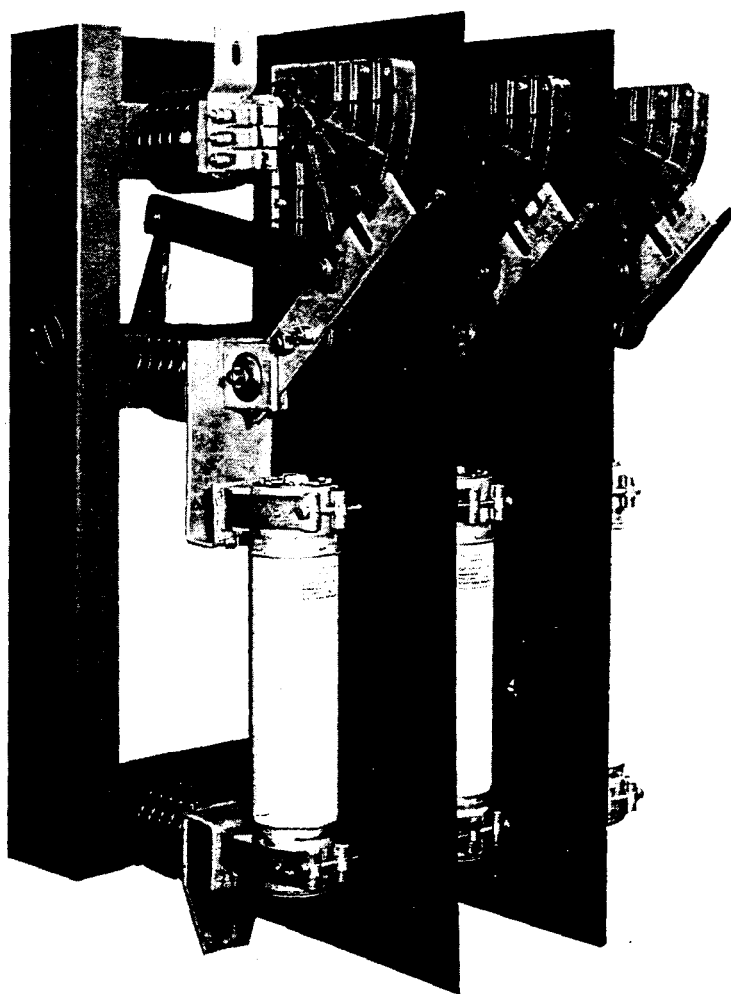


INSTRUCTIONS
FOR THE CARE & MAINTENANCE OF
TYPE IS
AIR INTERRUPTER SWITCHES



FPE FEDERAL PACIFIC ELECTRIC
OF CANADA
FPE CANADA LTD GRANBY - TORONTO - VANCOUVER



TYPE IS AIR INTERRUPTER SWITCHES

MAINTENANCE INSTRUCTIONS

FOR

TYPE IS AIR INTERRUPTER SWITCHES

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TYPE IS AIR INTERRUPTER SWITCHES



INTRODUCTION

The F.P.E. type IS Air Interrupter Switch is a rugged 3 pole gang operated device which will provide many years of reliable service under usual operating conditions. Low cost maintenance is a direct result of efficient and simple design to reduce the number and intricacy of arc control parts. Field adjustments are eliminated and replacements of worn parts can be done very quickly (usually less than one hour) and thus maintenance shut-downs can be very short.

SHIPMENT

Each switch is carefully inspected and tested before leaving the factory and then carefully packed in specially designed containers. Every switch should be examined immediately on receipt for any damage sustained while en-route. If injury is evident or if indication of rough handling is visible; a claim should be filed immediately with the transportation company. F.P.E. should also be notified immediately if replacement or renewal parts are required.

INSTALLATION

The switch should be securely bolted in position and the base grounded to a reliable ground using the lug provided on the base. This is a Cu/Al lug accommodating wire from #14 to 2/0. The handle mechanism should be mounted on the right hand side of the switch and optimum length of connecting pipe determined as outlined on page 5. Left hand or rear assemblies of handle mechanism are also available. Line and load connections should be made and tightened securely using 1/2" bolts. Wipe porcelains and blade drive links clean of dust before energizing.

