g

EntelliGuard™ Power Circuit Breakers

800–2000 A Frames, 240–600 Vac

User's Guide

DEH201

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.

This document is based on information available at the time of its publication. While efforts have been made to ensure accuracy, the information contained herein does not cover all details or variations in hardware and software, nor does it provide for every possible contingency in connection with installation, operation, and maintenance. Features may be described herein that are not present in all hardware and software systems. GE Consumer & Industrial assumes no obligation of notice to holders of this document with respect to changes subsequently made.

GE Consumer & Industrial makes no representation or warranty, expressed, implied, or statutory, with respect to, and assumes no responsibility for the accuracy, completeness, sufficiency, or usefulness of the information contained herein. No warrantees of merchantability or fitness for purpose shall apply.

The following are trademarks of GE Company:

EntelliGuard™, EntelliGuard Messenger™, Entellisys™

Chapter 1. Introduction

Chapter 2. Breaker Installation and Removal

Chapter 3. Breaker Operation

Chapter 4. Accessory Operation

Chapter 5. Maintenance

List of Figures

1.1 Overview

EntelliGuard 800–2000 ampere power circuit breakers are designed to protect low-voltage power circuits when used with Entellisys™ Low-Voltage Switchgear.

1.2 Receiving the Breaker

Unpack the circuit breaker and inspect it for shipping damage. Ensure that the breaker has the proper current, voltage, and interruption ratings for the application.

The weights of the various frame sizes are listed in Table 1, for reference.

Breaker Frame	Operation Type	Weight lb [kg]
800 A	Manual Electrical	188 [86] 193 [88]
800 A Fused	Manual Electrical	233 [106] 238 [108]
1600 A	Manual Electrical	198 [90] 203 [92]
1600 A Fused	Manual Electrical	243 [111] 248 [113]
2000 A	Manual Electrical	203 [92] 208 [95]

Table 1. Weights of various breaker frame sizes.

Storage

The breaker should be placed in service immediately in its permanent location. However, if it must be stored for an indefinite period, it should be carefully protected against condensation, preferably by storage in a warm dry room. The breaker should be stored in a clean location, free from corrosive gases or fumes. In particular, protect the breaker from moisture and cement dust, as that combination may be corrosive.

If the breaker is stored for any length of time, it should be inspected periodically to ensure good mechanical condition.

1.3 Preparation for Installation

Check that the primary disconnect fingers are smooth and free of nicks and burrs. If they are dry, apply a thin coat of GE Lubricant D6A15A1 (MobilGrease 28, catalog number 193A1751P1) to the contact surfaces.

Accessory Installation

The following accessories may be installed in the breaker at the factory. Refer to the instruction sheet supplied with each accessory for catalog numbers and installation instructions.

- Shunt Trip
- Charging Motor
- Remote Close
- Open-Fuse Lockout
- Bell Alarm with Lockout
- Network Interlock
- Hidden Close Button

1.4 Breaker Features

EntelliGuard circuit breakers are equipped with the standard and optional features illustrated in Figure 1. The letters are keyed to the list below the figure.

