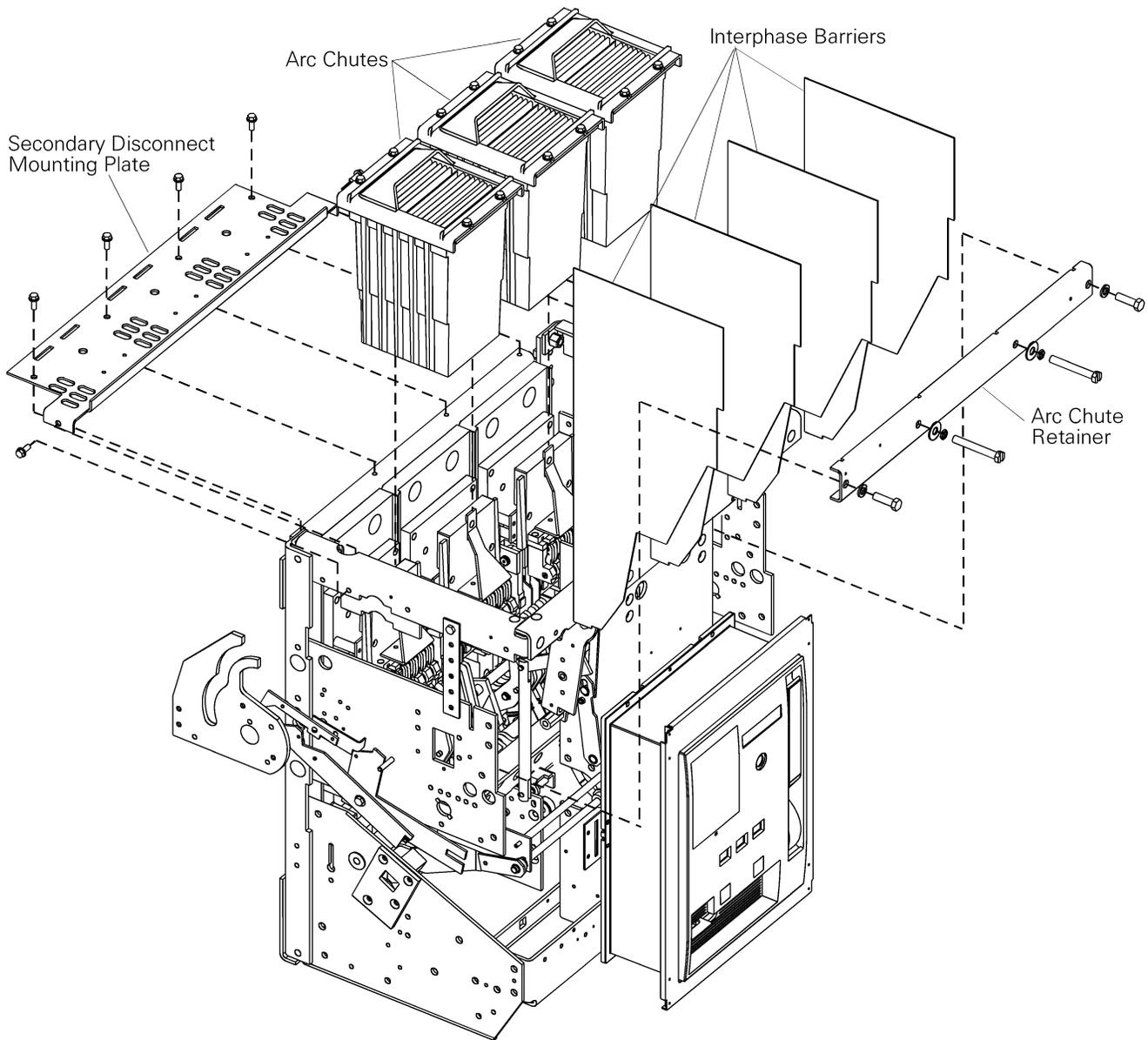


Figure 7. Removal of the interphase barriers, arc chutes, and secondary disconnect mounting plate.

6. Remove the two opening springs from the outside pole units on the lower part of the breaker, as illustrated in Figure 8. Note each spring's position on the pole unit pin. In 4,000A and 5,000A breakers, the right pole spring is mounted to the right of a tube spacer and flat washer. This position maintains sufficient clearance between the spring and the Network Interlock accessory.

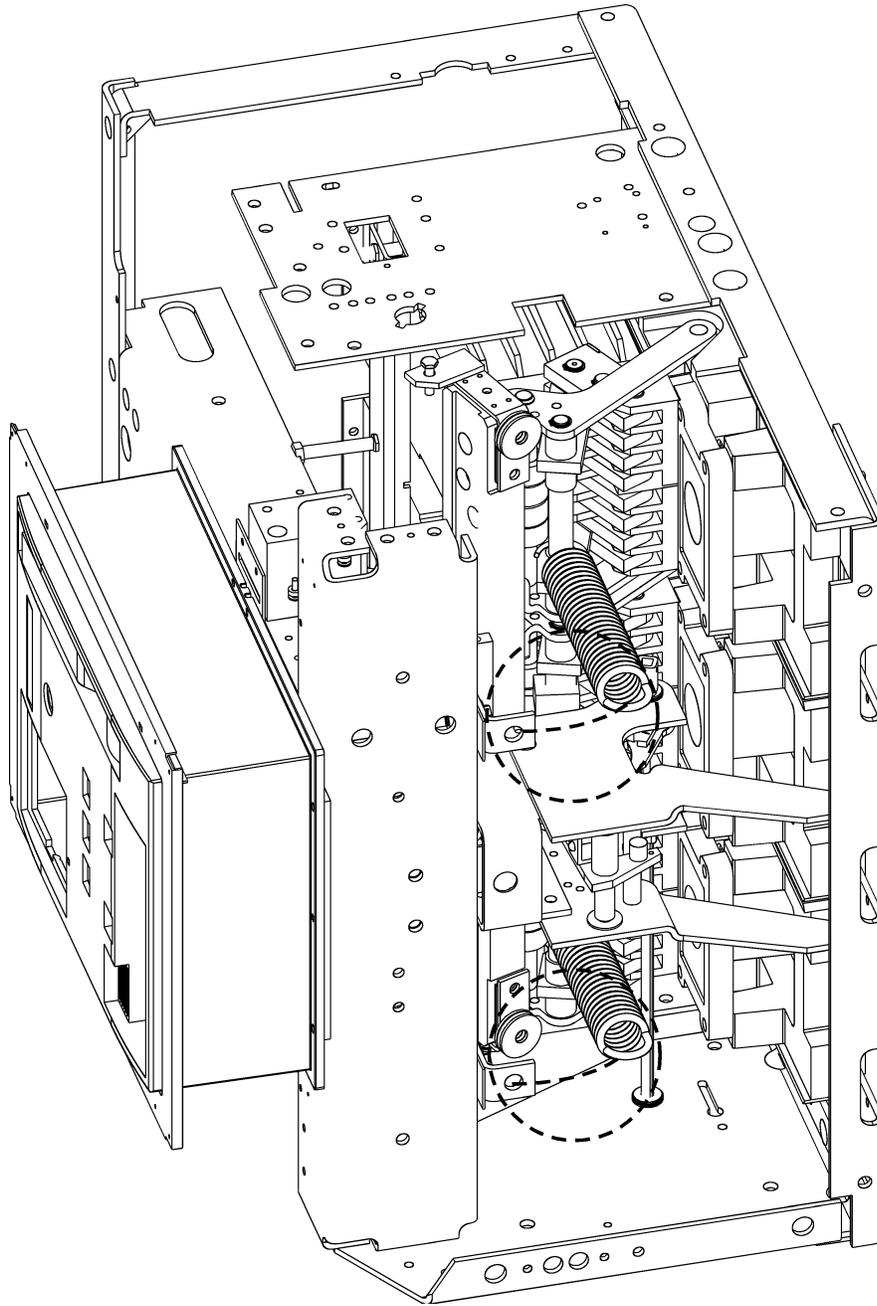


Figure 8. Removal of the two opening springs from the outside poles (view from the bottom of the breaker).

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7. Remove one of the snap rings on the clevis pin connecting the center pole to the crossbar, then remove the pin, as illustrated in Figure 9.

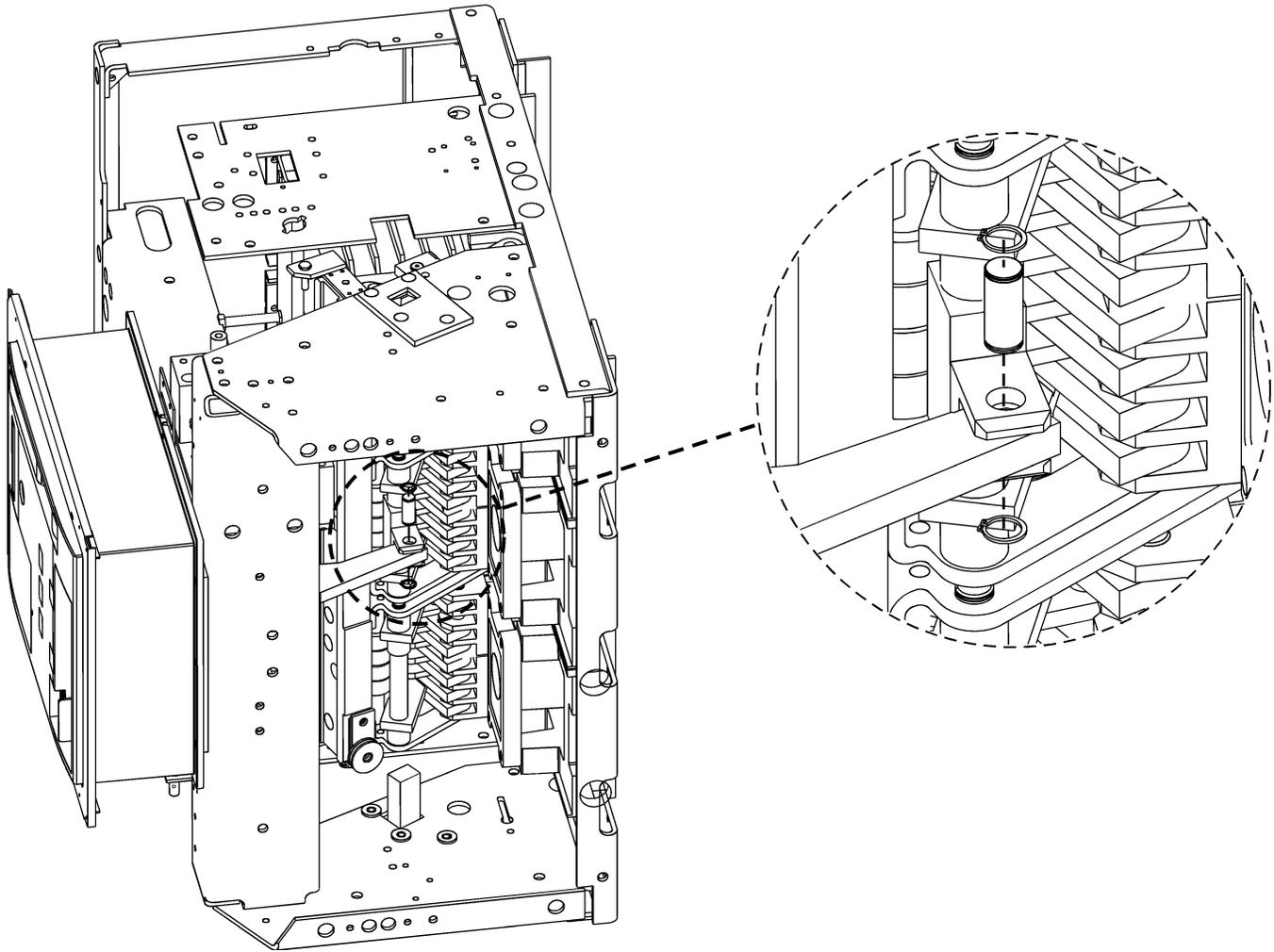
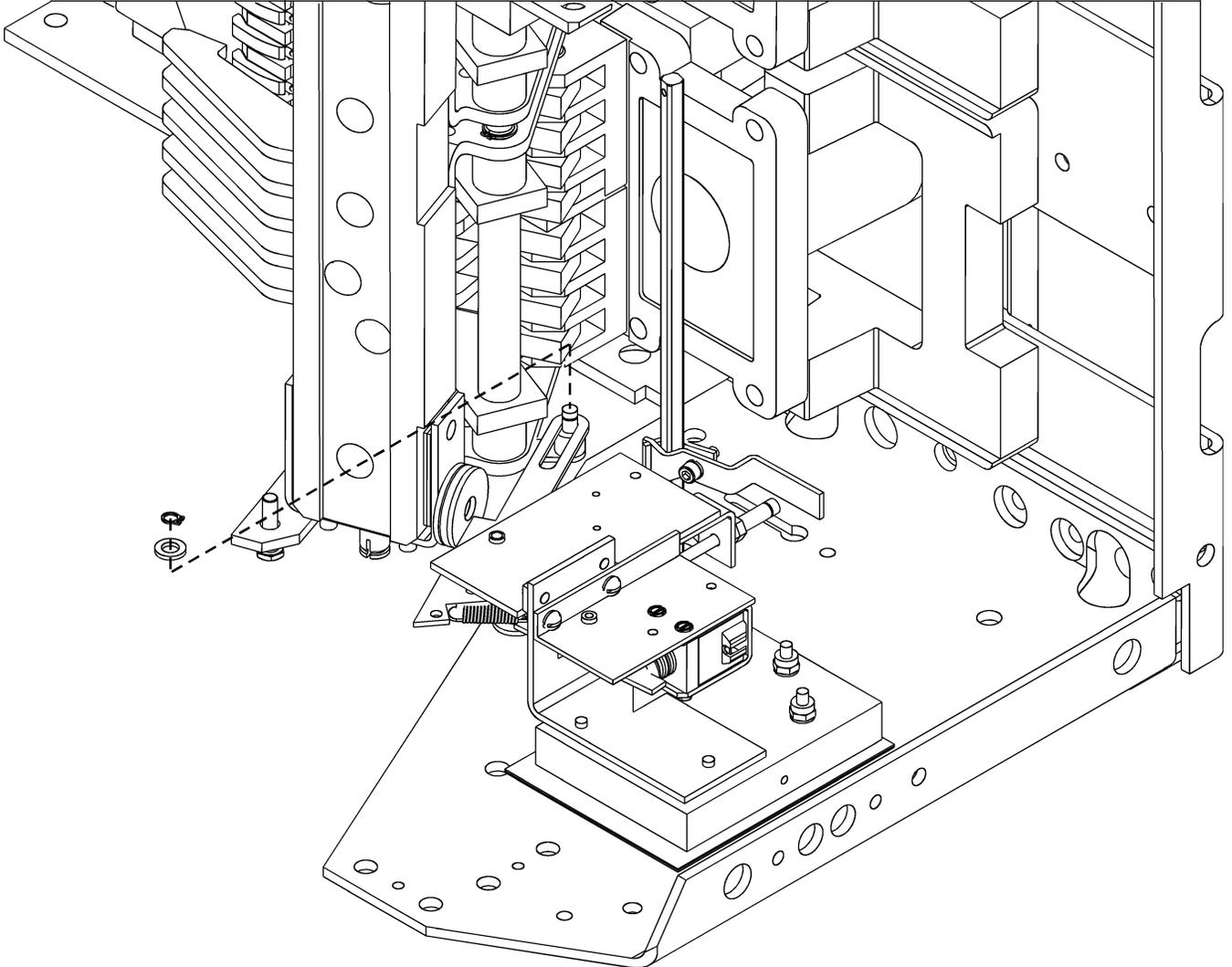


Figure 9. Removal of the clevis pin connecting the center pole to the crossbar.

8. Remove the snap ring and flat washer connecting the flux shifter actuator assembly to the crossbar assembly, as illustrated in Figure 10, then disconnect the actuator from the pin.



*Figure 10. Disconnecting the flux shifter actuator from the crossbar.*

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9. Remove one of the snap rings from the pin connecting the auxiliary switch operating rod to the cross bar, as shown in Figure 11, then remove the pin to disconnect the operating rod.

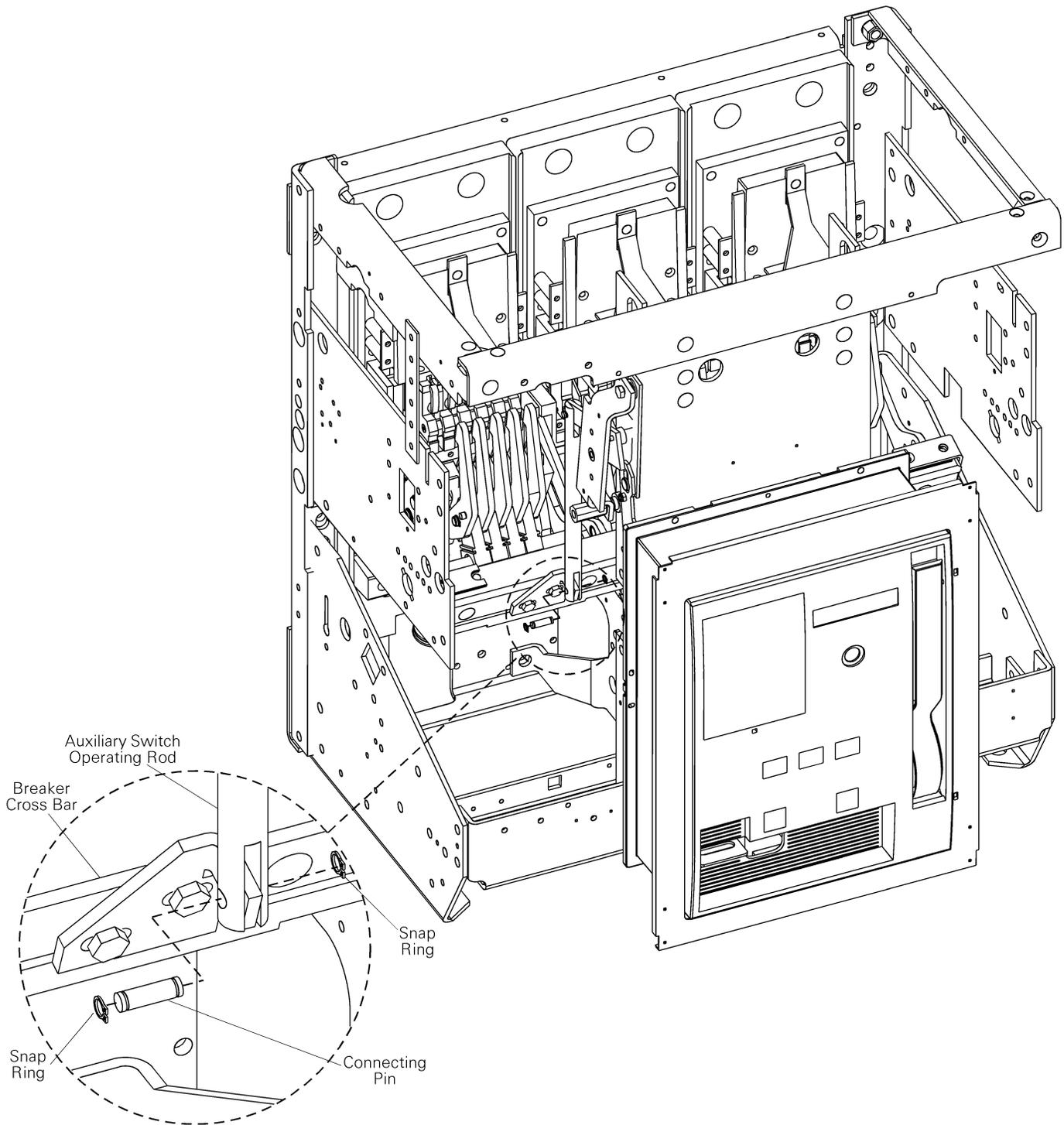
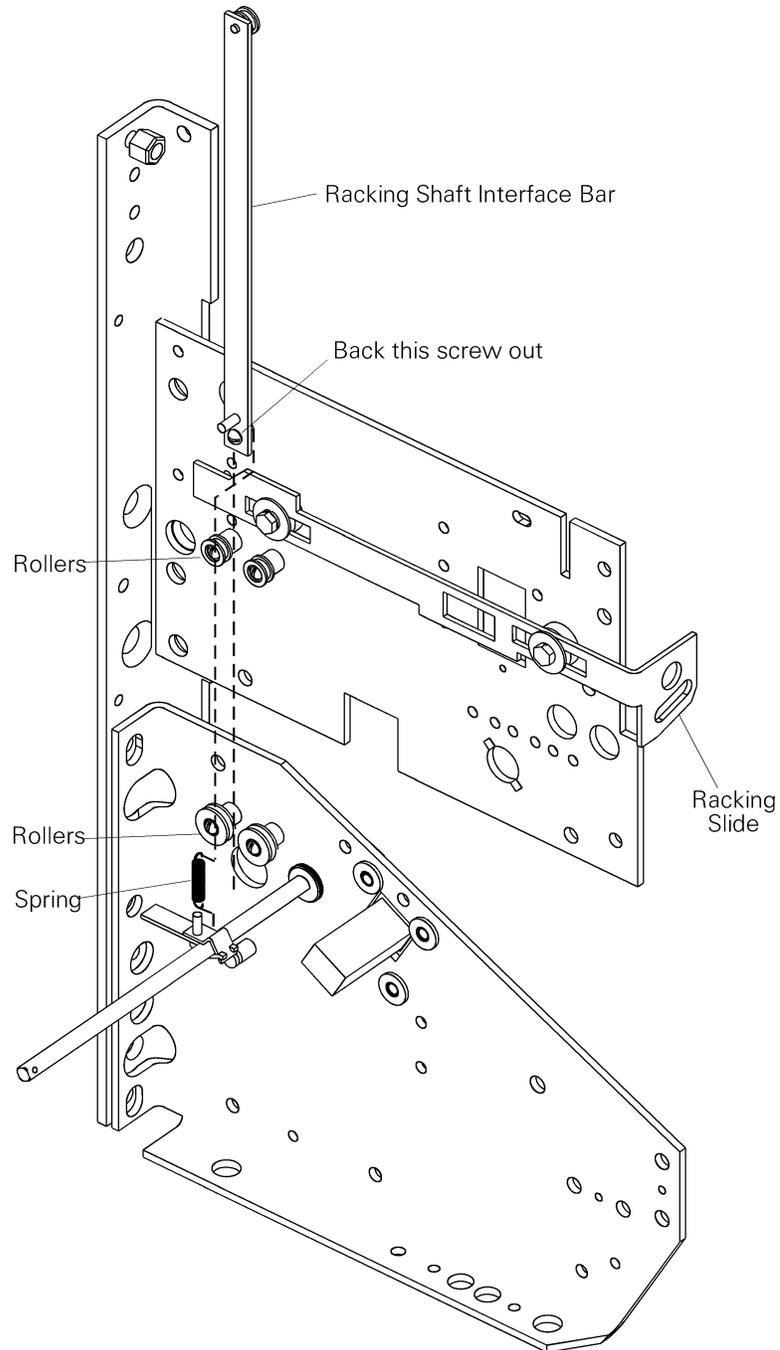


Figure 11. Disconnecting the auxiliary switch operating rod from the crossbar.

