Instructions for Type LBF Indoor Interrupter Switch

I.L. 36-151-1

1. GENERAL

The type LBF Interrupter Switch is a coordinated 3-pole assembly which combines the function of a disconnect switch with the ability to interrupt load and magnetizing currents. It has also a fault making capacity which enables it to be closed against a short circuit without sustaining significant damage, so that it can subsequently remain in service. Its performance satisfies all requirements of NEMA Standard Specification SG6. The Type LBF Switch differs from a circuit breaker in that it does not have a fault breaking capacity and that its operation is not automatic. The Type LBF Switch is designed for operation in a proper metal enclosure with or without fuses.

CAUTION: It is NOT SAFE to operate the switch outside an enclosure unless equivalent protection has been provided for the operating personnel.

2. DESCRIPTION

The Type LBF Switch is comprised of the following basic components:

2.1 Frame for 3 blade assemblies and operating mechanism.

2.2 Main Blades and Jaws. These are equipped with copper tungsten inserts on the arcing contacts and silver tungsten on the main contacts at the break ends for trouble-free performance at rated momentary and fault making currents.

2.3 Load Interrupter. It consists of an Auxiliary Blade and engaging contact fingers located inside a "De-ion" arc chute. On opening of the switch the main blades open first which shunts the current through the spring loaded auxiliary blades. Further travel of the main blades causes the auxiliary blades to snap out of their contact fingers and arcs are drawn within the "De-ion" arc chutes. Positive arc interruption is accomplished by the de-ionizing action of the arc chutes in combination with the high opening speed of the spring loaded auxiliary blades.

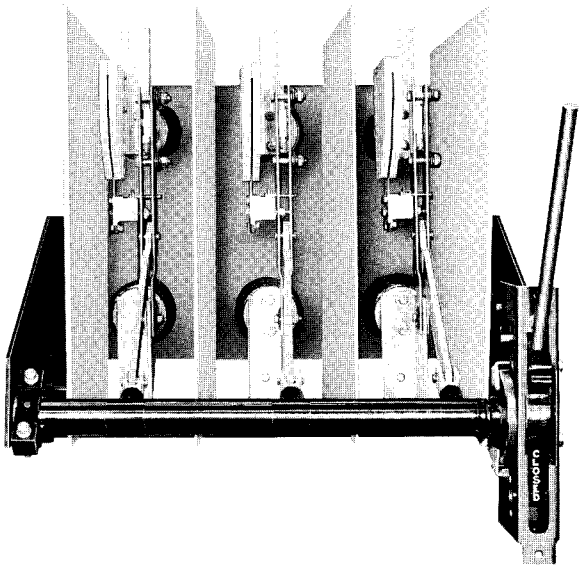
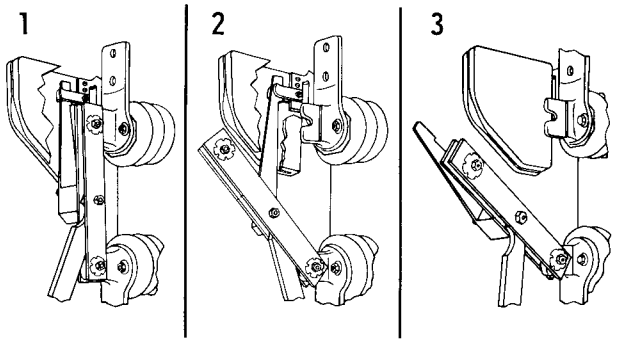


Figure 1

2.4 Operating Mechanism. This contains a set of torsion bars located inside the switch shaft. To close the switch, a removable handle is inserted into the mechanism cam which is rotated through an angle of 120°. This charges the torsion bars. At the end of its stroke, the cam releases a latch and the stored energy of the torsion bars is transferred to the shaft which snaps the switch closed. The mechanism is operated similarly for opening of the switch. This quick make mechanism provides the power to overcome blow-out forces which occur when the switch is closed against a fault. However, these forces are not transmitted to the mechanism cam and operating handle, since these are not rigidly connected with the blades, the torsion bars being the intervening link. Therefore it is SAFE to close the switch under short circuit conditions within its rating.