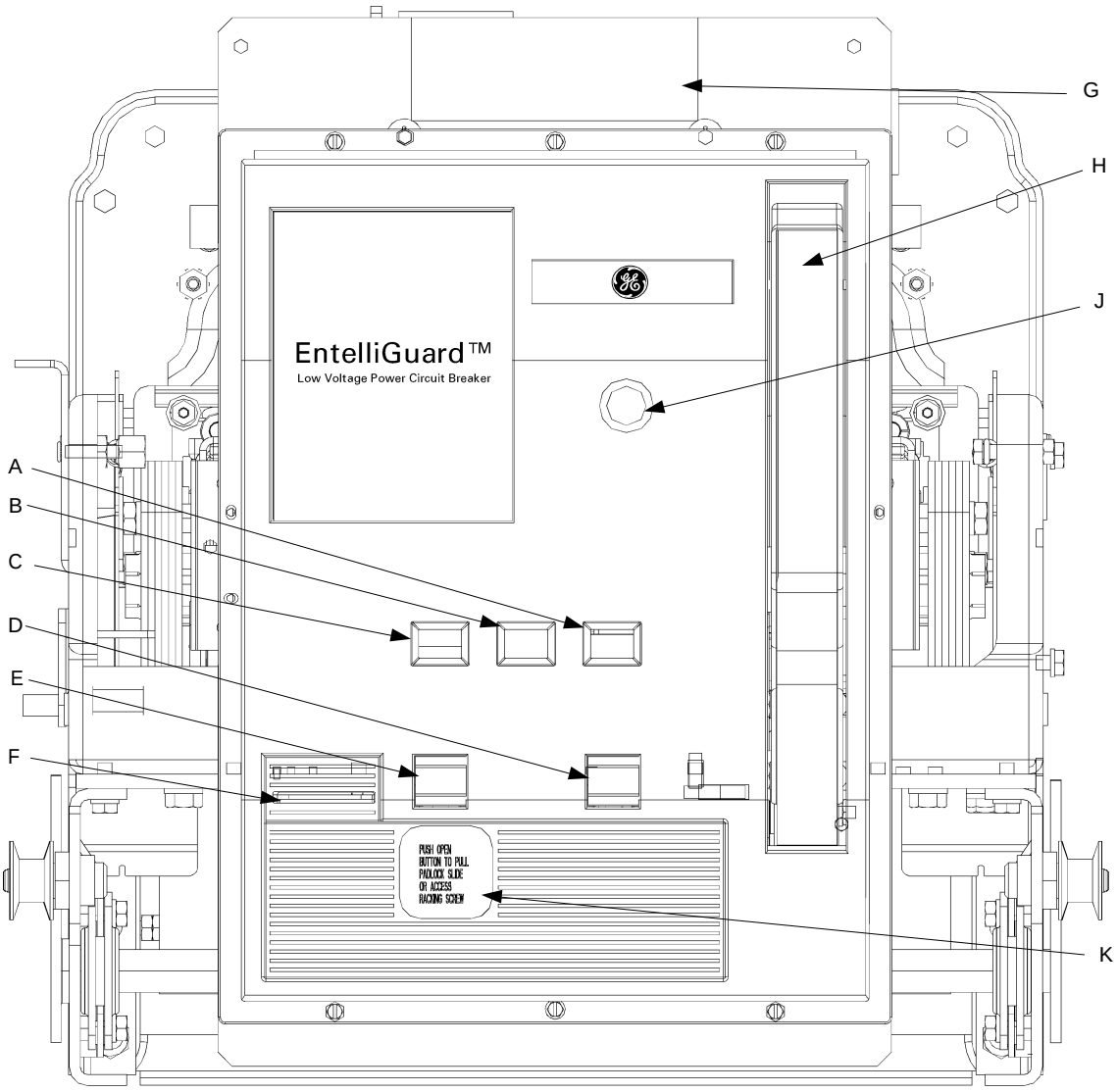


Figure 1. Front of the EntelliGuard circuit breaker, showing the locations of standard and optional features.

A Indicator: DISC (white)
TEST (white)
CONN (white)

B Indicator: CHARGED (yellow)
DISCHARGED (white)

C Indicator: CLOSED (red)
OPEN (green)

D CLOSE button (black)

E OPEN button (red)

F Padlock provision

G Catalog number, rating, and date code nameplate

H Manual charging handle

J Bell Alarm with Lockout target / RESET button

K Draw-out racking screw (behind door)

2.1 Introduction

EntelliGuard circuit breakers are installed in GE Entellisys™ Low-Voltage Switchgear. Draw-out construction permits activation of a new feeder, allows rapid replacement of a circuit breaker, and facilitates inspection and maintenance of the breaker with no need to deenergize the entire switchgear lineup. EntelliGuard breakers are used exclusively with the EntelliGuard Messenger™.

