



Record Plus™ Molded Case Circuit Breaker Accessories

Cable Operating Mechanism

Congratulations and thank you for choosing the **Record Plus™** family of current-limiting circuit breakers. This UL-listed handle operating mechanism kits and cables are suitable for use with the FC and FE circuit breaker series.

Record Plus™ circuit breakers are designed with a full line of integrated accessories. All units use the latest in integrated modular circuit breaker technology for flexibility in application and maximizing the product's utilization and capabilities.

Record Plus™ circuit breakers are listed by Underwriters Laboratories to the UL489 standard and the CSA Standard C22.2, No. 5. These circuit breakers are certified to EN 60947-2.

These accessories are also for use with our MAG-BREAK® motor circuit protectors, which meet the same standards and are UL-recognized components for use in motor applications. They can also be used with our molded case switches, which are listed per Underwriters Laboratories to the UL489 standard.

Record Plus™ circuit breakers and their accessories are designed and manufactured to exceed our global customers' high standards for reliability and quality.



Warning: DANGER of electrical shock or injury. Ensure ALL electrical power supplies are **OFF** before installing or removing any devices. Do not remove circuit protective devices until the power is turned **OFF**. The breaker, trip unit, or accessories **MUST ONLY** be installed and serviced by **QUALIFIED** personnel. See NEMA publication AB4.

Avertissement: Danger contre les risques d'électrocutions. S'assurer avant **TOUTES** manipulations du disjoncteur que les différentes sources d'alimentation sont en position **OFF**. Les disjoncteurs, unités de protection, ou accessoires doivent être installés par des personnes qualifiées et habilitées. Ne pas retirer l'appareil de protection avant que l'alimentation soit coupée. Lire NEMA publication AB4.

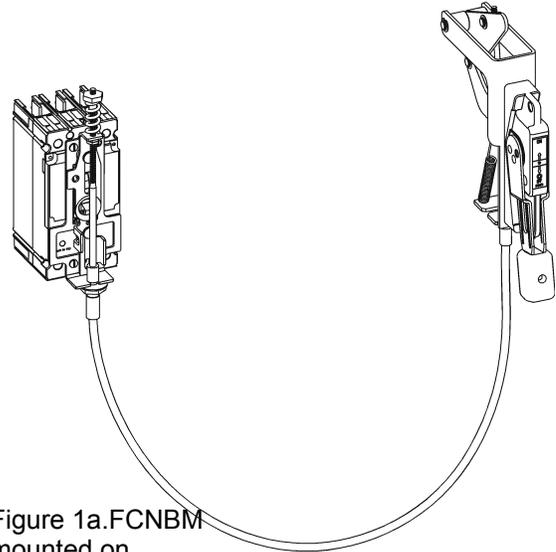


Figure 1a. FCNBM mounted on FC circuit breaker

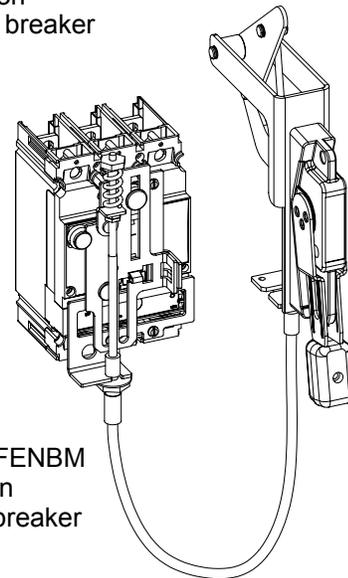


Figure 1b. FENBM mounted on FE circuit breaker

Figure 1. Cable operating mechanism mounted on **Record Plus™** circuit breakers.



CAUTION: This product is **NOT** suitable for use in equipment not specifically design to accept it. Contact the equipment manufacturer for possible equipment modifications.

ATTENTION: Cet appareil n' doit pas être employé dans un équipement non spécialement adapté à cet effet. Contactez le constructeur concernant les possibles modifications à apporter à l'équipement.

Product Description

GE Cable Operating Mechanisms, illustrated in Figure 1, are suitable for application with GE circuit breakers mounted in a wide variety of flanged enclosure types and sizes. The catalog numbers and appropriate applications for the available handle operating mechanisms, breaker operating mechanisms, and cables are listed in Table 1.

Flange-mounted handle assemblies are available for NEMA Type 1, 3R, 12, or 13 enclosures in either 6-inch (model FCNHM1) or 10-inch handle lengths (model FCNHM2). Corresponding assemblies, FCNHM3 and FCNHM4, are available for NEMA Type 4/4X enclosures. Handle assemblies are suitable for either left- or right-flange operation.

