TYPE LF-50H730 CONTACTOR

HIGH VOLTAGE **AIR BREAK**

DESCRIPTION

APPLICATION

The Type LF-50H730 Contactor is designed for starting and controlling three phase, 50-60 cycle a-c motors on 2200-2500 volt and 4000-5000 volt systems and has horsepower ratings up to 5,000 HP as shown in table below. The Type LF-50H730 contactor has a maximum 8 hour open rating of 700 amperes.

The Type LF-50H730 Contactor has an interrupting rating of 75,000 KVA, but when used in NEMA class E2 controllers, where current limiting fuses limit and interrupt short circuit current, the Type LF-50H730 contactor may be used on circuits having short circuit capacities up to 432,000 KVA as shown in table 1.

GENERAL DESCRIPTION

The Type LF-50H730 contactor is a 3-pole, D-C magnet closed device. It employs single break contacts with weld resistant silver alloy faces, and series connected electromagnetic blowout coils. The moving contact assemblies are mounted on molded insulating supports attached to a round steel shaft, which is supported by self-aligning ball bearings mounted in vertical end plates. The stationary contact assemblies, together with blowout coils and irons, are mounted on molded insulating supports, which are in turn bolted to a molded cross member supported between the contactor end plates. Magnetic blowout cores are mounted loosely in their supports, permitting the blowout pole pieces to be rotated up out of the way when work is to be performed on the contact assemblies or shunts.

Arc resistant and flame retardant insulating barriers are mounted between phases and also between the two outside poles and the contactor end plates.

OPERATING MAGNET

In order to isolate the low voltage control circuits from parts energized by high voltages and to achieve maximum accessibility, the d-c clapper type operating magnet is mounted on the outside of the right hand end plate. The magnet armature is clamped to an uninsulated portion of the main moving contact shaft, which projects through the right hand contactor end plate. The magnet armature is adjusted and locked in position by means of an adjusting bolt, with locknut, which engages an operating arm clamped and keyed to the same shaft. This adjustment controls the main contact over-travel so that both measurement and adjustment of contact over-travel is made simply, and in a most accessible location.

TABLE 1

Contactor 8 Hour Rating (Amperes)		System Voltage	Horsepower Rating ②			Controller Interrupting Capacity — 3 Phase Symmetrical KVA	
			Synchronous Motor		Induction Motor		
Open	Enclosed ①		100% P.F.	80% P.F.		NEMA E 1	NEMA E 2
700	650	2200-2500	3000	2500	2500	75,000	190,000 KVA @ 2200V 216,000 KVA @ 2500V
700	650	4000-5000	5000	4500	4500	75,000	346,000 KVA @ 4000V 432,000 KVA @ 5000V

① Ventilated enclosure

② Typical H.P. ratings. F.L. current of motor must not exceed 650 amp.

When an a-c control circuit is used, a rectifier to convert the a-c control power to d-c power for the coils, must be provided. No provision is made for mounting this item on the contactor. Silicon rectifiers for this purpose may be ordered by referring to the appropriate style number as listed in table 2. The operating coil and electrical interlock wiring is terminated at a plug mounted on the right hand end-plate. Contactors which are to be used as part of an **Ampgard** starter may in addition be supplied with a control transformer, control circuit, main fuse supports, and miscellaneous mechanical details to provide mechanical interlocking with the isolating switch, with other contactors, and to latch the contactor in place within the starter enclosure.

