TYPE LF-72H430 & LF-72H730 CONTACTORS
(MAGNET HELD)
TYPE LF-72H430L & LF-72H730L CONTACTORS
(MECHANICALLY HELD)

HIGH VOLTAGE AIR BREAK

DESCRIPTION

Application and Rating

These 7200 volt Type LF contactors are designed for starting and controlling three phase, 50-60 Hertz motors on 6200-7200 volt power systems and have horsepower ratings up to 8500 HP as shown in the table below. Continuous open ratings are 400 amperes for the Type LF-72H430 and LF-72H430L contactors and 700 amperes for the Type LF-72H730 and LF-72H730L contactors.

The Type LF-72H430 and LF-72H730 contactors are magnet held while the LF-72H430L and LF-72H730L contactors are mechanically held. The mechanically held contactors are designed for use in applications such as feeder circuits, where it is necessary to have the contactor remain closed even though the control circuit voltage may dip or fail completely.

All four contactors have interrupting ratings of 75 MVA, but when used in NEMA Class E2 Starters, where current limiting fuses limit and interrupt short circuit current, they may be used on circuits having short circuit capacities up to 570 MVA at 6600 volts.

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 operations, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

GENERAL DESCRIPTION

The Type LF contactors are 3-pole, DC magnet closed devices. They employ 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 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 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 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

Contactor Type	Contactor Continuous Current Rating Amperes		System Voltage	Horsepower Rating (2)			Controller Interrupting Capacity-Three Phase Symmetrical MVA	
				Synchronous Motor		Induction Motor		
	Open	Enclosed (1)		100% PF	80% PF		NEMA E1	NEMA E2
LF-72H430	400	360	6200-7200	4500	3500	3500	75	570
LF-72H430L	400	360	6200-7200	4500	3500	3500	75	570
LF-72H730	700	650	6200-7200	8500	7000	7000	75	570
LF-72H730L	700	650	6200-7200	8500	7000	7000	75	570

(1) Ventilated enclosure
(2) Typical H.P. rating, F.L. current of motor must not exceed contactor continuous rating.

Fig. 1 Rating Table

EFFECTIVE DATE - September 1980

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.

The magnet held contactors are closed by means of an intermittently rated DC magnet. After the main contacts close, a normally closed auxiliary contact mounted on the magnet frame, opens to insert a protective resistor in series with the closing coil to reduce coil voltage to a safe value. The mechanically held contactors are also closed by means of an intermittently rated DC magnet, but after the main contacts close, the magnet armature is mechanically latched in the closed position following which the closing coil is de-energized. In the latched position, the contactor will remain closed until the trip magnet is energized to disengage the armature latch.

The trip magnet is an intermittently rated device which may be operated on either AC or DC power. One or two trip magnets may be supplied using trip coil circuits of Figure 5.

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 item on the contactor. Silicon rectifiers for this purpose may be ordered by referring to the appropriate style number as listed in Figure 2. The operating coil and auxiliary contact 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.

CONTACT STRUCTURE

The stationary contact assemblies are made up of the 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.