"De-ion" Quick-break Operation



1: switch closed . . . When the switch is closed, practically all the current flows through the main blade.

2: main blade opens . . . As the main contacts separate, current is transferred momentarily through the quick-break blade, which is held in the arc chute by high pressure contact fingers.

3: quick-break blade opens . . . The main blade opens until the stop on the quick-break hinge prevents further angular movement between the main and quick-break blades. This starts the quick-break blade out of the high pressure contacts in the arc chamber. The combined pull of the torsional spring in the quick-break blade and the operating mechanism torsion bars snaps the quick-break blade into the open position at high speed. The heat of the arc, meanwhile, releases a blast of de-ionizing gas from the gas-generating material of the arc chamber. This combination of quick-break and De-ion action quickly extinguishes the arc and the arc and the circuit is safely de-energized.

Figure 2

2.5 Ratings - NEMA - Approved

Nominal Voltage Rating KV	4.8	7.2	13.8
Continuous Current Amperes (1)	1200	1200	1200
Interrupting Current Amperes (2)	600/1200	600/1200	600/1200
Momentary Current Amperes (1) (Switch Closed)	61,000	61,000	61,000
Fault Current Closing Amperes (1) (Maximum rms Total Current Including D-c Component)	61,000	40,000	40,000
Impulse Withstand, KV	60	75	90

(1) Switch in all 3 voltage ratings can be supplied with continuous current rating of 600 Amperes, fault current closing of 27,500 Amperes, and Momentary rating of 40,000 Amperes.

(2) Standard switch supplied with 600 Ampere interrupting capability only. Specify 1200 Ampere Arc chute when required.

