

DS2812 SYNCHRONOUS-MOTOR FIELD CONTACTORS

600 VOLTS MAXIMUM 265 AMPERES MAXIMUM

Before any adjustments, servicing, parts replacement or any other act is performed requiring physical contact with the electrical working components or wiring of this equipment, the POWER SUPPLY MUST BE DISCONNECTED.

GENERAL

These contactors are used for applying and removing dc power from the fields of synchronous motors. Their closing time is short so that field can be applied at the correct time and assist the motor in accelerating to synchronous speed.

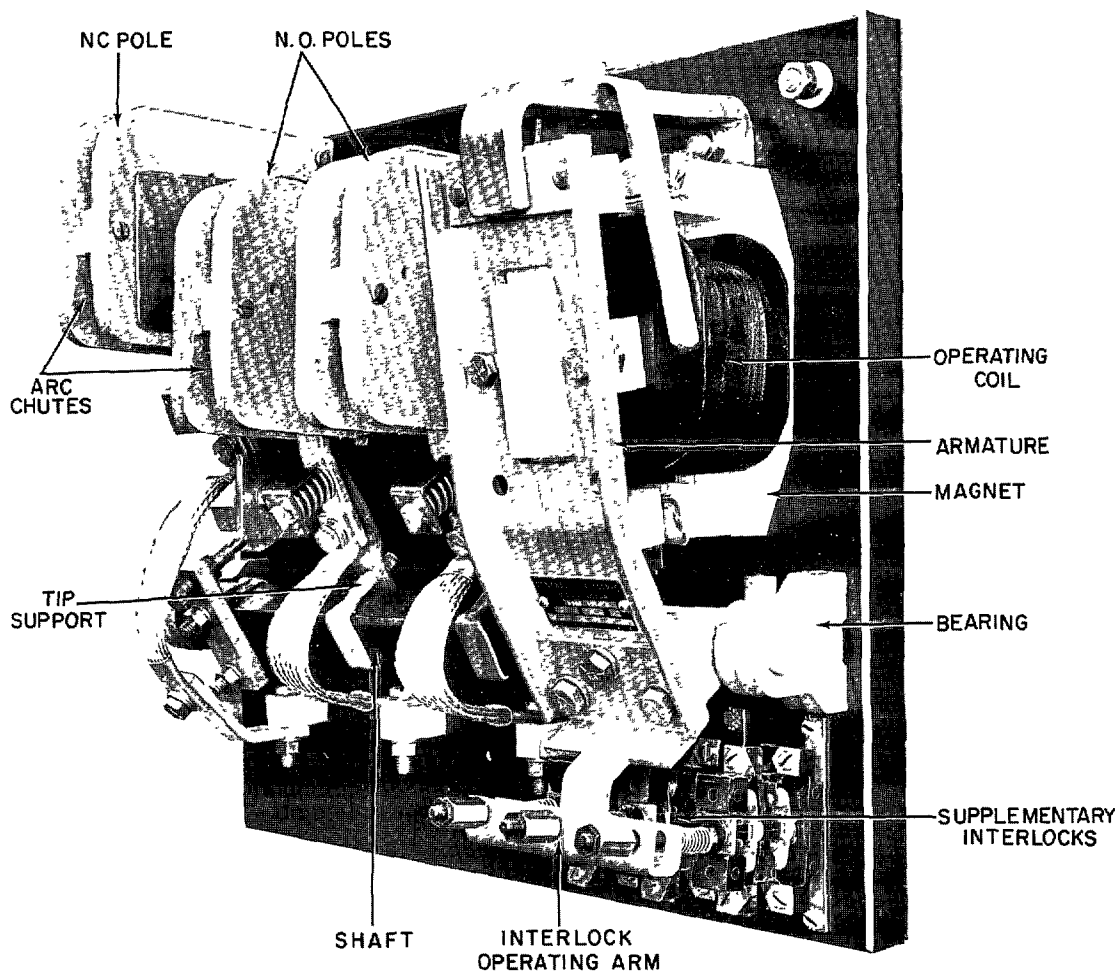


Figure 1. DS2812B207 Field Contactor

The contactors consist basically of a magnet at one end of a horizontal shaft which is rotated to operate the movable contacts. (Figure 1). Stationary contacts are mounted above the shaft. Individual arc chutes are set in place over each pole of the device.

