



SQUARE D

Instruction Bulletin

Bulletin No. 50006-316-02A

August, 1993

Raleigh NC, U.S.A.

Supersedes 50006-316-02 dated 11/92

MEDIUM VOLTAGE VACUUM CONTACTOR

Type X2720 2-Pole and X3720 3-Pole (DC Control Power)

Class 8110



Two-Pole and Three-Pole Vacuum Contactor

 **DANGER**

HAZARDOUS VOLTAGE.

Power must be disconnected from the controller and contactor prior to performing any installation or maintenance.

Electrical shock will cause severe injury or death.

The following list of precautions must be studied and followed during installation, operation and servicing of the equipment.

1. Read this instruction bulletin prior to installing or operating the equipment.
2. If contactors are to be stored prior to installation, they must be protected from the weather and be kept free of condensation and dust.
Storage temperature should be maintained between 0° F (-18° C) to 149° F (65° C) and humidity below 85%.
3. Use extreme care when moving or positioning contactors (even if crated) as they contain devices and mechanisms which may be damaged by rough handling.
4. Only authorized personnel should be permitted to operate or service the contactors.

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Only authorized personnel should be permitted to operate or service contactors and controllers. Electrical equipment should be serviced only by qualified electrical maintenance personnel, and this document should not be viewed as sufficient instruction for those who are not otherwise qualified to operate, service or maintain the equipment discussed. Although reasonable care has been taken to provide accurate and authoritative information in this document, no responsibility is assumed by Square D for any consequences arising out of the use of this material.

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INTRODUCTION

This bulletin covers the description, installation, operation and maintenance of Square D Class 8110 Type X2720 and X3720 vacuum contactors.

GENERAL DESCRIPTION

The Class 8110 Type X2720 electrically held contactor is a two-pole and X3720 is a three-pole device available only in a bolted design. The contactor contains two or three vacuum interrupters, a DC operating coil with resistor circuit and up to eight auxiliary contacts in any combination N.O. or N.C.

SPECIFICATIONS

This section lists the specifications for:

- Environmental conditions
- Contactor
- Contactor auxiliary contacts

Environmental Conditions

Ambient operating temperature range.....	-5° to +40° C
Altitude.....	3300 ft (1000 m)
Altitude derating (above 3300 ft).....	0.002% per ft 0.0061% per m

Contactor

Maximum rated voltage.....	7200 VAC
Rated current:	
Open.....	400 A
Enclosed.....	360 A
Class E1 interruption.....	7300 A @ 5000 V 4600 A @ 7200 V
Short time carrying capability:	
30 seconds.....	2700 A
1 second.....	6750 A
Fuse let-through current (1/2 cycle).....	50 kA peak
Chopping current (mean of distribution).....	0.5 A
Rated frequency.....	50/60 Hz
Switching frequency.....	1200 per hour
Mechanical life.....	1,000,000 cycles
Vacuum interrupter electrical life @ rated current & volts	250,000 cycles
Impulse withstand.....	60 kV
Average closing time.....	100 ms
Average opening time.....	70 ms
Control voltage.....	100 VDC
Pickup voltage.....	70% (hot), 60% (cold)
Dropout voltage.....	50% (hot), 60% (cold)
Control current:	
Pickup.....	4 A, DC
Holding.....	0.7 A, DC

Contactor Rating

Although the maximum continuous rating of the enclosed contactor is 360 A, the actual rating depends on the enclosure size and type (vented or non-vented). Table 1 lists the contactor/controller current ratings.

