Westinghouse

TYPE LF-72H430 CONTACTOR

HIGH VOLTAGE **AIR BREAK**

DESCRIPTION

APPLICATION AND RATING

The Type LF-72H430 contactor is a NEMA size H3 contactor designed for starting and controlling three phase, 50-60 Hertz AC motors on power systems up to 7200 volts and has horsepower ratings up to 5,000 HP as shown in Figure 1.

The Type LF-72H430 Contactor has a maximum continuous open current rating of 400 amperes and an interrupting rating of 50,000 KVA.

Contactor Continuous Current Rating Amperes		System Voltage	Horsepower Rating			Interrupting Capacity Three Phase Symmetrical KVA
			Synchronous Motor		Induction Motor	
Open	Enclosed		100% PF	80% PF		
400	360	7200	5000	4000	4000	50,000

Fig. 1 Ratings

GENERAL

The Type LF-72H430 contactor is a 3 pole, DC magnet closed device. It employs single break contacts with weld resisting 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 iron are mounted on molded insulating supports which are in turn bolted to an insulating 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 retarding insulating barriers are mounted between phases and also between the two outside poles and the contactor end plates.

In order to isolate the low voltage control circuits from parts energized by high voltages and to achieve maximum accessibility, the DC 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.

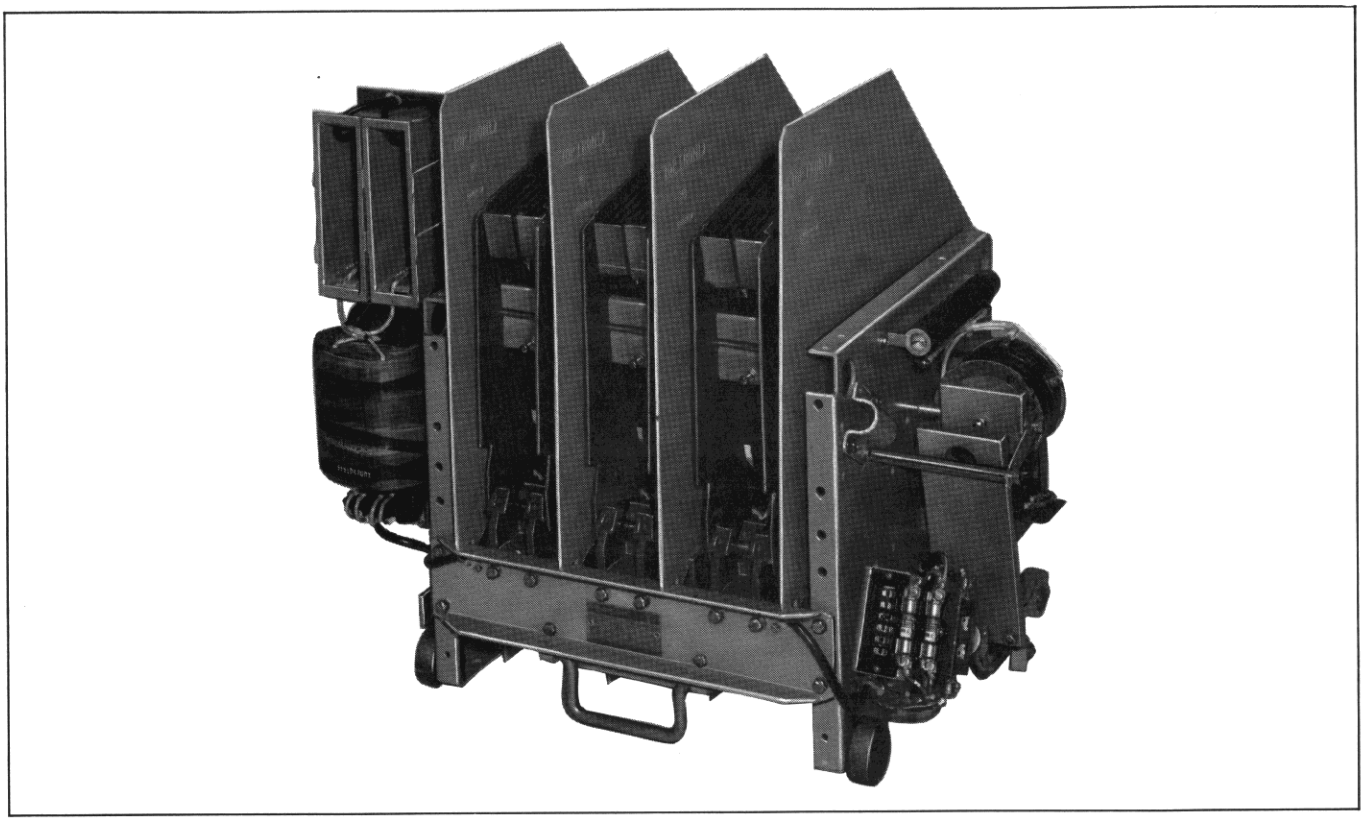

Fig. 2 Type LF-72H430 Contactor Photo BD - 73 - 0585

MAGNET COILS

When an AC control circuit is used, a rectifier to convert the AC control power to DC power for the coils, must be provided. No provision is made for mounting this detail on the contactor. Silicon rectifiers for this purpose may be ordered by referring to the appropriate style number as listed in Figure 3.

Control Voltage	Nominal Coil Voltage (DC)	Rectifier Unit Style	Coil Style	Protective Resistor Style
115-AC	100	2018A40G01	658C651G01	443A328H30 (36 Ohms)
230-AC	200	2018A40G02	658C651G02	443A335H35 (1) (75 Ohms) 2 Req'd.
125-DC	125	----------	658C651G04	443A328H30 (1) (36 Ohms) 2 Req'd.
230/250-DC	250	----------	658C651G03	443A326H08 (1) (125 Ohms) 2 Req'd.

Fig. 3 Ratings (1) Resistors are connected in series.

CONTACT STRUCTURE

The stationary contact assemblies comprise three molded insulators on which are mounted the following:

(a) Stationary contact support.

(b) Blowout coil.

(c) Blowout iron assembly.

(d) Bolt-on or stab type line connectors.

(e) Bolt-on or stab type load connectors.