The handle assembly is combined with one of eight operating cables, with lengths from 3 to 10 feet, to cover a broad range of breaker mounting locations in the enclosure. The cable links the handle assembly to the breaker-mounted operating mechanism and transmits the mechanical force and motion of the handle mechanism to the breaker-mounted mechanism. The force and motion are transmitted independent of the breaker mounting plane or location relative to the location of the handle assembly, provided only that the bending radius of the cable is no less than 3 inches. No mounting reinforcement of the breaker or enclosure flange is required.

The breaker operating mechanism mounts directly to the face of the breaker and does not involve any mounting interface with the enclosure. Standard breaker mounting screws for tapped holes are furnished with each mechanism to mount the breaker in the enclosure.

Installation of the handle assembly onto the enclosure flange can be performed independently from installation of the breaker operating mechanism onto the circuit breaker and from installation of the circuit breaker in the enclosure. First, install the breaker into the enclosure, and then mount the breaker operating mechanism on the breaker and the handle operating mechanism to the enclosure. Install the cable between the handle assembly and the breaker mechanism as the final step.

Circuit Breaker Type	Handle Operating Mechanism		Breaker Operating Mechanism	Operating Cable
	NEMA 1, 3R, 12, 13	NEMA 4/4X		
FC100	FCNHM1	FCNHM3	FCNBM	SC3L to SC10L
FE250			FENBM	
FG600	FCNHM2	FCNHM4	FGNBM	

Table 1. Catalog numbers of the cable operating mechanism components covered by these instructions.

Step 1 – Unpack and Inspect

Unpack the cable operator components and inspect for damage. Verify that all parts are supplied, as listed in Table 2, Table 3, and Table 4. Note that the numbers in brackets in the following figures and installation instructions refer to the item numbers in these tables.

Check Table 4 to verify that the handle assembly, cable, and breaker operating mechanism you have are correct for the job. Check Figure 2 and Table 5 to ensure that the cable is long enough to reach the breaker and that the 3-inch minimum bending radius requirement is not violated.

Item	Description		QTY
	FCNBM	FENBM	
1	Mechanism	Mechanism	1
2	Screw, #8-32 x 2.81"	Screw, #10-32 X 3.15"	4
3	Screw, #8-32 x 0.312"	Screw, #10-32 x 0.50"	4

Table 2. Parts included in the breaker operating mechanism kits.

Item	Description	Qty.
4	Handle assembly	1
5	O-ring	1
6	Cable adapter assembly	1
7	Screw, 1/4-20 x 5/8"	2
8	Lock washer, 1/4"	2
9	Interlock blade	1
10	SEMS screws, #8-32 x 3/8"	6
11	Connecting pin	1
12	Retaining ring	1
13	Spring	1
14	Interlock bracket	1
15	Interlock hook	1

Table 3. Parts included in the handle mechanism kits.

Item	Description	Qty.
16	Cable assembly	1
17	Hex nut, 7/16-20	2
18	Lock washer, 7/16"	2
19	Cable guide pin	1
20	Retaining ring	1
21	Hex nut, #10-32	2
22	Spring	1
23	Spring retainer	1

Table 4. Parts included in the cable kits.

Step 2 – Install the Breaker Operating Mechanism

This procedure is illustrated in Figure 2, Figure 3, and Figure 4a and 4b.

1. In coordination with the intended location of the handle operating mechanism, select the mounting location for the breaker. Figure 2 illustrates the zone in which the breaker can be mounted to meet the cable-bending requirement and Table 5 lists the maximum dimensions for various enclosure depths, mounting locations, and cable lengths. To determine maximum mounting dimensions for 60-inch through 120-inch-long operating cables, add the respective additional lengths to the 48-inch cable maximum dimensions. (For example, add 12 inches to E, F, and G dimensions for a 60-inch cable length.) When the cable is installed, the minimum permissible cable bend radius is 3 inches. This requirement must be met to ensure a safe operating environment.
2. Drill and tap the mounting holes for the breaker according to the pattern shown in Figure 3. The dimensions and hole sizes are listed in Table 6.
3. Mount the breaker to the enclosure using the four screws [2] (as per table 1) supplied with the breaker operating mechanism and tighten the screws to torque given as per Table 8.
4. Place the breaker operating mechanism [1] over the breaker, with the breaker operating handle extending through the slot in the mechanism slider, as shown in Figure 4a and 4b. Secure the mechanism to the breaker with the four screws [3] supplied (as per Table 1). Tighten the screws to torque given as per Table 8. These screws mount into the tapped holes in the heads of the breaker mounting screws [2] installed in the previous step.