OPERATION

Type IS Load Break switches are designed to operate under load and will break currents up to the full load rating at 80% power factor. The switches may be closed on short circuits where the prospective current does not exceed the "make" or "fault" closing rating of the switch. Where the switch is used with current limiting fuses the prospective current can be much higher because the duty on the switch will be limited by the cut-off characteristic of the fuse. In these applications, the let-through current of the fuse must not exceed the "make" rating of the switch.

The number of operations that the switch will withstand will vary considerably with the severity of duty imposed on the switch.

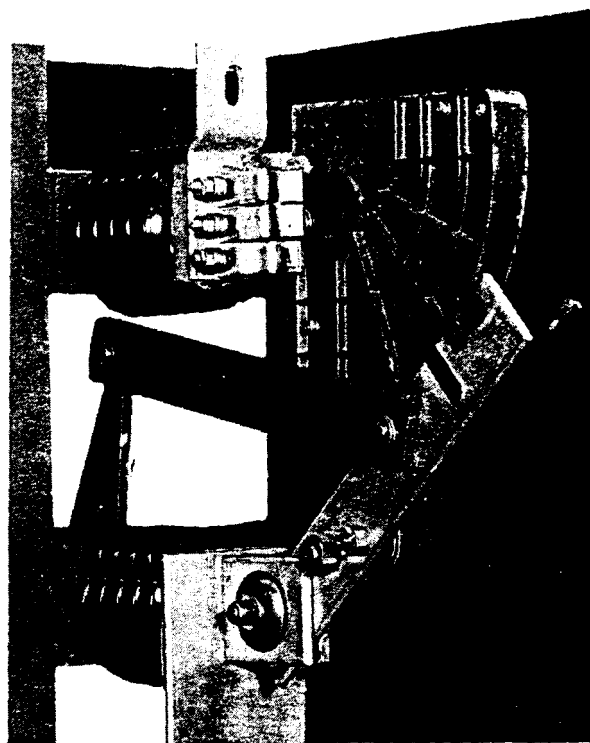
The following table lists the minimum requirements of C.S.A. standard C-105-1960.

NUMBER OF STANDARD OPERATING DUTY CYCLES	PER CENT OF CURRENT RATING	POWER FACTOR OF TEST CURRENT
10	10	Not higher than 80% lag.
10	50	
50	100	

Mechanical life test: - 500 open and close operations without load current after which all mechanical parts including contacts must be in order without permanent distortion or undue wear.

ARC INTERRUPTION

The auxiliary load breaking assembly consists of a phosphor bronze quick-break blade which engages a pair of arcing contacts shrouded by an arc chute. The blade and contacts are tipped with silver tungsten.



As the switch is opened the main contacts part and the current through the switch is momentarily carried by the load breaking assembly as the quick-break blade is held in position by the arcing contacts. As the main blade opens further to establish a wide air gap, it also winds a torsion spring attached to the quick break blade until enough energy is stored to overcome the resistance of the arcing contacts and the auxiliary blade snaps open. It should be noted that the main blade is opening itself at high speed with energy supplies from the spring charged mechanism.

As a safety feature, the mechanism is so designed that should the torsion spring fail to operate, the last part of the travel of the main blade will force the quick-break blade out of the contacts, which eliminates the danger of leaving a phase energized.

FAULT CLOSING

To ensure this high fault current is not carried by the relatively light load breaking assembly, the switch is designed so that the main contacts close first. To prevent damage to the main contacts one set of fingers is extended and tipped with silver tungsten and the main blade is also equipped with a pair of silver tungsten contacts. Thus on closing pre-arcing is confined to these contacts and the large thermal capacity of the main contacts is made available to carry the fault current without damage to the switch.

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INSPECTION OF CONTACTS

Contacts should be inspected at regular periods depending on the severity of duty but in no case should the number of operations as listed previously be exceeded without inspection.