2.2 Installing the Breaker

Use the following procedure to install the draw-out breaker into its cubicle, as illustrated in Figure 2.

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.
   - Verify that the breaker is the correct type for that compartment.
   - Ensure that the breaker is OPEN.
   - Apply a thin coat of Lubricant D6A15A1 (MobilGrease 28, catalog number 193A1751P1) to the breaker's primary disconnects.
   - 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 (catalog number 0324B4551G1) by locating the hooks in the slots on the side of the breaker and on the closing spring anchor pin.
3. Pull the rails all the way out to their withdrawn position.
4. Slowly lower the breaker onto the rails so that the grooves in the rollers on the side of the breaker align with the rails.
5. Push the breaker into the compartment until it reaches the stops. This is the Disconnect position (as shown by the legend DISC on the draw-out position indicator). Check to ensure that the secondary disconnect block on the breaker is aligned and is beginning to engage properly with the mating disconnect block in the compartment. At this point the racking arms are positioned to engage the fixed racking pins in the compartment and are ready to begin the racking motion. Push the rails back into the compartment.
6. Close the compartment door. Push the OPEN button and slide the racking screw access door to the right, exposing the racking screw.
7. Engage the Remote Racker accessory (WPEGRRLV) or the Racking Handle (0324B4721G001) with 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.
8. Depress the red OPEN button to close the racking screw access door to permit breaker closing.

2.3 Removing the Breaker

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

1. With the compartment door closed and latched, open the breaker.
2. Push the OPEN button and slide the racking screw access door to the right, exposing the racking screw.
3. Engage the Remote Racker accessory or the Racking Handle 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.
4. Open the compartment door. Pull out the rails, then pull the breaker out to the withdrawn position at the track travel limit
5. Verify that the indicators on the front of the breaker show that the springs are DISCHARGED and the breaker is OPEN.
6. Attach the Lifting Bracket by locating the hooks in the slots on the side of the breaker and on the closing spring anchor pin. Raise the breaker until its mounting wheels clear 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.

2.4 Testing the Breaker

The breaker can be operated without energizing the load when it is in the TEST position. Using the Racking Handle or Remote Racker, move the breaker from the CONN or

DISC position to the TEST position, as shown on the draw-out position indicator. The breaker can now be operated manually or electrically without energizing the load.