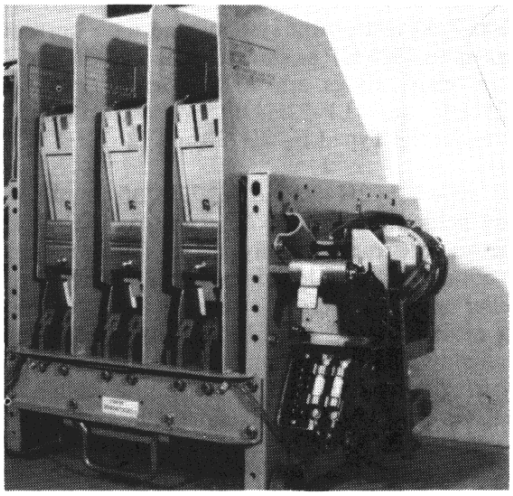

Fig. 3 Type LF-72H430L Contactor

Control Voltage	Application	Coil Data			Rectifier Style	Protective Resistor Style (2)
		Nominal Voltage	Style	Number Required		
115-AC	Close	100	658C651G01	1	2018A40G01	443A328H30 (36 Ohms)
230-AC	Close	200	658C651G02	1	2018A40G02	443A335H35 (3) (75 Ohms) 2 Req'd.
125-AC	Close	125	658C651G04	1	_____	443A328H30 (3) (36 Ohms) 2 Req'd.
230/250-DC	Close	250	658C651G03	1	_____	443A326H08 (3) (125 Ohms) 2 Req'd.
115-AC	Trip	115-AC	296B892G22	(1)	_____	_____
230-AC	Trip	230-AC	296B892G23	(1)	_____	_____
125-DC	Trip	125-DC	296B892G01	(1)	_____	_____
230/250-DC	Trip	250-DC	296B892G02	(1)	_____	_____
115-AC	Trip	100-DC	296B892G22	(1)	2018A40G01	_____
230-AC	Trip	200-DC	296B892G23	(1)	2018A40G02	_____

Fig. 2 Magnet Coils

ARC CHUTE

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 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 gasses, generated during arc interruption, are directed towards the front of the starter enclosure, and away from the vicinity of energized components and connections.

AUXILIARY CONTACTS

Two Type L-64 auxiliary contact units are mounted on the right hand contactor end plate and are operated by the magnet armature. This provides a maximum of four auxiliary contacts which may be any combination of normally open or normally closed by selection of the appropriate auxiliary contact units from Figure 4.

On the mechanically held contactor, one of these contacts is connected in series with the latch trip coil, as shown in Figure 5, to deenergize the trip coil as soon as the contactor opens. The three remaining auxiliary contacts are for general use in the starter control circuits. A third Type L-64 auxiliary contact unit is mounted on the trip magnet. This auxiliary contact is connected in series with the magnet closing coil, as shown in Figure 5 to deenergize the closing coil as the armature latch engages.

On the magnet held contactor, all four auxiliary contacts mounted on the contactor end plate are for general use in the starter control circuits. A third auxiliary contact unit 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.

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

Auxiliary Contact Unit Style	Circuit Combination Provided By One Contact Unit
843D943G04	One Normally Open, One Normally Closed
843D943G05	Two Normally Open
843D943G06	Two Normally Closed

Fig. 4 Auxiliary Contact Units

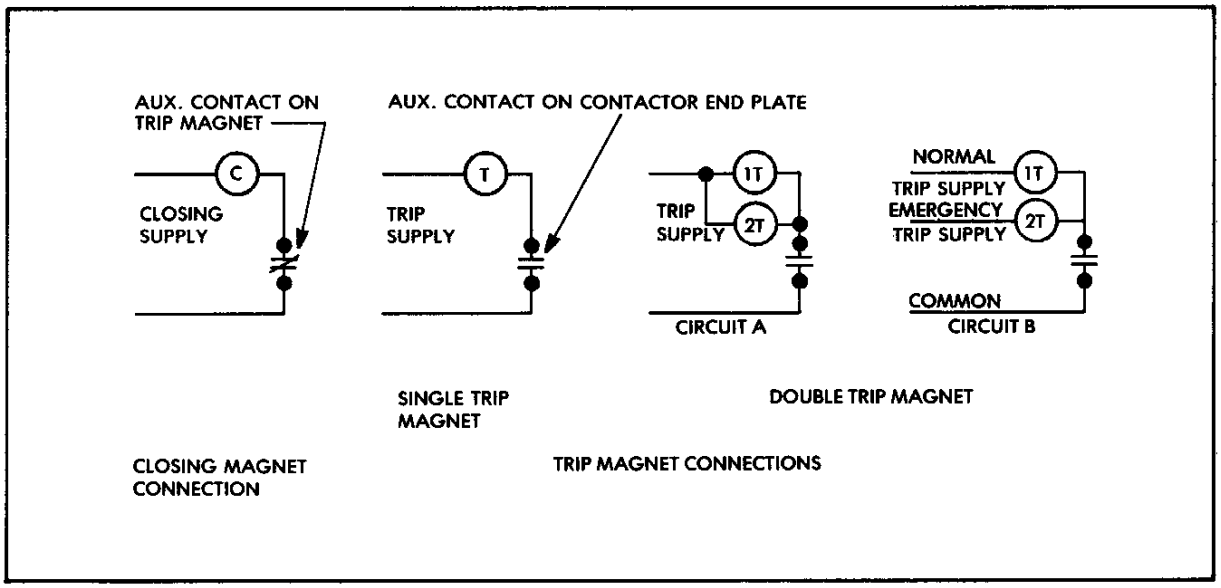

Fig. 5 Operating Coil Circuits for Mechnically Held Contactors (DWG 3513C80)