Two normally open (N.O.) poles are included which have a continuous rating of 265 amperes. The normally closed (N.C.) pole has a continuous rating of 40 amperes. Two types of pole operation are described in the table below.

Form	Pole Operation
A	The single, normally closed pole opens slightly before the two normally open poles close.
AA, AB, AC and AD	The two normally open poles close slightly before the single, normally closed pole opens.

The contactor may be operated by either ac or dc coils mounted in the same magnet assembly. The ac coils are continuously rated, while the dc coils are intermittently rated with a holding resistor in series with the coil

INSTALLATION

All contactors should be carefully inspected before their installation to see that parts and adjustments, as indicated in these instructions, are in proper operating condition. Any packing material or other foreign matter should be removed, particularly from the contact tip and armature assemblies.

Grease or other foreign material must be removed from the armature and magnet mating surfaces. Use a cloth dampened with a suitable solvent such as Xylol. The armature and magnet should then operate positively and quietly in the closed position. The armature should be closed manually to be sure that the contactor operates without excessive friction or binding.

**** NOTE ****

Since this is a front-connected contactor, care should be taken to install the back insulation supplied with contactor when mounted on a steel panel.

ADJUSTMENTS

**** NOTE ****

The following adjustments are made at the factory and should not have to be changed. If it is necessary to replace parts, the following adjustments should be performed.

SHAFT

The shaft bearings must be assembled to allow the shaft to rotate freely with an end play of 1/64 to 1/32 inch.

ARMATURE AND MAGNET

1. Line up the armature and magnet pole faces so that allowable horizontal misalignment, with shaft end play equally divided, is 1/32 inch maximum. Check the alignment at both top and bottom. The top and bottom misalignment may be equalized in opposite directions. Check the alignment by depressing the armature.
2. The vertical alignment of upper and lower pole faces should not exceed 1/32 inch maximum.
3. Both horizontal and vertical end play of the armature in its bracket should be a minimum of 1/32 inch. (See Figure 2).
4. With the armature seated against the magnet frame, it must be possible to move the armature bracket toward the panel a minimum of 1/64 inch. (See Figure 2).

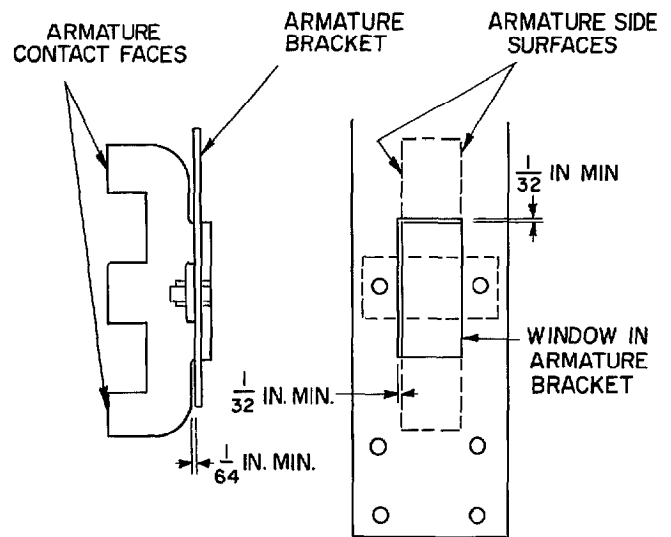
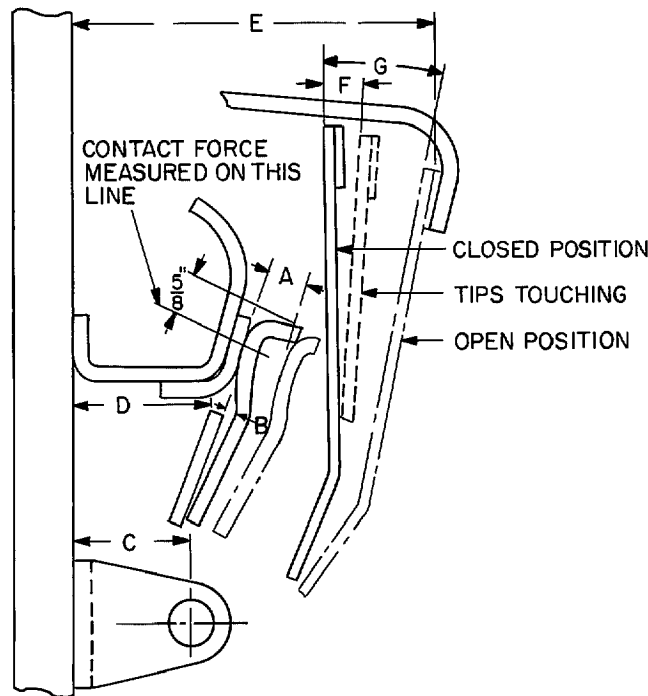