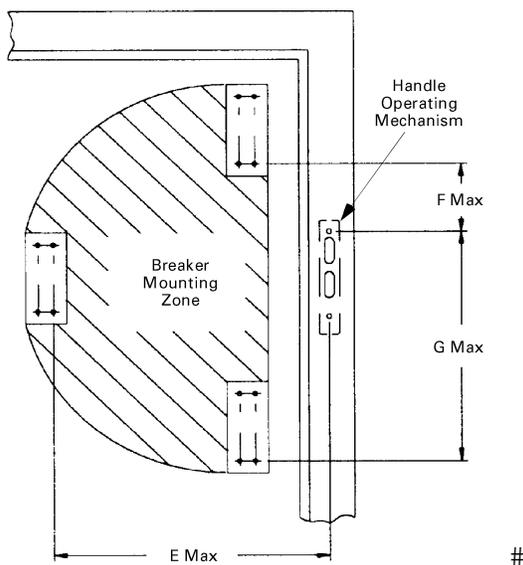


Figure 2. Circuit breaker mounting zone dimensions.

Enclosure Depth, in.	36-Inch Cable (SC3L)			48-Inch Cable (SC4L)		
	E	F	G	E	F	G
8	13.5 (343)	4.0 (102)	15.0 (381)	25.5 (648)	16.0 (406)	27.0 (686)
10	13.0 (330)	5.0 (127)	14.8 (376)	25.0 (635)	17.0 (432)	26.8 (681)
12	12.8 (325)	6.0 (152)	14.5 (368)	24.8 (630)	17.0 (432)	26.5 (673)
16	10.5 (267)	4.5 (114)	14.2 (361)	22.5 (572)	16.5 (419)	26.2 (665)
18	8.5 (216)	3.5 (89)	12.6 (320)	20.5 (521)	15.5 (394)	24.6 (625)
20	—	0.5 (13)	10.0 (254)	22.0 (559)	15.0 (381)	24.0 (610)
24	—	—	—	19.5 (495)	14.0 (356)	22.0 (559)

Table 5. Maximum lengths in inches (mm) for dimensions illustrated in Figure 2.

Breaker Frame	Dimension, in. (mm)				Mounting Screw
	A	B	C	D	
FC100	1.0 (25.4)	4.98 (126.5)	0.69 (17.5)	6.36 (161.5)	#8-32
FE250	1.38 (35.0)	4.94 (125.5)	0.87 (22.0)	6.69 (170.0)	#10-32
FG600	1.77 (45.0)	7.87 (198.1)	1.22 (31.0)	10.31 (261.9)	#12-24

Table 6. Dimensions for breaker mounting hole pattern, shown in Figure 3.

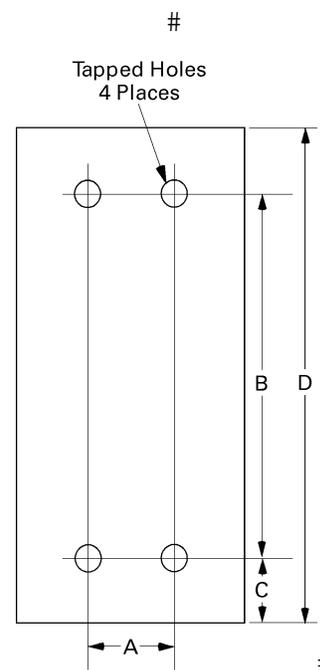


Figure 3. Breaker mounting hole pattern.