10. Disconnect the spring from the racking screw interface bar. Back off the screw at the bottom end of the bar, then slide the bar up through the two sets of rollers to remove it, as illustrated in Figure 12.



*Figure 12. Disconnecting the racking screw interface bar (right side view).*

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11. Remove the screw, lock washer, and nut attaching the harness support bracket to the back frame side plate, as illustrated in Figure 13.
12. Remove the long bolt, plastic tube, and two washers comprising the side supports on each side of the breaker.
13. Remove the two screws and washers connecting the trip indicator support to the back frame side plate.
14. Remove the screw, lock washer, and flat washer from the draw-out indicator connector plate and remove the plate.

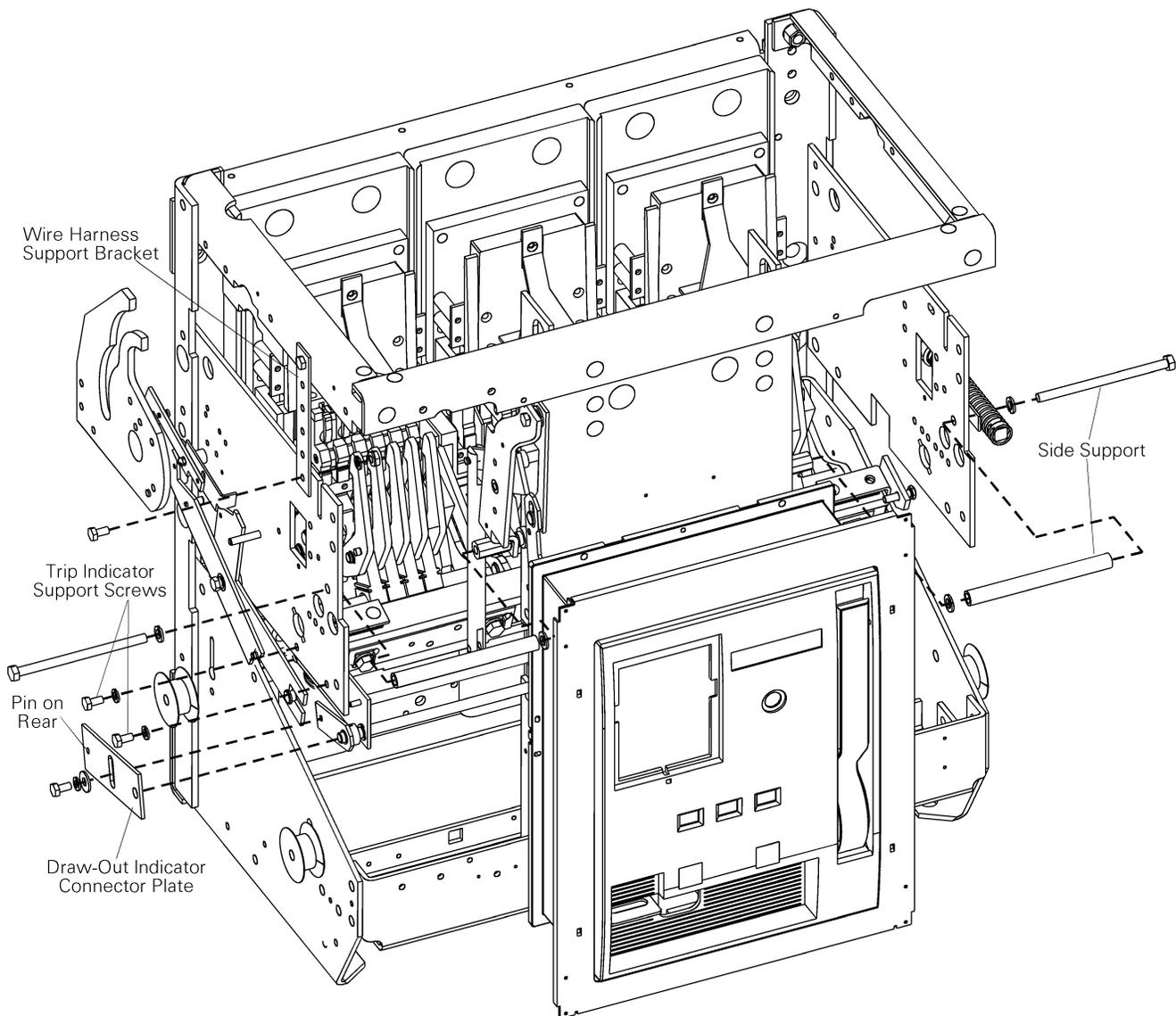


Figure 13. Removal of the position interlock and draw-out indicator support plate.

15. Carefully place the breaker on its back surface, resting on the primary disconnects.
16. Remove the six sets of nuts and washers connecting the front frame to the back frame, as illustrated in Figure 14.
17. Using a suitable lifting device, pull the front frame straight up and off the back frame to separate the two assemblies.

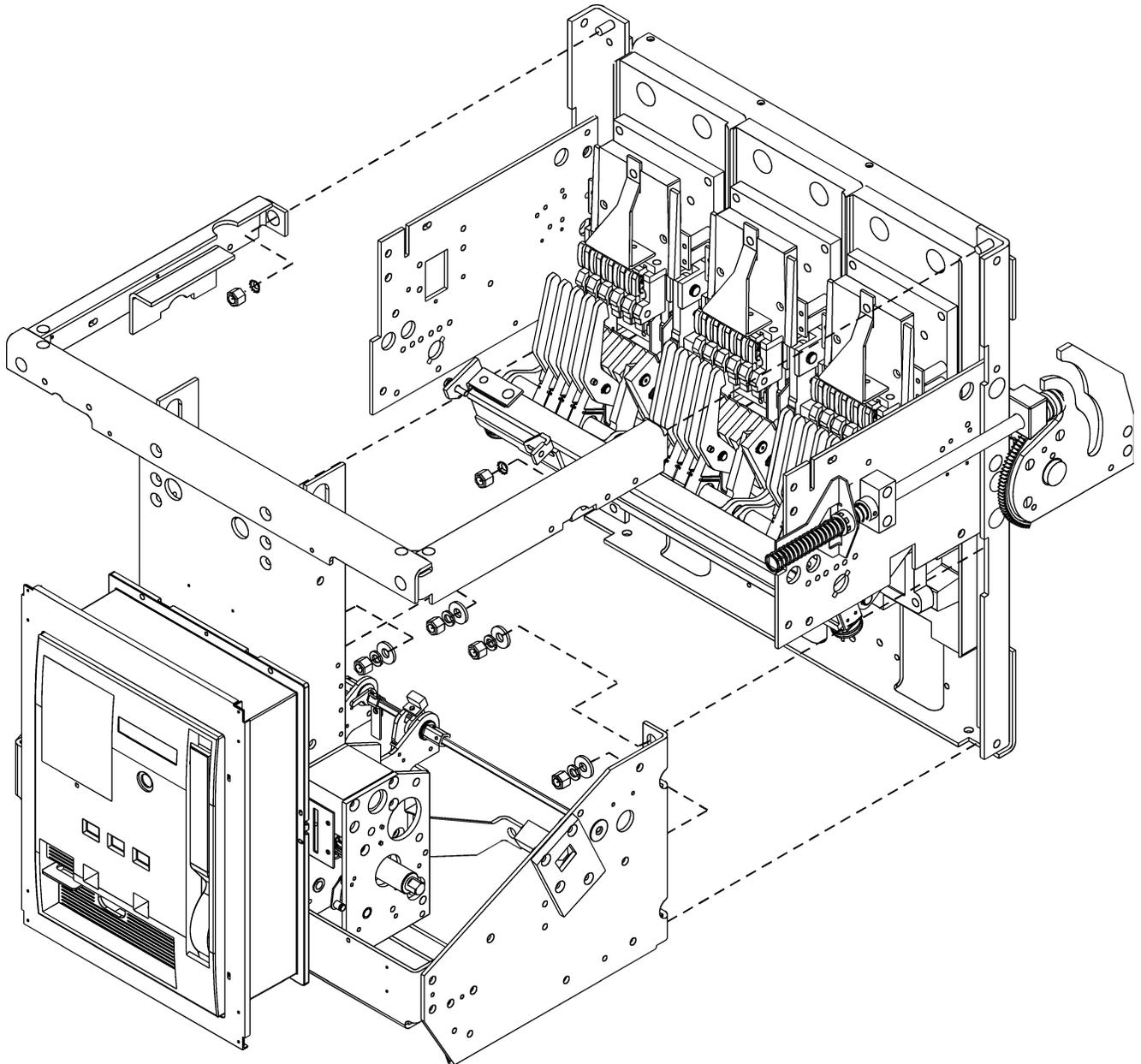


Figure 14. Separating the front frame from the back frame.

### Reassembly of Breaker Front and Back Frames

1. Place the breaker back frame on the work surface, resting on the primary disconnects. Lower the front frame into position, lining up the corresponding holes with the six mounting studs in the back frame, as illustrated in Figure 14. Attach the six sets of nuts and washers to the mounting studs and tighten to 30 ft-lbs.
2. Raise the breaker to the normal position, resting on its base.
3. Reattach the wire harness support bracket with the screw, lock washer, and nut, as illustrated in Figure 13.
4. Reattach the trip indicator support to the back frame side plate with the two screws and lock washers.
5. Reattach the long bolt, plastic tube, and two washers of the side support on each side of the breaker.
6. Place the pin on the rear of the draw-out indicator connector plate into the open slot in the end of the draw-out indicator. Place the hole in the plate over the pin on the end of the shaft, as indicated in Figure 13. Place the screw, lock washer, and flat washer through the slot in the connector plate into the tapped hole as shown. To adjust the connector plate, back the plate with the spring against the stop screw, then tighten the screw on the connector plate.
7. Slide the racking screw interface bar through the two sets of rollers on the breaker side plate, as illustrated in Figure 12, and reconnect the spring onto the pin on the bar. The roller on the upper end of the bar should rest on the cam end of the trip bar. Tighten the screw previously loosened.
8. Align the holes in the auxiliary switch operating rod with the connection hole in the crossbar, then insert the connecting pin. Secure by reattaching the snap ring to the end of the pin, as illustrated in Figure 11.
9. Place the slot in the flux shifter actuator rod over the pin on the crossbar, then secure it with the flat washer and snap ring, as illustrated in Figure 10.
10. Align the hole in the bar from the center pole mechanism with the attachment point on the crossbar, then secure with the clevis pin and snap ring removed earlier, as illustrated in Figure 9.
11. Reconnect the two opening springs to the outer pole mechanisms, as illustrated in Figure 8.
12. Slow close the breaker, as described in Section 5.3, to check for proper operation and adjustment.
13. Compress the closing springs with the manual charging handle. Remove the safety pins from the closing springs and return them to their storage clips, as illustrated in Figure 5. Close and then trip the breaker.
14. Replace the four arc chute interphase barriers into their slots, as illustrated in Figure 7.
15. Slide the arc chutes into place, with the slots over the movable contact arms. Replace the arc chute retainer bar and secure it with four screws and washers, as illustrated in Figure 7.
16. Attach the secondary disconnect mounting plate to the breaker with its six screws, as illustrated in Figure 7.
17. Place the flexible washer on the molded pin on bottom of the secondary disconnect, then slide the two feet into the slots on the mounting plate. Secure with the two screws and standoffs, as illustrated in Figure 6. Replace the wire bundle into the channel on the top of the frame and secure with wire ties.
18. Check to see that no wires are interfering with breaker operation and that all bolts and nuts are tight. Operate the breaker a few times to ensure proper operation.

### 5.5 Breaker Mechanism Adjustments

Both electrically and manually operated breakers have the same basic mechanism, illustrated in Figure 15, Figure 16, Figure 17, and Figure 18, with the drawing key in Table 4. All the adjustments described in this section must be made with the breaker upright and mechanism reset, as shown in Figure 16. Reset the mechanism by fully charging the closing springs. For safety, insert the safety pins into the guide rods, as illustrated in Figure 5.

1	Spring	11	Trip latch
2	Cam	12	Trip shaft
3	Link	13	Clevis pin
4	Reset spring	14	Clevis
5	Spring adjusting nuts	15	Reset latch
6	Prop	16	Roller
7	Adjusting screw	17	Prop
8	Adjusting screw stop pin	18	Bearing
9	Prop return spring	19	Latch buffer
10	Roller	20	Nut

Table 4. Key to the numbered parts in Figure 17 and Figure 18.

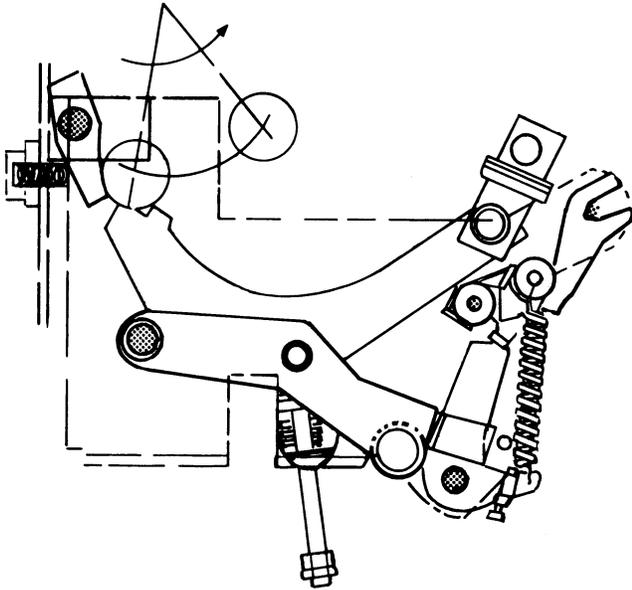


Figure 15. Breaker mechanism in motion before resetting.

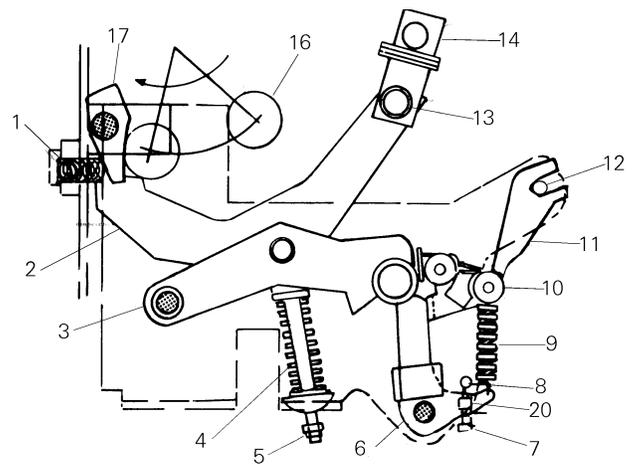


Figure 17. Breaker mechanism in closed position (closing springs discharged).

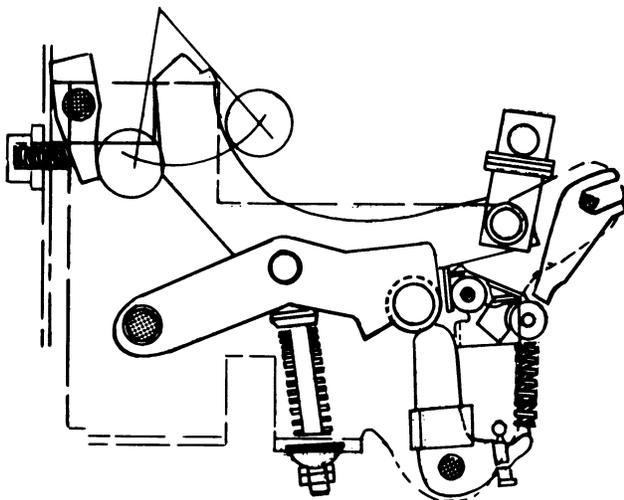


Figure 16. Breaker mechanism in the reset position.

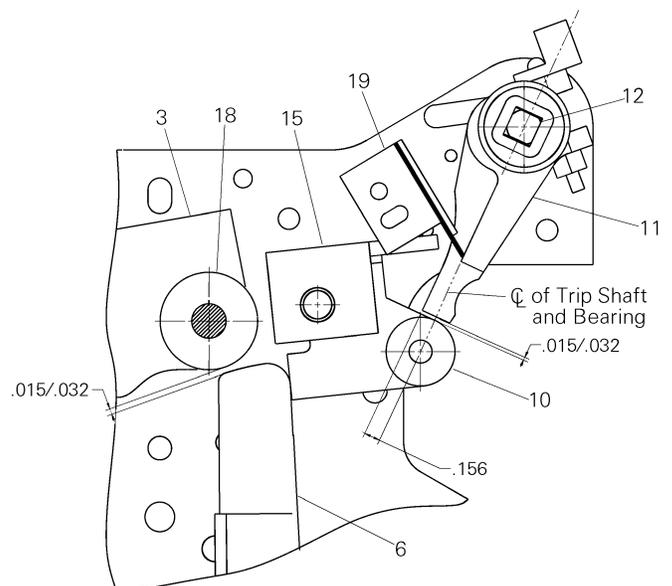


Figure 18. Latch, bearing, and prop adjustment.

### ***Trip Latch Adjustment***

As shown in Figure 18, the gap between the trip latch (11) and the roller (10) should be between 0.015 and 0.032 inch. To adjust this dimension, loosen the nut (20) and turn the Allen screw (7).

The center line of the trip latch (11) is 0.156 inch from the edge, as shown in Figure 18.

### ***Latch Buffer Adjustment***

As shown in Figure 18, the center line of the trip latch (11) should pass through the center of the roller (10). To adjust this dimension, loosen the screws retaining the latch buffer (19) to the mechanism frame, then reposition the latch with respect to the roller.

### ***Reset Latch, Bearing, and Prop Adjustment***

As shown in Figure 18, the gap between the bearing (18) and the prop (6) should be between 0.015 and 0.032 inch. To adjust this dimension, turn the adjusting nut (5) to expand or compress the reset spring (4).