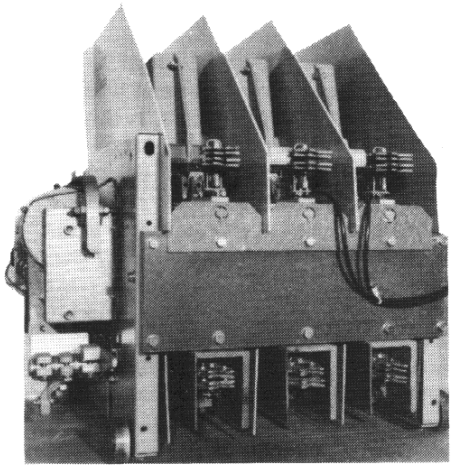

Fig. 6 Rear View of Type LF-72H430L Contactor

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 con-

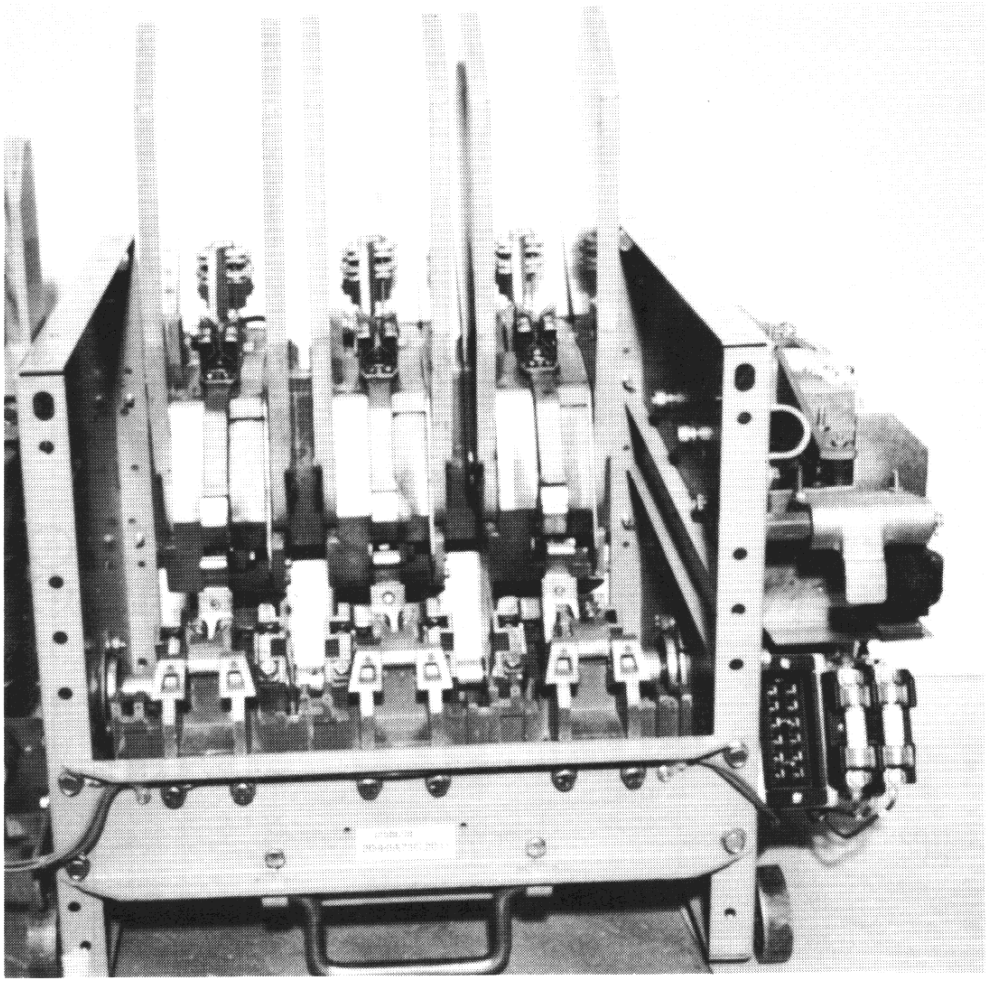

Fig. 7 Front View of Main Contacts and Shunts

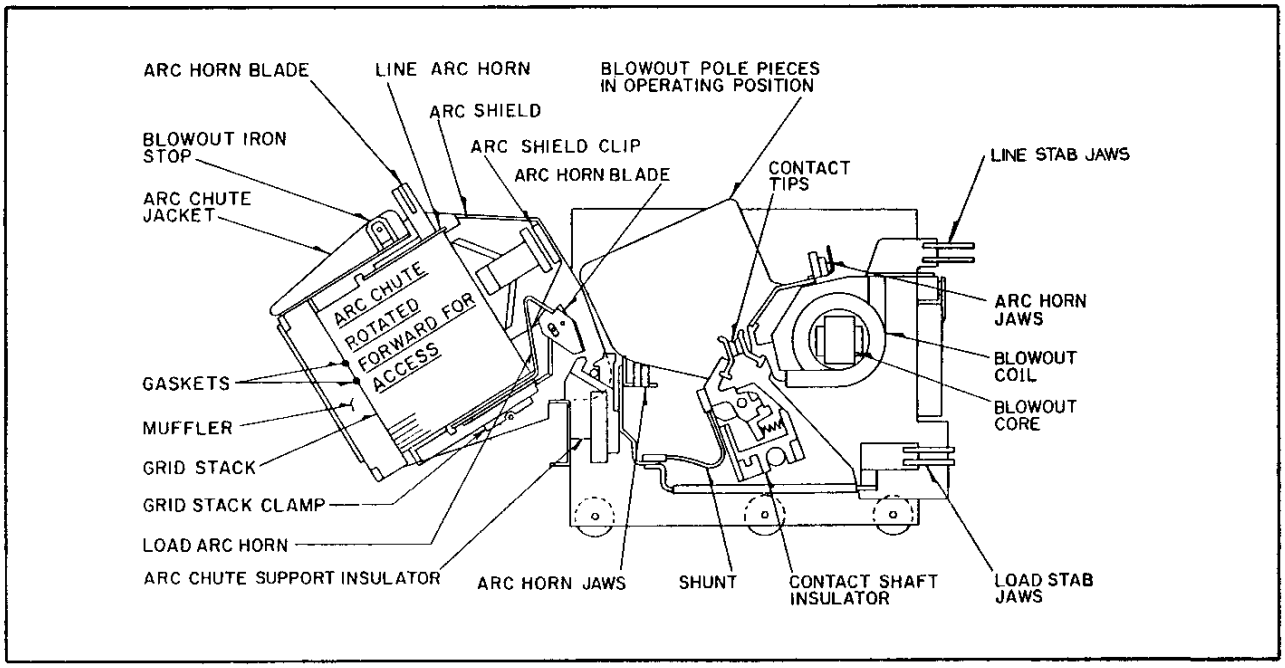

Fig. 8 Sectional View Through Contacts (Dwg. 5250CO5)

nected 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 8.

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 barrier and arc chutes and rotate