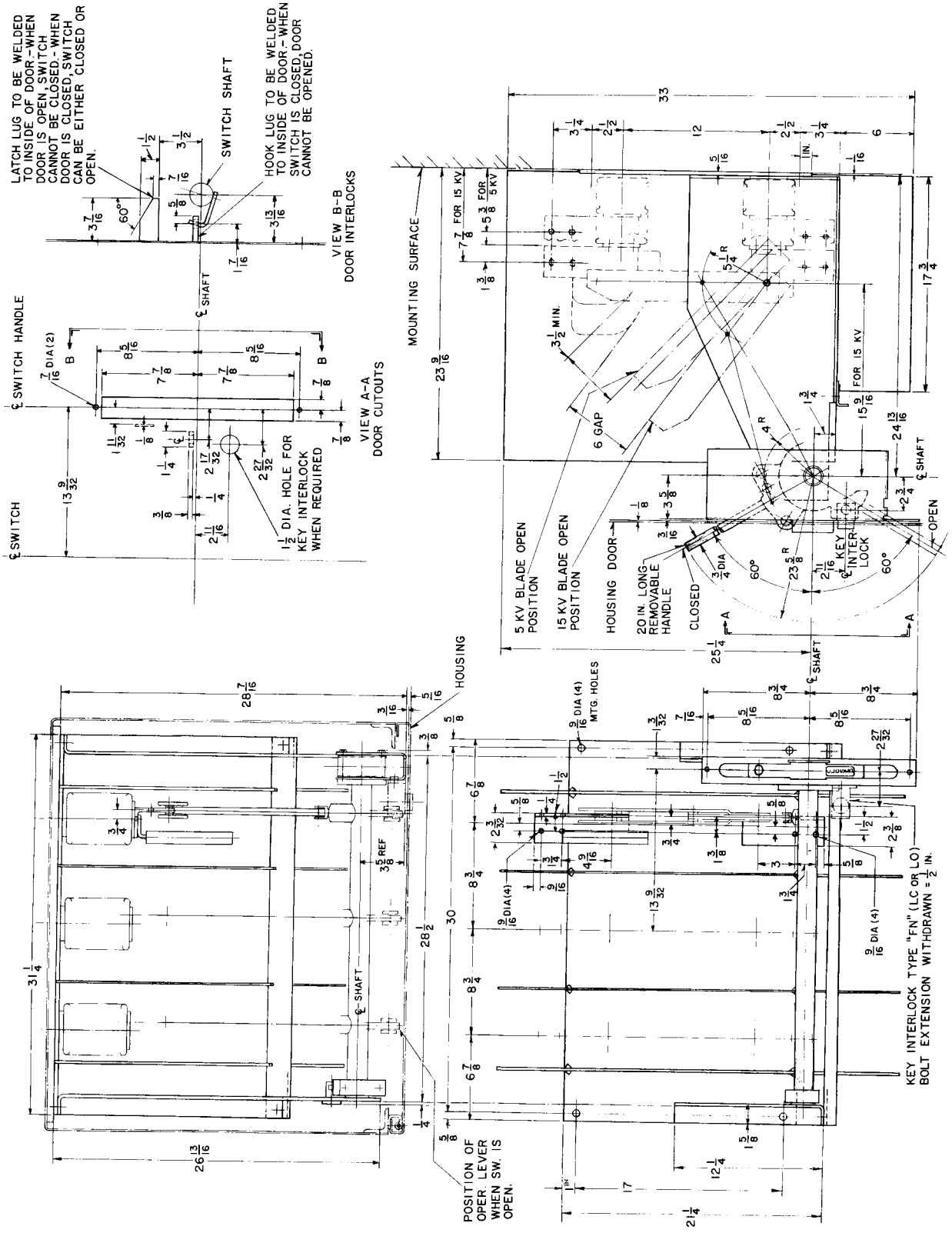


Figure 4 - Typical Outline LBF Switch

DO NOT USE FOR CONSTRUCTION PURPOSES

(b) Upper spacers of main blades should rest approximately 1/16" above the bottom in the depressions of the angular switch jaws.

(c) Latches of operating mechanism should move freely when not engaged.

(d) Hardware must not be loose.

(e) Automatic and non-automatic interlocks should operate correctly.

(f) Arc chute and insulating surfaces should be free from dust.

If the inspection revealed some defects in adjustment, this should be corrected as outlined in paragraph 4.2.

After the switch adjustment has been found (or made) satisfactory, the switch should be closed and opened twice before it is energized.

4. MAINTENANCE

4.1 Inspection Schedule. It is recommended that each switch be inspected after 24 months of service or after approximately 100 rated current interruptions, whichever occurs first. When the current interrupted is smaller than rated, the duty is proportionally lighter and more operations may be allowed before inspection. After the switch has been closed against a fault current, it should be inspected at the first opportunity at which it can be de-energized. Inspections should be conducted as listed in paragraphs 3.5(a) to 3.5(f). In addition, it is desirable to check the following:

(i) In order to ensure adequate blade engagement, the line of contact between the convex silver-tungsten contacts on the main blades and the corresponding contacts on the jaw should be at least 1/8" from the edge of the jaw.

(ii) In order to check adequate auxiliary blade engagement lift latches off the mechanism cam (see Fig. 3) thus defeating the quick-opening action of the torsion bars. Open switch slowly. The auxiliary blades should remain engaged in their contact fingers while the main blades open. When the main blades hit the stop on the auxiliary blades, this starts the latter out of their contact fingers. The auxiliary blades will then snap open from the forces in their charged torsional coil springs.

(iii) Check main blade contact pieces and the leading edges of the auxiliary blades for arc erosion.

(iv) Close and open the de-energized switch two or three times to check the performance of the operating mechanism.