Figure 2. Magnet assembly shown with contactor closed.

POWER CONTACT TIPS

1. Adjust the contact tips of one N.O. pole to the required tip gap and wiper as shown in Figure 3. With these tips just touching, the tips of the second N.O. pole must not have more than 1/64 inch gap. When the armature is in its fully energized position, the wiper on tips measured at "B", see Figure 3, should come within the indicated limits. If either the 1/64 inch dimen-

sion, or the wiper are not correct, rotate the shaft clamps to obtain adjustment. Spread the adjustment over both clamps rather than attempting correction with a single clamp. Tighten the clamps after rotating and make certain that the contact tip support "M", see Figure 1, lies flat against the shaft. Check the tip gaps to be certain they are within specified limits.



Wipe	Gap A	B*	C	D	E	F	G	Pounds Tip Pressure		Spring Space on Center Line	
								Initial	Final	Initial	Final
$\frac{14}{64} \pm \frac{1}{32}$	$\frac{25}{64} \pm \frac{1}{32}$	$\frac{9}{64} \pm \frac{1}{64}$	$1\frac{7}{8}$	$2\frac{5}{16}$	$5\frac{11}{32}$	$3^\circ 45'$	9°	$4 \pm \frac{1}{2}$	8 ± 1	$1\frac{1}{16}$	$\frac{31}{32}$

When "A" and "B" dimensions are correct, other dimensions need not be checked except to locate test trouble.
 * When "B" dimension measures 1/16" it is recommended tips be renewed.

Figure 3. Contact tip and wiper data - normally open tips.

2. Adjust the N.C. tip gaps and wiper as shown in Figure 4. With the contactor de-energized, adjust stop "N" to obtain N.C. tip wiper (B). Adjust the return spring of the normally closed pole to zero turns (point where tension will start to be applied to spring) then tighten the adjusting nut two full turns. Due to spring tolerances, it may be necessary to increase the

spring tension to assure that the N.C. tips wiper in completely when shaft mechanism is operated slowly.

3. All movable contacts should be free to rock on the cone points in order to obtain self alignment.
4. Movable and stationary contacts must line up laterally within 1/32 inch and the movable tips

must not touch their respective arc chutes during operation of the contactor.

5. It is important that the contact forces be maintained at the values given in Figure 3. If the forces are too low, the contacts can overheat; if the forces are too high, the magnet may be prevented from completely closing.
6. To measure the initial pressure, use a spring scale attached to a string approximately 5/8 inch down from the top of the movable tip as shown in Figure 3. The initial contact force is measured at the moment a strip of thin paper between the movable contact tip support and the contact itself is released. The final contact force is measured with the contactor in its energized position, at the moment a strip of paper held between the movable and the stationary contacts is released. This final contact force applies to new contacts only.