Removable contact tips bolt to the stationary contact

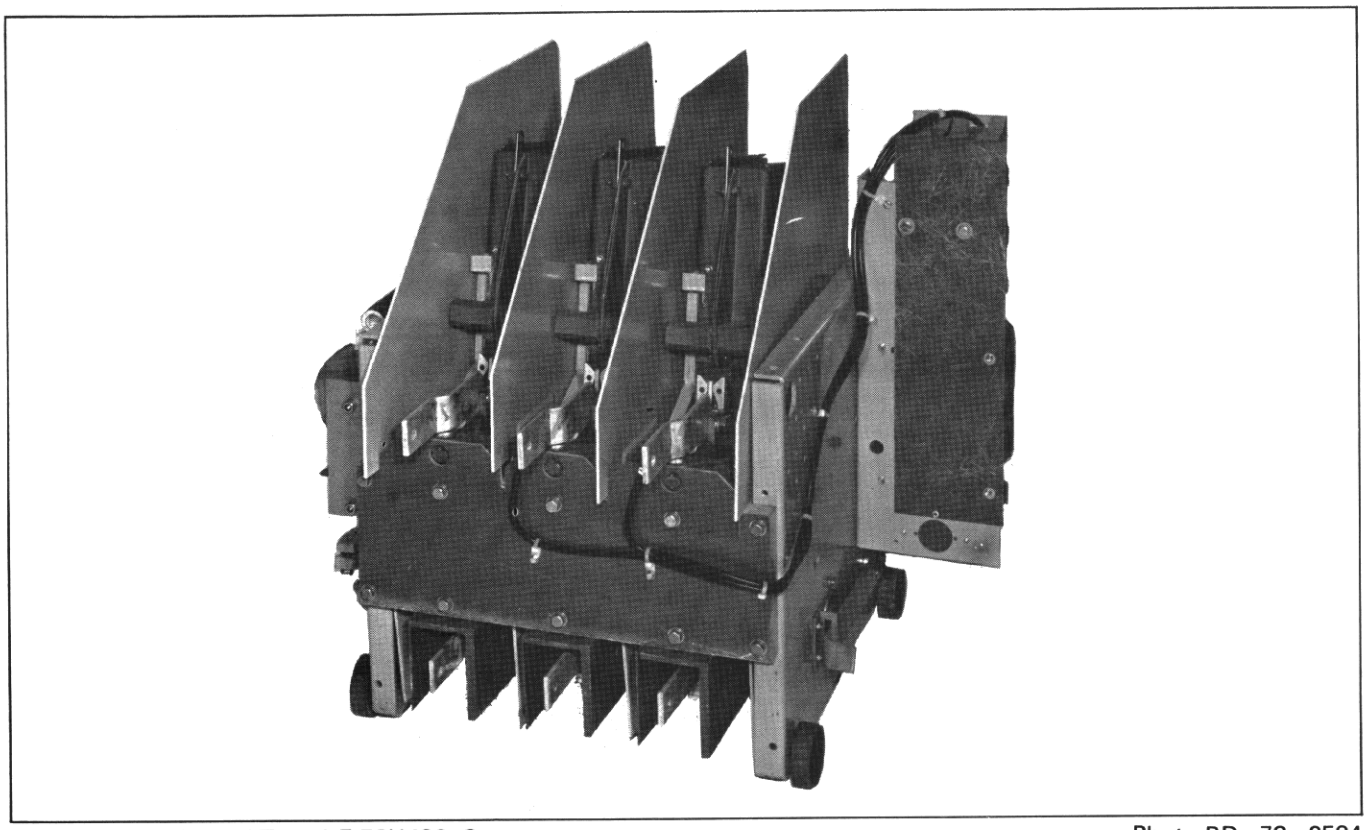

Fig. 4 Rear View of Type LF-72H430 Contactor

Photo BD - 73 - 0584

support member and have thick weld resisting silver alloy faces.

Spring loaded moving 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.

ARC CHUTES

The arc chute assemblies consist of a single cemented grid stack, molded muffler, arc resisting ceramic arc shields, and metal arc horns, bolted and clamped securely in place between arc and flame retarding 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 a maximum of four auxiliary circuits for use in the starter control circuits. Any combination of normally open or normally closed circuits are made available by selection of the appropriate style of interlock assembly from Figure 5.

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 operates the type L-64 interlock plungers.

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

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

Fig. 5 Electrical Interlocks

MAINTENANCE AND REPAIR

GENERAL

This industrial type control is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

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, and 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 which are to be used in Ampgard starters 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.

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 corrected.

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 7.

The general condition of the connectors and shunts should be noted, especially any discoloration which would indicate excessive heating due to loose hardware,