## 6.1 Introduction

Breakers subjected to frequent interruption of high currents may eventually require replacement of their contacts. The general rule for determining if replacement is required is the loss of one-half or more of the mass of the contact tip material. Roughening or light pitting of the contact surface does not indicate loss of ability to carry or interrupt current.

When contacts are replaced, they must be adjusted to ensure that the proper force and contact depression is developed between the movable and stationary contacts when the breaker is closed. This is called the *wipe* adjustment. Wipe is the distance through which the stationary contacts move when the breaker closes. It is measured between the point of contact on a stationary contact when the breaker is open and the position of the same point when the breaker is closed. The actual wiping motion is greater than this measurement, since the contacts over-travel.

The wipe adjustment provides proper depression to assure full current-carrying capacity without overheating and influences proper current transfer during interruption of fault currents. Transfer of the current is the forced sequential movement from the main to the intermediate contacts, then to the arcing contacts, to the arc runner, and finally to the arc chutes, where energy is dissipated and the arc is extinguished. Contact wipe should be checked periodically during normal maintenance inspections and after any overcurrent trip.



**CAUTION:** Before performing any contact adjustment or replacement, disable the closing springs, as described in Section 5-3.



**ATTENTION:** Avant d'effectuer tout ajustement ou remplacement de contact, neutraliser les ressorts de fermeture, tel que décrit à la Section 5-3.

## 6.2 Arc Chute Removal and Replacement

The arc chutes should be removed and inspected at the regular inspection period. Arc chutes and interphase barriers are available as renewal parts.

The breaker must be removed from its compartment, as described in Section 5.2, and placed on a suitable work surface.

1. Verify that the breaker contacts are open and the closing springs are discharged.
2. Remove the four screws securing the arc chute retainer bar and remove the bar, as illustrated in Figure 7.

3. Lift out the four interphase barriers, then lift out the three arc chutes.
4. Check the arc chutes and barriers for damage and replace them, if necessary.
5. Replace the four arc chute interphase barriers into their slots
6. Slide the arc chutes into place, with the slots over the movable contact arms.
7. Replace the arc chute retainer bar and secure it with four screws and washers.



**CAUTION:** All insulating barriers must be in place before the breaker is placed back into service.



**ATTENTION:** Toutes les barrières isolatrices doivent être en place avant que le disjoncteur ne soit remplacé en service.

## 6.3 Back Frame Assembly

The breaker back frame assembly consists of a frame to which the pole units are mounted. Each pole unit is connected to a common cross bar. A typical back frame is shown in Figure 19.

The pole units consist of a molded base that supports the line and load stud assemblies, stationary and movable contact assemblies, and the actuating linkage, as illustrated in Figure 20. The numbers in parentheses below refer to the numbered components in Figure 20.

The stationary main contact assembly consists of spring-loaded contact fingers (7). The intermediate contact fingers (5) are spaced among the main contacts, with their contact surface projecting beyond that of the main contacts, so that the intermediate contacts make before and break after the main contacts.

Mating with the stationary contacts is the movable contact assembly consisting of multiple main (8) and intermediate (6) contact fingers. These movable contact fingers pivot on a stationary pin (not shown), which fastens them to the lower contact block. The insulated link (11) is attached to the movable contact assembly and gives the open and close motion to the contact arm.

The stationary arcing contact assembly (1) is a separate set of contact fingers, pins, springs, and pivot block.

The movable arcing contact assembly consists of multiple contact arms (3) carried on two movable pins (4) and (10). The arcing contact arms are mounted among the main contacts and pivot with them about pin (4).

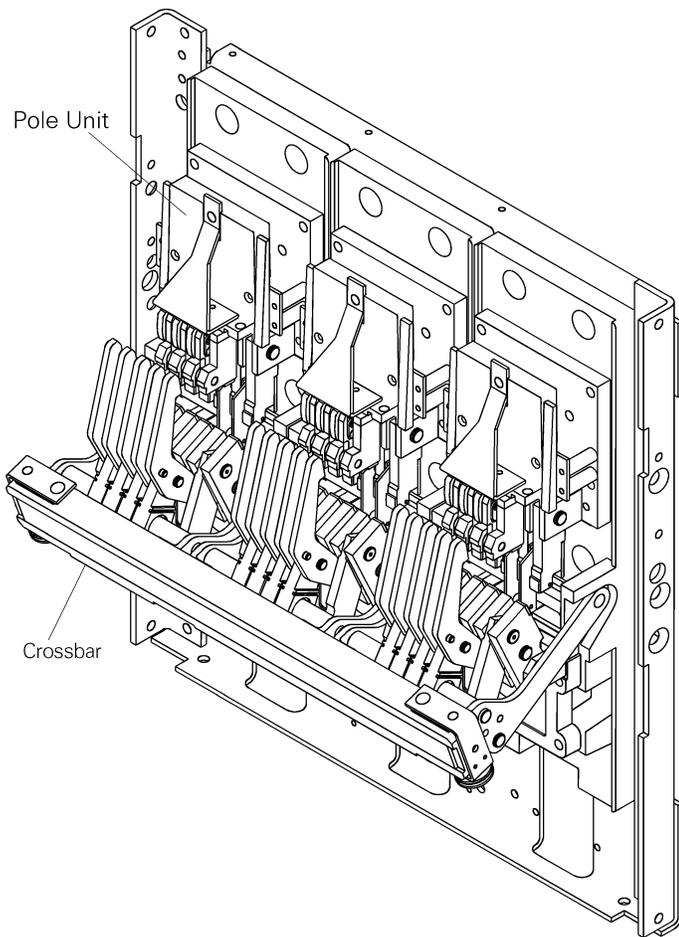
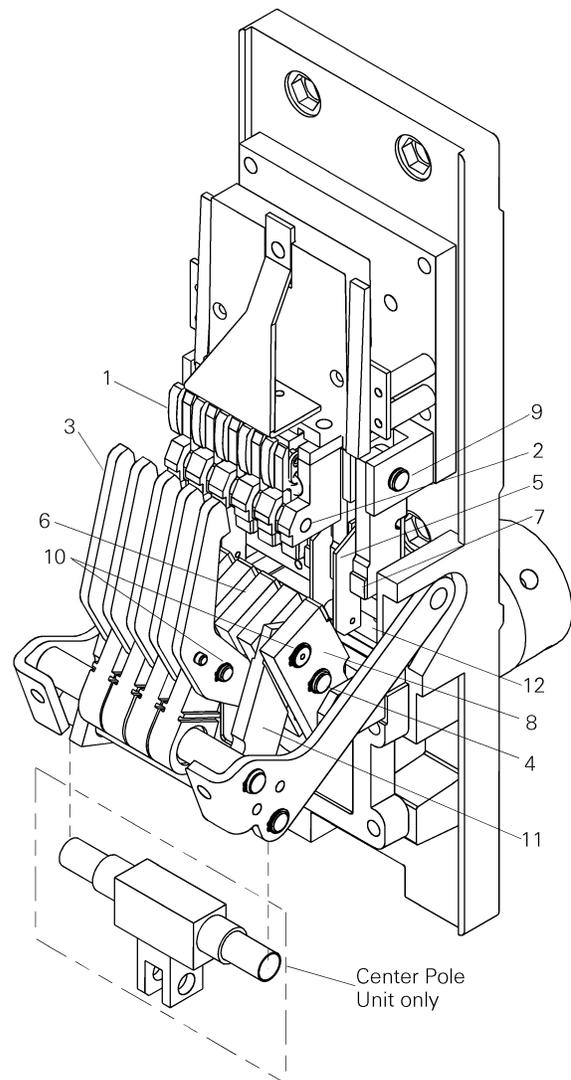


Figure 19. Back frame assembly.



- |                                    |                            |
|------------------------------------|----------------------------|
| 1. Stationary arcing contact       | 7. Stationary main contact |
| 2. Pin – stationary arcing contact | 8. Movable main contact    |
| 3. Movable arcing contact          | 9. Pivot pin               |
| 4. Pin – movable arcing contact    | 10. Drive pin              |
| 5. Stationary intermediate contact | 11. Insulated link         |
| 6. Movable intermediate contact    | 12. Contact stop block     |

Figure 20. Pole unit components.

### 6.4 Replacement of Contacts

The following are the criteria for replacement of contacts:

- Arcing contacts should be replaced when eroded to a thickness of 0.08 inch.
- Intermediate contacts should be replaced when they have worn to the level of the main contacts. New intermediate contacts extend 0.06 inch beyond the main contacts.
- Main contacts normally need replacement only if the arcing contacts have been neglected, resulting in erosion of the main contacts so that proper contact depression can not be obtained.

The front frame does not have to be separated from the back frame to replace 3,200A arcing contacts. It may be necessary on 4,000A breakers to separate the frames or remove the side sheet.

### Replacing Stationary Arcing Contacts

Use the following procedure to replace the stationary arcing contacts, as illustrated in Figure 21.

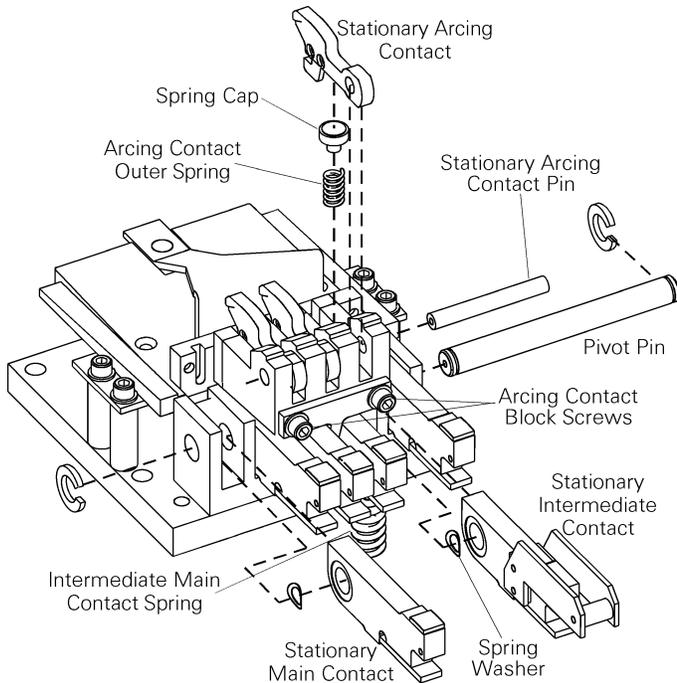


Figure 21. Replacing stationary contacts.

1. Slide the stationary arcing contact pin out to one side.
2. Lift off the stationary arcing contact arms. Remove the spring cap and two springs under each contact arm (there is also an inner spring not shown in Figure 21).
3. Install the replacement springs and spring cap for each contact arm. Replace the contact arms.
4. Replace the stationary arcing contact pin.

### Replacing Stationary Intermediate and Main Contacts

Use the following procedure to replace stationary intermediate and main contacts, as illustrated in Figure 20 and Figure 21.

1. Separate the front and back frames of the breaker, as described in Section 5.4.
2. Remove the cross bar, as described in Section 6.5.
3. Remove the screws holding the arcing contact block in place, then lift off the contact block.
4. Depress the main and intermediate contacts to relieve the spring pressure on the contact stop bracket (12 in Figure 20), then remove the mounting screws. On EG40 and EG50 breakers, the outside movable contact arm must be removed before the

contact stop bracket mounting screws can be removed.

5. Remove the retaining ring on one end of the pivot pin, then slide out the pin.
6. Remove the stationary main and intermediate contacts, noting the spring washers on each contact pivot.
7. Place the spring washers in the counterbore on each contact arm.
8. Replace the contact arms, being careful to maintain correct right-left orientation of the arms.
9. Replace the pivot pin and retaining ring to secure the contact arms.
10. Place the arcing contact block and mounting screws in position. Depress the main and intermediate contacts to relieve the spring pressure on the bracket, then tighten the screws fully before releasing the pressure.
11. Place the arcing contact block into position. Depress the arcing contacts, insert the mounting screws, and tighten.
12. Replace the cross bar, as described in Section 6.5.
13. Reassemble the breaker front and back frames, as described in Section 5.4.
14. Check contact wipe, as described in Section 6.7.

### Replacing Movable Arcing Contacts

Movable arcing contacts should be replaced whenever the stationary arcing contacts are replaced. See Figure 22.

1. Remove the retaining rings on one side of the drive pin and the movable arcing contact pin, then slide out the pins.
2. Remove the movable arcing contact arms.
3. Insert the replacement movable arcing contact arms.
4. Slide the drive pins and the movable arcing contact pin back into place, then reattach the retaining rings.

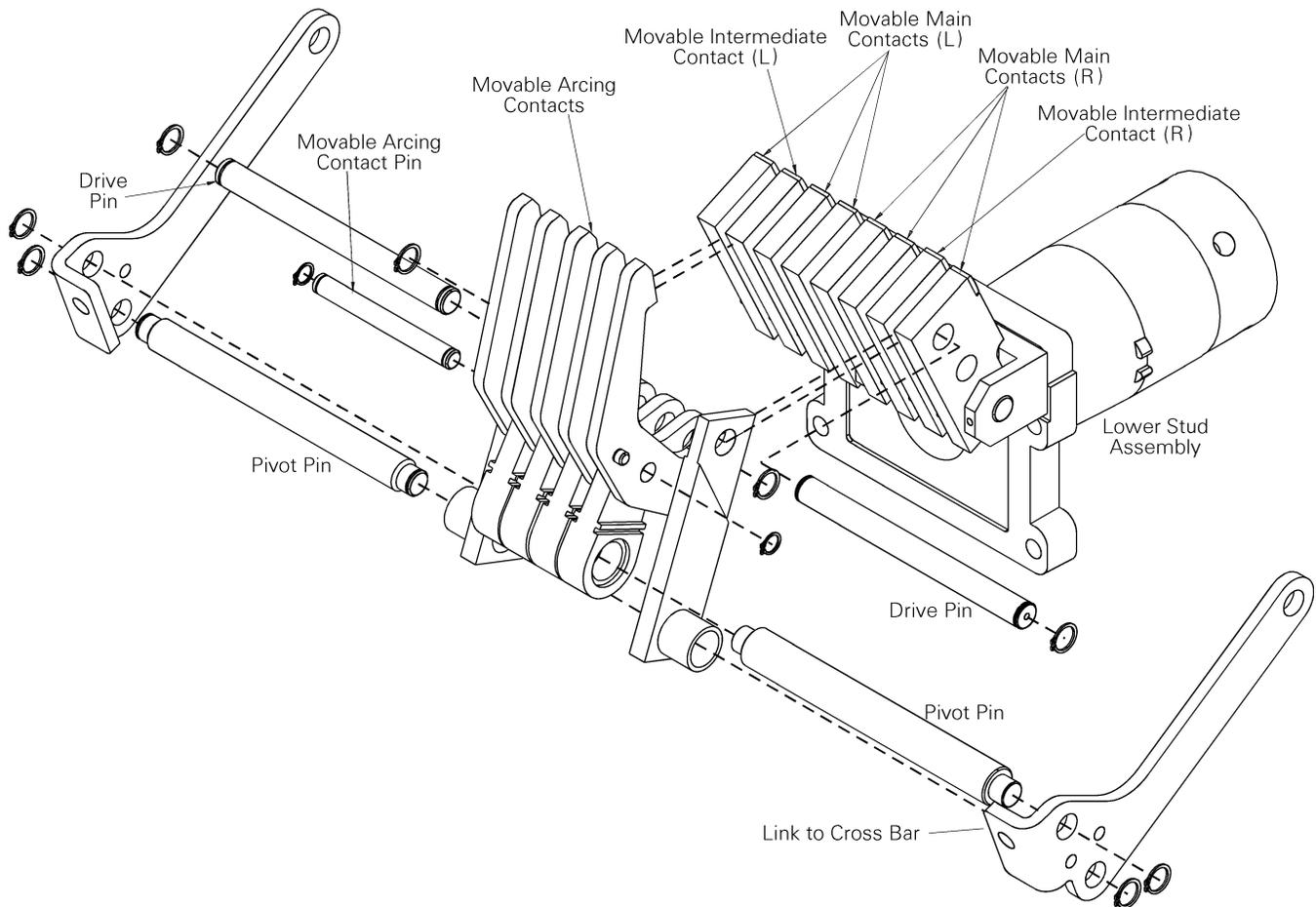


Figure 22. Replacement of movable contact arms.

### Replacing Movable Main and Intermediate Contacts

The following procedure for replacing movable main and intermediate contact arms is illustrated in Figure 22.

1. Loosen the cross bar bolts, shown in Figure 23, so that the link can move freely.
2. Remove the retaining rings from one end of the drive pins, then slide the pins until the contact arms can be withdrawn.
3. Remove the contact arms, noting the two spring washers on each contact arm pivot.
4. Position two spring washers into the counter bore of the replacement contact arms.
5. Insert the contact arms into position, being careful to maintain correct right-left orientation of the arms.
6. Reinsert the drive pins to secure the contact arms, then attach the retaining rings.
7. Adjust the cross bar, as described in Section 6.5, then tighten the cross bar bolts.

### 6.5 Removal, Assembly, and Adjustment of Cross Bar

For these procedures, refer to Figure 23.

#### Removal of Cross Bar

The cross bar is removed from the breaker with the following procedure:

1. Bend down the tabs on the adjustment plates securing the six screws.
2. Remove the six screws and three adjusting plates.
3. Lift off the cross bar.

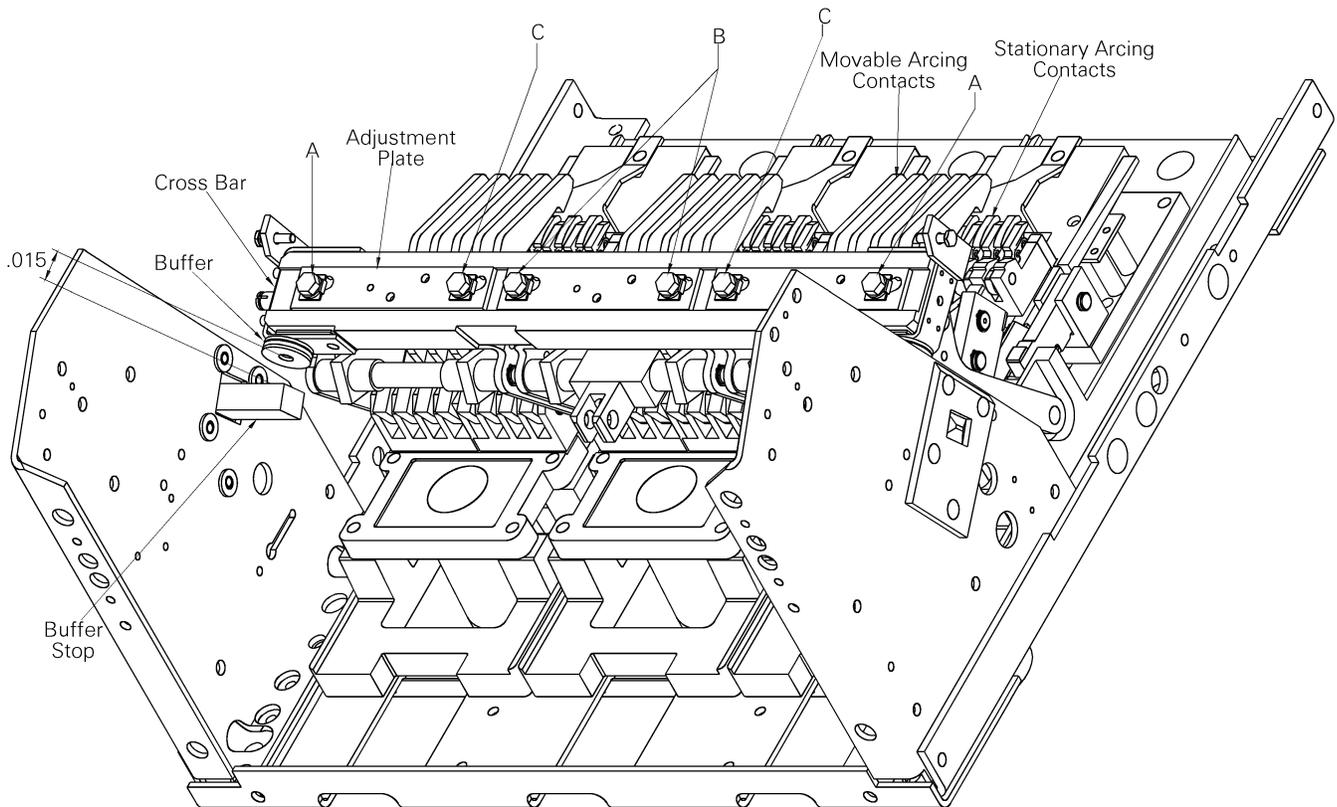


Figure 23. Assembly and adjustment of the cross bar.