Form A

Adjust screw that operates N.C. tips so that when N.O. tips touch the N.C. tips will have 1/32 to 1/16 inch gap. The minimum gap shown in Figure 4 must be maintained when the contactor is fully energized.

Forms AA through AD

Adjust the screw that operates the N.C. tips to give "B" wipe (Figure 4) 3/64 inch to 5/64 inch with N.O. tips just touching.

ARC CHUTES

The arc chutes should hook over the top of the arc horn without binding.

COVER OF N.C. SPRING MECHANISM

A minimum of 1/2 inch clearance should be maintained between the adjusting studs of the N.C. tips and inside of the metal cover mounted on the back of base.

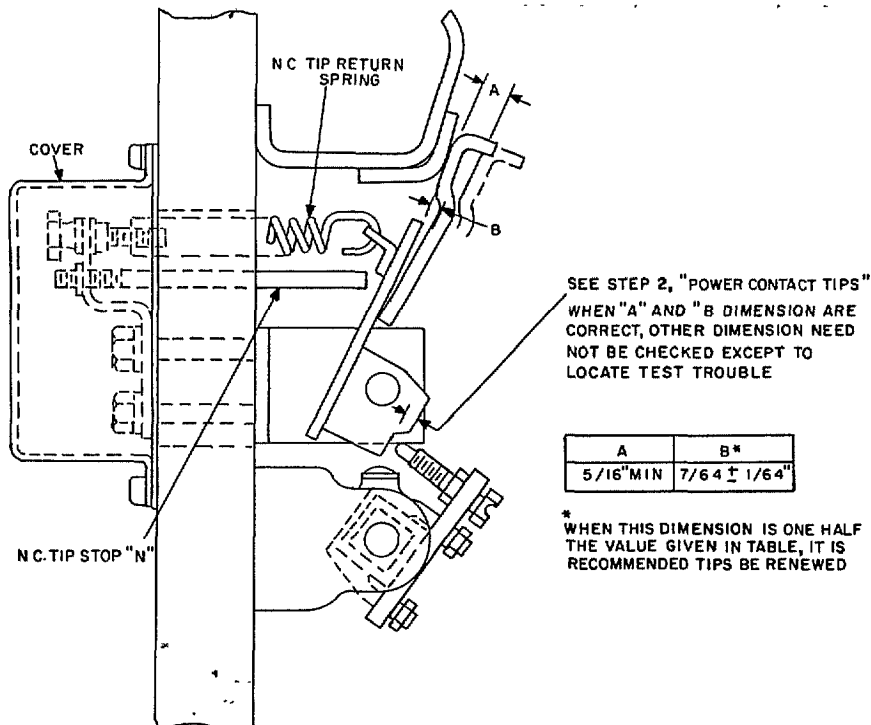


Figure 4. Contact tip and wipe data – normally closed tips.

ELECTRICAL INTERLOCKS

Check the operation of the supplementary interlocks as follows:

1. The interlock plunger and operating arm plunger must line up horizontally and vertically within 1/16 inch. (See Figure 5). To correct the horizontal alignment, loosen the shaft bolts that mount the operating arm, and slide the arm in the direction desired. To adjust for

vertical alignment, loosen the thread-cutting screw by one thread that mounts the interlock on its bracket and rotate the interlock up or down as desired. See Figure 6.

2. Any misalignment or angular position of the operating arm should be corrected by twisting the operating arm at Point "A" in the direction needed for correction. See Figures 6 and 7.

- All interlocks should have a minimum tip gap of $5/64$ inch and a minimum tip wiper of $3/64$ inch measured at locations shown in Figure 8. They should not normally require any adjustment. If necessary to readjust, bend the operating arm at "A" as shown in Figure 7. Do not adjust the spacer and jam nut on the operating arm plungers.
- With the contactor de-energized, the interlock plungers should be at the bottom of their travel and there should be a minimum gap of $1/16$ inch between the spacer and the operating arm. See Figure 6.