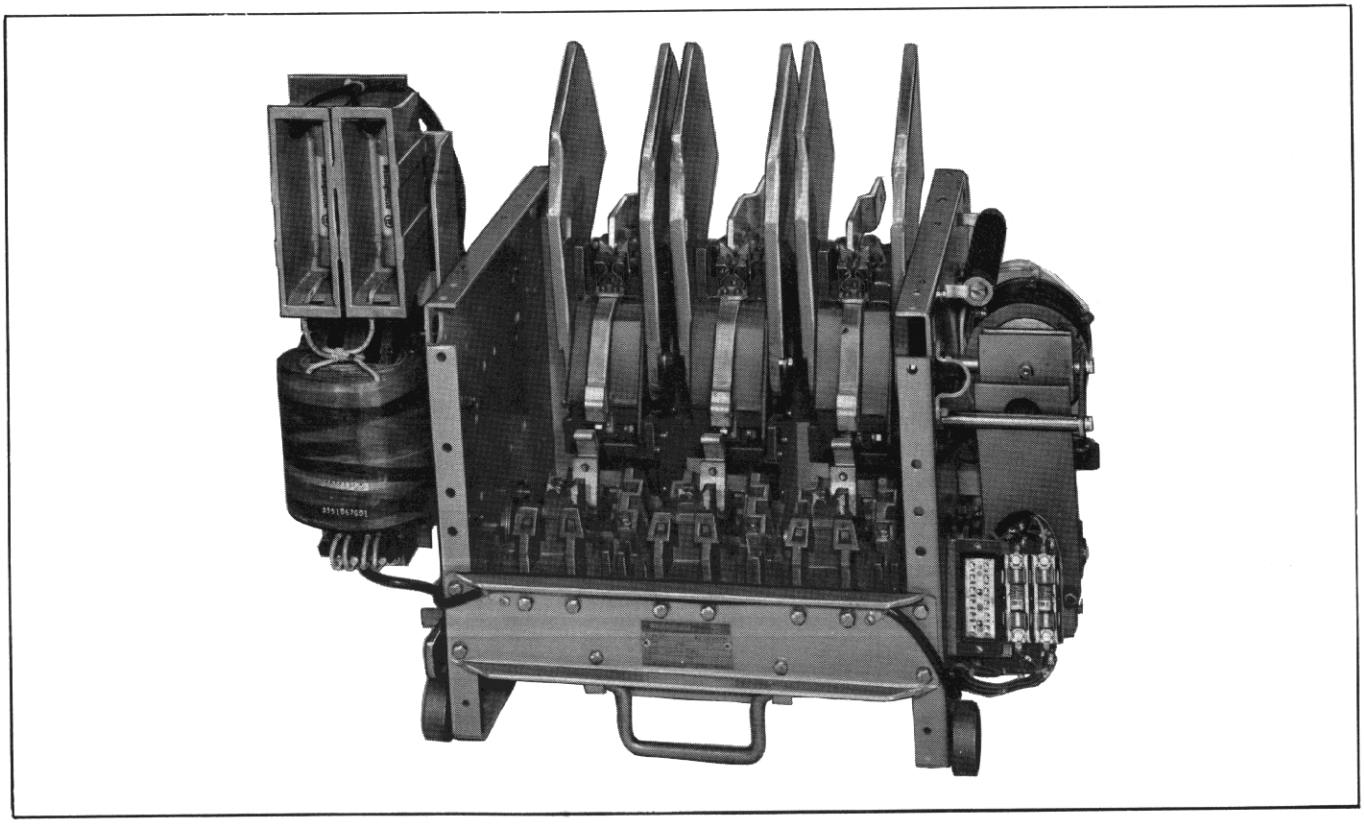

Fig. 6 Front View of Main Contacts and Shunts

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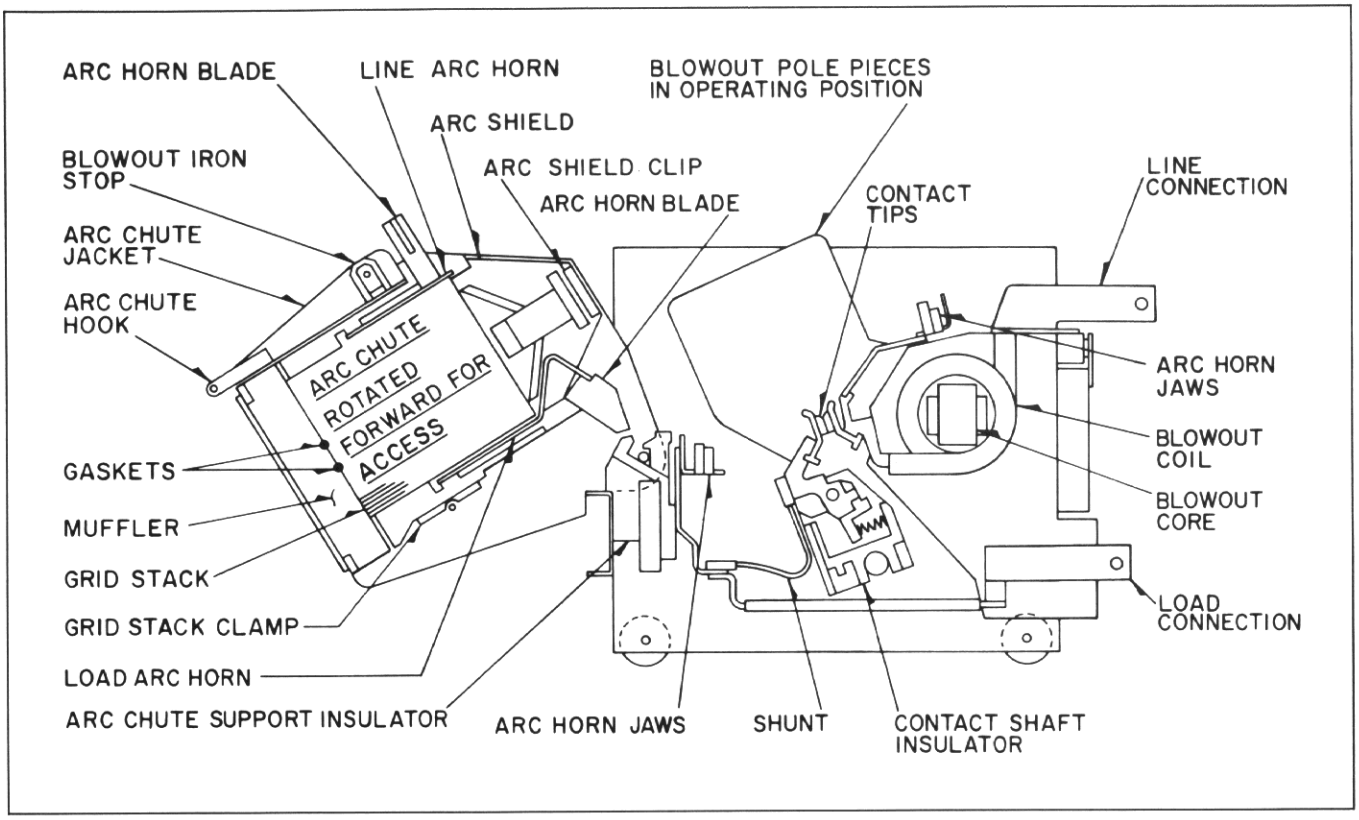

Fig. 7 Sectional View Through Contacts (Dwg. 3513C87)

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 Figures 6 and 8.

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 and also those used to make main circuit connections should be high strength S.A.E. grade 8 which is indicated 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. Move the contacts to the contact touch position by hand and check to see that moving and stationary contacts line-up within .032". 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 .032".

3. Check initial contact forces. Contact forces measured at the heel of contact inlays as shown in Figure 8 are as follows:

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

To measure the initial force the armature should be blocked within .06"-.12" 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 8. A small piece 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 9.