### Assembly and Adjustment of Cross Bar

The cross bar is assembled to the breaker with the following procedure:

1. Push the movable contacts of each pole back until they touch the stationary arcing contacts on the upper terminal.
2. Lay the cross bar on top of the links on the pole units.
3. Place the three adjusting plates onto the cross bar.
4. Fasten the six screws finger tight through the adjustment plates and cross bar into the tapped holes in the links on each pole assembly.
5. Set the cross bar to the 0.69 dimension shown in Figure 24. Check that all three poles of the movable arcing contacts are touching the stationary arcing contacts to within .03 inch.
6. Tighten the screws in the sequence A, B, then C to 400 in-lbs.
7. Check contact wipe and open gap, as described in Sections 6.7 and 6.8.
8. Bend the tabs on the adjustment plates to secure the screws.

## 6.6 Measuring Contact Force

Measure contact force only when contact arms are replaced. Perform the measurement while the front and

back frames of the breaker are still separated during the contact replacement procedure.

### Stationary Arcing Contacts

Place a push scale on the stationary arcing contact at a point 1.19 inch from the contact pivot, as illustrated in Figure 24, and depress the contact 0.25 inch. The load on the scale should be within the range listed in Table 5. If the load is not within the correct range, replace the spring under that contact assembly.

### Stationary Main and Intermediate Contacts

Place a push scale on the stationary contact at a point 2.88 inch from the contact pivot, as illustrated in Figure 24, and depress the contact to the wipe dimension listed in Table 5. The load on the scale should be within the range listed in Table 5. If the load is not within the correct range, replace the spring under that contact assembly.

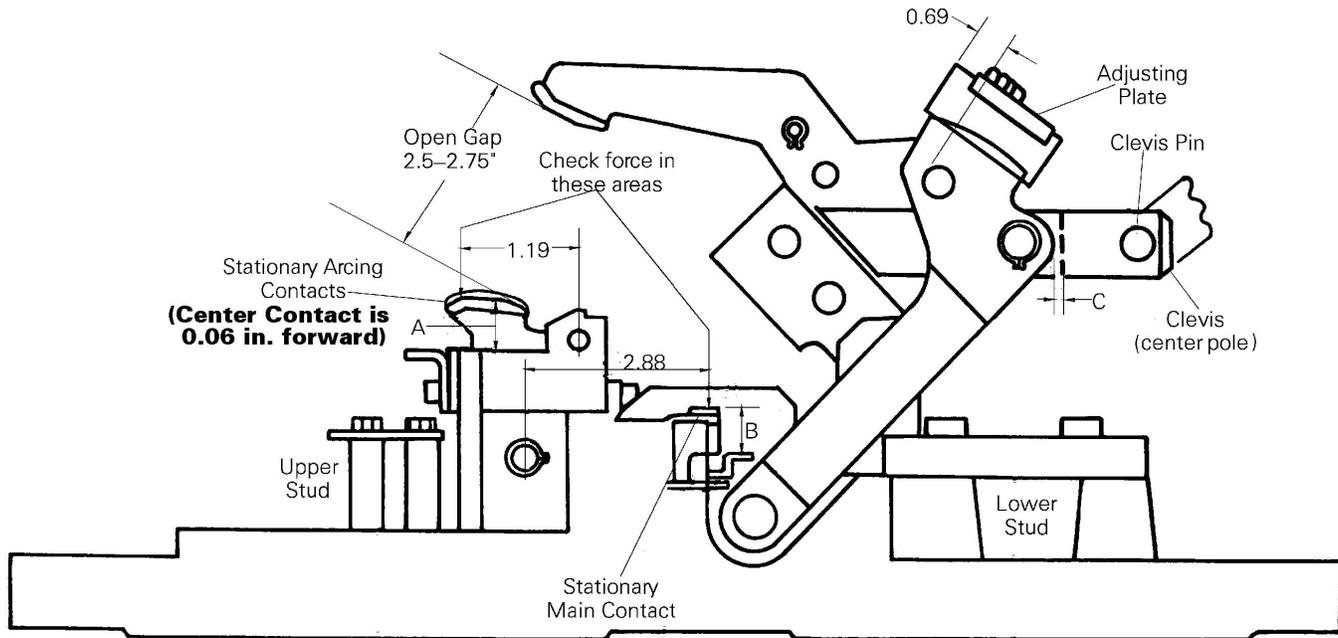


Figure 24. Measuring contact force and adjusting contact wipe.

Breaker Type	Main Contacts			Intermediate Contacts			Arcing Contacts		
	No. per Pole	Force, lbs	Wipe, in. (B)	No. per Pole	Force, lbs	Wipe, in. (B)	No. per Pole	Force, lbs	Wipe, in. (A)
EG-32	5	25–55	0.06–0.11	1	25–55	*	3	31–43	0.16–0.28
EG-40 EG-50	6	25–55	0.06–0.11	2	25–55	*	5	31–43	0.16–0.28

\* The intermediate contact wipe should be at least 0.06 inch greater than the main contact wipe.

Table 5. Contact force and wipe specifications.

### 6–7 Measuring and Adjusting Contact Wipe

Use the following procedures to measure and adjust contact wipe. Refer to Figure 24 for dimensions and measuring points. All contact adjustments must be performed with the opening springs disconnected, as illustrated in Figure 8.

#### Measuring Contact Wipe

1. Remove the arc chutes, as described in Section 6.2.
2. With the breaker open and the opening springs disconnected, measure the distance between the edge of the stationary arcing contact and the retainer (dimension A). For main and intermediate contacts, measure the distance between the top of the contact and the contact arm retainer (dimension B).
3. Close the breaker and repeat the measurements in step 2. The difference between the two readings is the contact wipe. The correct values are listed in Table 5.

### **Adjusting Contact Wipe**

The center pole is driven by the closing mechanism, which drives the cross bar, which then drives the outer poles. The adjusting plates on the cross bar have diagonal slots for the six screws that attach the cross bar to the three pole assemblies. Thus, moving the adjusting plate on the center pole changes the contact wipe on both outer poles by moving the cross bar with respect to the center pole. Moving the adjusting plate on an outer pole moves that pole assembly with respect to the cross bar and so changes the wipe only on that pole.

If adjustment is required, increase or decrease dimension C in Figure 24 to increase or decrease contact wipe, respectively, on the center pole.

1. Remove the clevis pin and rotate the clevis as needed to change dimension C.
2. To prevent overstressing the clevis threads, dimension C should not exceed 0.19 inch and space C should be filled with shims to within 0.005 inch of being solid.
3. When the proper center pole wipe is obtained, move the crossbar adjusting plate on the center pole to simultaneously change the wipe on both outer poles. Move the plate to the right to increase wipe, to the left to decrease wipe on both outer poles.
4. To change the wipe on either outside pole, move the cross bar adjusting plate of that pole. Move the plate to the left to increase wipe or to the right to decrease wipe on that pole.
5. When proper wipe has been established, tighten the adjustment plate screws to 400 in-lb. Bend the tabs on the adjustment plates to secure the screws.

### **6.8 Measuring and Adjusting Contact Open Gap**

Use the following procedure to measure and adjust the gap between the movable and stationary contacts.

1. Remove the arc chutes, as described in Section 6.2.
2. Verify that the buffer assemblies on the ends of the crossbar, as illustrated in Figure 23, are touching. With the breaker contacts open, there should be no more than a 0.015-inch gap on one end when the buffers on the other end are touching. If necessary, adjust this dimension by adding or removing washers under one of the buffers.
3. Measure the contact open gap between the stationary and movable arcing contacts, as illustrated in Figure 25. This distance should be between 2.5–2.75 inches.
4. If necessary, adjust the contact open gap by repositioning the shims on the cross bar assembly. The locking nuts on the buffer bolts should be locked in position so that the buffer bolt can rotate freely.

### **6.9 Checking Contact Sequence**

These tests can be best performed by slow closing the contacts, as described in Section 5.3.

The center stationary arcing contact is positioned 0.06 inch forward of all others on each pole and will make first. All other arcing contacts on each pole should make within 0.06 inch of each other. If there is a mismatch, identify the source and replace the appropriate movable or stationary contact arm.

The difference between making of the arcing contacts on different poles must be no greater than 0.06 inch. To advance or retard the closing of all contacts on a pole, loosen the bolts holding the adjusting plate of that pole, illustrated in Figure 23, then slide the plate to the left to advance contact closing or to the right to retard closing. Make this adjustment on the outer poles, using the center pole as a reference.

When the arcing contacts are just touching, as illustrated in Figure 25, the intermediate contact gap should be at least 0.19 inch and the main contact gap at least 0.25 inch.

If it is necessary to make any adjustments in contact sequence, check and, if necessary, adjust contact wipe, as described in Section 6.7.

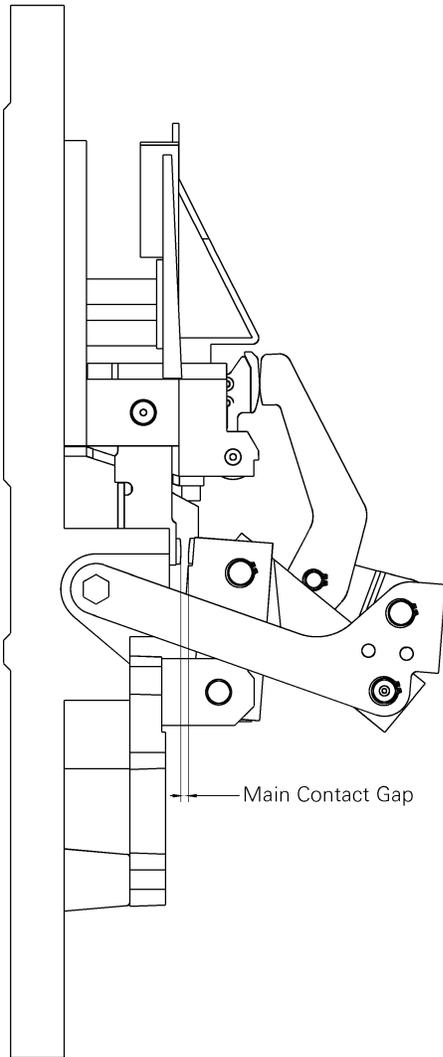


Figure 25. Measuring the main contact gap.

This section describes procedures for replacing the standard parts and assemblies available as renewal parts.

Before any of the operations in this chapter can be performed, the breaker must be removed from its compartment, as described in Section 5.2, and placed on a suitable work surface.

### 7.1 Primary Disconnects

Primary disconnects provide the flexible connection between the breaker line and load terminals and the equipment line and load terminals.

Primary disconnect assemblies are available in two configurations for the upper and lower terminals. Each pole on the lower disconnect requires two assemblies, illustrated in Figure 26 (one half of one pole shown). Each pole on the upper disconnect requires two assemblies and one inner heat sink, illustrated in Figure 27 (completed pole assembly shown) with two additional outer heat sinks on the center (B) pole.

#### Primary Disconnect Removal and Replacement

To replace an upper primary disconnect pole assembly, remove the four bolts and lock washers attaching the assembly to the back frame, as illustrated in Figure 28. Put the replacement assembly in position, then insert the four mounting bolts and lock washers and tighten to 200–250 in-lbs of torque.

To replace a lower primary disconnect pole assembly, remove the two bolts and nuts securing the two halves of the unit to the back frame. Put the replacement units in position, then insert the two mounting bolts through the disconnects and back frame pole unit. Attach the two nuts and tighten to 200–250 in-lbs of torque.

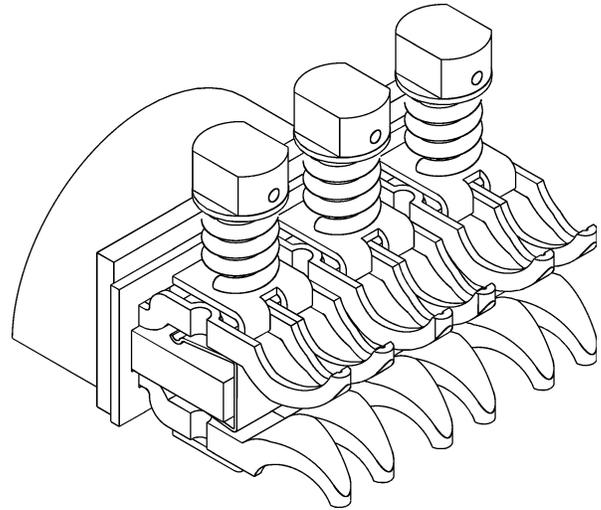


Figure 26. Lower primary disconnect assembly.

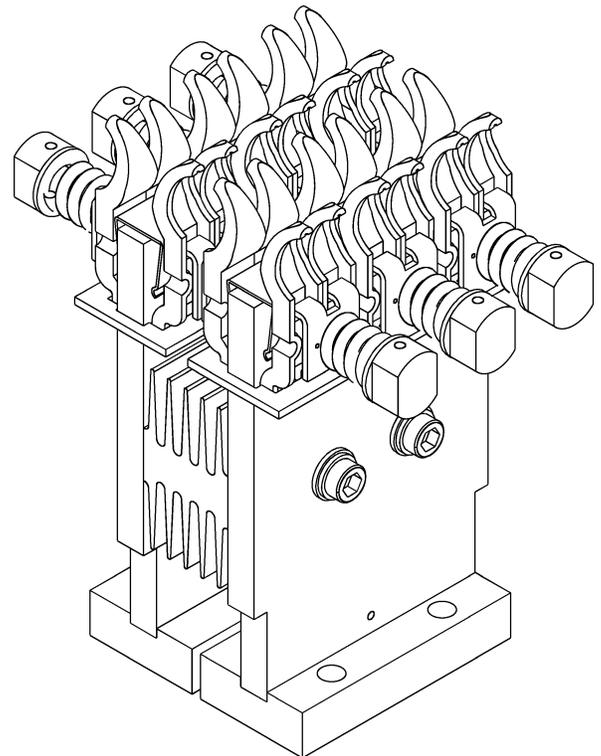


Figure 27. Upper primary disconnect outer pole assembly.

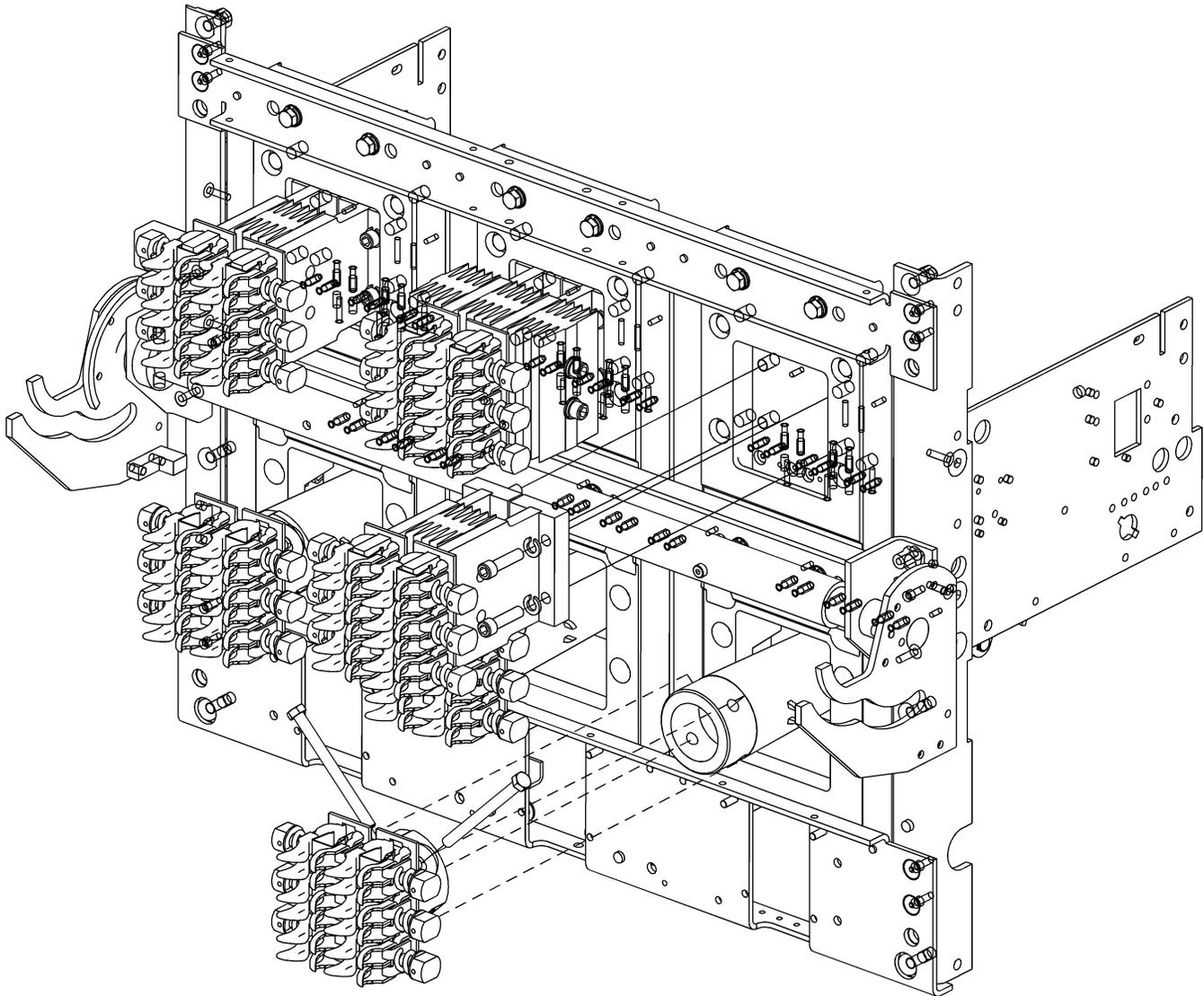


Figure 28. Removing or installing the primary disconnects.

## 7.2 Secondary Disconnect

The secondary disconnect, illustrated in Figure 29, serves as a connection between the breaker control circuits and external circuit elements. It is attached to a mounting plate on the breaker back frame. It automatically makes and breaks the control circuit connections as the breaker is racked into or out of its compartment. Figure 30 illustrates the numbering of the terminals in the secondary disconnect.

### Secondary Disconnect Removal

To remove the secondary disconnect, use the following procedure, as illustrated in Figure 31:

1. Unplug all control circuit wires from the secondary disconnect, carefully marking each wire with its position number in the disconnect.
2. Remove the two screws and standoffs securing the disconnect to the mounting plate.
3. Slide the disconnect mounting feet out of the slots in the mounting plate. Remove the spring washer if it has detached from the molded pin on the underside of the disconnect.

### Secondary Disconnect Installation

To replace the secondary disconnect, use the following procedure, as illustrated in Figure 31:

1. Place the spring washer on the molded pin on the underside of the disconnect body and hold it in place.
2. Slide the mounting feet on the disconnect into the two slots in the secondary disconnect mounting plate.
3. Place the two screws and standoffs into the slots on the front of the disconnect and into the tapped holes in the mounting plate. Tighten to 40 in-lbs.
4. Insert the control circuit wires into the correct positions in the secondary disconnect.

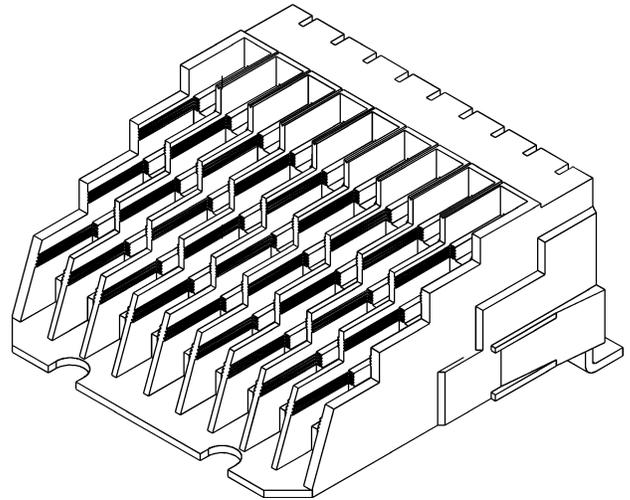


Figure 29. Secondary disconnect.

9	8	7	6	5	4	3	2	1
18	17	16	15	14	13	12	11	10
27	26	25	24	23	22	21	20	19
36	35	34	33	32	31	30	29	28

Figure 30. Secondary disconnect terminal numbering. (As seen from the front of the breaker.)