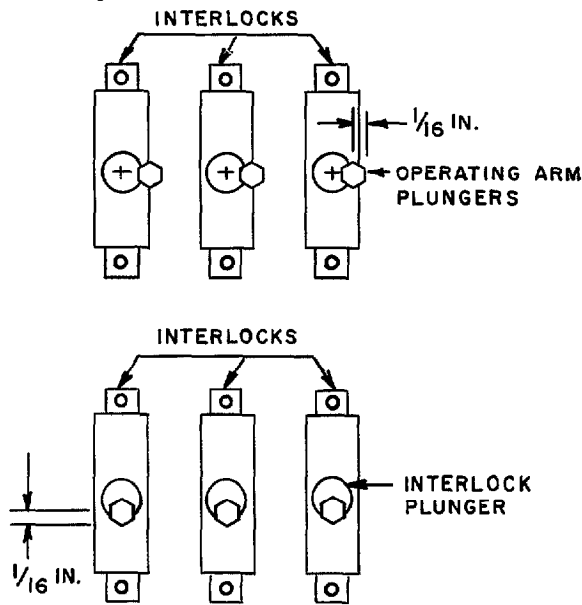


Figure 5. Alignment of interlock plungers and operating arm plungers.

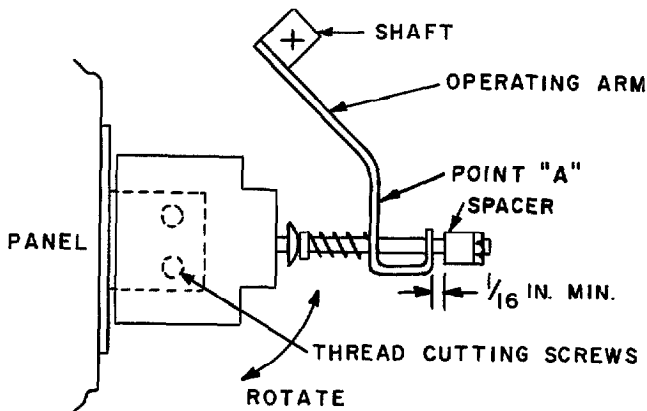


Figure 6. Interlock and operating arm assembly.

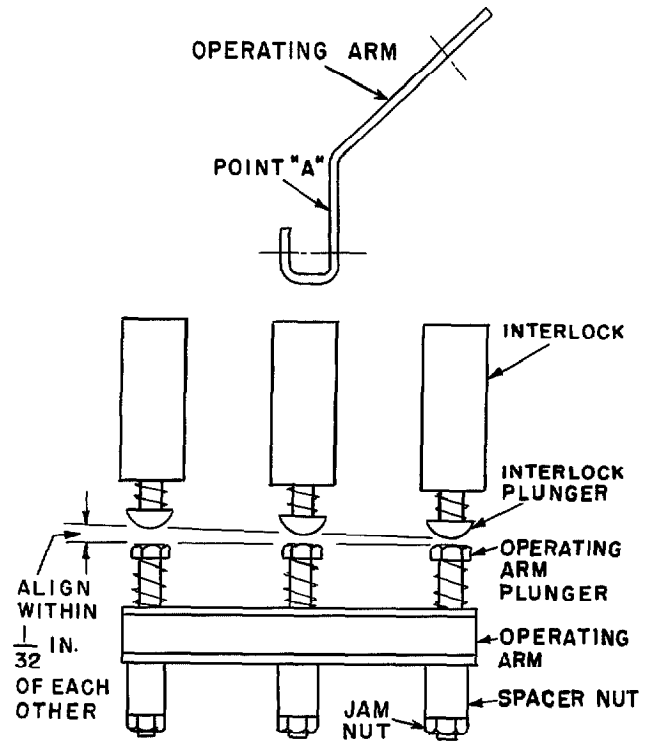


Figure 7. Adjustment of operating arm plungers and interlock plungers.