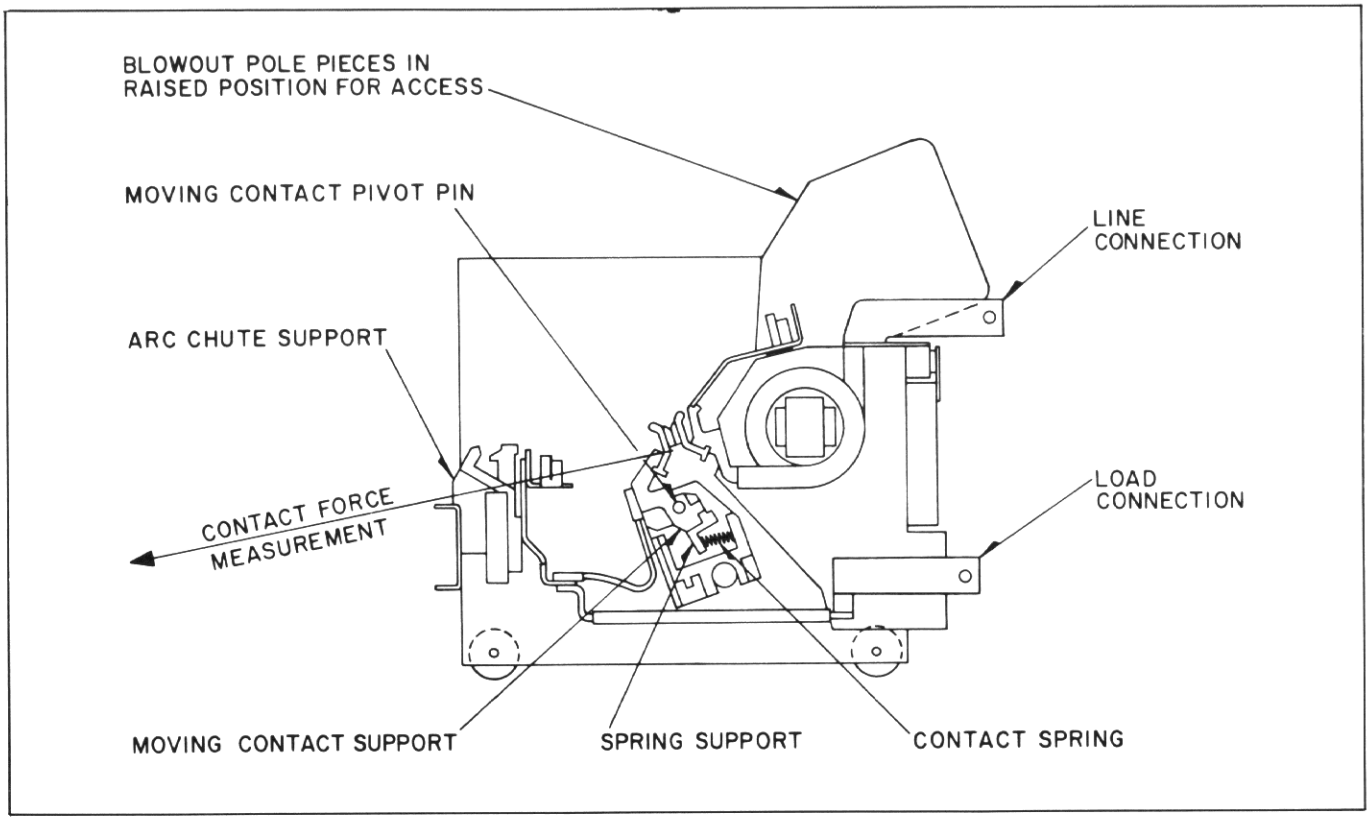

Fig. 8 Contact Force Measurement (Dwg. 3513C86)

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

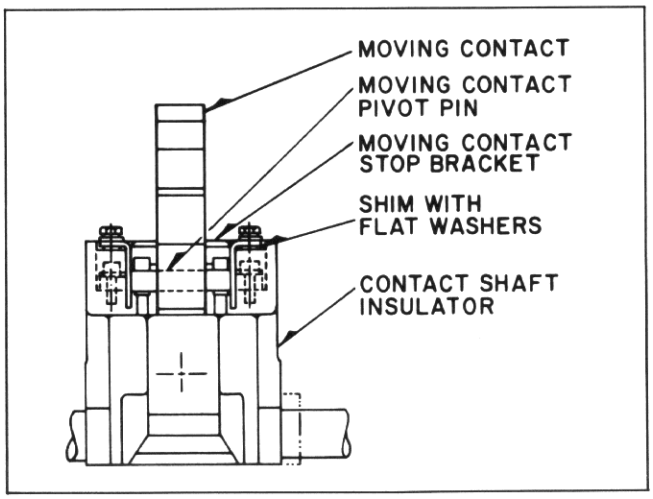

Fig. 9 Moving Contact Adjustment (Dwg. 3513C83)