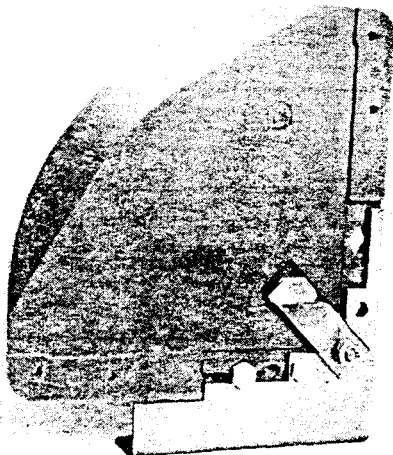
As the "make" contacts and the moving arcing contact are readily visible with the switch in the open position, inspection of contacts is a very simple matter. Heavy pitting and erosion of these contacts would indicate replacement of the stationary arcing contacts within the arc chute as well.

REPLACING ARCING CONTACTS

With the switch in the open position, the moving arcing contact (Item 13) is removed from the main blade assembly by removing the special mounting bolt (Item 17). The new part can be mounted in place of the worn part and the parts re-assembled. Care should be taken to ensure the end of the spring projects through the arcing blade.

The fixed arcing contacts are removed with the arc chute assembly by removing the two 1/4-20 round head machine screws in the line terminal assembly. Exercise care in handling this assembly as the arc chute material is brittle and will break if dropped or is hit by a hard object.

Removal of the 1/4-20 cap screws and 10-32 machine screws will allow the two halves of the arc chute to separate and expose the fixed arcing contact parts. Replace worn parts and re-assemble in the reverse order making sure contact springs and spacers are correctly positioned in the arc chute cavities.



Arc Contact Assembly showing fixed arcing contacts visible after removal of one-half of the arc chute.

REPLACING FAULT CLOSING CONTACTS

Moving Contact. The moving contact is an integral part of the main blade and the complete blade assembly must be replaced when this contact has deteriorated.

With the switch in the open position disconnect the drive links and remove arc control parts. Remove the bolt through the hinge and the blade may be removed. It is recommended that the cup washers be renewed when the main blade is replaced.

When re-assembling the blade in the hinge jaw lubricate both sides of the blade with lubriplate No. 105. Vaseline may be used as a substitute.

To obtain the proper tension on the hinge jaw, the following procedure is used before the blade driving links are connected to the blade. With the main blade out of the contacts, hook a spring scale to the hole used for the driving link pin. Tighten the hinge bolt until the scale registers approximately 16 pounds to move the blade.

Fixed Contacts. With the switch open remove the bolts through the arc contact pair of fingers which are slightly longer than the main contacts and have a tungsten overlay.

Re-assemble making sure the finger spacer (item 6) is correctly positioned in the finger slots.

To check contact pressure a piece of copper 1/4" thick by 3/4" wide is placed between the fingers. Tighten the contact mounting bolts until, using a spring balance, the tension necessary to withdraw the piece of copper is approximately 10 pounds. Be sure that the piece of copper is restrained by the arcing contacts only.

REPLACING MAIN CONTACTS

With the switch open, follow the same procedure as for the fault-make fixed contacts. Main contacts (Item 3) are slightly shorter and have no special contact material added to them. To check pressure follow same procedure as outlined for fault-make fixed contacts but pressure should be 20 pounds for each pair of fingers.

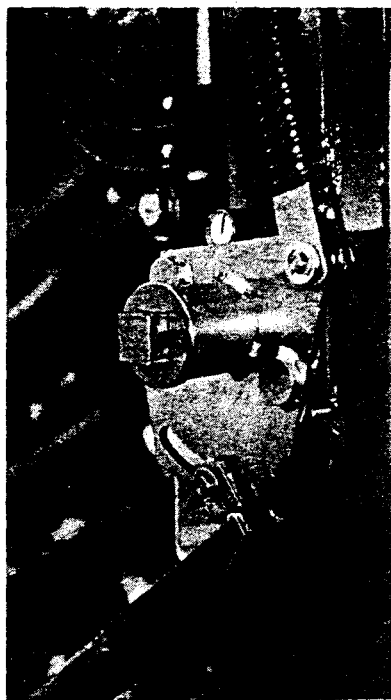
OPERATING MECHANISM

The spring closing and opening mechanism does not require adjustment and the only maintenance necessary is lubrication of moving parts. Lubriplate No. 150 or any light machine grease may be used for this purpose.

The blade stop adjustment is made at the factory and should not require further adjustment in the field. This adjustment stops the mechanism so that the main blades have approximately 1/8" to 1/4" clearance from the bottom of the contact jaw when the switch is closed. There may be some variation between poles.