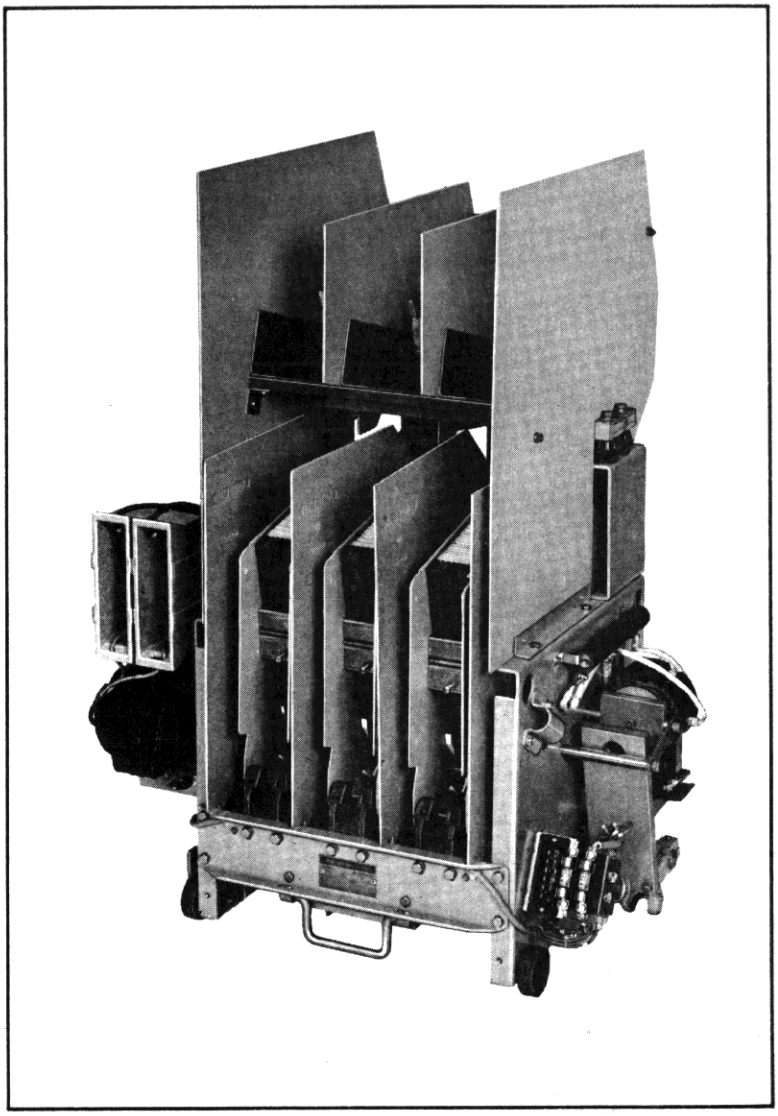

Fig. 1 *(Photo 69-0243)*
Type LF-50H730 Contactor

CONTACT STRUCTURE

The stationary contact assemblies are made up of molded insulators on which are mounted the following:

a) Stationary contact support.

b) Blowout coil and core.

c) Blowout iron assembly.

d) Bolt-on or stab type line terminals.

e) Stab type load connectors.

Removable contact tips bolt to the stationary contact support member and have thick weld resistant silver alloy faces.

Spring loaded moving contact support assemblies are provided with tapped holes for bolting the removable contact tips and flexible shunt connection in place. The removable contact tips for the moving contact assemblies are identical to the stationary contact tips.

TABLE 2

AC Control Voltage	Nominal Coil Voltage (DC)	Rectifier Unit S #	Coil S #	Protective Resistor S #
115	100	2018A40GO1	658C651GO1	443A328H30 (36 Ohms)
230	200	2018A40GO2	658C651GO2	443A335H35 (75 Ohms) 2 Req'd.