Check, and if necessary adjust contact overtravel. Overtravel is measured at point "X" of Figure 10 at the tip of the magnet armature. With new contacts this dimension should be .62" ± .016" when the main contacts are at the touch point.
Contact overtravel adjustment is mae as follows:

1. Loosen the two bolts at "A" in Figure 10 which clamp the magnet armature to the shaft.

2. Block the magnet armature to provide a gap of .62" at point "X" of Figure 10.

3. Adjust bolt "B" in Figure 10 as required to make contacts just touch. With this adjustment contact open gap should be 1" ± .125" 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 .62" gap at "X" has decreased to .12" 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) Weal broken or incorrect contact springs.

(c) Incorrect adjustment of the moving contact stop bracket.

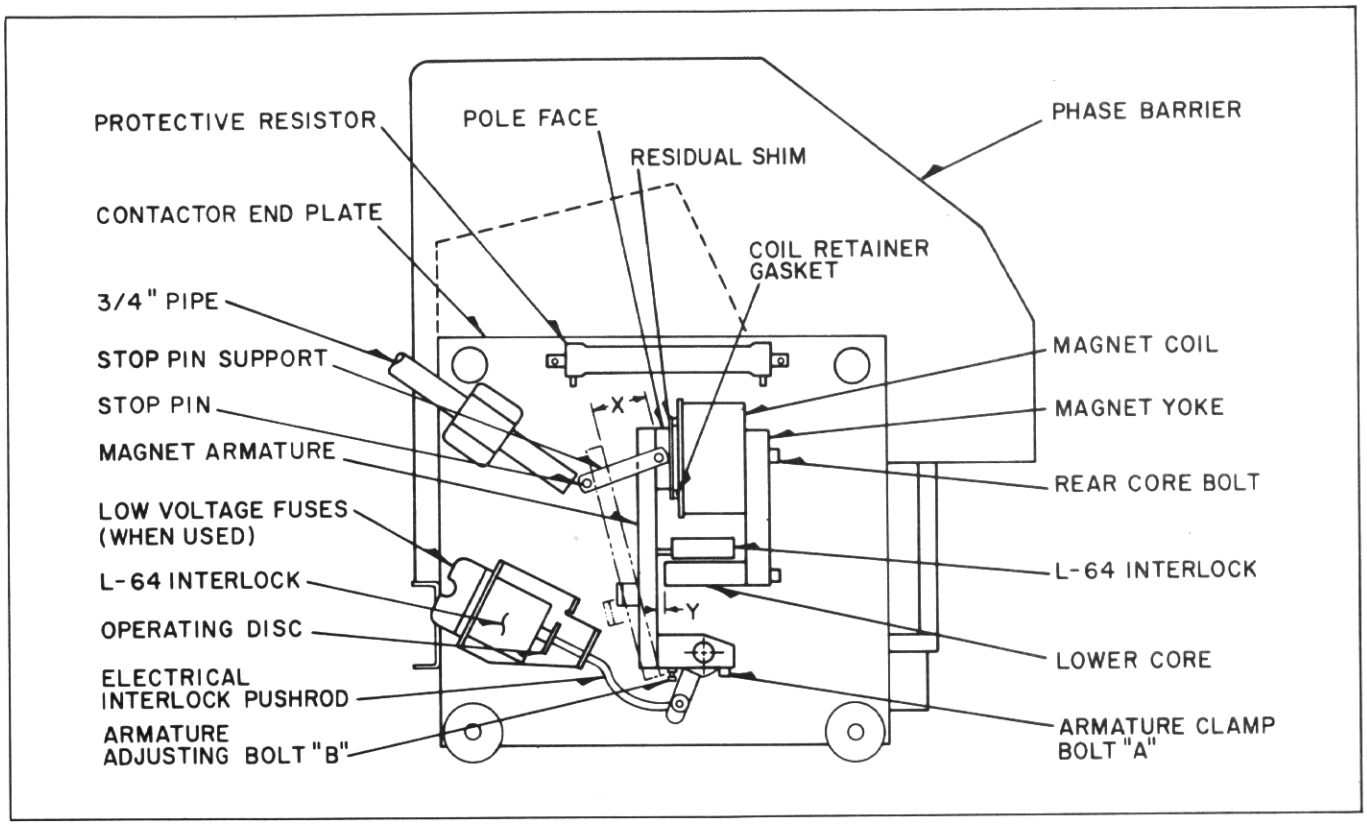

Fig. 10 Magnet Adjustments (Dwg. 3513C84)