4.2 Preventive Maintenance. Referring to paragraphs 3.5(a) to 3.5(f) and 4.1(i) to 4.1(iv) proceed as follows if defects were observed:

(a) In order to line up main blades, loosen hinge terminal mounting bolts on top of insulator. Adjust blades, then tighten bolts.

In order to line up auxiliary blade, proceed as follows:

Loosen mounting bolts of arc chute assembly at break jaw.

Adjust arc chute opening to be parallel with main blade, then tighten mounting bolts. If necessary, bend the auxiliary blade slightly to move it into line with the arc chute opening.

(b) To prevent bottoming of blade spacer, adjust stop on left end of shaft assembly by adding one or more flat washers under its bolt heads.

If this is not sufficient, disconnect glass-polyster pull-rod from its rod-end, loosen holding nut and turn rod-end deeper into shaft assembly; then tighten nut and re-assemble pull-rod with rod-end.

3. INSTALLATION

3.1 Storage and Handling. These units should remain in their packing cases until ready to install. They should be completely protected from weather, building dirt, cement dust and the like. Reasonable care is necessary when unpacking to prevent damage. All dust and packing material should be cleaned from the interrupting chambers, contacts, and insulators.

When welding, sanding, drilling, filing or sawing operations are performed nearby, the contacts, interrupting chambers, insulators and mechanism parts should be covered and kept clean.

3.2 Mounting. Four holes 9/16" diameter for 1/2" bolts are provided in the base of the frame for mounting of the switch in the enclosure. This enclosure must have a slot in its front door as shown on the template drawing of Fig. 4, to clear the mechanism cam when it is rotated with the removable handle. Note on Fig. 4 the recommended distance of 1/4" between the back of the front door and the front of the switch frame.

3.3 Power Connections. The angular shaped jaw terminals are suitable for connections to flat bus bar runs in two planes i.e., parallel and perpendicular to the switch base.

3.4 Interlocks (See Fig. 4). Each switch is equipped with two automatic interlocks as follows:

A. DOOR INTERLOCK. The switch shaft is equipped with a hook which engages a hasp supplied by the enclosure manufacturer and welded to the back of the enclosure door so that the door cannot be opened when the switch is closed.

B. DOOR OPERATED INTERLOCK. When the enclosure door is opened, a spring biased interlock link is moved into position, blocking rotation of the mechanism cam and preventing the switch from being inadvertently closed while the enclosure door is open.

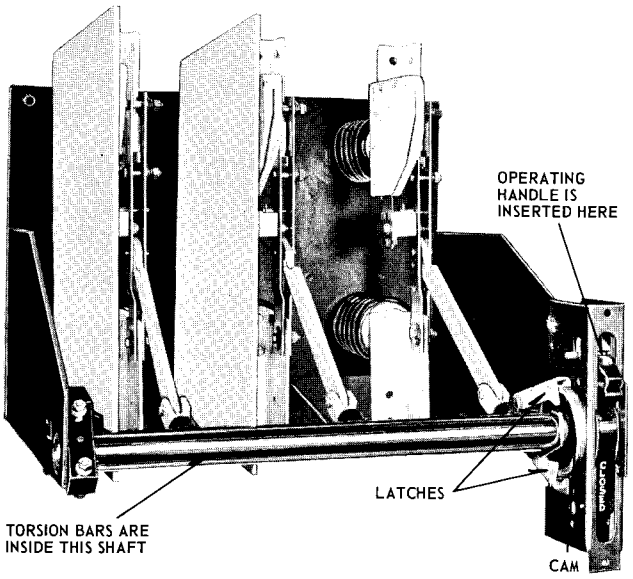


Figure 3

Each switch is also equipped with the following facilities for non-automatic interlocking:

C. PADLOCKING. The mechanism cam has lugs permitting the switch to be padlocked in the open and/or closed positions.

D. KEY INTERLOCKS.

a. A key interlock can be bolted to the handle mounting bracket. The switch can be locked in the open and/or closed positions.

b. Another lock can be provided on the opposite side of the handle mounting frame to lock the switch in its open position.