- With the contactor energized, there should be a gap of at least $1/32$ inch between operating arm plunger and interlock plunger, except for the holding interlock used with a dc magnet. See Item 7 in this section.

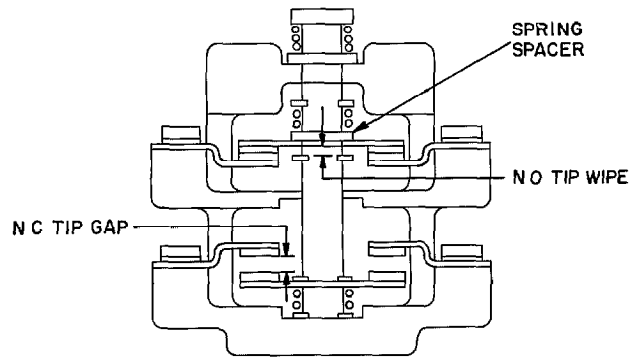


Figure 8. Interlock block with one set of normally open contacts and one set of normally closed contacts in de-energized position of contactor.

- If it is necessary to change the interlock contacts from normally open to normally closed or vice versa; reassemble the contacts, springs, and retainers as shown in Figures 8, 9 and 10. The spring ends must not project in the holes or keys or otherwise interfere with the movement of the operating arm.

Contact blocks with two normally closed circuits require a spring spacer (see Figure 10) to assure that the center spring is in place properly. Because of the circuit re-arrangement feature, a spring spacer is supplied with all other two-circuit contact blocks as shown in Figures 8 and 9.

When circuits are rearranged to obtain one normally open and one normally closed circuit, the contacts should be assembled as shown in Figure 8.

**** NOTE ****

The tip springs must be located as shown in Figure 8.

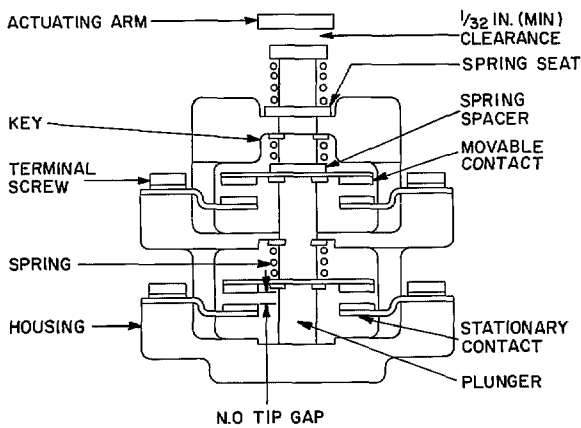


Figure 9. Interlock block with normally closed contacts in energized position of contactor.

- When a dc coil is used (see Figure 13), a normally closed contact on the outside right interlock must be used to insert the holding resistor. Adjust the jam nut and spacer on the operating arm plunger so that when the contactor is energized, the normally closed contact will have a gap of 1/16 inch.

The interlock ratings are shown in Table 1.

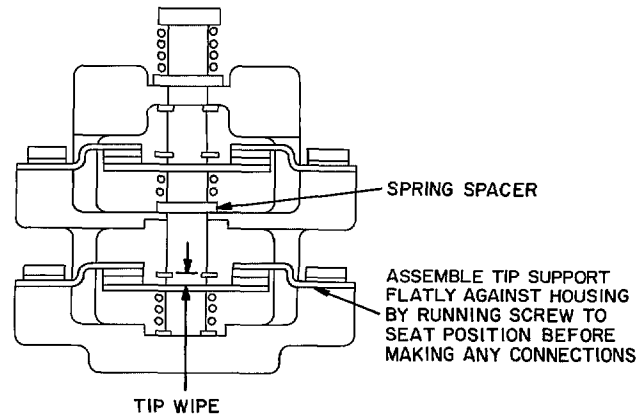


Figure 10. Interlock block with normally open contacts in energized position of contactor.