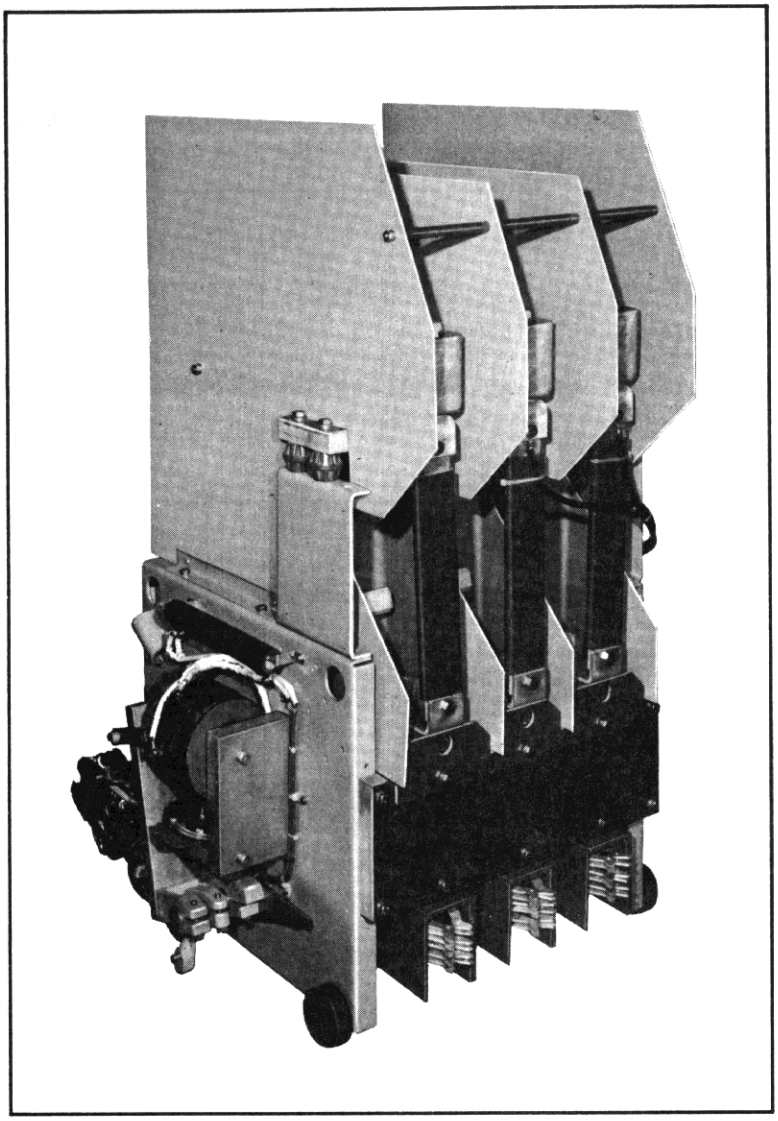

Fig. 2 *(Photo 69-0422)*
Rear View of Type LF-50H730 Contactor

ARC CHUTE

The arc chute assemblies consist of a cemented grid stack, arc resistant ceramic arc shields, and metal arc horns, bolted and clamped securely in place between arc resistant and flame retardant arc chute sides. The arc chutes are supported by, and pivoted on, molded insulators mounted on a steel cross member bolted to the front flanges of the contactor end plates. The arc chutes may be rotated out of their normal operating position or lifted off their pivot points to provide convenient access for contact inspection or replacement. When the arc chutes are in their normal operating position, electrical connections to the arc horns, mounted within the arc chutes, are completed through knife jaw assemblies mounted adjacent to the moving and stationary contacts.

In the operating position, the arc chute grid stacks are tilted slightly forward at an angle so that hot gases, generated during arc interruption, are directed towards the front of the starter enclosure, and away from the vicinity of energized components and connections.

ELECTRICAL INTERLOCKS

Two type L-64 electrical interlocks are mounted in front of the magnet to provide four auxiliary circuits for use in the starter control circuits. Any combination of normally open or normally closed circuits is available by selection of the appropriate style of interlocks.

Actuation of the interlocks is by a pushrod attached to the armature adjusting casting mounted on the uninsulated portion of the moving contact shaft. The pushrod carries an adjustable operating disc that actuates the interlock plungers.

A third L-64 electrical interlock with two normally closed contacts is mounted on the lower magnet core. This is reserved for use in the coil circuit to insert a protective resistor in series with the magnet coil when the armature is sealed.

L-64 INTERLOCKS

Interlock Style	Circuit Combination Provided by One Interlock Assembly
843D943GO4	One normally open, one normally closed
843D943GO5	Two normally open
843D943GO6	Two normally closed

MAINTENANCE AND REPAIR

The following sections describe the recommended maintenance and repair procedures including details of the various contact gaps and forces, etc.