the magnetic blowout pole pieces upward to the vertical position as shown in Figure 9.

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. .75 inch wide contacts must always be used on these 7200 volt contactors.

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

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 .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 adjust-

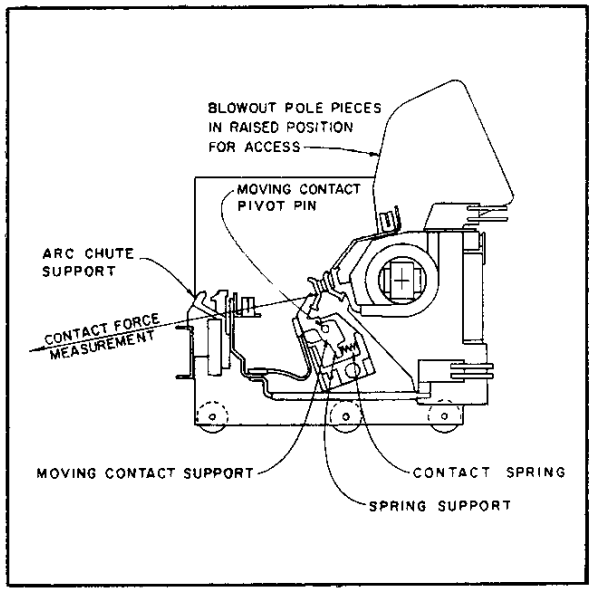

Fig. 9 Contact Force Measurement (Dwg. 5249C60)