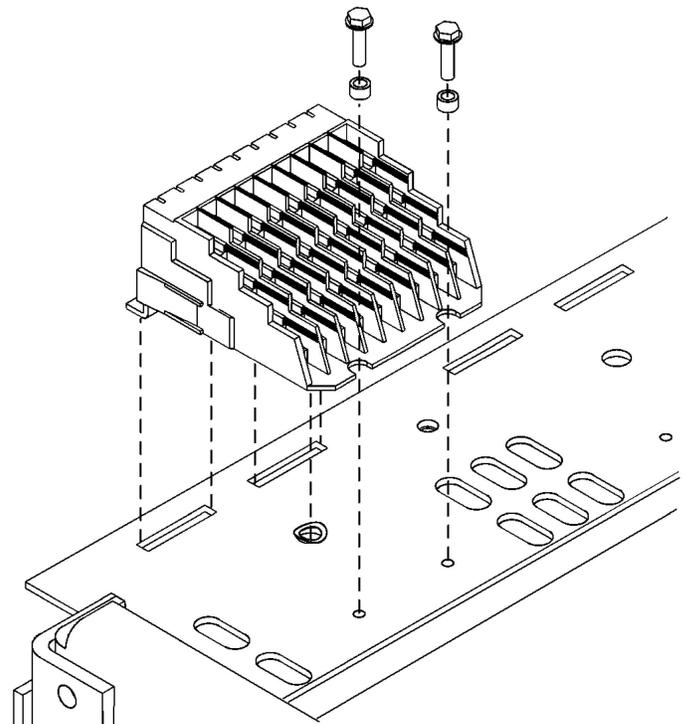


Figure 31. Removing or installing the secondary disconnect.

### 7.3 Flux Shifter

The function of the flux shifter, illustrated in Figure 32, is to actuate the trip shaft and trip the breaker upon receiving a signal from the EntelliGuard Messenger.

#### Flux Shifter Adjustment

The only adjustment required on the flux shifter is the trip rod length. As shown in Figure 33, the clearance between the trip rod end and the trip paddle is set to  $0.11 \pm 0.03$  inch. To make this adjustment, open the breaker and charge the closing springs to restore the mechanism to the Reset position. Loosen the lock nut, rotate the adjuster until the proper gap is attained, then retighten the lock nut.

#### Removing the Flux Shifter

Use the following procedure to remove the flux shifter, as illustrated in Figure 34.

1. Unplug the connector at the end of the flux shifter leads.
2. Remove the snap ring and flat washer connecting the reset linkage to the actuator bracket on the breaker main shaft.
3. Remove the three bolts, nuts, and flat washers that mount the flux shifter to the back frame side panel, then remove the flux shifter.

#### Installing the Flux Shifter

Use the following procedure to install a replacement flux shifter, as illustrated in Figure 34.

1. Mount the replacement flux shifter in position on the breaker side panel, insert the three mounting bolts, and secure with the flat washers and nuts. Tighten to 50 in-lbs.
2. Connect the flux shifter reset linkage to the actuator bracket on the main shaft and secure with the flat washer and snap ring.
3. Plug the connector on the flux shifter leads into the breaker socket.
4. Ensure that the actuator bracket will not interfere with the cross bar buffer during breaker operation. If necessary, loosen the actuator bracket mounting screws and rotate the bracket to take up the mounting hole slack. Retighten the screws.

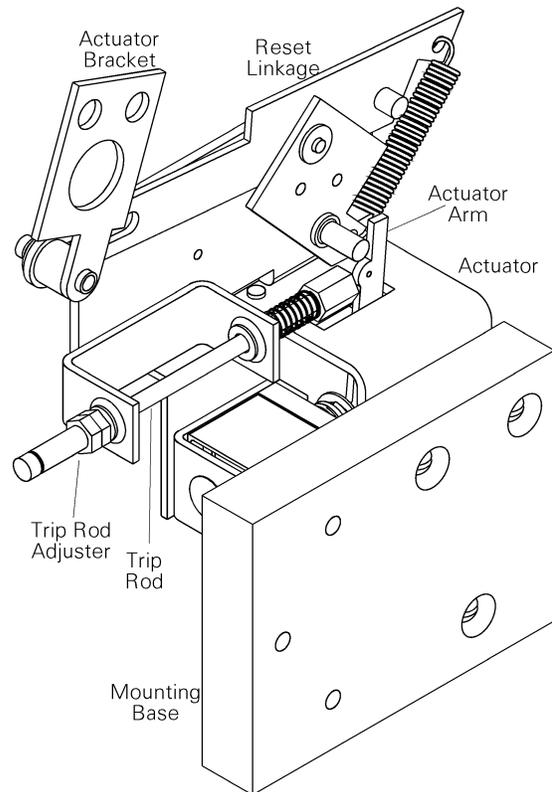


Figure 32. Flux shifter.

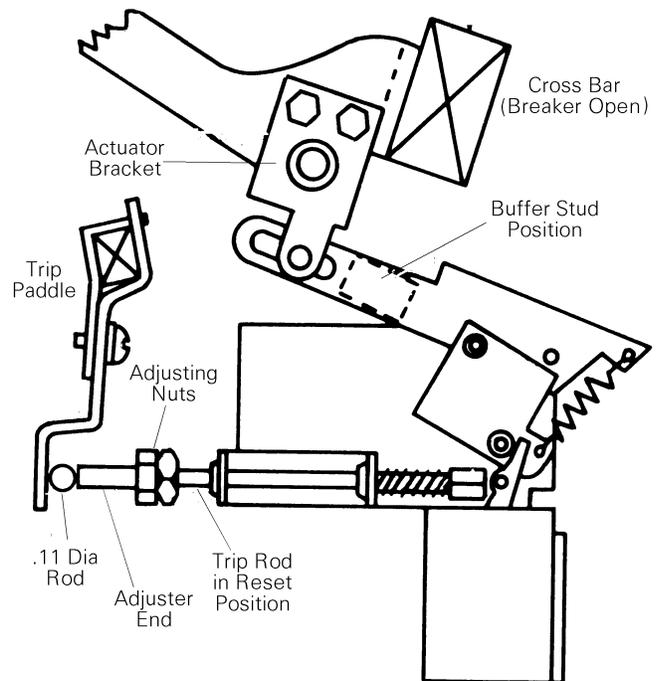
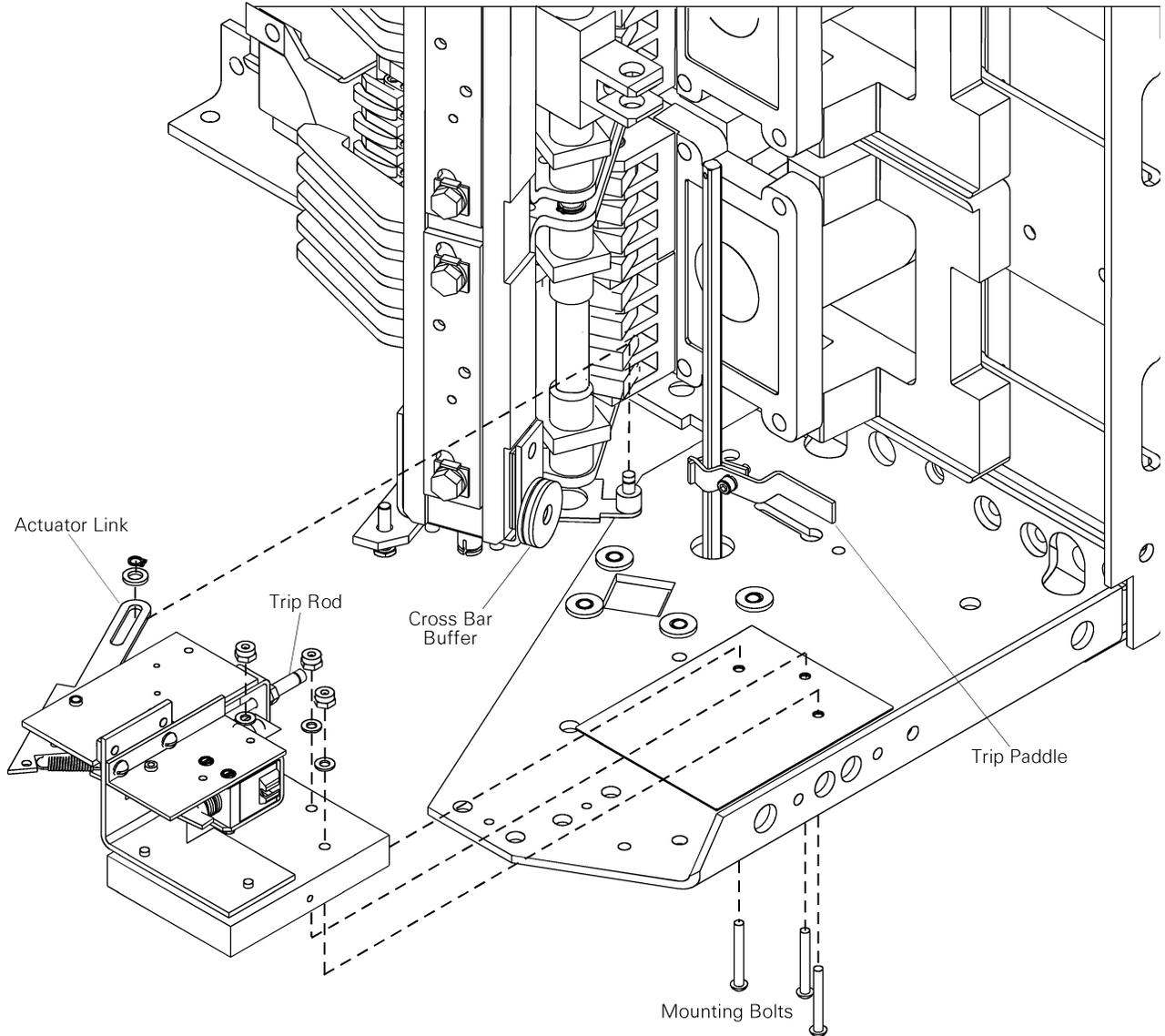


Figure 33. Adjusting the flux shifter trip rod length.



*Figure 34. Flux shifter removal and replacement on the left side of the breaker back frame.*

### 7.4 Draw-Out Mechanism

EntelliGuard breakers are manufactured for use in GE Entellisys™ switchgear cubicles only. The draw-out racking mechanism, illustrated in Figure 35, is available as a replacement assembly.

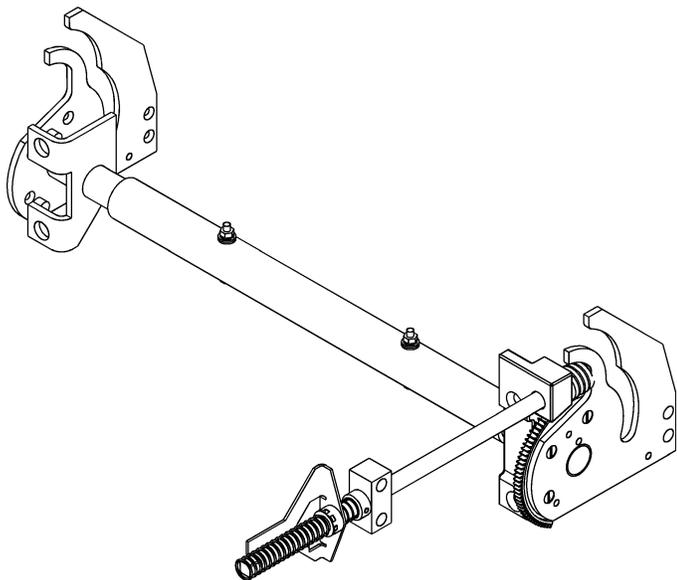


Figure 35. Draw-out racking mechanism.

### Draw-Out Mechanism Removal

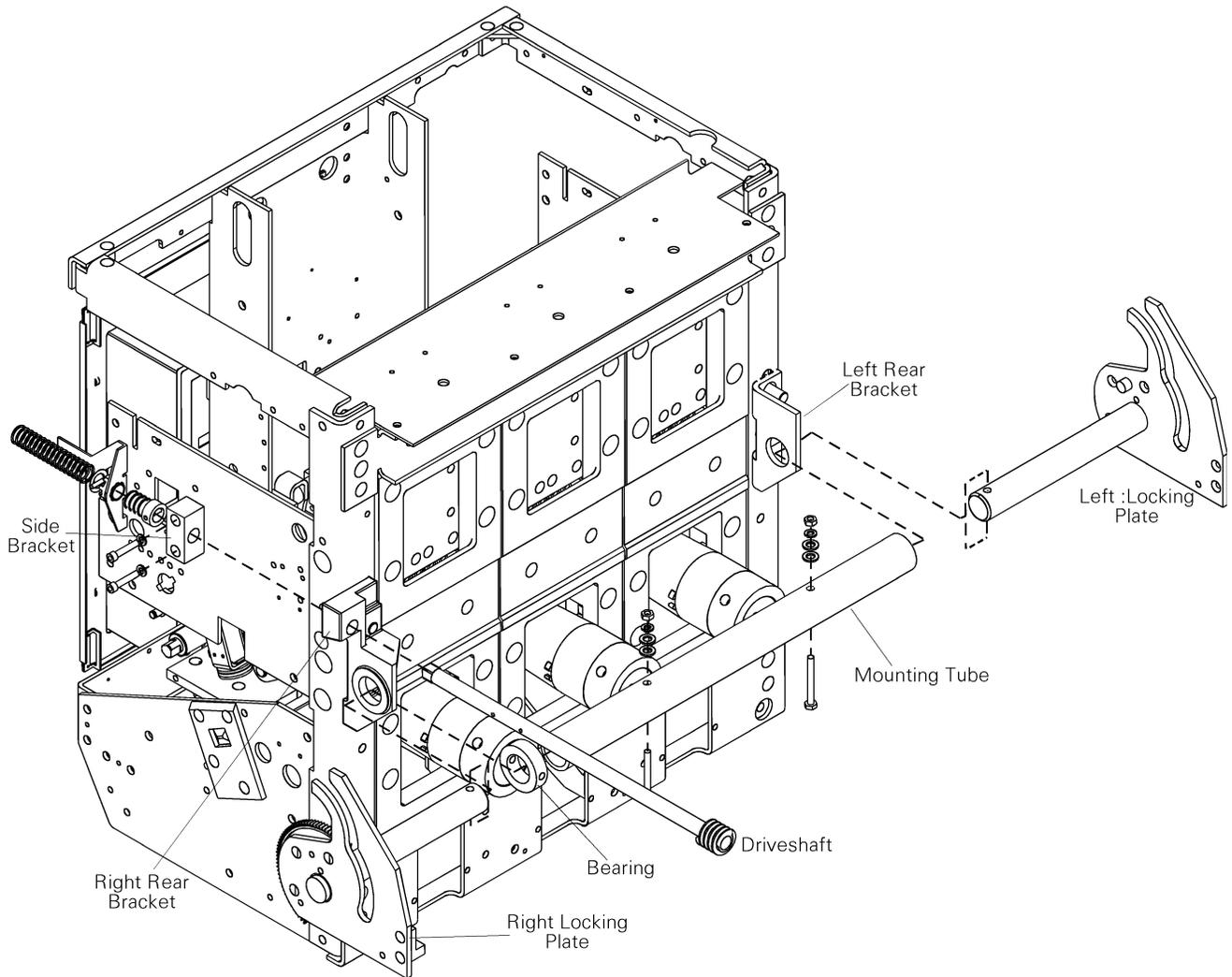
The following procedure describes the complete removal of the draw-out racking mechanism, as illustrated in Figure 36 and Figure 37.

1. Remove the two sets of bolts, nuts, and washers attaching the shafts on the draw-out locking plates to the mounting tube. Pull the right and left locking plate assemblies out to the sides.
2. Remove the bearing from the right rear mounting bracket.
3. Remove the two pins, shown in Figure 36, attaching the locking collar and the spring bracket to the drive shaft.
4. Pull the driveshaft out from the rear, removing the spring, flat washer, spring bracket, and locking collar.
5. Remove the two bolts and washers securing the side bracket to the breaker and remove the bracket.
6. Remove the two bolts securing the two rear brackets to the breaker frame and remove the brackets. The bolt heads are reached from the inside of the breaker.

### Draw-Out Mechanism Installation

The following procedure describes the installation of the draw-out racking mechanism, as illustrated in Figure 36 and Figure 37.

1. Attach the two rear mounting brackets to the breaker frame with two bolts each. The bolt heads must be on the inside of the breaker frame.
2. Mount the side bracket with two bolts and washers to the tapped holes in the side of the breaker frame.
3. Insert the bearing into the right rear mounting bracket, then slide the shaft of the right locking plate assembly through the bracket.
4. Insert the shaft of the right locking plate assembly into the mounting tube. Line up the holes in the shaft and tube and secure with a screw, nut, lock washer, and two flat washers.
5. Insert the shaft of the left locking plate through the right rear bracket and into the mounting tube. Line up the mounting holes and secure with a screw, nut, lock washer, and two flat washers.
6. Insert the square end of the driveshaft into the upper hole in the right rear bracket and through the hole in the side bracket.
7. Slide the two shims, locking collar, and spring over the end and secure to the shaft with a pin through the collar and the rear hole in the shaft.
8. Slide the spring bracket over the shaft and secure it to the shaft with a pin through the hole in the bracket and the front hole in the shaft.
9. Slide the flat washer and spring over the end of the shaft. The end of the driveshaft protrudes through the hole in the end of the racking slide, shown in Figure 12, which secures the spring in place on the driveshaft.
10. Mesh the gear on the end of the driveshaft with the gear on the right locking plate.



*Figure 36. Draw-out racking mechanism removal and installation.*

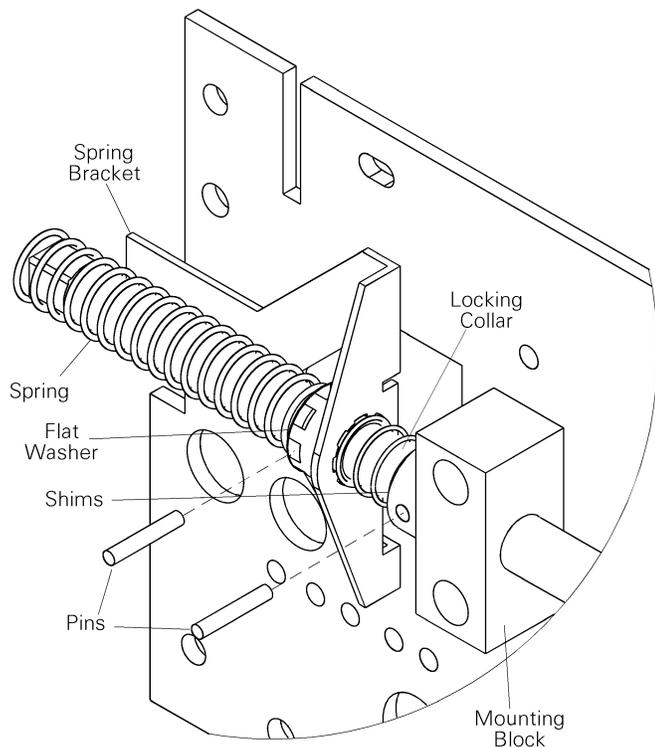


Figure 37. Exploded view of racking screw assembly/disassembly.

### 7.5 Escutcheon

The escutcheon is illustrated in Figure 38.

#### Escutcheon Removal

Use the following procedure, illustrated in Figure 39, to remove the escutcheon:

1. Pull the ends of the two trim plate mounting rods out of the holes at the rear of both sides of the escutcheon, then remove the trim plate.
2. Remove the six screws securing the escutcheon to the breaker. Pull the manual charging handle out part way, then slide off the escutcheon.

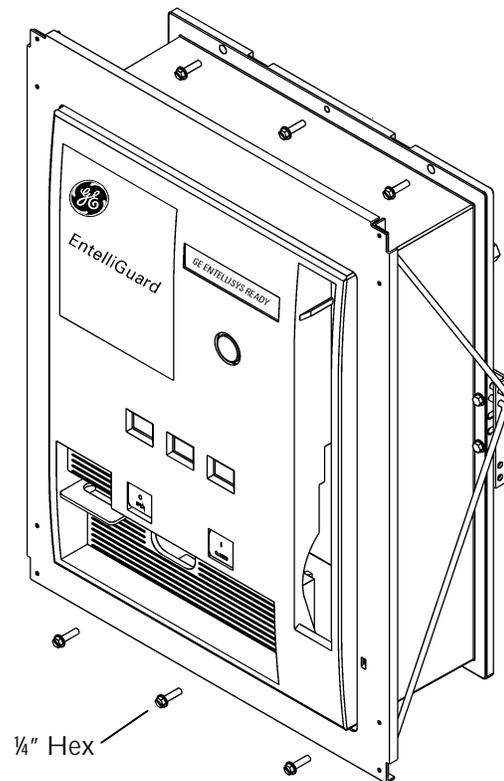


Figure 38. Escutcheon and related parts.