GENERAL

A maintenance program should be established as soon as the contactor is installed and put into operation. After the contactor has been inspected a number of times at monthly intervals, and the condition noted, the frequency of inspection can be increased or decreased to suit the conditions found, since this will depend upon the severity of the contactor duty.

All work on this contactor should be done with the main circuit disconnect device open, using a separate source of control power to operate the magnet.

HANDLING

Lifting holes are provided at the top edge of both right and left hand end plates for use with lifting hooks or ropes. Remove the outer phase barriers to obtain full access.

Contactors are supplied with wheels and provision for inserting a short length of standard ¾" pipe in the contactor end plate to aid in moving the contactor about.

For further **Ampgard** starter details see I.L. 11-202-5.

INSULATION LEVEL

After installation, and before energizing the contactor for the first time, the insulation resistance between poles and from each pole to ground, should be measured and recorded. It is not practical to specify an absolute value for this reading since it is dependent on other connected apparatus, and conditions of service. However, any unusually low reading or abrupt reduction in this reading would indicate a possible source of trouble, and the cause should be established and immediately corrected.

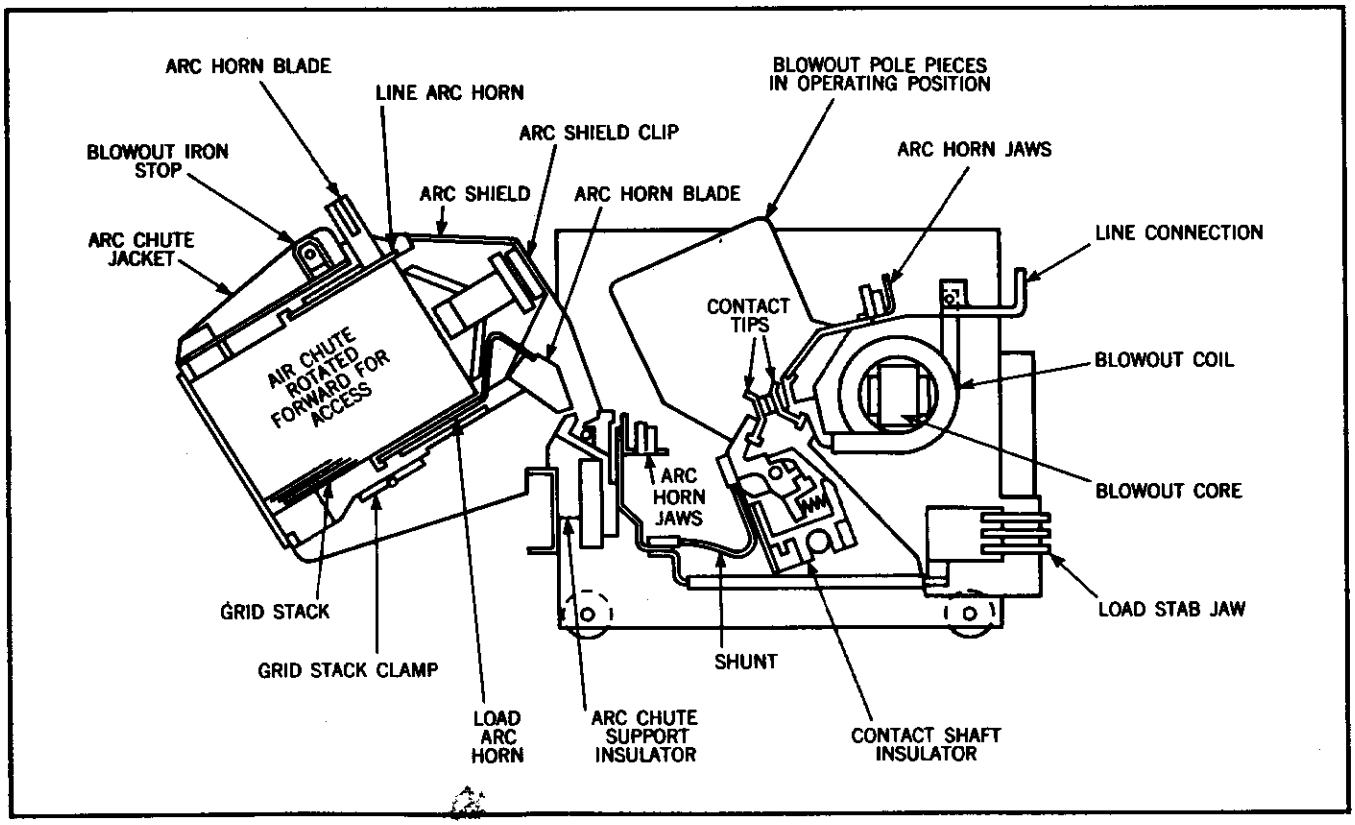

Fig. 3

MAIN CONTACTS AND SHUNTS

For visual inspection of the contacts and shunts the arc chutes may be rotated forward out of the normal operating position as shown in Figure ③.