3.5 Adjustment. Each switch is completely factory adjusted and operated 25 times before shipment. No further adjustment should be necessary. However, in order to ensure that the adjustment has not been affected in transit or during installation, it is recommended that each switch be inspected after installation in the enclosure and before it is put into service as follows:

(a) Main and auxiliary blades should be in proper alignment with jaws and arc chute openings, respectively.

(c) Remove any foreign matter which may have obstructed free operation of latches; make sure latches are not jammed. Replace worn out pins.

(d) Ensure all mounting bolts are tight. Turn hinge bolt fingertight, then turn nut additional 1 revolution to obtain proper pressure of cup washers. Turn bolts on break end of blades fingertight then turn nuts additional 3 revolutions to obtain proper pressure of conical springs.

(e) Adjust enclosure door to ensure proper operation of interlocks.

(f) Inspect arc chute sides and replace them if they are damaged.

(i) Adjust blade engagement as described in paragraph 4.2(b).

(ii) Replace worn or damaged parts of the auxiliary blade assembly. Arc chute must be dismantled in order to examine condition.

(iii) After a fault closing operation it may be necessary to clean up the arcing contacts. This may be done with a few light strokes of a fine file. It is only necessary to remove sharp and high points; no attempts should be made to file out the pit marks. DO NOT USE abrasive material for cleaning.

NOTE: The main current carrying contacts should not be filed. Opening and closing of the switch will clean the contacts.

(iv) If operating mechanism appears defective, disconnect pull-rods from rod-ends, undo and remove bolts mounting the handle bracket on the switch frame then slide the shaft assembly out of the frame. Dismantle, replace damaged parts, then reassemble shaft in frame, tighten bolts, making sure shaft rotates freely in bearings. Completely re-assemble connecting glass-polyester pull-rods to rod-ends. Operate de-energized switch twice to ensure proper operation of all parts before returning switch to service.

Westinghouse Electric Corporation
Assembled Switchgear & Devices Division, East Pittsburgh, Pa. Printed in U.S.A.

Instructions for Type LBF Indoor Interrupter Switch

I. L. 36-151-1A

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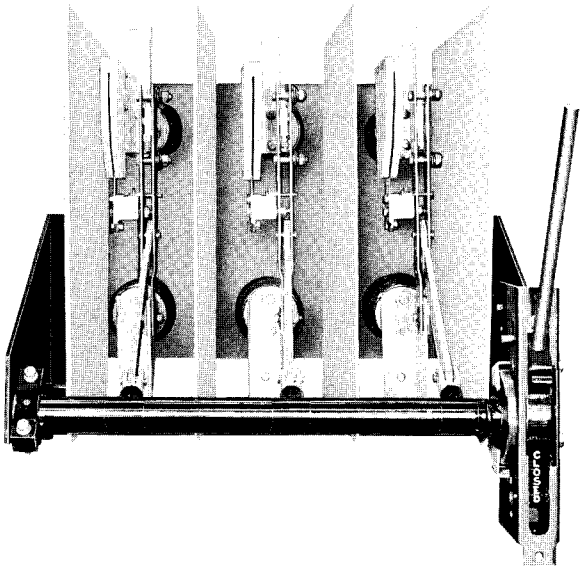
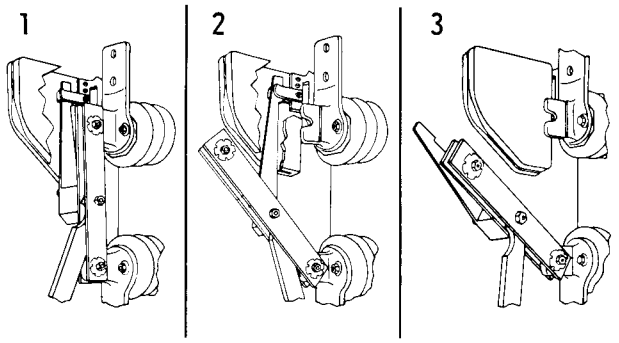