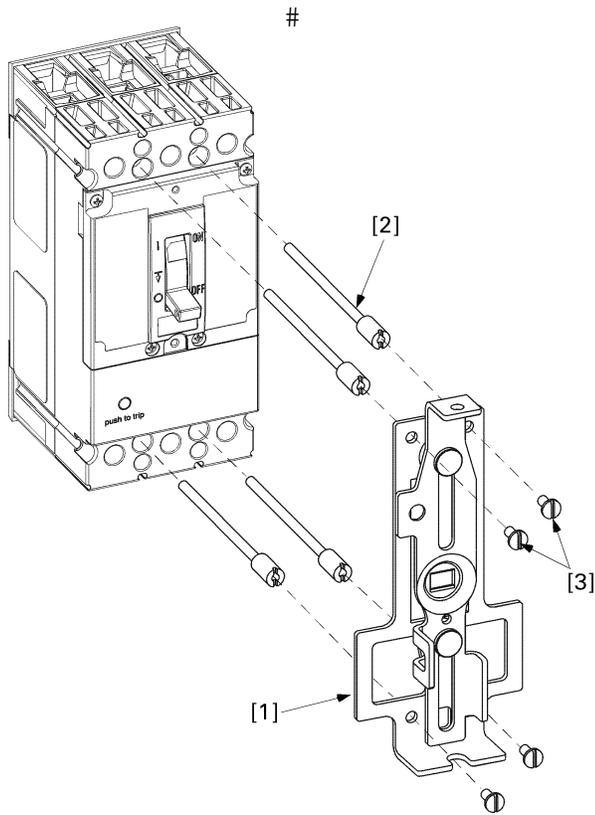


Figure 4a. Installing the circuit breaker operating mechanism on the FC breaker.

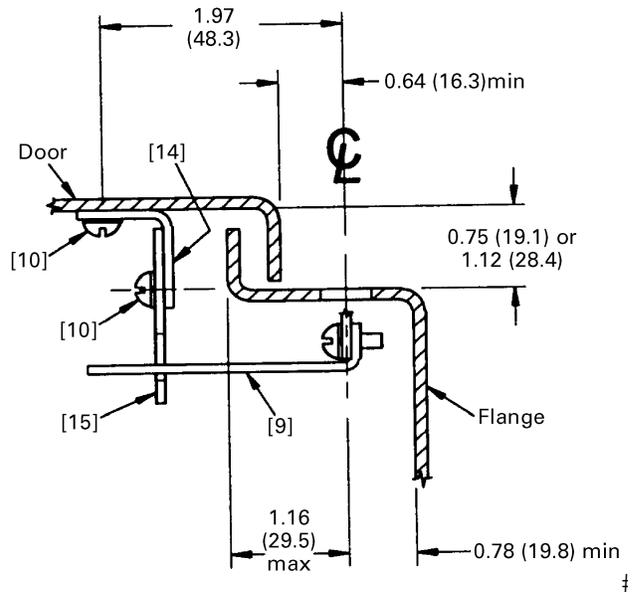


Figure 5. End view of flange and door (right end shown).

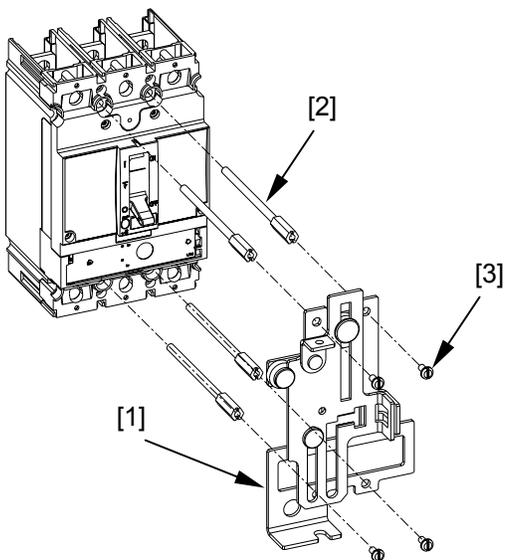


Figure 4b. Installing the circuit breaker operating mechanism on FE breaker.