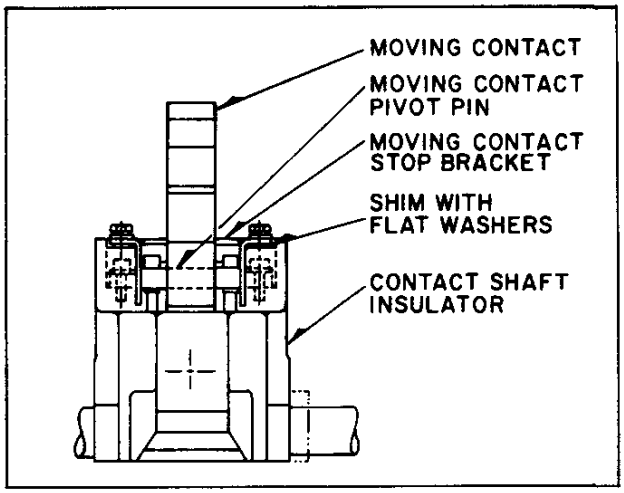

Fig. 10 Moving Contact Adjustment (Dwg 3513C83)

ment 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 9 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 9. 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, adjustments may be made by increasing or decreasing the number of flat washers under the stop bracket mounting lugs as shown in Figure 10.

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 11 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 made as follows:

1) Loosen the two bolts at "A" in Figure 11 which clamp the magnet armature to the shaft.
2) Block the magnet armature to provide a gap of .62" at point "X" of Figure 11.
3) Adjust bolt "B" in Figure 11 as required to make

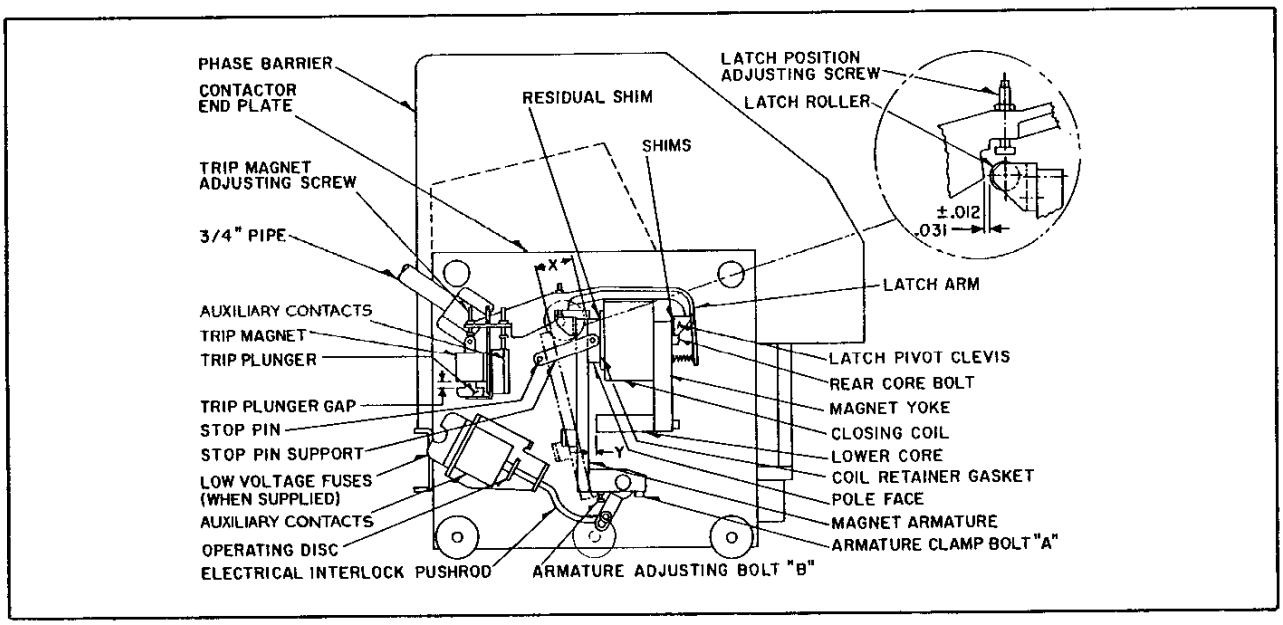

Fig. 11 Magnet Adjustments (Dwg 3513C85)

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) Weak, broken or incorrect contact springs.

c) Incorrect adjustment of the moving contact stop bracket.