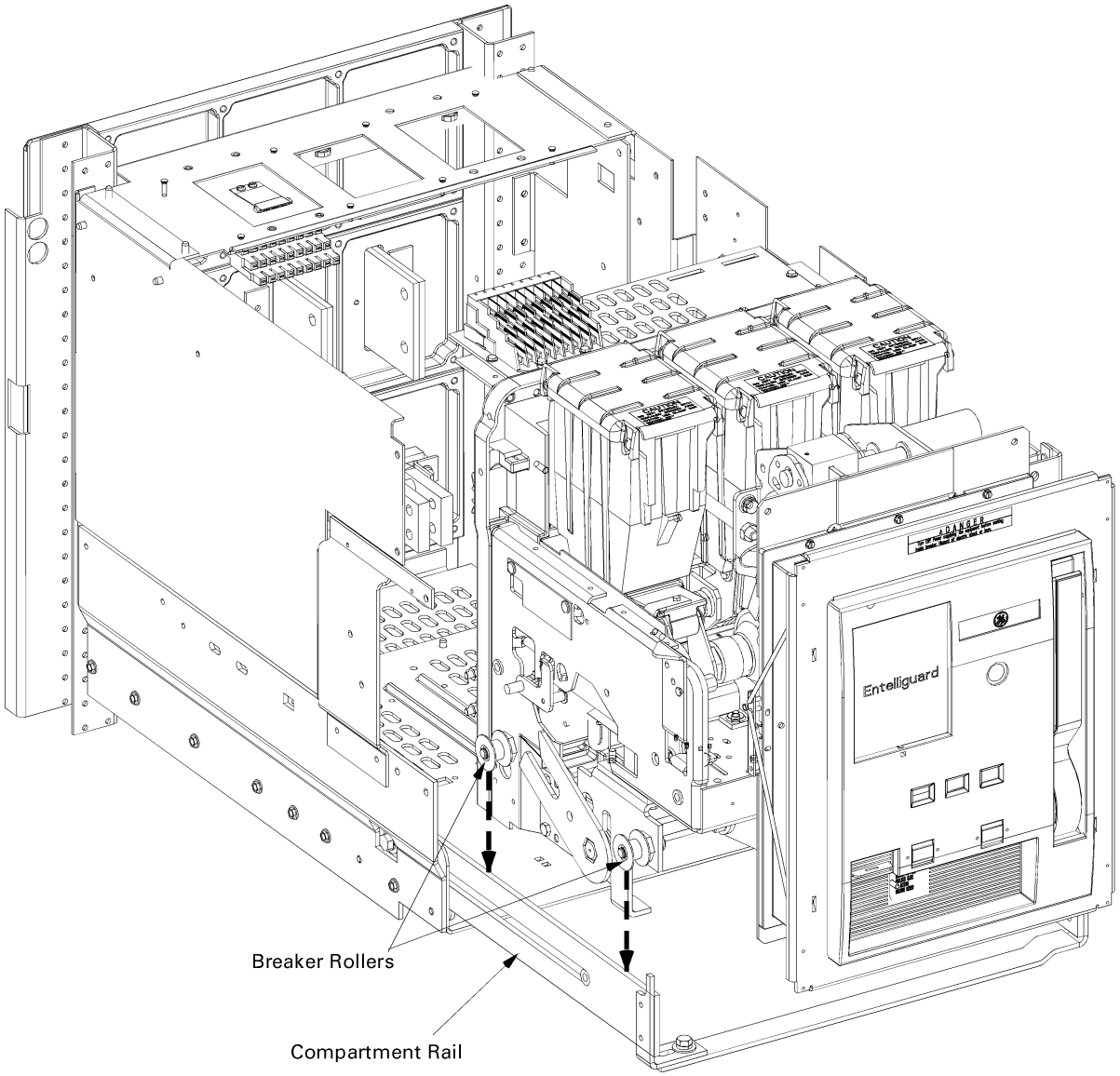


Figure 2. Installing the breaker into the compartment.

3.1 Operating Instructions

Sequence of Operations

The sequence of operations that may be performed on the circuit breaker are listed in Table 2. Refer to Chapter 4 for information about accessory operation.

Operation of the Breaker

Manually Charging the Mechanism Springs

Pull the charging handle down about 90° (until it stops) five to six times to fully charge the closing 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 Mechanism Springs

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

- With the breaker in the TEST position, install the Charging 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 charge 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 then 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.
- 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 Charging 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 blocage pour fusible ouvert n'a pas été remis en place après le remplacement d'un fusible éclaté.
- Le verrouillage réciproque optionnel de réseaun'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" to 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 padlock mechanism, as described in Step 1 below, 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.

3.2 Control Wiring

Figure 3 is the wiring diagram for the breaker control circuitry. Table 3 lists the secondary disconnect terminals and the items connected to each. The location of the secondary disconnect is illustrated in Figure 4.

3.3 Breaker Interlocks

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

Drawout Interlock

The Drawout Interlock prevents the breaker from being closed when the breaker is in neither the CONN or 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 access door to the racking mechanism is open.

Contact Interlock

The Contact Interlock keeps the door to the draw-out mechanism racking screw closed whenever the breaker contacts are CLOSED. This prevents changes to the breaker's position with the main contacts CLOSED.

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.

3.4 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.