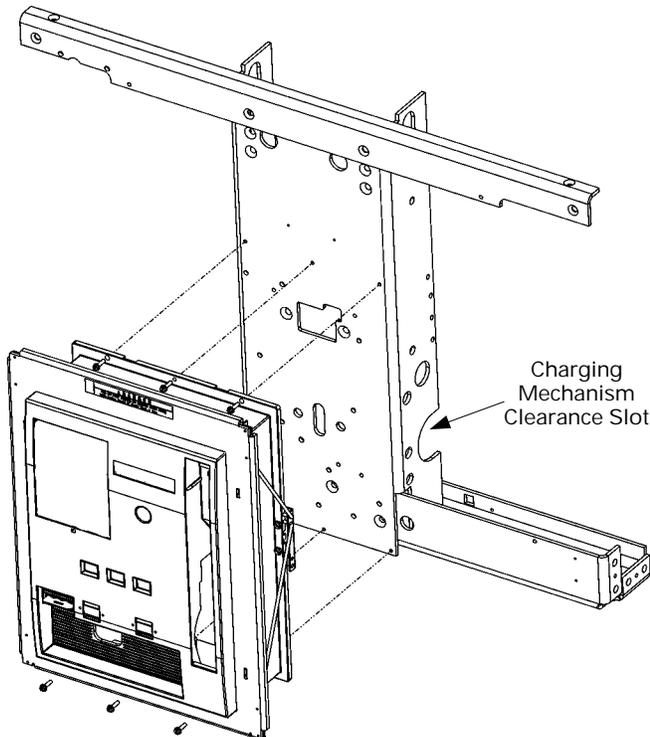


Figure 39. Removal and installation of the escutcheon.

### Escutcheon Installation

Use the following procedure, illustrated in Figure 39, to install the escutcheon:

1. Pull the manual charging handle out part way, then slide the handle through the slot in the replacement escutcheon and move the escutcheon into place. Insert the six mounting screws and tighten to 14–20 in-lb.
2. Replace the trim ring around the escutcheon, with the narrow side at the bottom. Insert the trim plate mounting rods into the rear of the escutcheon.

### 7.6 Charging Handle and Mechanism Assembly

The charging handle and the charging mechanism assembly, illustrated in Figure 40, are available as renewal parts. See DEF005.

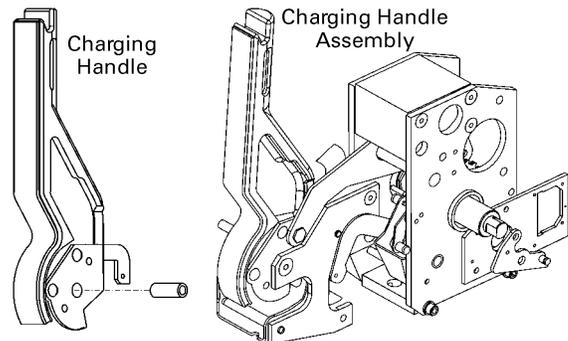


Figure 40. Charging handle and mechanism assembly.

### Removing and Replacing the Charging Handle

Use the following procedure to replace the charging handle, as illustrated in Figure 41.

1. Remove the escutcheon, as described in Section 7.5.
2. Remove the two bolts, lock washers, and nuts connecting the handle to the charging linkage and to the handle mounting plate on the charging mechanism.
3. Insert the pivot pin into the replacement handle, slide the handle into position on the charging mechanism, and insert the pivot bolt through the mounting plate and handle. Secure the bolt with the lock washer and nut and tighten to 96 in-lbs.
4. Connect the charging link to the handle with the bolt, lock washer, and nut and tighten to 200 in-lbs.
5. Replace the escutcheon, as described in Section 7.5.

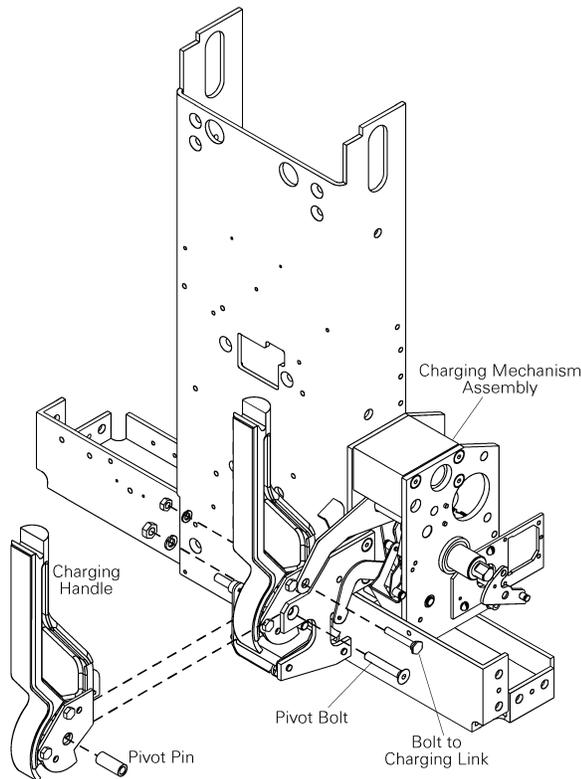


Figure 41. Replacing the charging handle.

### Removing the Charging Mechanism Assembly

Use the following procedure to remove the charging mechanism assembly for replacement, as illustrated in Figure 42.

1. Remove the escutcheon, as described in Section 7.5.
2. Remove the retaining ring connecting the spring discharge interlock to the charging mechanism assembly. Save the retaining ring and washer for reinstallation.
3. Charge and pin the closing springs, as described in Steps 1–3 of the procedure in Section 5.3.
4. Remove the mounting bolt and lock washer from the side of the charging mechanism assembly.
5. Remove the two bolts and lock washers securing the bottom of the charging mechanism assembly to the frame. Note the positions of the two spacers and reassemble them in the same positions. One of the spacers is covered with heat-shrink insulation, as shown in Figure 42.
6. Push the TRIP button. Use the maintenance handle to rotate the mechanism link to a horizontal position, so that it can pass through the slot shown in Figure 39.
7. Slide the charging mechanism assembly out toward the right side of the breaker.

8. If present, remove the Remote Close, as described in Section 8-4, and the Charging Motor, as described in Section 8-3.

### Installing the Charging Mechanism Assembly

Use the following procedure to install a replacement charging mechanism assembly, as illustrated in Figure 42.

1. Install the Remote Close and Charging Motor, if present, onto the replacement charging mechanism assembly.
2. Place the replacement charging mechanism assembly into position on the two spacers and insert the two bolts and lock washers through the bottom of the frame. Be sure to rotate the mechanism link to a position that will clear the slot shown in Figure 39.
3. Insert the side mounting bolt, with lock washer, through the charging mechanism assembly and into the breaker frame.
4. Reconnect the closing link on the charging mechanism assembly to the spring discharge interlock rod with the washer and snap ring removed earlier. If necessary, adjust the length of the rod as illustrated in Figure 43 (this figure shows a Remote Close installed on the charging mechanism).
5. Replace the escutcheon, as described in Section 7.5.
6. Charge the closing springs and remove the pin, as described in steps 5 and 6 of the procedure in Section 5.3.

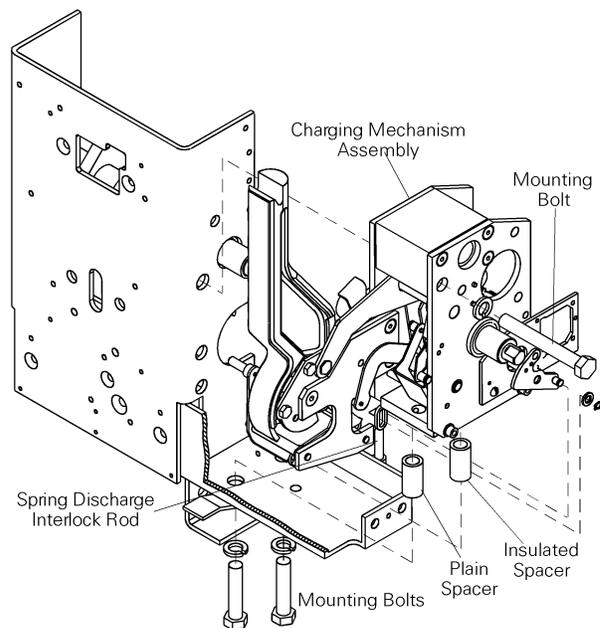
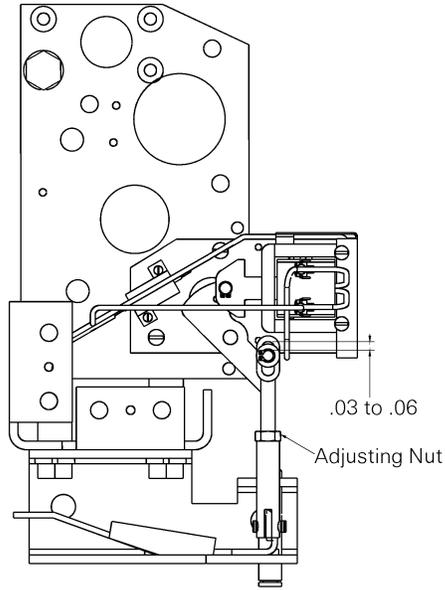


Figure 42. Removing or installing the charging mechanism assembly.



*Figure 43. Adjusting the closing link connection to the spring discharge interlock rod.*

This section describes the removal, replacement, and adjustment of the various accessories available with EntelliGuard breakers.

Before any of the operations in this chapter can be performed, the breaker must be removed from its compartment, as described in Section 5.2, and placed on a suitable work surface.

### 8.1 Bell Alarm with Lockout

The Bell Alarm with Lockout locks out the breaker in the event of a protection trip. The device has one normally open output switch and a trip circuit that are connected to the secondary disconnect as illustrated in

Figure 44. The switch output provides status feedback to the EntelliGuard Messenger™. The Bell Alarm with Lockout can only be reset manually by pressing the yellow target/RESET button on the breaker escutcheon.

Renewal parts for the Bell Alarm with Lockout are a complete kit, including mounting hardware, illustrated in Figure 45, or the module only.

Note: The lockout feature will only function if the circuit breaker is racked into the CONN position.

#### Removing the Bell Alarm with Lockout

Use the following procedure to remove the Bell Alarm module and mounting plate, as illustrated in Figure 46. If only the Bell Alarm module is to be replaced, it is not necessary to remove the mounting plate (perform Steps 1 through 3 only.)

1. Remove the breaker escutcheon, as described in Section 7.5.
2. Remove the four Bell Alarm wires from the secondary disconnect, as listed in Table 6. Cut the wire ties securing the wire bundle to the breaker frame so that the four wires can be removed with the Bell Alarm.
3. Remove the two screws and washers securing the Bell Alarm module to the mounting plate and remove the module.
4. Remove the long bolt with two washers that passes through the mounting plate linkage pivot into the breaker frame and the nut and washer that secure the mounting plate to the standoff.
5. Disengage the mounting plate from the breaker mechanism and remove the plate.

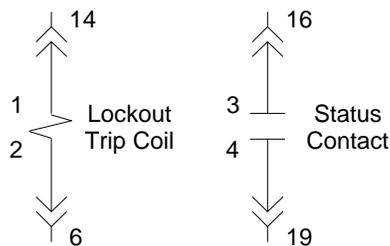


Figure 44. Bell Alarm with Lockout connections to the secondary disconnect. The contact is shown in the RESET state.

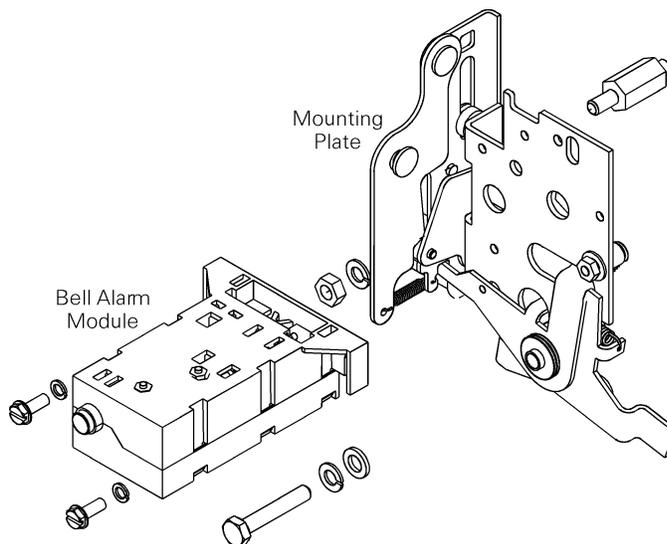


Figure 45. Bell Alarm with Lockout accessory kit.

Connection	Wire Color	Sec. Disc. Terminal #
Lockout trip	white	14
Lockout trip COM	green	6
Status switch N/O	blue	16
Status switch COM	black	19

Table 6. Bell Alarm with Lockout wires and corresponding secondary disconnect terminals.

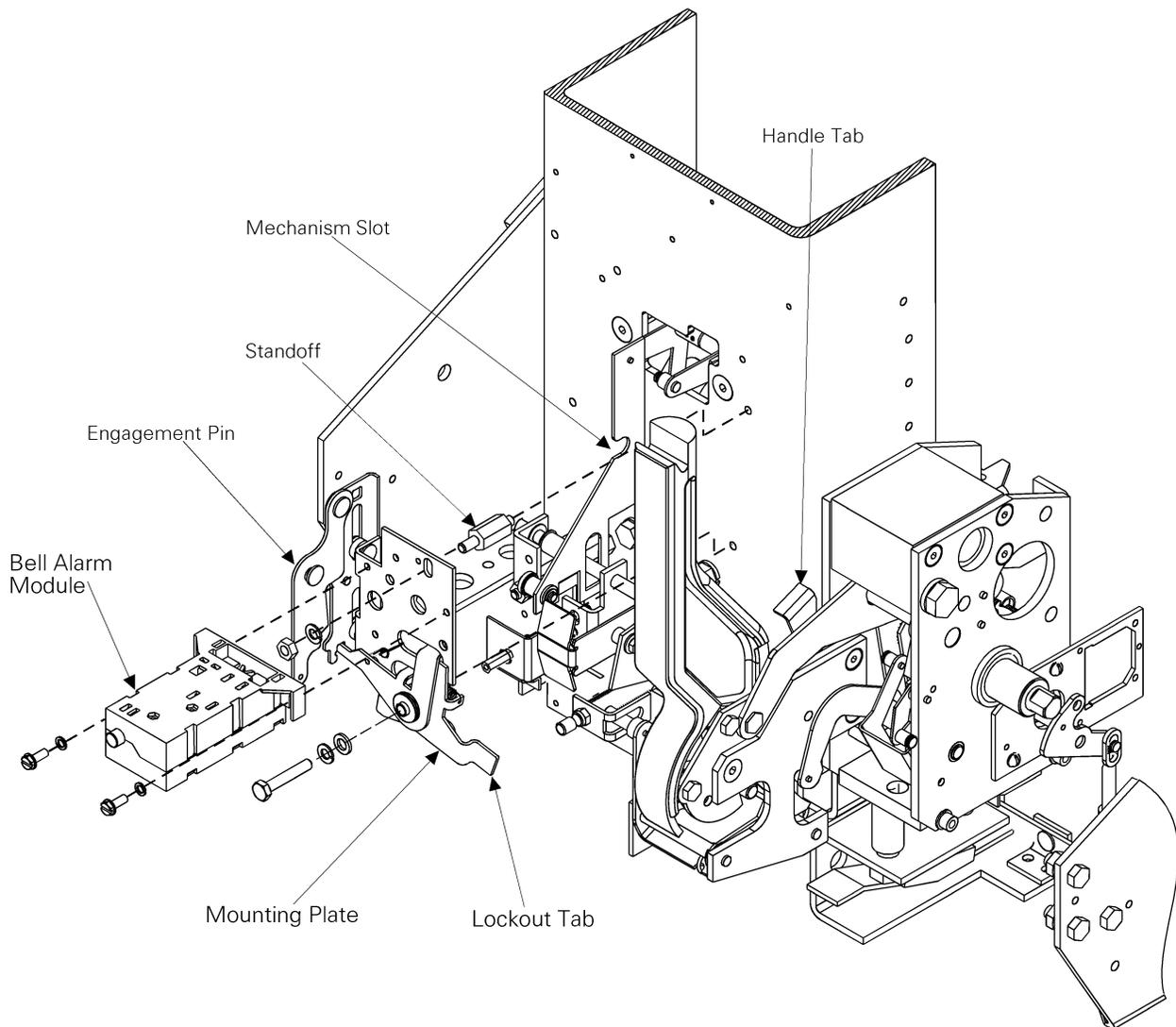


Figure 46. Removing and installing the Bell Alarm with Lockout module and mounting plate.

### Installing the Bell Alarm with Lockout

Use the following procedure to install the Bell Alarm mounting plate and module, as illustrated in Figure 46. If only the module is to be replaced, begin at step 3.

1. Place the Bell Alarm mounting plate over the stand-off and secure with a washer and nut. Insert the long bolt, with two washers, through the pivot on the mounting plate and screw it into the tapped hole in the front plate of the breaker. Ensure that the engagement pin on the side of the mounting plate, also shown in the top view in Figure 47, fits into the slot in the breaker mechanism.

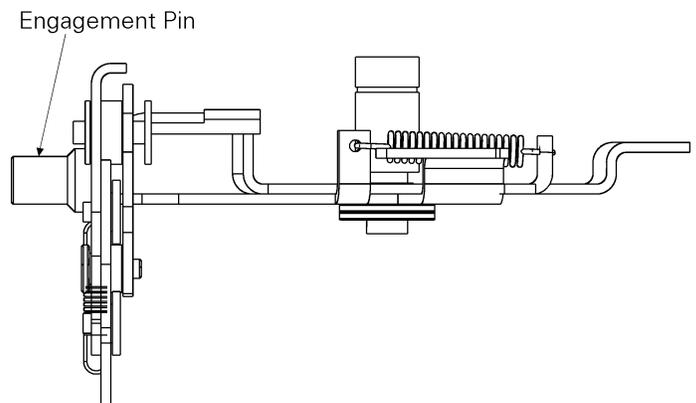


Figure 47. Top view of the Bell Alarm mounting plate, showing the breaker mechanism engagement pin.

2. Ensure that the lockout tab is underneath the handle tab.
3. Line up the Bell Alarm module on the mounting plate, as shown in Figure 46, so that the solenoid plunger and locating pin fit in the appropriate holes. The label on the end of the module must appear as in Figure 48, with the legend ↑ LF LO (Large Frame Lockout) horizontal.

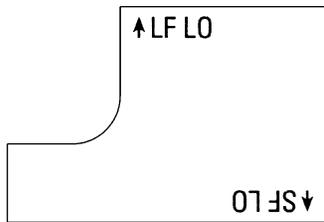


Figure 48. Orientation of the label on the Bell Alarm with Lockout module.

4. Attach the Bell Alarm with Lockout module to the mounting bracket with the two screws provided.
5. Run the four wires from the Bell Alarm to the secondary disconnect and connect to the terminals listed in Table 6. Use wire ties to secure the wire bundle to the breaker frame.
6. Replace the breaker escutcheon, as described in Section 7.5.

### 8.2 Shunt Trip

The Shunt Trip allows the breaker to be opened remotely by the EntelliGuard Messenger™. It is always provided on electrically operated breakers. The device causes the circuit breaker to open when its coil is energized. An “A” auxiliary switch, which is closed when the breaker is closed, is connected in series with the Shunt Trip coil, as illustrated in Figure 49. The voltage source is connected to terminals 5 and 7 on the secondary disconnect.

Renewal parts for the Shunt Trip are a complete kit, illustrated in Figure 50, and the module only. Electrical ratings for the Shunt Trip are listed in Table 7.

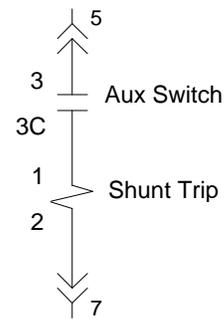


Figure 49. Shunt Trip connections to the auxiliary switch and secondary disconnect.