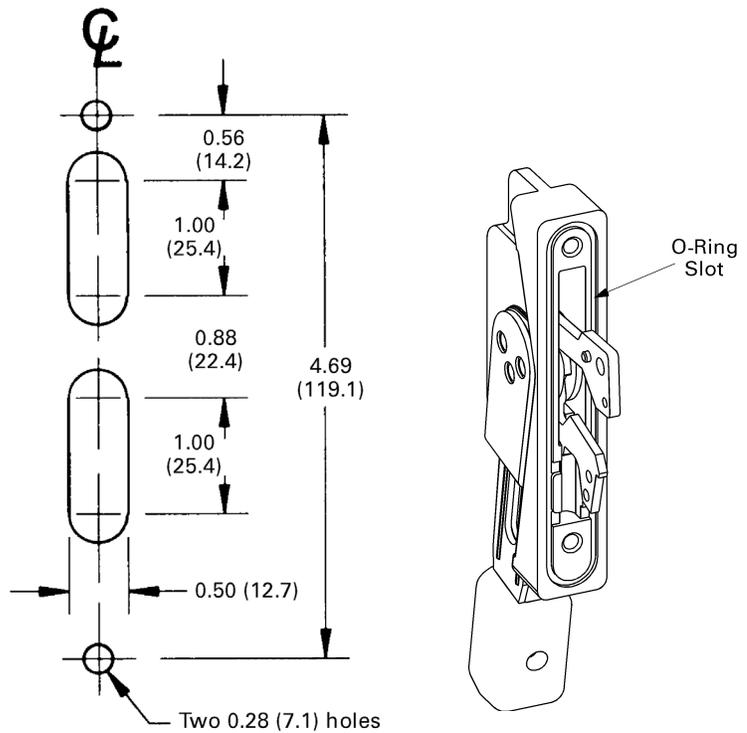


Figure 6. Handle mechanism mounting hole pattern.

Figure 7. Underside of handle, showing the O-ring slot.

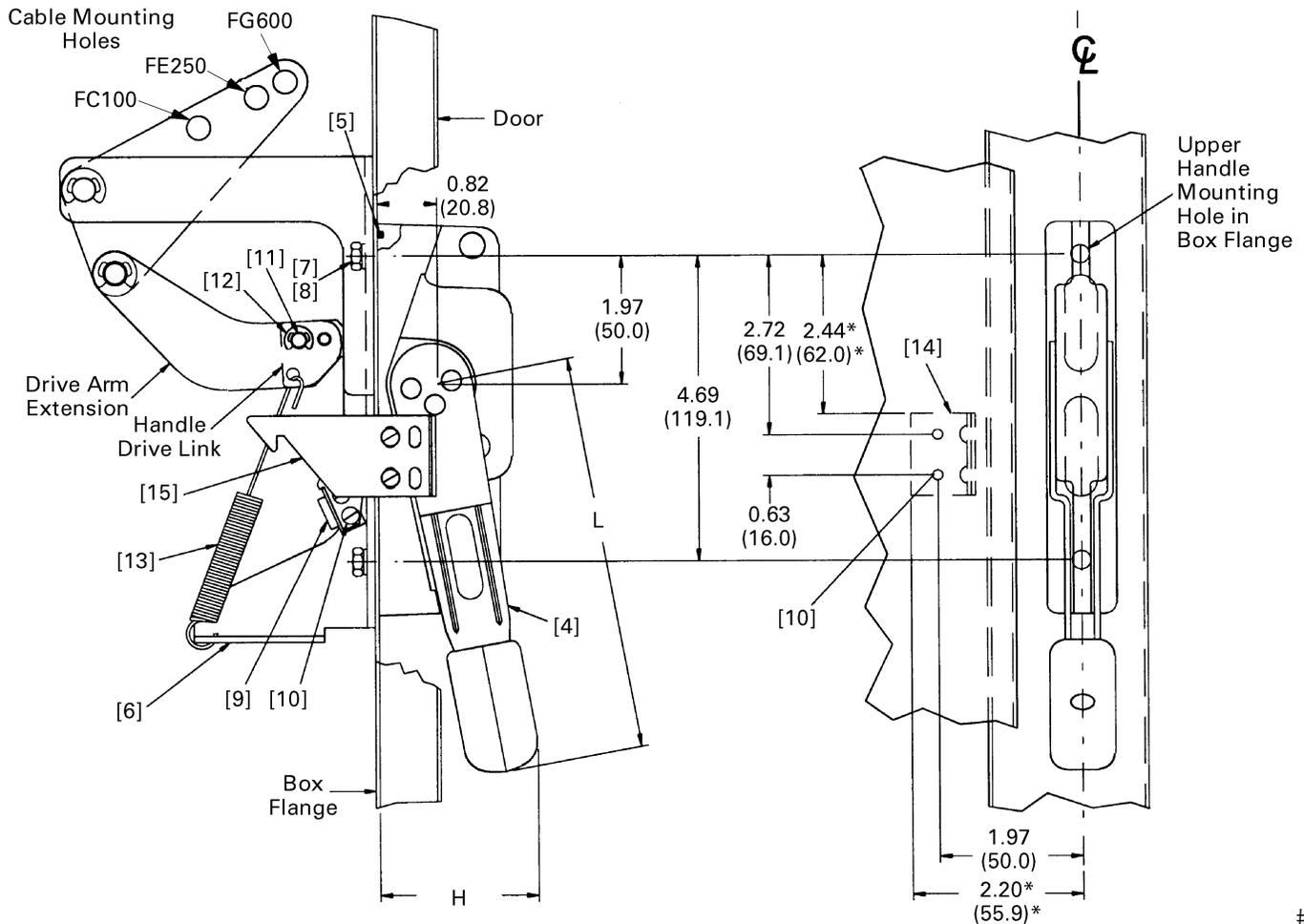


Figure 8. Handle mechanism installation.