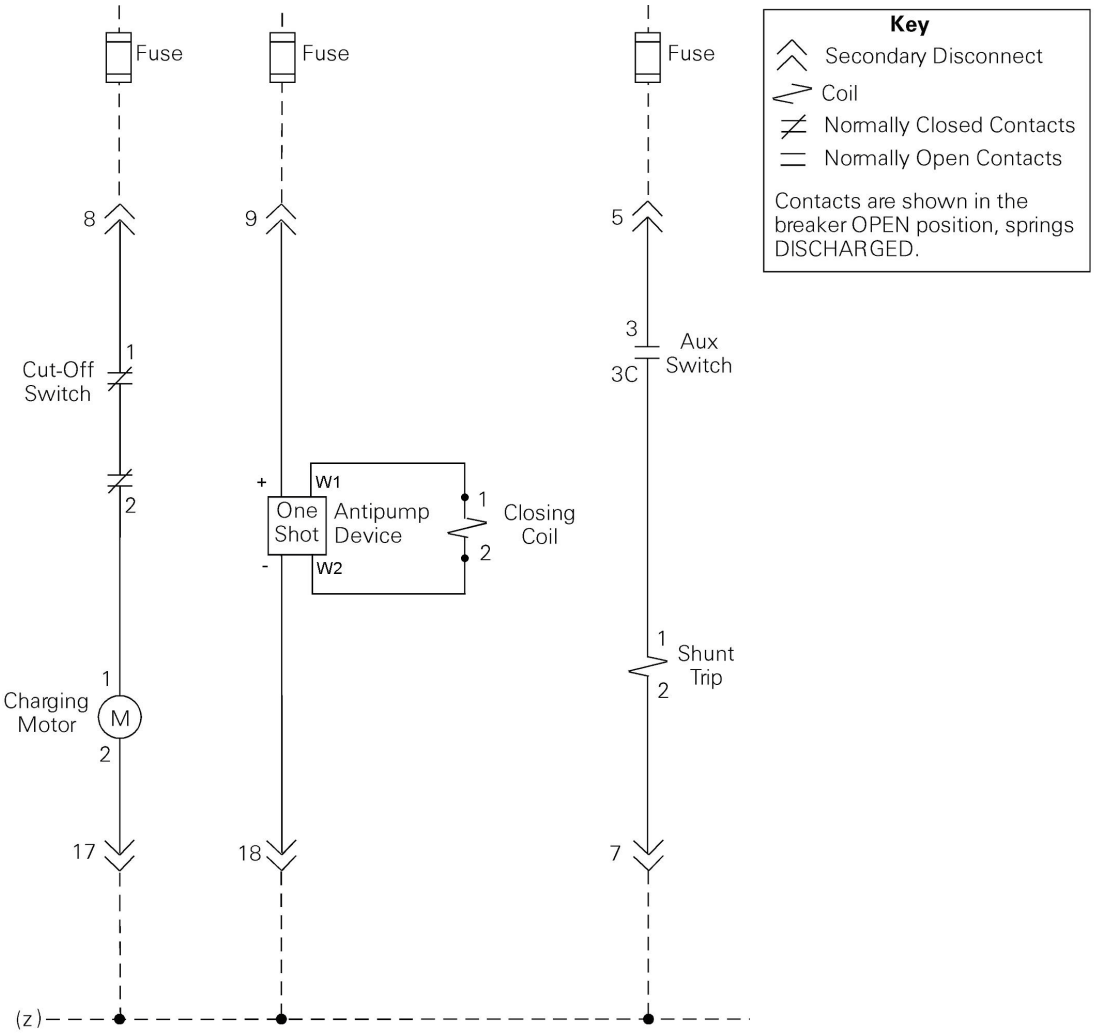


Figure 3. Elementary diagram of the breaker control circuits.