Should it be necessary to reset this adjustment, the two eccentric cam stops must be loosened by releasing the nuts inside the base and then the cams rotated to provide the clearance listed above. Both cams are used to stop the mechanism in both the open and closed position of the switch.

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connection is too long the switch may open but it will not close when the handle is returned to the "on" position. Move handle slowly when opening or closing switch to ensure momentum of parts is not affecting operation. When all adjustments are complete, tighten the lock nuts.

If it is required to mount the switch and handle so that the operating pipe does not fall into the 30° to 60° zone, the pipe can be kinked so that the angles that approach the switch and handle are still 30° or more. However, considerably more stress is placed on the operating pipe and it may be necessary to use extra heavy pipe, solid rod, or reinforcing gussets at the kinks to ensure a solid connection between the switch and handle.

SPECIAL FEATURES

(a) **Magnetic Latch** is supplied on switches with momentary ratings of 61,000 amps. No adjustments are required on the latch itself. An air gap of approximately 1/16" between the fixed and moving armature is usual with the blade fully closed.

(b) **Interlocks** The handle mechanism accepts one key interlock (type V8) as standard, but accommodation for 3 separate locks can be provided.

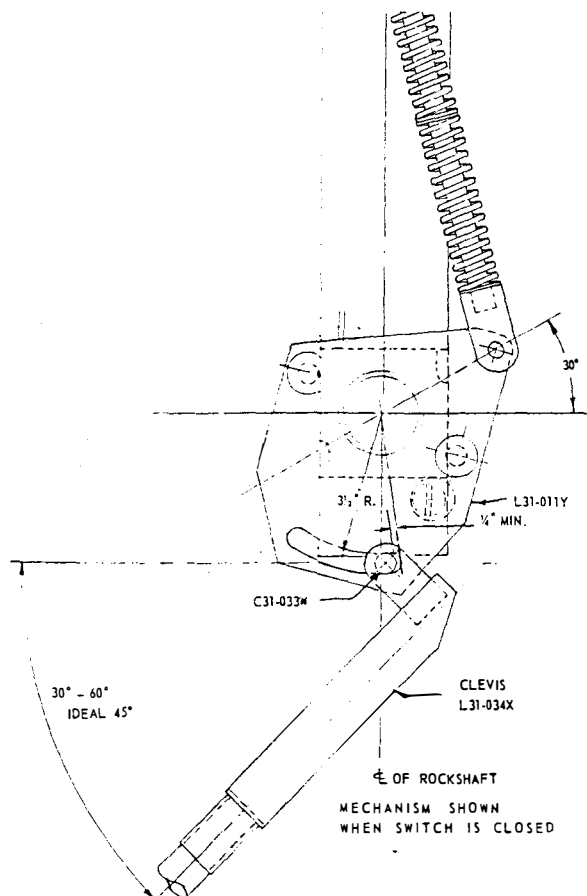
ADJUSTMENT OF PIPE COUPLING

The pipe coupling between the handle mechanism and the load break switch is adjusted at the factory and locked with pipe nuts when the load break switch is shipped in a cubicle. If it should be necessary to remove the load break switch this pipe should be carefully measured or marked and then re-assembled to these dimensions or markers making further adjustments unnecessary.

When the switch and handle are supplied separately they should be mounted so that the operating pipe makes an angle of approximately 45° to the horizontal. The switch can be operated between the limits of a 30° to 60° angle but requires slightly more effort the farther the angle is from the preferred 45°.

The handle should be mounted on a solid support and placed in the "up" or "on" position. The switch should be bolted to a solid support and be in a closed position. The two clevises are held approximately in line with the back clevis about 1/4" to 3/8" from the back of the slot. Add 1 3/4" to the distance between the clevis on the handle and the clevis on the switch and cut a piece of 1" I.P.S. to suit. Thread each end of the pipe approximately 1" and add lock nuts one on each end. Screw pipe into handle clevis and remove switch clevis and screw onto the pipe. Replace the clevis on the switch.