Handle	L, in. (mm)	H, in. (mm)
FCNHM1 / FCNHM3	6.04 (153.4)	2.38 (60.5)
FCNHM2 / FCNHM4	9.38 (238.3)	3.00 (76.2)

Table 7. Handle dimensions shown in Figure 8.

Screw Size	Torque	
	lb-in	N-m
#8-32	16 to 20	1.8 to 2.25
#10-32	27 to 32	3.0 to 3.6
#1/4-20	40 to 50	4.5 to 5.6

Table 8. Tightening torque details.

Step 3 – Install the Handle Operating Mechanism

This procedure is illustrated in Figure 2, Figure 5, Figure 6, Figure 7, and Figure 8. The handle dimensions, as shown in Figure 8, are listed in Table 7.

1. In coordination with the location of the breaker, select the mounting location for the handle operating mechanism on the flange of the enclosure. The handle can be mounted on either the right or the left side of the enclosure.
2. If the enclosure flange does not have handle mounting holes and slots, drill these as shown in Figure 5 and Figure 6.
3. Position the O-ring [5] in the groove in the handle, as shown in Figure . Assemble the handle [4] and the cable adapter assembly [6] to the flange of the enclosure with two 1/4-20 x 5/8" screws [7] and lock washers [8]. Tighten the screws to torque given as per Table 8.
4. Attach the interlock blade [9] to the handle with two #8-32 SEMS screws [10], as shown in Figure 5.

5. Attach the drive arm mechanism to the handle drive link with the connecting pin [11]. Secure with a retaining ring [12], as shown in Figure 8.
6. Attach one end of the handle-return spring [13] to the holes in the drive link and the drive arm extension. Attach the other end to the hole in the lower flange of the cable adapter assembly.
7. Drill and tap two #8-32 holes in the door, as shown in Figure 5 and Figure 8. Attach the interlock bracket [14] to the door with two #8-32 SEMS screws [10] from inside the door. Alternatively, the bracket may be welded to the cover, using the dimensions noted with an asterisk in Figure 8, to locate the upper left corner of the bracket.
8. Attach the interlock hook [15] to the interlock bracket [14] with two #8-32 SEMS screws [10]. Use the lower set of holes in the hook for a door with a $3/4$ " turned edge (as shown) or the upper set of holes if the door has a $1 1/8$ " turned edge.
9. With the handle in the OFF position, attempt to close the door. If the interlock blade interferes with the interlock hook *DO NOT* force the door closed. Loosen the two #8-32 screws [10] and move the interlock hook upward. The door should close without interference. Try to turn the handle ON; if the handle turns ON, loosen the two #8-32 screws [10], secure the interlock hook, and move the hook toward the bottom of the enclosure to provide more depression of the interlock blade, thus preventing the handle from engaging.
10. As the handle is moved to the ON position, the interlock hook should engage the interlock blade, preventing the door from opening unless the handle interlock is manually disengaged by rotating the interlock defeat button on the handle clockwise with a flat-bladed screwdriver [4]. If the door can be opened with the handle in the ON position without having to defeat the interlock blade, readjust the interlock hook downward and repeat steps 9 and 10.
11. Turn the handle to the OFF position. You should be able to open the door. Note that if a vault-type interlock (GE cat. no. TDVI) or a similar assembly has been installed, the door hardware must first be defeated.

Step 4 – Install the Cable

Use the following procedure to install one end of the operating cable to the operating handle, then the other end to the breaker operating mechanism. This procedure is illustrated in Figure 9.