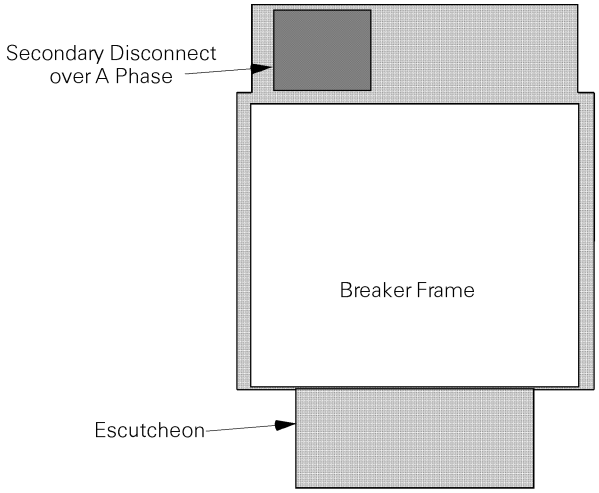


Figure 4. Location of the secondary disconnect (top view of the breaker.)

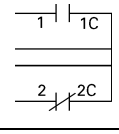
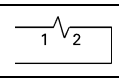
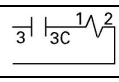
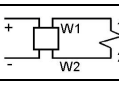
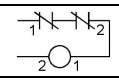
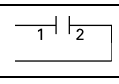
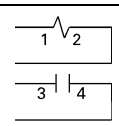
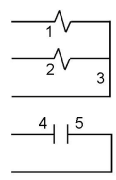
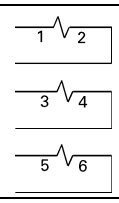
10	Aux Switch (NO contact)	
1	Aux Switch	
2	Aux Switch	
11	Aux Switch (NC contact)	
13	Flux Shifter	
12	Flux Shifter common	
5	Shunt Trip	
7	Shunt Trip common	
9	Close Circuit	
18	Close Circuit common	
8	Closing Spring Charging Motor	
17	Closing Spring Charging Motor common	
3	Remote Charge Indicator	
4	Remote Charge Indicator	
14	Bell Alarm Trip	
6	Bell Alarm Trip common	
16	Bell Alarm Status	
19	Bell Alarm Status common	
	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	Spare	
36	Spare	

Table 3. Secondary disconnect terminals with standard and optional connections.

Chapter 4 contains the operation procedures for each of the available breaker accessories.

4.1 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 catalog number and operating voltage for the Shunt Trip are listed in Table 4. For installation instructions see DEH168.

Catalog Number	Voltage Rating
WPS1SF60120	120 Vac, 60 Hz

Table 4. Catalog number and operating voltage for the Shunt Trip accessory.

Operation

The Shunt Trip causes the circuit breaker to trip when its coil is energized. An "A" auxiliary switch, which is closed when the breaker is closed, is in series with the Shunt Trip coil, as illustrated in Figure 5. The voltage source is connected to positions 5 and 7 on the secondary disconnect.

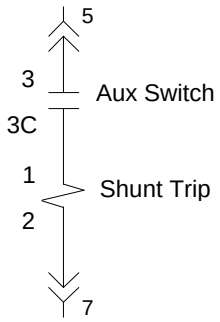


Figure 5. Shunt Trip connections to the auxiliary switch and secondary disconnect.

4.2 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.

Operation

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

4.3 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. The catalog number and operating voltage for the Remote Close accessory are listed in Table 5. For installation instructions see DEH172.

Catalog Number	Voltage Rating
WPRCSF60120	120 Vac, 60 Hz

Table 5. Catalog number and operating voltage for the Remote Close accessory.

Operation

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.

4.4 Open-Fuse Lockout

The Open-Fuse Lockout, shown in Figure 6, is supplied on integrally fused breakers or when the breaker 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.

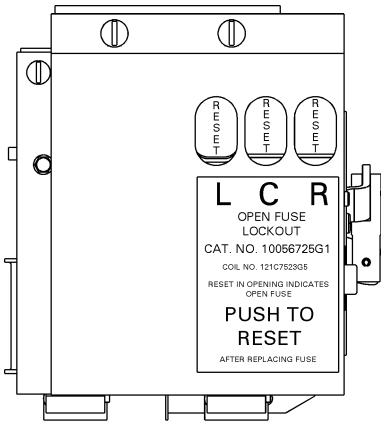


Figure 6. Open-Fuse Lockout accessory.