OPERATION (SEE FIGURE 11)

POWER CONTACTS

The normally open poles (FC) of this contactor are usually connected to a motor field as shown in Figure 11. These poles will close and open the dc field of the synchronous motor. The normally closed power pole (FC) inserts discharge resistor "A". This resistor (A) limits ac induced current during startup and also limits the dc field-discharge current. The discharge current flows after the normally open poles are again opened when the contactor is de-energized. The resistance of resistor, (A), must be supplied by the motor designer. Unit "N" is a motor-protective device which also is not supplied with this contactor.

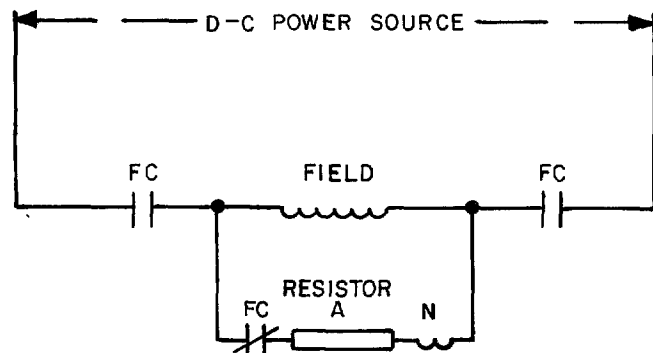


Figure 11. Contactor poles which connect dc power source to motor field.

CONTROL CONNECTIONS

Ac Magnet

Alternating-current-control power should be connected to the ac coil in accordance with Figure 12. The

contactor will operate satisfactorily with an ac control voltage from 85 percent to 110 percent of rated voltage. Voltages below 85 percent should not be used, as the closing speed of the contactors will be apprecia-

bly reduced and operation can be impaired. Voltages above 110 percent will shorten the life of the magnet through additional coil heating and magnet slam.

TABLE 1
INTERLOCK RATINGS (In Amperes)

NUMBER OF CONTACTS	CARRY	MAKE	INTERRUPT						
			*DC INDUCTIVE			†AC			
			125 V	250 V	600 V	110 V	220 V	440 V	600 V
One Set	10	60	1.8	0.5	0.2	6	3	1.5	1.2
Two Sets In Series	10	60	4.0	1.2	0.35				

* Noninductive dc interrupting rating is 1.5 times inductive.

† Capable of interrupting inrush current of 60 amperes at 110 volts, 30 amperes at 220 volts, 12.5 amperes at 440 volts and 8.5 amperes at 600 volts a limited number of times.

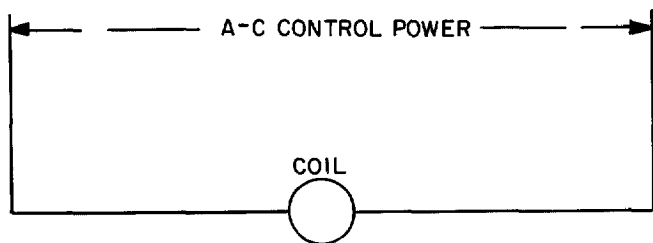


Figure 12. Ac connections to contactor coil.

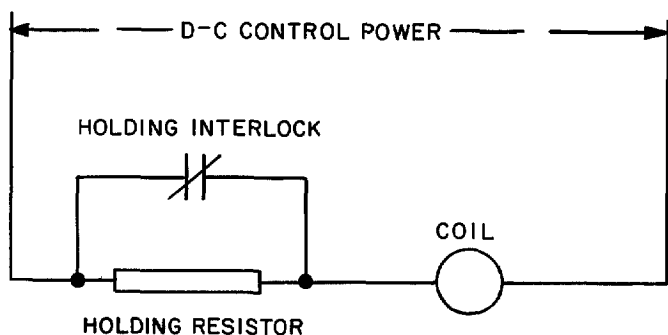


Figure 13. Dc connections to contactor coil.