The general condition of the contacts and shunts should be noted, especially any discoloration which would indicate excessive heating due to loose hardware, high current, or low contact force. Since silver alloy contact faces are used, dressing or filing of the contacts is not required.

To obtain access to the contacts and shunts for tightening or replacement, remove the phase barriers and arc chutes and rotate the magnetic blowout pole pieces upward to the vertical position as shown in Figure ④.

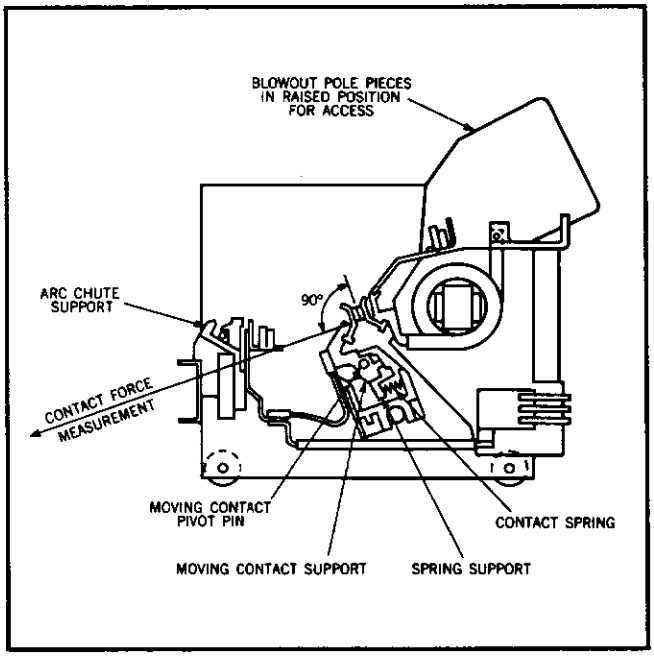

Fig. 4

When replacing contacts, make sure that they sit flat against the contact supports and tighten the bolts firmly until the lockwashers are fully compressed. Bolts used to hold the contacts in place should be high strength S.A.E. grade 8 which is identified by six radial marks on the bolt head.

Check, and if necessary, adjust the contact forces and overtravel, and see that all contacts touch simultaneously, using the following procedure:

1) Close the armature by hand to move the contacts to the contact touch position. Check to see that the moving and stationary contacts line-up laterally within 1/32".

   Lateral adjustments of the moving contacts may be made by loosening the 5/16" bolt attaching the molded spring support to the moving contact support and sliding the moving contact support to the left or right on the pivot pin as required to obtain proper contact alignment. Following this adjustment the 5/16" bolt must be re-tightened before proceeding with the remaining contact adjustments.

2) Again move the contacts to the contact touch position by hand and check to see that all contacts touch simultaneously, within 1/32 in.