1. Slide a $7/16$ -20 hex nut [17] and lock washer [18] over the end of the cable with the #10-32 x $7/8$ " thread. Screw the nut onto the threaded cable shank past the groove in the middle of the shank.
2. Screw the cable guide pin [19] onto the same end of the cable as in step 1. Do not tighten.
3. Place the flange-mounted operating handle [4] in the OFF position. Position the cable behind the drive arm linkage, with the groove on the threaded shank placed into the slot in the bottom of the cable operator assembly [6]. Tighten the $7/16$ -20 nut [17] against the cable operator assembly until it is snug.
4. Insert the cable guide pin [19] on the end of the cable into the appropriate mounting hole on the drive arm. Snap the retaining ring [20] into the groove in the guide pin [19].
5. Slide a $7/16$ -20 hex nut [17] and lock washer [18] over the end of the cable with the #10-32 x 3 " thread. Screw the nut onto the threaded cable shank past the groove in the middle of the shank.
6. Screw two #10-32 hex nuts [21] approximately $2 3/4$ " onto the end of the cable. Insert the end of the cable through the upper end of the slider on the breaker operating mechanism [1].
7. Insert the groove in the threaded cable shank into the slot on the bottom of the breaker operating mechanism [1]. Tighten the $7/16$ -20 hex nut [17] until it is snug.
8. Verify that the power to the circuit breaker is OFF. Move the cable-operating handle [4] to the ON position. Move the two #10-32 hex nuts up on the cable shaft against the slider bracket.
9. Move the cable-operating handle [4] to RESET the breaker and place the spring [22] over the cable end at the breaker. Press the slider of breaker operating mechanism [1] down and thread the spring retainer [23] over the end of the cable. Tighten the spring retainer [23] until the breaker handle is moved to RESRT position. The installed height of the spring [22] is $1 7/16$ ".
10. Move the cable-operating handle [4] ON and then OFF. If the breaker does not turn ON, then, with the handle in the OFF position, adjust the #10-32 hex nuts away from the slider bracket. Move the operating handle [4] to the ON position, and then repeat the adjustment, as needed, until the breaker turns ON. Readjust the spring installed height to $1 7/16$ " with the cable operating handle [4] ON.