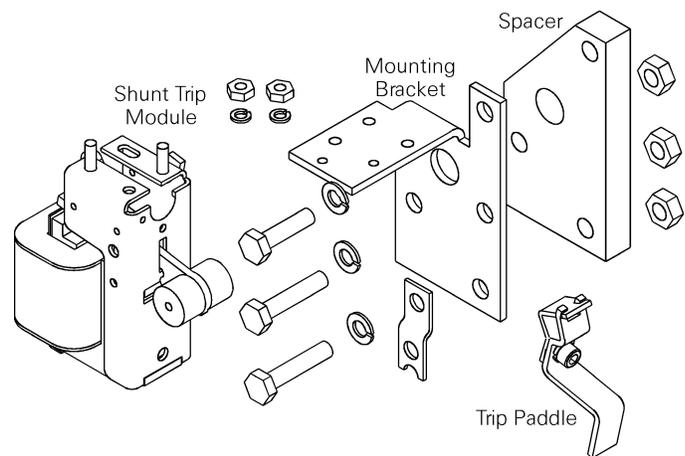


Figure 50. Shunt Trip accessory kit.

Catalog Number	Voltage Rating
WPS1LF60120	120 Vac, 60 Hz

Table 7. Catalog number and operating voltage for the Shunt Trip accessory.

### Removing the Shunt Trip

Use the following procedure to remove the Shunt Trip module for replacement, as illustrated in Figure 51. The mounting bracket does not normally require replacement.

1. Position the breaker on the work surface so that the left front is accessible.
2. Disconnect the wire at the secondary disconnect, terminal 7. Disconnect the other wire from the auxiliary switch, terminal 3C. Bring the wires back to the Shunt Trip, removing wire ties as necessary.
3. Remove the two nuts and washers securing the Shunt Trip module to the mounting bracket, then remove the module.

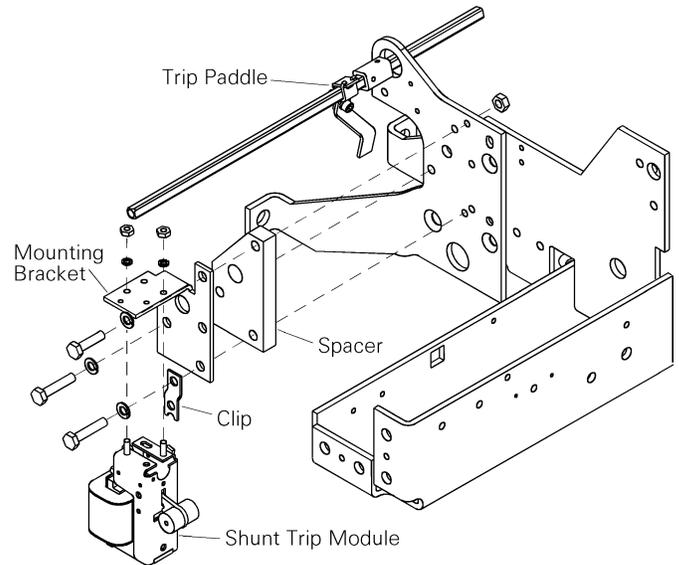


Figure 51. Removing and installing the Shunt Trip.

### Installing the Shunt Trip

Use the following procedure to install the Shunt Trip module as a replacement, as illustrated in Figure 51.

1. Insert the two mounting studs on the top of the Shunt Trip module into the holes on the top of the mounting bracket and secure with the two lock washers and nuts supplied.
2. Run one wire from the Shunt Trip module to auxiliary switch terminal 3C. Run the other wire to secondary disconnect terminal 7. Cut all wires to the appropriate length and crimp on the terminals provided (the right-angle flag for the auxiliary switch, the spade terminal for the secondary disconnect connection).
3. Attach the wires to the breaker frame with wire ties as appropriate.
4. Figure 52 shows the installed Shunt Trip in side view. With the breaker mechanism reset, there must be clearance between the trip paddle and armature of 0.090 inch. If adjustment is necessary, bend the trip paddle to achieve this distance.

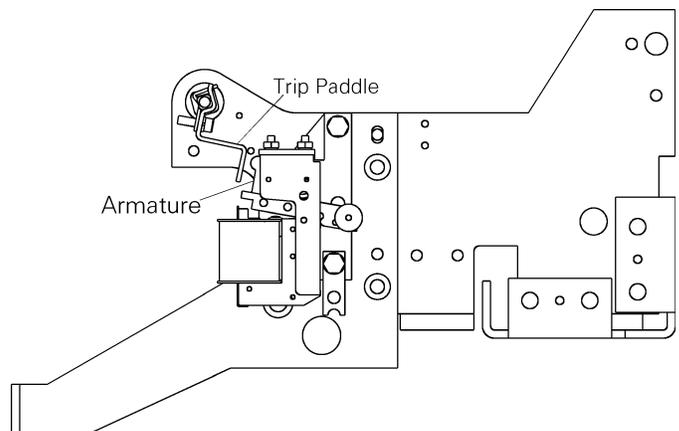


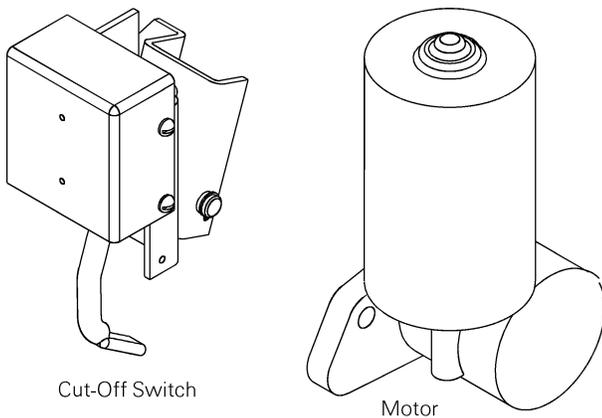
Figure 52. Installed Shunt Trip in side view.

### 8.3 Charging Motor

The Charging Motor provides a means of electrically charging the springs that close the breaker. The Charging Motor is available only as a factory-installed option. It is always provided on electrically operated breakers.

The circuit breaker closing springs are charged automatically when control voltage is applied to terminals 8 and 17 of the secondary disconnects. When the springs are fully charged, a cutoff switch automatically de-energizes the motor. The closing springs will recharge automatically after the breaker closes.

Renewal parts for the Charging Motor are the motor and the cut-off switch module, illustrated in Figure 53. The catalog number and electrical characteristics of the Charging Motor are listed in Table 8.



Cut-Off Switch

Motor

Figure 53. Charging Motor and motor cut-off switch.

Catalog Number	Voltage Range, V
568B596G5	104–127

Table 8. Catalog number and electrical rating for the Charging Motor accessory.

### Removing the Charging Motor

Use the following procedure to remove the Charging Motor for replacement, as illustrated in Figure 54.

1. Position the breaker on the work surface so that the right front is accessible.
2. Remove the breaker escutcheon, as described in Section 7.5.
3. Disconnect the motor wires at the connector.
4. Remove the three mounting bolts and lock washers securing the motor to the charging mechanism.
5. Remove the motor.

### Installing the Charging Motor

Use the following procedure to install a replacement motor, as illustrated in Figure 54.

1. Place the motor in position on the charging mechanism and insert the three mounting bolts and lock washers. Tighten the bolts to 360 in-lb.
2. Connect the motor wires by plugging the connector into place.
3. Replace the escutcheon, as described in Section 7.5.

### Removing the Motor Cut-Off Switch

Use the following procedure to remove the motor cut-off switch, as illustrated in Figure 54.

1. Carefully position the breaker on the work surface so that the right front is accessible.
2. Remove the breaker escutcheon, as described in Section 7.5.
3. Disconnect the wires at the screw terminals on the switch.
4. Remove the three mounting bolts and lock washers securing the switch to the right side of the breaker frame. Note that the bottom bolt is longer than the other two and is placed through a spacer.
5. Remove the cut-off switch.

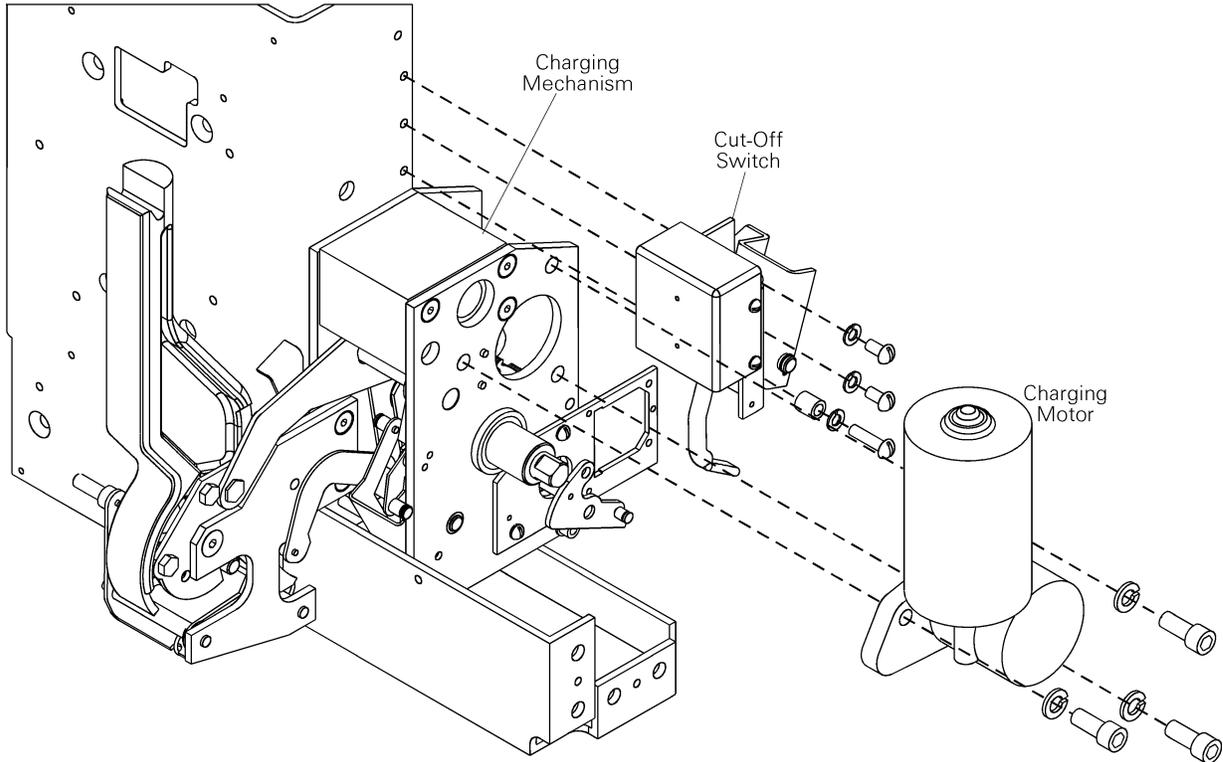


Figure 54. Removal and installation of the Charging Motor and cut-off switch.

### Installing the Motor Cut-Off Switch

Use the following procedure to install a replacement motor cut-off switch, as illustrated in Figure 54.

1. Place the cut-off switch in position on the right side of the breaker frame. Insert the three bolts and lock washers. Note that the bottom bolt is longer than the other two and is inserted through a spacer. Tighten the bolts to 96 in-lb.
2. Connect the wires at the screw terminals on the switch.
3. Adjust the cut-off switch as illustrated in Figure 55:
  - a. Charge the closing springs with the manual charging handle.
  - b. The main stem of each switch should be located between 0.005 and 0.030 inch from the threaded barrel.
  - c. If necessary, adjust the switch depression by screwing the switch button in or out of the threaded housing.
4. Replace the escutcheon, as described in Section 7.5.

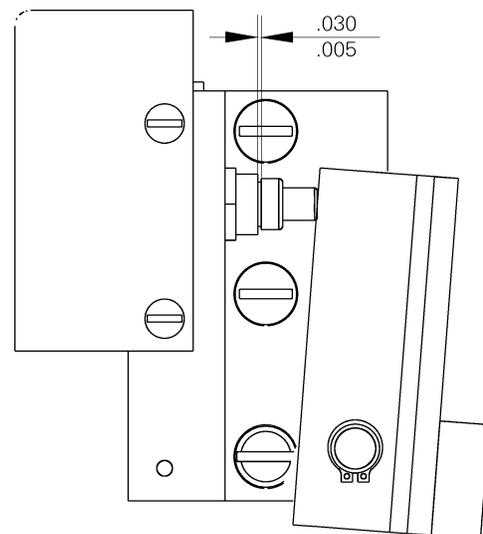


Figure 55. Motor cut-off switch adjustment.

### 8.4 Remote Close

The Remote Close allows the breaker to be closed remotely by the EntelliGuard Messenger™ after the closing springs have been charged. It is always provided on electrically operated breakers.

A circuit breaker equipped with the Remote Close accessory can be closed by applying the rated control voltage to terminals 9 and 18 of the secondary disconnect.

The Remote Close accessory is continuously rated and has an antipump feature that prevents a motor-operated breaker from repeatedly closing if the closing signal is maintained. The closing control voltage must be removed for 1–2.5 seconds and then reapplied for each breaker closure.

Renewal parts for the Remote Close are the complete kit, illustrated in Figure 56, the circuit board, and the solenoid.

Electrical characteristics of the Remote Close are listed in Table 9.

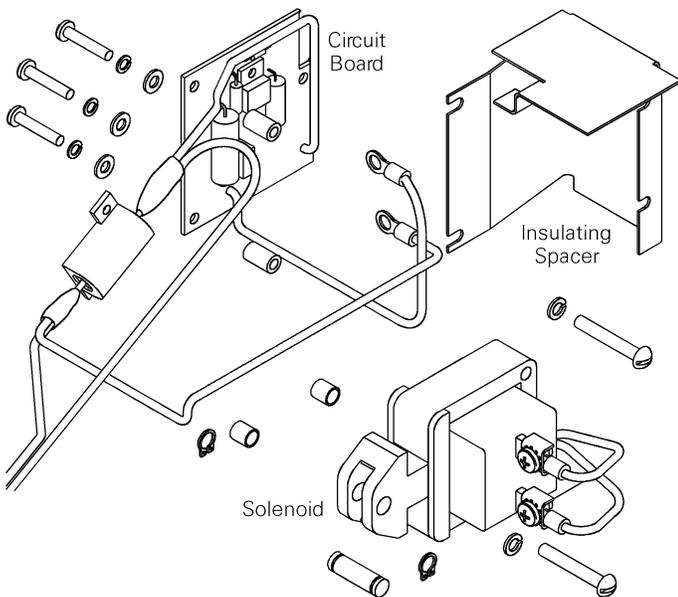


Figure 56. Remote Close accessory kit.

Catalog Number	Voltage Rating
WPRCLF60120	120 Vac, 60 Hz

Table 9. Catalog number and electrical rating for the Remote Close accessory.

### Removing the Remote Close

Use the following procedure to remove the Remote Close solenoid and circuit board for replacement, as illustrated in Figure 57. If only the solenoid or circuit board is to be replaced, it is not necessary to remove both components.

1. Carefully place the breaker on a suitable working surface, so that the right front of the breaker is accessible.
2. If the circuit board is to be replaced, disconnect the two Remote Close wires at terminals 9 and 18 of the secondary disconnect. Cut the wire ties, as needed, so that the wires can be removed with the circuit board.
3. Remove the two screws and lock washers securing the resistor to the mounting plate, as illustrated in Figure 58. Two access holes in the side plate, indicated in Figure 59, may be useful for inserting a screw driver to loosen the screws.
4. Disconnect the two leads from the circuit board to the solenoid.
5. Remove one of the snap rings from the pin connecting the solenoid to the closing link on the charging mechanism, then slide out the pin to disconnect the solenoid from the charging mechanism.
6. Remove the two screws C, lock washers, and spacers attaching the solenoid to the mounting plate, then remove the solenoid. Two access holes in the side plate, indicated in Figure 59, may be useful for inserting a screw driver to loosen screws C.
7. Carefully place the breaker on its back surface, supported on the primary disconnects.
8. Disconnect and remove the opening spring from the right pole, as illustrated in Figure 8.
9. Working from the bottom of the breaker, loosen screws B attaching the insulating spacer to the circuit board, then slide out the spacer.
10. Remove screws A and B with their lock washers, flat washers, and spacers. Remove the circuit board from the mounting plate.

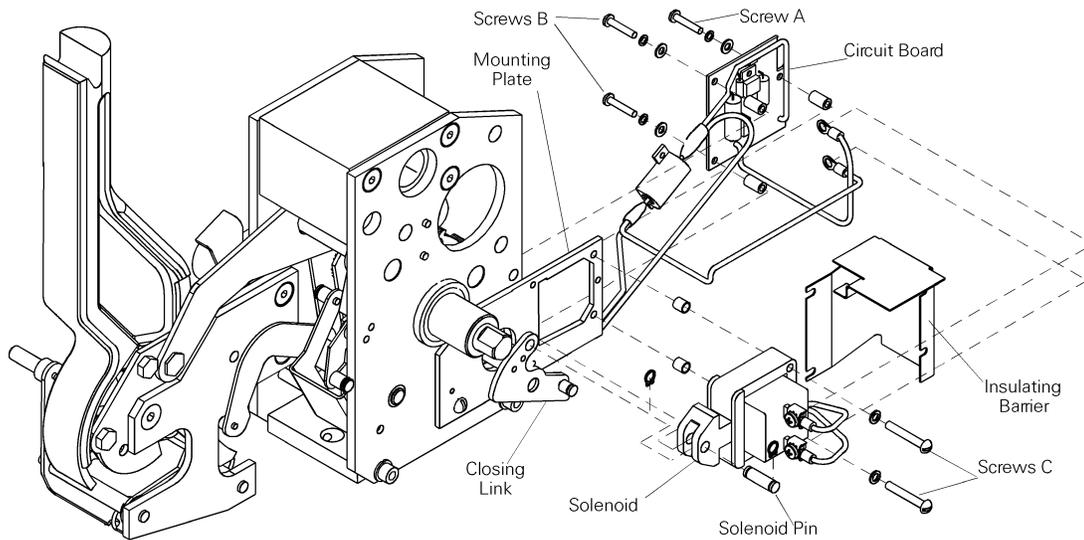


Figure 57. Removal or installation of the Remote Close accessory.

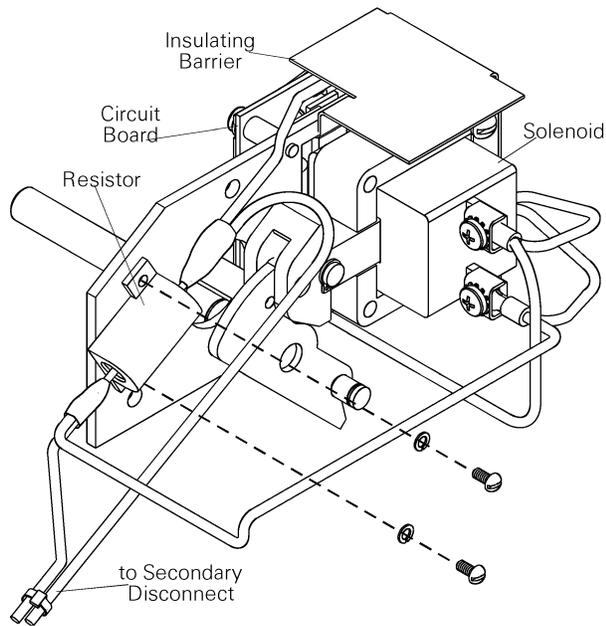


Figure 58. Attaching or removing the resistor.

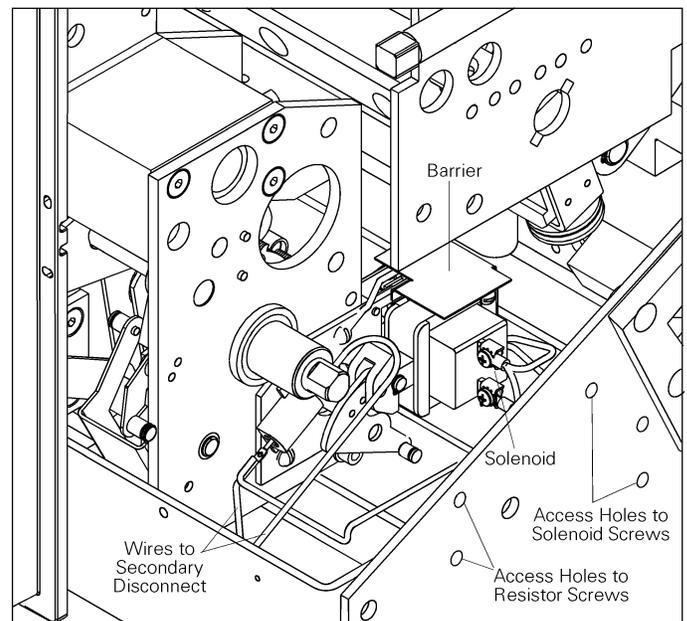


Figure 59. Remote Close installed in the breaker, showing the locations of access holes in the breaker side plate.