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 squarely without hitting the magnet pole face bolts, and that a .09" to .16" gap at point "Y" of Figure 10 has been maintained.

To change operating coils, proceed as follows:

1) Disconnect the leads from the coil terminals.

2) Remove the two ⅜"-16 Allen 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 10.

5) Re-install the core assembly by reversing the above disassembly procedure.

ARC CHUTE

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 shute 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 7, 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 7 and loosen the grid stack clamping screw.

2) With the right hand arc chute side facing upwards, remove the hardware from the three ¼-20 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 top half of the arc chute off.

3) The two arc horn assemblies, the grid stack and muffler 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 supports 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. Be sure to use .75" wide 7.2 KV. arc horns.

4) Bolt the arc chute muffler to the end of the line arc horn insulator using the long #10-32 self locking screw and allowing a gap of approximately .12" between the two moldings.

5) Lay the line arc horn and muffler 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.

6) Lay the grid stack, grid stack clamp, and load arc horn sub-assemblies in place with the long ¼-20 through bolts passing through the hole in arc horn knife blade and through the indentation in grid stack clamp.

7) 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 ¼-20 hardware and including the steel arc chute hook and 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 ¼-20 hardware along the arc chute flanges should now be tightened.

8) Install hardware on the long through bolts finger tight and bolt the front end of muffler to the load arc horn using a long #10-32 screw together with wide flat washers and locknuts.

9) The #10-32 screws at ends of the muffler should now be tightened down as required to compress the two gaskets, in the center of the muffler, against the end of the grid stack. This will usually allow a .06" gap between the muffler and molded arc horn insulators.

10) Tighten the ¼-20 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 ¼"-20 bolts passing through the arc chutes.

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

12) 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.

13) Return arc chutes to contactor by dropping pivot bolt into the slot of molded arc chute support as shown in Figure 7 and then rotate the arc chute into operating position as shown in Figure 2. When in the operating position arc horn blades should make at least .25" engagement with their respective arc horn jaws. In the event an attempt is made to install 5 KV arc chutes on this 7.2 KV contactor or if blowout pole pieces are not in their proper operating position, projections on the arc chute flanges will strike the pole piece assemblies preventing the arc chutes from being rotated into operating position. When the contactor is mounted in an Ampgard starter the arc chute will then prevent the enclosure door and isolating switch from being closed if 5 KV arc chutes are used or if the blowout pole pieces are not in their proper operating position.

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 slightly beyond the position it takes when the magnet armature is fully sealed. This adjustment is effected by adjustment of the operating disc mounted on the pushrods.

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 10 is approximately .18".

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 DC 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 voltage to a value which the coil can withstand continuously. The holding voltage applied to the coil should be approximately 25% of nominal rating when the coil is cold and approximately 30% of nominal coil voltage when the coil is hot.

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.** 7.2 KV arc chutes equipped with .75" wide arc horns and red jackets must always be used with the 7.2 KV Type LF contactor. Never energize the contactor at line potential without having arc chutes, phase barriers, and blowout iron in place.

RENEWAL PARTS

Name of Part	Identification No.	Number Per Unit	
		Two Pole	Three Pole
Stationary Contact	**316B948GO2**	2	3
Moving Contact	**316B948GO2**	2	3
Moving Contact Spring	**488A898HO1**	2	3
Moving Contact Shunt	**657C766GO1**	2	3
Arc Chute Complete	**2078A72G16**	2	3

Fig. 11

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