Operation

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 and trips the breaker. An indicator shows which fuse has blown. The breaker is mechanically trip-free and cannot

be reclosed until the blown fuse is replaced and the Open-Fuse Lockout is reset.

The Open-Fuse Lockout is internally wired to the fuses on 800- and 1600-ampere frame breakers. On 2000-ampere frame breakers, the Open-Fuse Lockout is wired to the secondary disconnect as illustrated in *Figure 7*. The Open-Fuse Lockout connects to the fuses in a Fuse Rollout Element through the secondary disconnect.

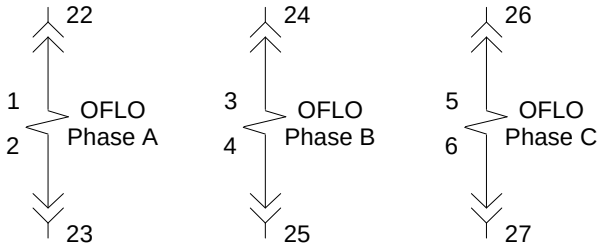


Figure 7. Open-Fuse Lockout (OFLO) connections to the secondary disconnect for EGF-20 breakers.

4.5 Bell Alarm with Lockout

The Bell Alarm with Lockout prevents closing of the breaker after a protection trip until the Bell Alarm with Lockout is reset. It contains a set of switch contacts to remotely indicate that the circuit breaker has tripped because of a protection trip. Catalog numbers for the Bell Alarm with Lockout module and kit are given in Table 6. For installation instructions and trouble-shooting, see DEH238.

Kit Catalog Number	Module Catalog Number
EGBLALMSFKIT	EGBLALMRPLC

Table 6. Catalog numbers for the Bell Alarm with Lockout module and kit.

Operation

The Bell Alarm with Lockout prevents reclosing of the breaker after a trip until it is reset. The accessory is activated and its status circuit changes state whenever the breaker is tripped by an overcurrent, ground fault, or protective relay function via the EntelliGuard Messenger™. The EntelliGuard Messenger continuously monitors the state of the status circuit. The connections of the Bell Alarm with Lockout to the secondary disconnect are illustrated in Figure 8. A trip caused by the manual OPEN button or by the Shunt Trip does not activate the Bell Alarm with Lockout.

The Bell Alarm with Lockout can be reset by manually depressing the yellow target/RESET button on the breaker escutcheon. This will return the Bell Alarm with Lockout status contact to its normal configuration and allow the breaker to be closed.

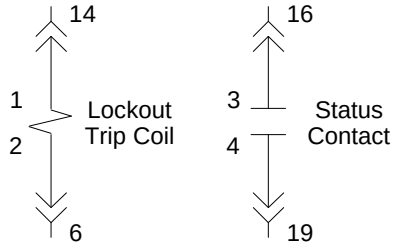


Figure 8. Bell Alarm with Lockout connections to the secondary disconnect. The contact is shown in the RESET state.

4.6 Network Interlock

The Network Interlock provides a means of locking out a breaker 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 able to close either remotely or locally. The Network Interlock contains a set of switch contacts to remotely indicate the state of the lockout and, thus, whether or not the breaker can be closed. Catalog numbers and the operating voltage for the Network Interlock are listed in Table 7. For installation instructions and trouble-shooting, see DEH41119. The Network Interlock accessory is only available on electrically operated breakers.

Kit Catalog Number	Module Catalog Number	Voltage Rating
EGNTWKSFKIT	EGNTWKSFRPLC	120 Vac, 60 Hz

Table 7. Catalog numbers and operating voltage for the Network Interlock accessory.

Operation

The Network Interlock consists of a set circuit, a reset circuit, and a status circuit. The device connections to the secondary disconnect are shown in Figure 9. Note that a Bell Alarm with Lockout and a Network Interlock cannot be installed concurrently in a breaker.