3) Check initial contact forces. Contact forces measured at the heel of contact inlays as shown in Figure ④ are as follows:

   18 to 22 lbs. initial
   31 to 38 lbs. final

   To measure the initial force the armature should be blocked within 1/16-1/8" of the contact touch point. Force is then conveniently measured by looping a piece of string around the heel of the moving contact face and pulling in a direction perpendicular to the contact face as indicated in Figure ④. A small spacer of cardboard or wood approximately 3" long should be suspended between the two strands of string to avoid interference with the arc chute support insulator.

4) In the event initial contact forces or contact touch points are not within allowable limits, adjustment may be made by increasing or decreasing the number of flat washers under the stop bracket mounting lugs as shown in Figure ⑤.

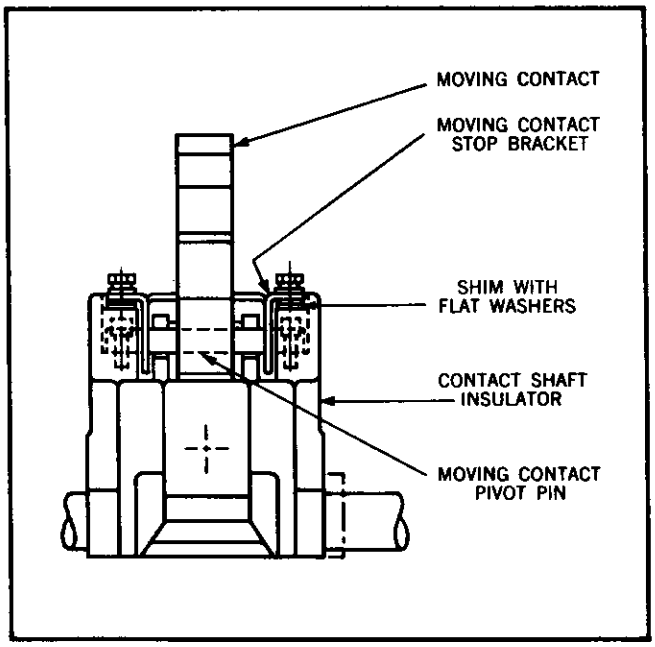

Fig. 5

Since this adjustment affects both the initial contact force and touch point simultaneously, both contact force and touch must be re-checked following this adjustment.

Check, and if necessary, adjust contact overtravel. Overtravel is measured at point "X" of Figure ⑥ at the tip of the magnet armature. With new contacts this dimension should be 5/8" ± 1/64" when the main contacts are at the touch point. Contact overtravel adjustment is made as follows:

1) Loosen the two bolts at "A" in Figure ⑥ which clamp the magnet armature to the shaft.
2) Block the magnet armature in the contact touch position.
3) Adjust bolt "B" in Figure ⑥ as required to obtain the 5/8" ± 1/64" overtravel dimension at point "X". With this adjustment, contact open gap should be 1" ± 1/8", measured at the heel of contact faces when the armature is resting against the stop pin.
4) Re-tighten the two bolts at "A" and locking nut on bolt "B".

As the contact faces become worn the overtravel dimension will gradually decrease When the 5/8" gap at "X" has decreased to 1/8" with all three main contacts touching, the main contacts should be replaced.

The procedures outlined above, provided they are done when new contacts are fitted, will automatically set the contact forces; however, the contact forces should be checked as a matter of routine. Failure of contact forces to fall within limits would indicate the following:

a) An incorrect overtravel adjustment (final force only).
b) Weak, broken or incorrect contact springs.
c) Incorrect adjustment of the moving contact stop bracket.