OPERATING MECHANISM

In carrying out general inspections, operate the magnet armatures and latch arm by hand. Any friction in these moving parts should be investigated and corrected.

The armature holding latch is adjusted as follows:

a) Add or subtract .012 thick shims between latch pivot clevis and closing magnet yoke as required to make the corner of latch arm clear the extreme projection of latch roller by .031 ± .012", when the latch arm drops into the latched position and the closing magnet armature is tight against the pole face (See Fig. 11)

b) Set the "Trip" magnet adjusting screw to release the closing armature when the "trip" plunger gap is .060".

c) With the armature latch engaged, set the latch position adjusting screw so that the trip magnet plunger strikes the trip magnet adjusting screw when the trip magnet plunger gap is .375 ± .031".

d) The vertical pull required on the trip magnet plunger to release the latch should be 5 to 8 lbs.

REPLACING COILS

To change operating coils, proceed as follows:

Closing Coil

1. Disconnect the leads from the coil terminals.
2. Remove the two 3/8" - 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 remove the core and coil assembly from the magnet frame.
4. Install the new coil on the core assembly being sure the residual shim and coil retainer gasket are mounted as shown in Figure 11.
5. Re-install the core assembly by reversing the above disassembly procedure.

Trip Coil

1. Disconnect the coil leads.
2. Remove the four #8 screws from the mounting flanges of the trip magnet and remove the trip magnet assembly.
3. Using care not to bend or distort magnet parts, the roll pin bridging the plunger legs should next be pressed out to permit removal of the plunger. The retaining hook at one end of the plunger guides should then be straightened out to permit removal of the plunger guides following which the coil may be removed.
4. The new coil, new plunger guides, plunger and roll pin should now be restored in order being sure to bend over the ends of the plunger guides and inspect the completed assembly to make sure the plunger can slide freely without friction, sticking, or interference of any kind.
5. Re-check latch adjustments.

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 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 Fig. 8 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 8 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 two 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 the #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 .5" 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. Correct grid stack for this 75 MVA contactor will have 34-36 ceramic grid plates stacked up to a height of approximately 8.6 inches.

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 including 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 lockouts.

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 8 and then rotate the arc chute into operating position as shown in Figure 3. When in the operating position, arc horn blades should make at least .25" engagement with their respective arc horn jaws. 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 in the event the blowout pole pieces are not in their proper operating position.

Auxiliary Contacts

The two Type L-64 auxiliary contact units mounted on the right hand contactor end plate should be checked to be sure the auxiliary contact plunger does not reach its solid stop before the contactor is fully closed. The auxiliary contact 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 pushrod.

The third Type L-64 auxiliary contact unit 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 auxiliary contact is permanently mounted in a position such that its contacts will open when the armature gap "X" of Figure 11 is approximately .188".

The third Type L-64 auxiliary contact unit which is

used to de-energize the closing coil, is mounted on the rear of the trip magnet assembly and should be adjusted to have .10" ± .016" contact gap when the armature latch is fully engaged. This auxiliary contact is for use only in the closing coil circuit.

For further details of the L-64 auxiliary contact unit 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. This voltage is approximately three times the continuous rating of the coil, so when the armature of the magnet held contactor 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 nominal rating when the coil is cold and approximately 30% of nominal coil rating 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 .5" wide arc horns and 34-36 plate grid stacks must always be used with this 7200 volt 75 MVA Type LF contactor. Never energize the contactor at line potential without having arc chutes, phase barriers, and blowout iron in place.

Name of Part	Identification No.	Number Per Unit	
		Two Pole	Three Pole
Stationary Contact	316B948G02	2	3
Moving Contact	316B948G02	2	3
Moving Contact Spring	488A898H01	2	3
Moving Contact Shunt			
400 Amperes	657C766G01	2	3
700 Amperes	666C931G01	2	3
Arc Chute Complete	785A02G10	2	3
Latch Spring	441A241H06	1	1
Operating Coils	See Figure 2		

Fig. 12 Renewal Parts