Figure 1

2.4 Operating Mechanism. This contains a set of torsion bars located inside the switch shaft. To close the switch, a removable handle is inserted into the mechanism cam which is rotated through an angle of 120°. This charges the torsion bars. At the end of its stroke, the cam releases a latch and the stored energy of the torsion bars is transferred to the shaft which snaps the switch closed. The mechanism is operated similarly for opening of the switch. This quick make mechanism provides the power to overcome blow-out forces which occur when the switch is closed against a fault. However, these forces are not transmitted to the mechanism cam and operating handle, since these are not rigidly connected with the blades, the torsion bars being the intervening link. Therefore it is SAFE to close the switch under short circuit conditions within its rating.

Effective July, 1969 Supersedes I.L. 36-151-1, dated October 1963.

"De-ion" Quick-break Operation



1: switch closed . . . When the switch is closed, practically all the current flows through the main blade.

2: main blade opens . . . As the main contacts separate, current is transferred momentarily through the quick-break blade, which is held in the arc chute by high pressure contact fingers.

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Figure 2

Para. 2.5 Ratings

Nominal Voltage Rating KV	4.8	7.2	13.8
Continuous Current Amperes ①	600	600	600
Interrupting Current Amperes	600/1200	600/1200	600/1200
Momentary Current Amperes ① (Switch Closed)	40,000	40,000	40,000
Fault Current Closing Amperes ① (Maximum rms Total Current Including D-c Component)	27,500	27,500	27,500
Impulse Withstand, KV	60	75	90

① Switch in all 3 voltage ratings can be supplied with continuous current rating of 1200 Amperes, fault current closing of 27,500 Amperes, and Momentary rating of 61,000 Amperes. Switches supplied with 600 Ampere interrupting capability only.