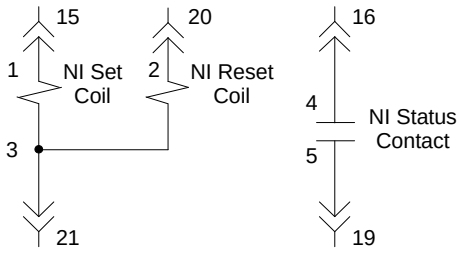


Figure 9. Network Interlock connections to the secondary disconnect.

4.7 Hidden Close Button

The Hidden Close Button is an unmarked replacement for the normal CLOSE button. Hidden Close Buttons are provided on all breakers with Network Interlock accessories. Pressing the Hidden Close Button in the normal manner will not close the breaker. The catalog number is WPHIDONKIT1. For installation instructions see DEH187.

Operation

Charge the breaker closing spring, then insert the end of a stiff rod, with maximum diameter of 0.1 inch, through the hole in the center of the Hidden Close Button, as illustrated in Figure 10. When the rod engages the mechanism, light pressure on the rod will close the breaker mechanism. The Hidden Close Button is double-insulated from the current-carrying parts of the breaker.

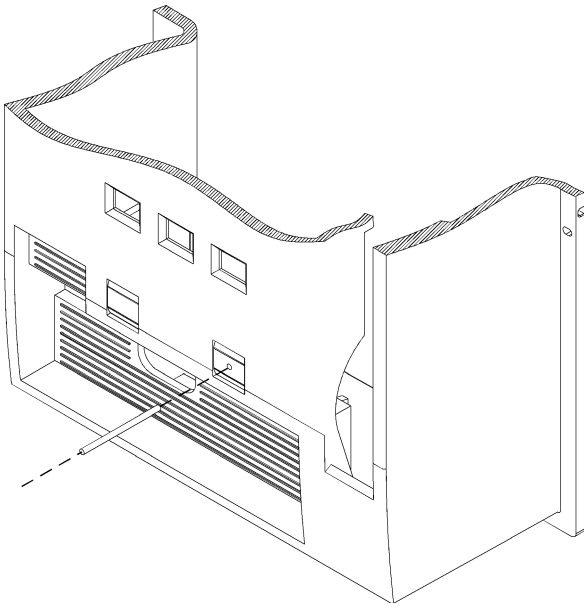


Figure 10. Operation of the Hidden Close Button.

5.1 Inspection

The circuit breaker should be inspected at least once every two years. More-frequent inspections are recommended when the breaker is employed under unfavorable conditions such as severe load, dust, moisture, a large number of operations, or if the vital nature of the load warrants it.

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

WARNING: Before inspecting the breaker, disconnect it from all voltage sources.

AVERTISSEMENT: Débrancher le disjoncteur de toutes sources de courant avant de l'inspecter.

The following checks should be made with the breaker drawn out to the TEST position.

1. Manually operate the breaker several times, checking for obstructions or excessive friction.
   - To charge the mechanism springs, pull the operating handle down until it stops (about 90°) five or six times. The charge indicator will show CHARGED on a yellow background.
   - Depress the ON button on the front of the breaker. The springs should discharge and, if the latch is properly reset, the breaker will close.
2. Check electrical operation of all installed accessories and the motor-charge system, if so equipped.
3. Remove the arc chutes, then inspect the arc chutes and contacts for breakage or excessive burning. For the proper procedure for removing and reinstalling the arc chutes, see DEH203.
4. Check insulating parts for evidence of overheating and for cracks that may indicate thermal aging.

5.2 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.

5.3 Maintenance Publications

See DEH203 for detailed maintenance procedures and DEF004 for available renewal parts.

Notes

g

GE Consumer & Industrial

General Electric Company
41 Woodford Avenue, Plainville, CT 06062

DEH201 R02 1005