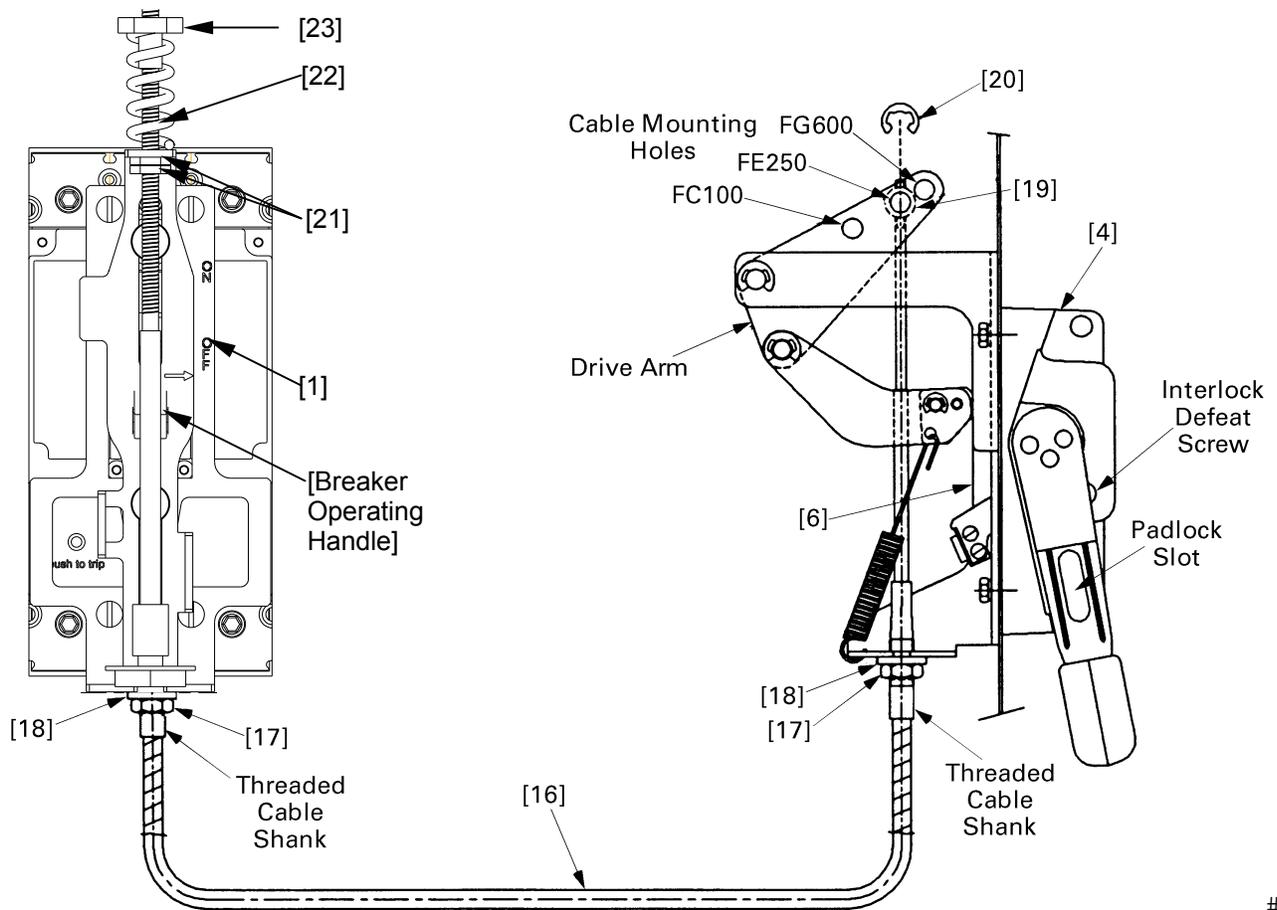


Figure 9a. Installing the operating cable between the handle assembly and the breaker operating mechanism

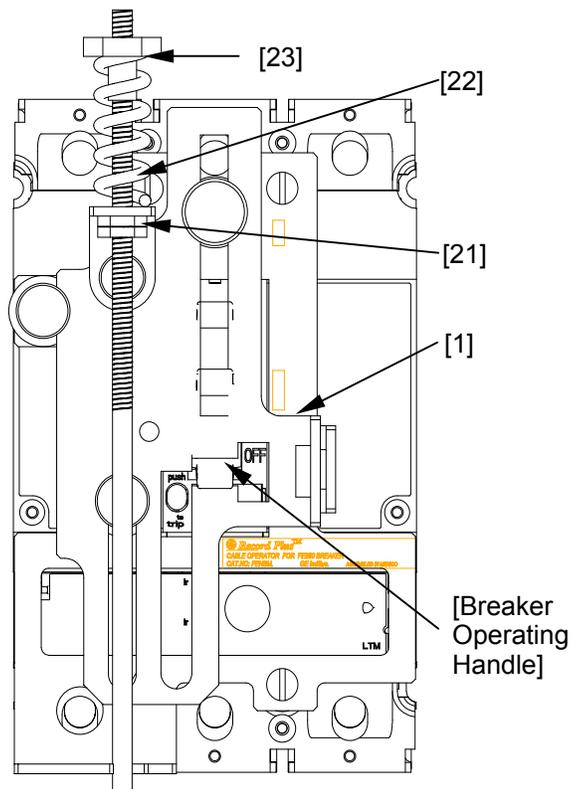


Figure 9b. Installing the operating cable on FE breaker operating mechanism

Step 5 – Operation

Normal Operation

Move the handle to the ON position to close the breaker or to the OFF position to open the breaker.

Reset the Breaker after a Trip

To reset the breaker after a trip, move the handle beyond OFF position and then back ON.

Handle Padlock

When the handle is in the OFF / RESET position, it can be padlocked to prevent the handle's being moved to the ON position to close the breaker. Insert the shank of a padlock through the slot in the handle, shown in Figure 9 and Figure 10, and the corresponding hole in the handle support.

Door Interlock

When the breaker is turned ON with the handle operator, the interlock blade [9] normally engages the interlock hook [15] to prevent the enclosure door from opening. If it is necessary to open the door with the breaker ON, turn the interlock defeat screw, shown in Figure 10, counterclockwise to move the interlock blade out of the way of the interlock hook, which allows the door to be opened.

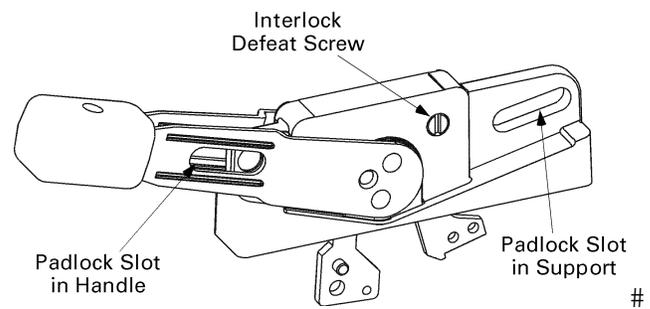


Figure 10. Handle in ON position, showing the interlock defeat screw and the padlock slots.

These instructions do not cover all details or variations in equipment nor do they provide for every possible contingency that may be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise that are not covered sufficiently for the purchaser's purposes, the matter should be referred to the GE Company. The circuit breaker is a sealed unit that contains no user-serviceable parts. Tampering with the seal will void the warranty.



GE Consumer & Industrial

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