### Installing the Remote Close

Use the following procedure to install a replacement Remote Close solenoid and circuit board, as illustrated in Figure 57. (The circuit breaker should be resting on the primary disconnects with the right pole opening spring removed, as in the removal procedure above.)

1. Attach the circuit board to the rear of the mounting plate with the three screws, flat washers, lock washers, and spacers. Tighten screw A, but leave screws B loose.
2. Place the insulating barrier over the circuit board so that the two slots on the edge slide underneath the heads and washers of screws B. Tighten screws B.
3. Reconnect the opening spring on the right pole and place the breaker upright on its bottom surface for the rest of the installation.
4. Slide the solenoid underneath the insulating barrier, then attach with two screws C and lock washers through the slots in the barrier, with the two spacers between the solenoid and the mounting plate. Two access holes in the side plate, indicated in Figure 59, may be useful for inserting a screw driver to tighten screws C. Slide the tab on top of the barrier into the window in the mounting plate.
5. Attach the resistor to the mounting plate with the two screws and lock washers provided, as shown in Figure 58. Two access holes in the side plate, indicated in Figure 59, may be useful for inserting a screw driver to tighten the two screws.
6. Slide one of the snap rings onto the solenoid pin, connect the solenoid closing mechanism to the upper hole on the closing mechanism with the pin, then attach the other snap ring.
7. Connect the two leads with circular lugs from the circuit board to the solenoid screw connectors, as shown in Figure 59.
8. Run the wires from the Remote Close to the secondary disconnect A block and attach to terminals 9 and 18. Attach the wires to the breaker frame with wire ties as needed.

### 8.5 Open-Fuse Lockout

The Open-Fuse Lockout, illustrated in Figure 60, is used in combination with a fuse rollout element. When any fuse blows, the Open-Fuse Lockout trips the breaker to prevent single-phasing. This accessory is available only as a factory-installed option.

The Open-Fuse Lockout contains an individual trip solenoid for each pole, connected directly across the fuse in that phase. When any fuse blows, its solenoid is energized through connections to the secondary disconnect, illustrated in

Figure 61, and trips the breaker. An indicator shows which fuse has blown. The breaker cannot be reclosed until the blown fuse is replaced and the RESET button is pressed on the Open-Fuse Lockout.

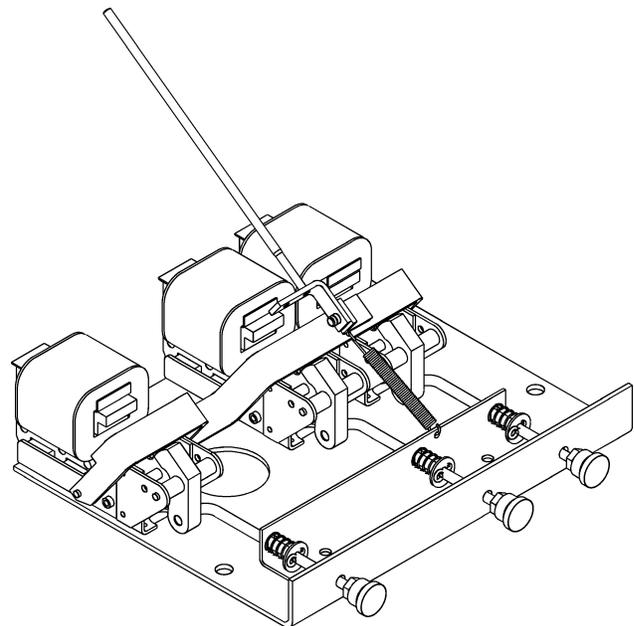


Figure 60. Open-Fuse Lockout accessory.

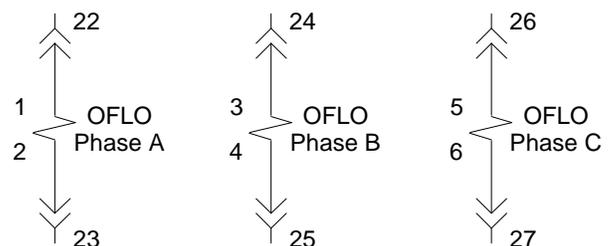


Figure 61. Open-Fuse Lockout connections to the secondary disconnect.

### Removing the Open-Fuse Lockout

Use the following procedure to remove the Open-Fuse Lockout device.

1. Disconnect the wires from the Open-Fuse Lockout at terminals 22, 23, 24, 25, 26, and 27 of the secondary disconnect. Cut any wire ties, as necessary to release the wires back to the Open-Fuse Lockout.
2. Remove the five bolts securing the Open-Fuse Lockout to the side plate and front frame of the breaker.
3. Lower the Open-Fuse Lockout, guiding the trip rod through the trip rod guide on the mounting bracket, as shown in Figure 62.

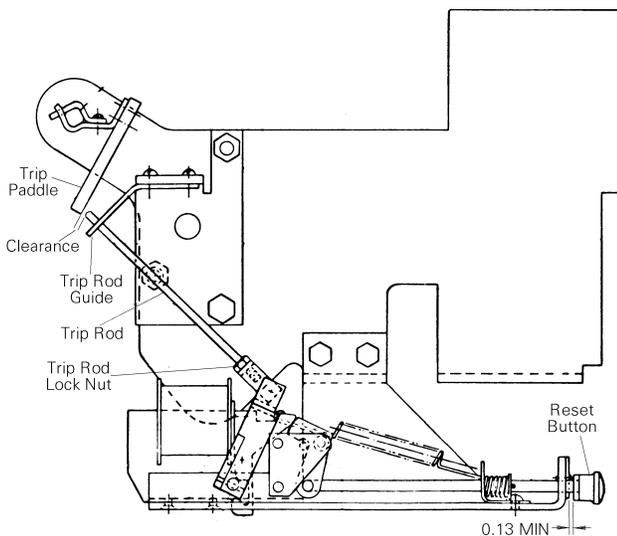


Figure 62. Open-Fuse Lockout adjustments, side view.

### Installing the Open-Fuse Lockout

Use the following procedure to install a replacement Open-Fuse Lockout.

1. Move the replacement Open-Fuse Lockout into position, carefully guiding the trip rod through the hole in the trip rod guide on the mounting bracket.
2. Insert the five bolts to secure the Open-Fuse Lockout to the breaker side plate and front frame. Tighten to 96 in-lb.
3. Connect the wires from the coils on the Open-Fuse Lockout to the secondary disconnect block as follows:
  - Phase A to terminals 22 and 23.
  - Phase B to terminals 24 and 25.
  - Phase C to terminals 26 and 27.
4. Armature overtravel of 0.03–0.06 inch is required when the breaker is tripped. Adjust armature overtravel as follows:

- a. Charge the closing springs to put the breaker in the RESET position.
  - b. Loosen the trip rod lock nut and turn the rod in or out to give a 0.13-inch clearance between the trip paddle and the end of the trip rod, as shown in Figure 62.
  - c. Retighten the trip rod lock nut.
5. Clearance of 0.13 inch should be maintained at the reset knob, as shown in Figure 62. To adjust this clearance, loosen the lock nut at the button and turn the button in until the proper distance is achieved. Retighten the lock nut.

### 8.6 Remote Charge Indication Switch

The Remote Charge Indication Switch, illustrated in Figure 63, allows remote monitoring of the state of the closing springs on breakers equipped with a Charging Motor. When the springs are charged, terminals 3 and 4 at the secondary disconnect are shorted and are open when the springs are discharged.

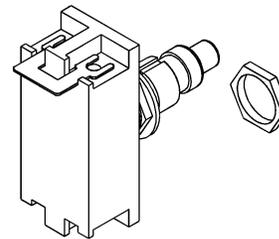


Figure 63. Remote Charge Indication Switch.

### Removing the Remote Charge Indication Switch

Use the following procedure to remove the Remote Charge Indication Switch for replacement, as illustrated in Figure 64.

1. Carefully position the breaker on the work surface so that the right front is accessible.
2. Remove the escutcheon, as described in Section 7.5.
3. Remove the two screws and lock washers securing the cover over the remote-charge indication switch and the motor cut-off switch and lift off the cover.
4. Disconnect the two wires on the screw terminals on the remote-charge indication switch.
5. Remove the nut securing the switch to the mounting bracket and remove the switch.

### Installing the Remote Charge Indication Switch

Use the following procedure to install a replacement Remote Charge Indication Switch, as illustrated in Figure 64.

1. Insert the button end of the switch into the hole in the mounting bracket and secure with the nut on the threaded shaft.
2. Attach the two wires to the screw terminals on the switch.
3. Adjust the switch as illustrated in Figure 55:
  - a. Charge the closing springs with the manual charging handle.
  - b. The main stem of the switch should be located between 0.005 and 0.030 inch from the threaded barrel. (See Figure 55.)
  - c. If necessary, adjust the switch depression by screwing the switch button in or out of the threaded housing.
4. Place the cover over the switches and secure to the mounting bracket with the two screws and lock washers.
5. Replace the escutcheon, as described in Section 7.5.

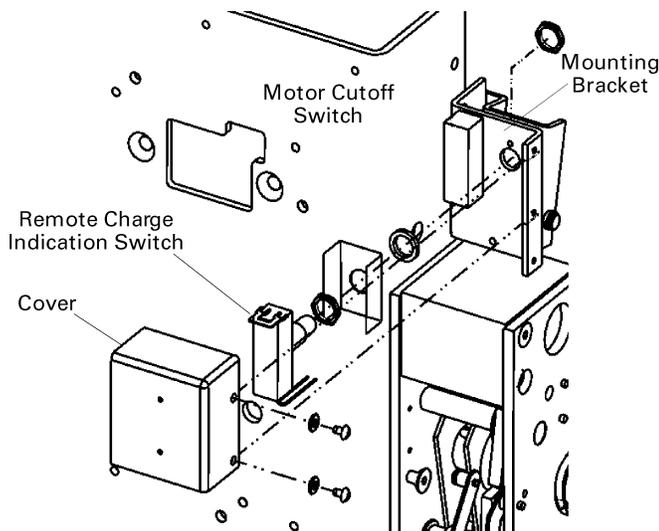


Figure 64. Removal or installation of the Remote Charge Indication Switch.

### 8.7 Network Interlock

The Network Interlock provides a means of locking out a breaker in order to coordinate its operation with other breakers in the distribution network. When activated by the EntelliGuard Messenger™, the Network Interlock prevents the breaker from closing. When the EntelliGuard Messenger™ issues a RESET signal, the breaker is then able to close either remotely or locally. The accessory includes a manual reset knob to reset the device in the absence of a signal from the EntelliGuard Messenger.

The Network Interlock consists of a trip coil, a reset coil, and a status switch. The device connections to the secondary disconnect are shown in Figure 65. When voltage is applied across the trip coil, the device locks out the breaker. Conversely, when voltage is applied to the reset coil or when the reset knob is pulled, the Network Interlock resets, allowing the breaker to reclose. The Network Interlock does not close the breaker.

Renewal parts for the Network Interlock are available as a complete kit or as a module. The Network Interlock accessory is only available on electrically operated breakers.

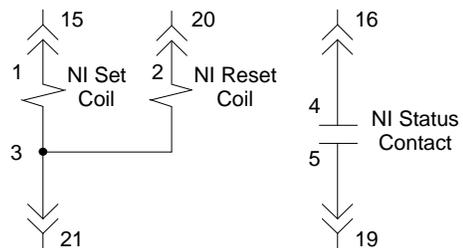


Figure 65. Network Interlock connections to the secondary disconnect.

### Removing the Network Interlock

Use the following procedure, illustrated in Figure 66 and Figure 68 to remove the Network Interlock module.

1. Disconnect the six wires from the Network Interlock module. Label each wire as it is removed. Cut wire ties as necessary.
2. Remove the push nut and washer from the top of the manual reset rod and slide the rod out of the reset lever as shown in Figure 68.
3. Remove the Network Interlock module from the mounting plate by removing the three nuts and washers, as shown in Figure 66.

### Installing the Network Interlock

Use the following procedure to install the Network Interlock module as a replacement, as illustrated in Figure 66. If this is a new installation into a breaker that was not equipped at the factory with a Network Interlock, see the

installation instructions in DEH41118, supplied with the Network Interlock kit.

1. Open the circuit breaker and remove it from the cubicle or substructure. Check to ensure the breaker closing springs are DISCHARGED. (See DEH-202 for detailed instructions.)
2. Carefully place the circuit breaker on a suitable working surface, resting on the primary disconnects, so that the bottom of the circuit breaker is accessible.
3. Fasten the Network Interlock module to the mounting bracket using three sets of # 8-32 nuts, spring washers, and flat washers as shown in Figure 66.
4. Ensure the Network Interlock is in the RESET state (shown in Figure 69) by manually rotating the reset lever counterclockwise. If the Network Interlock was SET, this operation will cause the set lever to retract away from the trip paddle.
5. With the breaker open, charge the breaker closing springs. Do not close the breaker. Adjust the gap between the Network Interlock set lever and paddle by rotating the adjusting screw as shown in Figure 69. The distance between the set lever and the trip paddle must be between 0.060 and 0.090 inch.
6. Manually push the set lever toward paddle, locking the Network Interlock into the SET position. Check to ensure that this operation causes the trip paddle to move.
7. Close the breaker by either depressing the close button or activating the close coil circuit. The breaker should not have closed since the Network Interlock was SET.
8. Fasten the top end of the vertical manual reset rod to the reset lever with the push nut shown in Figure 68.
9. Pull the manual reset knob. Check that the Network Interlock has returned to the RESET state, as shown in Figure 69.
10. Charge and close the breaker. The breaker should close properly since the Network Interlock is RESET.
11. Open the breaker. Connect six wires to the available terminals on the Network Interlock device. Connect two of the wires to the NC and COM terminals of the microswitch as shown in Figure 67.
12. Reset the Network Interlock by pulling the manual reset knob. The Network Interlock status circuit should be open. Close the breaker manually or electrically. The breaker should close properly.
13. Set the Network Interlock by applying 120 VAC across terminals 15 and 21 on the secondary

disconnect. The breaker should trip open and the status circuit should change from open to close.

14. Charge the breaker manually or electrically. Close the breaker. The breaker should trip open, discharging the closing springs.
15. Reset the Network Interlock by applying 120 VAC across terminals 20 and 21 on the secondary disconnect. The status circuit should change from closed to open.
16. Charge and close the breaker. The breaker should close properly.
17. Set the Network Interlock, and repeat Steps 12 through 16.

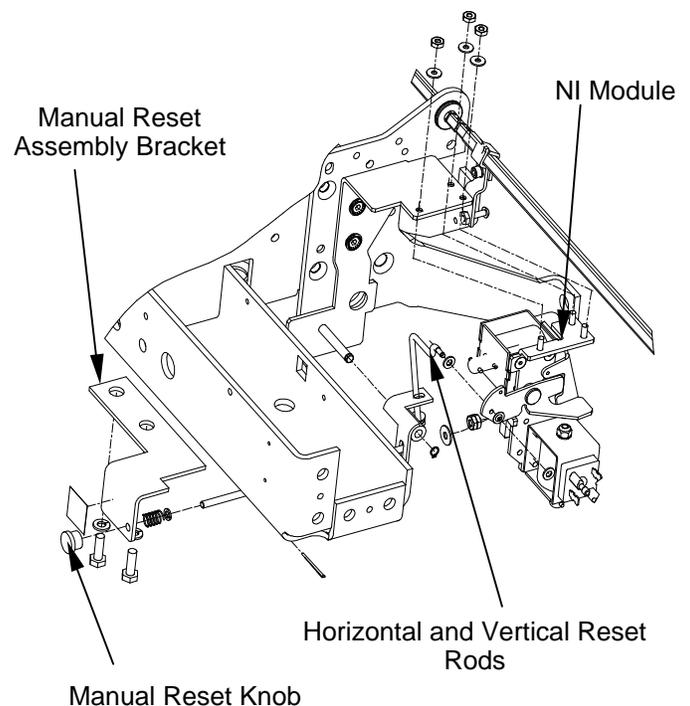


Figure 66. Network Interlock module and manual reset mounting

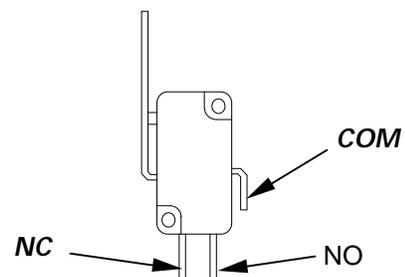


Figure 67. Microswitch terminals.

# EntelliGuard™ 3200–5000 A Power Circuit Breakers

## Chapter 8. Accessory Maintenance

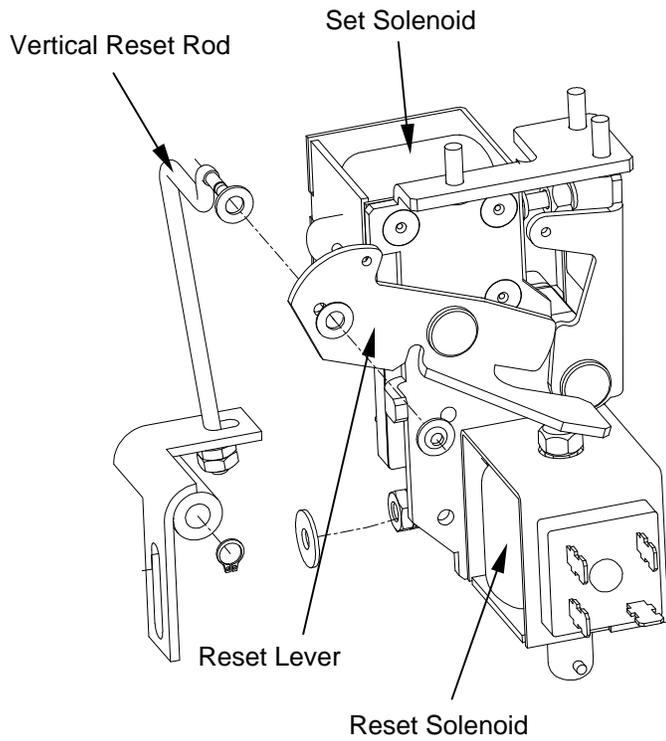


Figure 68. Manual reset assembly interface with Network Interlock module

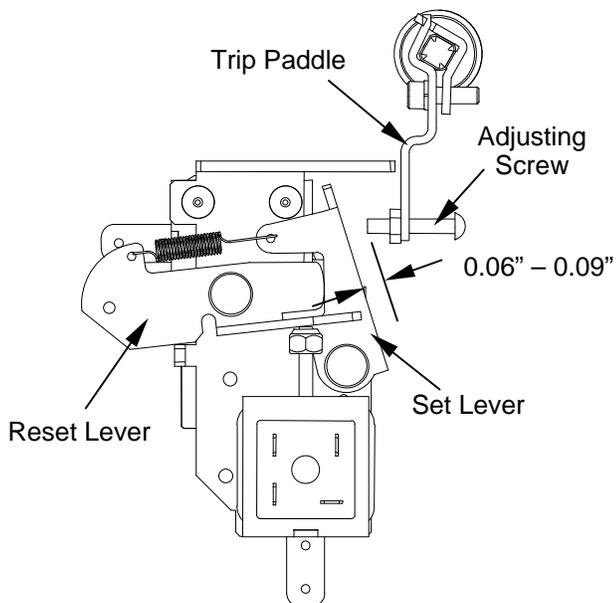


Figure 69. Trip paddle and set lever gap calibration. (Breaker charged. NI module shown in RESET position.)

### **A.1 Breaker Retaining Hardware**

The retaining hardware items listed in Table A.1 are available in packages of 100. Order by the catalog number listed.

<b>Shaft Size, in.</b>	<b>Squeeze Rings</b>	<b>Retaining Rings</b>	<b>Retaining Clip</b>
0.187	10081394G5	10081394G9	—
0.250	10081394G3	10081394G10	—
0.312	10081394G2	—	—
0.375	10081394G1	10081394G11	—
0.438	10081394G7	—	—
0.500	10081394G6	10081394G12	—
0.625	10081394G4	—	—
0.875	—	10081394G13	—
1.000	—	10081394G14	—
1.250	—	10081394G15	—
Aux Switch	—	—	10081394G8

*Table A.1. Catalog numbers of retaining hardware available for EntelliGuard breakers.*

## ***EntelliGuard™ 3200–5000 A Power Circuit Breakers***

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*Notes*

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**g**

**GE Consumer & Industrial**

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*General Electric Company  
41 Woodford Ave., Plainville, CT 06062*

DEH204 R02 1005

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