Dc Magnet

Dc control power should be connected to the dc magnet in accordance with Figure 13. The contactor will operate satisfactorily with 80 percent to 110 percent of rated voltage. Voltages outside these limits should not be used for the reasons mentioned previously. The dc coils are intermittent-rated and require a holding resistor as shown in Figure 13. The holding interlock must be made available as explained under ELECTRICAL INTERLOCKS.

MAINTENANCE

GENERAL

This contactor will provide maximum service if given the benefit of preventive maintenance and inspection. It is important that a definite inspection schedule be maintained. Of course, the frequency of the inspection periods will depend upon operating conditions.

Contactor life depends on the severity of the service required. The contactor should be thoroughly inspected after approximately 25,000 operations.

INSPECTION

During routine inspections, the following should be checked in accordance with the procedures described below.

1. Screws, nuts and bolts must be tight.
2. Electrical interlock contact tips and springs.
3. Power contact wipe, surface condition and alignment.

If the contactor has been required to interrupt power above its rated capacity or has operated without proper adjustments and/or has been operating for a year since the last thorough inspection, the following checks should be made.

1. Contact forces
2. Shaft Bearing – Lubrication of bearings will be necessary for all bearings having an oil cup in the bearing block. Bearings that do not have the oil cup do not require lubrication as these bearing blocks contain permanently lubricated bearings.
Alignment of the bearing supports for free operation of the shaft must be maintained.
3. Adjustments – Adjustments should be checked in accordance with the section on ADJUSTMENTS at the times mentioned under MAINTENANCE.

ELECTRICAL INTERLOCKS

Gaps, wipes and alignment of electrical interlocks can be changed by loose hardware or by normal operation of the contactor. It is, therefore, important that contact wipes and alignment be maintained in accordance with the "Electrical Interlocks" section under ADJUSTMENTS.

Contact assemblies, or preferably the whole interlock assembly (one assembly includes contacts for two circuits), should be replaced when the following conditions exist:

1. The contacts are badly pitted to the point where the bottoms of the pits are close to touching the steel backing for the silver facings of the contacts.

**** NOTE ****

Tarnish on the silver facings does not need to be removed. The tarnish breaks down into conductive products.

2. If contacts are worn so that the contacts are thrown very badly out of alignment, the contact

assemblies should be replaced to reduce friction between the movable parts of the interlock.

3. When the wipe is reduced to one half of the minimum values shown in the "Electrical Interlocks" section of ADJUSTMENTS, the contact assemblies should be replaced to obtain the proper pressures to allow the interlock to operate satisfactorily.

When replacing the contact assemblies of a housing, it is recommended that both movable and stationary assemblies be replaced at the same time for best operation and minimum maintenance expense. When these replacements are made, the contacts of a movable contact assembly must make within 1/64 inch with the corresponding stationary contacts. Bend the stationary contact supports with the fingers, if necessary, to obtain this requirement.

POWER CONTACT TIPS

Power contact tip material will transfer from one tip to the other at some area of the tip. The bad build-up on the one contact opposite the pit of the mating contact can be removed and extend the life of the contacts through forcing the contacts to make on other areas. If contacts are wearing away with the contacts misaligned more than 1/16 inch, the contacts should be replaced, as the misaligned condition can only get worse and accentuate the wear of other mating parts. Contacts should also be replaced if the facing is nearly removed, or if the "B" dimension is reduced to 1/16 inch. See Figure 3 or 4.

When replacing contacts, see that the surfaces between the contact and the shunt are clean, but do not remove the plating from the bolted joints.

Power contact pressures as given in Figure 3 and 4 should be checked if the contactor has interrupted power beyond its rating or, if it has been operated without proper adjustments. Contact pressures should also be checked if the springs have a grayish black color which could indicate overheating. Power contact springs must be replaced if weak spring pressures are measured.

MAGNET AND ARMATURE

Replace the magnet and armature when wearing of outer legs of the armature magnet allow the center legs to make contact.

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in installation, operation, and maintenance. Should further information be desired or should particular problems arise that are not sufficiently covered for the purchaser's purpose, the matter should be referred to GE Drive Systems, Salem, Virginia, U.S.A.