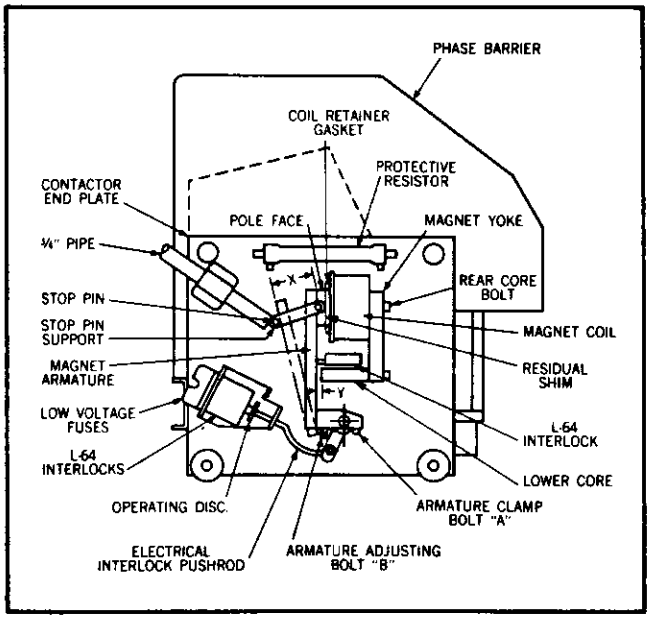

Fig. 6

OPERATING MAGNET

The section above, dealing with main contact overtravel, also covered the principal magnet adjustment since this controls the contact overtravel.

In carrying out general inspections, operate the magnet armature by hand. Any friction should be investigated and corrected. Check that the armature seats securely without hitting the magnet pole face bolts, and that a 3/32" to 5/32" gap at point "Y" of Figure ⑥ has been maintained.

REPLACING COILS

To change operating coils, proceed as follows:

1) Disconnect the leads from the coil terminals.
2) Remove the two 3/8"-16 socket head cap screws used to attach the magnet pole face to the contactor end plate and armature stop pin support.
3) Remove the rear core bolt attaching the core to the magnet yoke and lift the core and coil assembly out of the magnet frame in a vertical direction.
4) Install the new coil on the core assembly being sure the residual shim and coil retainer gasket are mounted as shown in Figure ⑥.
5) Re-install the core assembly by reversing the above disassembly procedure.

ARC CHUTES

Usually, the arc chutes require little or no maintenance, but it is convenient to check them whenever the main contacts are examined or changed.

With the arc chutes pulled forward out of the operating position, examine the arc horns and the insulating supports for excessive arc erosion; also examine the arc shields at each side of the arc chute and the grid stack assembly for either excessive arc erosion or metal deposits, and for cracks. Examine the two knife switch blades at the ends of the arc horns, and the corresponding knife switch jaws mounted adjacent to the contacts, to ensure good contact surfaces. Note the deflection of the knife switch jaws when the blade is engaged, since this deflection indicates the presence of contact pressure. Note that these knife switch assemblies carry current only while an interruption is taking place.

Arc chutes can be removed completely by first rotating them forward toward the front, as shown in Figure ③, and then lifting upward until the horizontal pivot bolt comes free. It is not necessary to loosen hardware to remove the arc chutes.

In the event arc shields are to be removed for cleaning or replacement, this may be done without disassembling the arc chute simply by removing the two screws and spring clips which hold the arc shields in place and sliding the arc shields out the bottom of the arc box.

If more minute examination is desired, or if, after prolonged use, there is sufficient arc erosion to require replacement of parts, the arc chutes may be dismantled as follows:

1) Refer to Figure ③ and loosen the grid stack clamping screw.

2) With the right hand arc chute side facing upwards, remove the hardware from the three 1/4-20 bolts along the flanged joint and also from the three long bolts passing through the arc chute. Remove the two 10-32 screws next to the flange and lift the right hand arc chute cover off.

3) The two arc horn assemblies, the grid stack, and arc horn insulators can now be lifted out, and the two screws holding the arc shields can be removed if arc shield replacement is necessary.

4) The arc horns are mounted on their insulators by two 10-32 screws. These too can now be removed.

This completes the dismantling of the arc chute.

To reassemble the arc chute continue as follows:

1) Attach the arc shields to the arc box sides using #10-32 screws and spring clips.