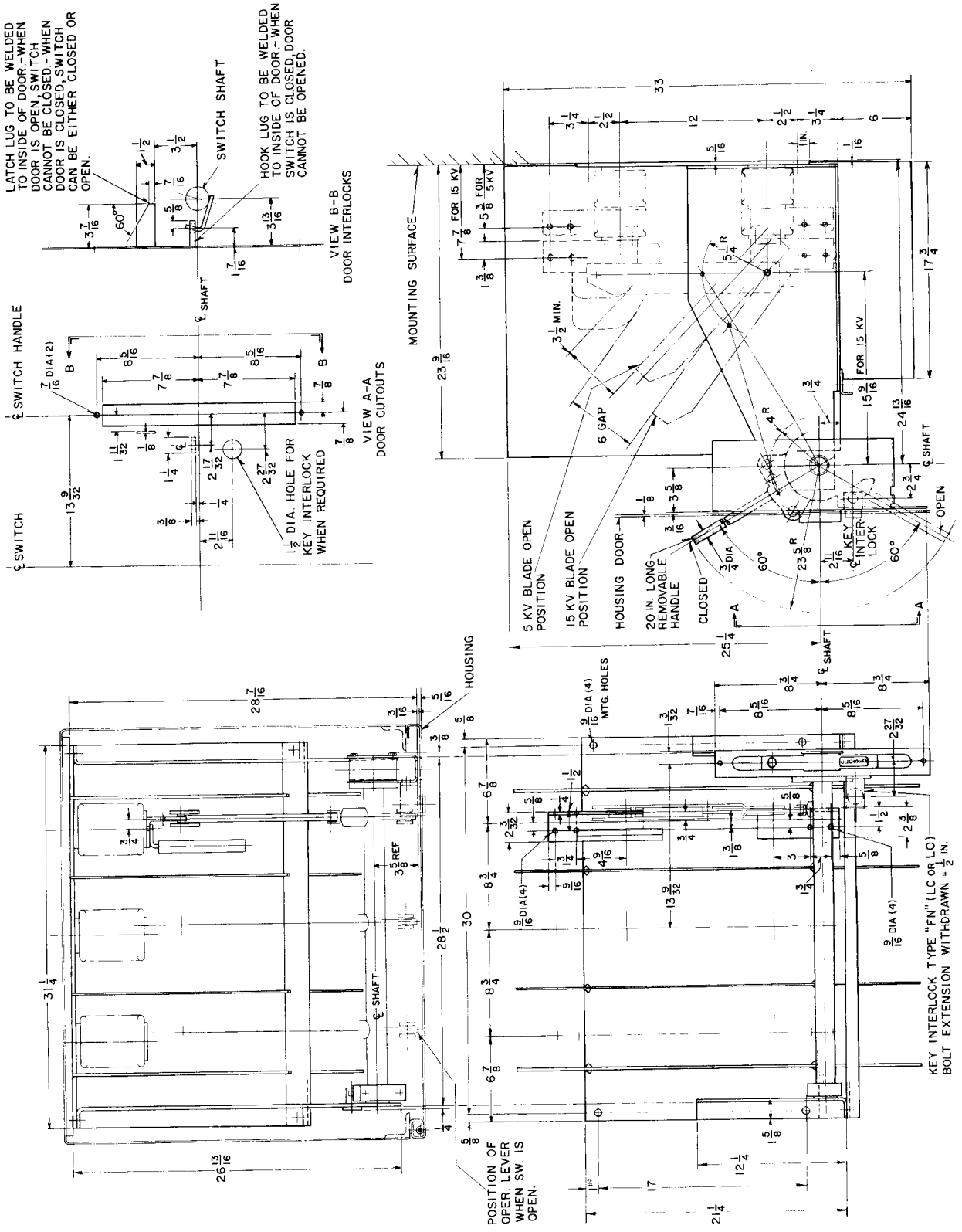

Figure 4 - Typical Outline LBF Switch

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(b) Upper spacers of main blades should rest approximately 1/16" above the bottom in the depressions of the angular switch jaws.

(c) Latches of operating mechanism should move freely when not engaged.

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(e) Automatic and non-automatic interlocks should operate correctly.

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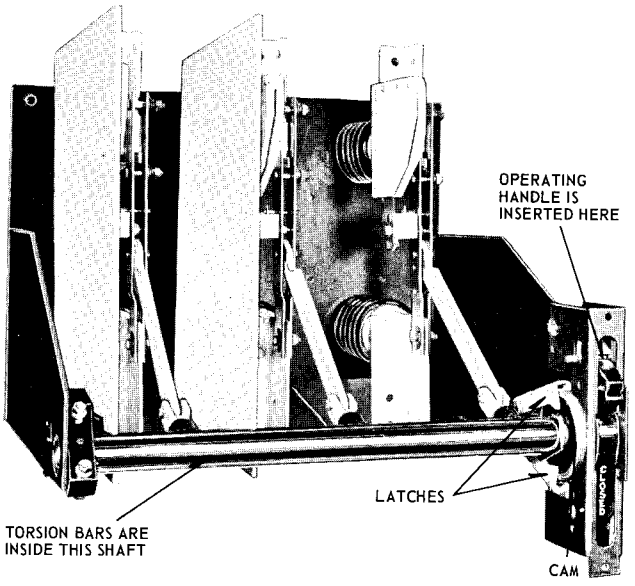

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(e) Adjust enclosure door to ensure proper operation of interlocks.

(f) Inspect arc chute sides and replace them if they are damaged.

(i) Adjust blade engagement as described in paragraph 4.2(b).

(ii) Replace worn or damaged parts of the auxiliary blade assembly. Arc chute must be dismantled in order to examine condition.

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Westinghouse Electric Corporation
Assembled Switchgear & Devices Division, East Pittsburgh, Pa. Printed in U.S.A.

TED SLAVY
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