Pull the handle down to open the switch. If the switch does not open, return the handle to the "on" position, remove the clevis from the switch and extend the length of the arm by unscrewing the clevis two or three turns. Repeat the opening operation. The switch should open and close when the handle is approximately 15° from the end of its stroke. If the pipe



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RENEWAL PARTS 600 AMP FUSED OR UNFUSED SWITCH

ITEM NUMBER	DESCRIPTION	NO. PER SWITCH	5 KV PART NO.	15 KV PART NO.
1	Main Blade	3	L31-050X	L31-084X
2	Contact Finger "Make"	6	L31-049W	L31-049W
3	Contact Finger "Main"	18	49B-2261A	49B-2261A
4	Contact Springs	24	C31-140W	C31-140W
5	Spring Cups	24	55A-2262B	55A-2262B
6	Contact Finger Spacer	12	241A-2450	241A-2450
	Cup Washers	6	290B-6295	290B-6295
	Set of Contact Hardware	1	-	-
7	Arc Chute (2 pieces)	3	2601-0382	2601-0382
8	Arcing Contact Stationary RH	3	2651-0385	2651-0385
9	Arcing Contact Stationary LH	3	2652-0385	2652-0385
10	Arcing Contact Springs	6	2601-0383	2601-0383
11	Arcing Contact Spacer	6	2604-0385	2604-0385
12	Arc Chute Mounting Bracket	3	B31-108X	B31-108X
	Set of Arc Chute Hardware	1	-	-
13	Arcing Contact Moving	3	L31-052X	L31-095X
14	Arcing Contact Spring	3	2601-0395	2601-0395
15	Arcing Contact Holder	3	120C-2	120C-2
16	Arcing Contact Stop	3	B31-046W	B31-046W
17	Arcing Contact Mounting Bolt	3	C31-019W	C31-019W
18	Blade Operating Arm	6	V31-098W	
18	Blade Operating Arm 95KV BIL	6	-	V31-079W
18	Blade Operating Arm 110KV BIL	6	-	V31-133W
19	Pin with tru-arc rings	6	201B-2432	201B-2432
20	Interphase Barrier	3	V31-024W	V31-081W
21	Upper Insulator Assy.	3	L31-056Y	-
21	Upper Insulator Assy. 95KV BIL	3	-	L31-089Y1
21	Upper Insulator Assy. 110KV BIL	3	-	L31-089Y2
	For switches rated at 61KA ONLY			
	Magnetic latch Yoke	3	C31-131W	C31-131W
	Magnetic latch Armature	3	C31-132W	C31-132W

The life expectancy of the arc control parts of the switch will vary with the severity of duty imposed on the switch, but it is recommended that, as a minimum, a set of arc control parts for all three phases be kept in stock for emergency repairs.

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RENEWAL PARTS



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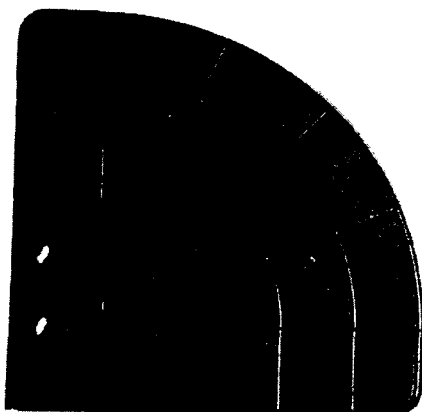
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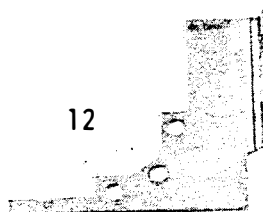
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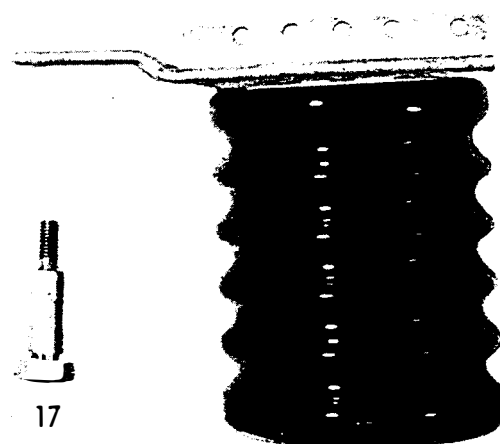
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