2) Lay the left hand arc chute side on a flat surface with the three long through bolts pointing up in the air

3) Attach the arc horns to the molded arc horn insulators using two #10-32 screws.

4) Lay the line arc horn and insulator sub-assembly in place on the left hand arc chute side and bolt the arc horn insulator to the arc chute side using a #10-32 screw.

5) Lay the grid stack, grid stack clamp, and load arc horn sub-assemblies in place with the long 1/4-20 through bolts passing through the hole in arc horn knife blade and through the indentation in the grid stack clamp.

6) Lay the right hand arc chute side in place on the left hand side and bolt the two arc chute sides together finger tight at their flanges using 1/4-20 hardware, including the molded blowout iron stops. The right hand arc chute side should now be bolted to the line arc horn insulator using a #10-32 screw. The 1/4-20 hardware along the arc chute flanges should now be tightened.

7) Install hardware on the long through bolts finger tight.

8) Tighten the 1/4-20 screw in the grid stack clamping plate until the load arc horn assembly and grid stack are clamped tightly in place. Now tighten the locking nut on the clamp screw and also the hardware on the two long 1/4″-20 bolts passing through the arc chutes.

9) Tighten the long 5/16″-18 pivot bolt hardware as required to provide a snug fit with the arc chute support insulator.

10) When new arc horns or arc horn jaws are installed they should be lubricated with a thin film of silicone grease or vaseline to reduce sliding friction

11) Return arc chutes to the contactor by dropping the pivot bolt into the slot of the molded arc chute support as shown in Figure ③. Then rotate the arc chute back into the operating position as shown in Figure ①. When in the operating position arc horn blades should make at least 1/4″ engagement with their respective arc horn jaws. In the event blowout pole pieces are not in their proper operating position, projections on the arc chute flanges will strike the pole pieces preventing the arc chute from being rotated into operating position. When the contactor is mounted in an **Ampgard** starter the arc chute will prevent the enclosure door and isolating switch from being closed if the blowout pole pieces are not in the operating position.

CAUTION — Following any inspection procedure, or after any maintenance work — **BE SURE TO REPLACE the arc chutes and four large phase barriers and lower the magnetic blowout pole pieces to the operating position. Never energize the contactor at line potential without having arc chutes, phase barriers, and blowout irons in place.**

ELECTRICAL INTERLOCKS

Two type L-64 interlocks for general use in the control circuit are mounted on a steel base which is in turn bolted to the right hand contactor end plate, in front of the magnet. It is very important to be sure the interlock plunger does not reach its solid stop before the contactor is fully closed. The interlock adjustment is properly set when the plunger can be depressed slighlty beyond the position it takes when the magnet armature is fully sealed. This adjustment is made by positioning of the operating disc mounted on the interlock pushrod.

A third type L-64 interlock which is used to insert a protective resistor in the magnet coil circuit, is mounted on the lower magnet core and is operated directly by the magnet armature. In this application a "late break" operation is required so the interlock is permanently mounted in a position such that its contacts will open when the armature gap "X" of Figure ⑥ is approximately 3/16".

For further details of the L-64 interlock see I.L. 15-829-7.

PROTECTIVE RESISTOR

The nominal voltage rating of the magnet coil is the D-C voltage which must be applied to the coil to close the main contacts. When the armature picks up, a protective resistor is inserted in series with the coil to reduce the coil current to a value which the coil can withstand continuously. The holding voltage applied to the coil should be approximately 25% of normal rating when the coil is cold and approximately 30% of nominal coil voltage when the coil is hot.

RENEWAL PARTS

The following parts are most subject to wear in ordinary operation.*

Name of Part	Identification No.	Number per Contactor	
		Two Pole	Three Pole
Stationary Contact	316B948G01	4	6
Moving Contact	316B948G01	4	6
Moving Contact Spring	488A898H01	2	3
Moving Contact Shunt	666C931G01	2	3
Arc Box Complete	2044A51G10	2	3

* For Complete Parts List refer to RPD16200A7.

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