Table 1 Contactor/Controller Current Ratings

Contactor/ Controller Current Rating (A)	Enclosure w/o Ventilation	Enclosure w/Ventilation		Min. Enclosure Height (in)
	Min. Volume (ft ³)	Min. Volume (ft ³)	Min. Door Ventilation ^[1] (in ²)	
360	44	—	—	68
300	40	—	—	64
260	36	—	—	60
360	—	40	80	60
300	—	30	80	55

[1] Total area of ventilation opening. One-half of this area shall be in a vent at bottom of door (at contactor mounting shelf level) and the remaining half of area at top of door/controller. **This table is for reference only.**

**Contactor Auxiliary
 Contacts**

Inductive current @ 35% PF
 Make..... 7200 VA
 Break 720 VA
 Continuous..... 10 A

Resistive current @ 75% PF
 Make, break and continuous..... 10 A

Rated voltage 600 VAC

RECEIVING

Examine shipping crate before unpacking the contactor to make sure it has not been damaged in transit. If shipping crate is damaged, pay particular attention when unpacking to see if contents are also damaged. Notify carrier if damage is found. Also, notify your local Square D sales office of damage.

UNPACKING

Carefully unpack the contactor. Do not insert any tools into the crate, as they may damage the contents.

INSPECTION

Check the packing list against the order to confirm that the shipment is complete. Verify the armature assembly operates freely. Refer to "CONTACTOR OPERATION" on page 3. Inspect contactor visually for possible shipping damage.

 **CAUTION**

EQUIPMENT MISALIGNMENT HAZARD.

- Do not use contactor line bus to move or lift contactor. Lifting by bus may cause misalignment.
- Make sure, following any inspection, that all connections are tight. Also, make sure vacuum interrupter assemblies are not damaged and are properly installed before energizing the contactor.

Failure to observe this precaution could result in personal injury, product damage or property damage.

Periodic Inspection

Periodic inspection and maintenance should be established to minimize down time. The frequency will depend on the severity of operating conditions. Inspection and maintenance is recommended once a year or every 20,000 operations.

**CONTACTOR
OPERATION**

For maintenance or test purposes the contactor can be operated either manually, per instructions listed in "MANUAL CONTACTOR OPERATION" on page 6, or electrically by connecting a separate 100 VDC source of control power to the contactor.

**MAINTENANCE AND
TESTING**

 **DANGER**

HAZARDOUS VOLTAGE.

Disconnect all power from the controller equipment prior to performing any troubleshooting or maintenance work on the contactor.

Electrical shock will cause severe injury or death.

Cleaning

Clean all dirt from the contactor. Pay particular attention to molded parts and tracking surfaces. Foreign materials on these surfaces should be removed.

**Contact Tip Gap
Measurement**

The contact tip gap measurement must be taken with the contactor fully closed. The armature plate must be positioned against the magnet frame for the contactor to be fully closed. Refer to "MANUAL CONTACTOR OPERATION" on page 6".

Measure gap from bottom of gap adjustment nut (item 2) to the top of metal pivot plate (item 9). Refer to Figure 1 for item locations. **Do not change adjustment of nut.** This measurement must be 0.020" minimum. If measurement is less than 0.020", the contact tips have worn beyond acceptable tolerances and a new vacuum interrupter assembly is required.

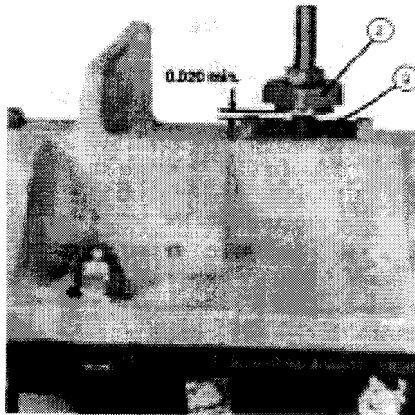


Figure 1 Adjustment Nut and Pivot Plate

CONTROL CIRCUIT RECEPTACLE REPLACEMENT

The receptacle for the control circuit plug consists of a plug housing and male contact pins with wire leads inserted from the rear. An extraction tool (Square D P/N 29904-08400) is required for pin removal. This tool, inserted into the receptacle from the front, compresses the retention springs allowing the lead and pin to be withdrawn from the plug housing.

The complete receptacle can be removed from the contactor control module by removing hardware (item D, Figure 2) and sliding receptacle out of mounting slot.

RESISTOR ASSEMBLY CHECK AND REPLACEMENT

To check resistors (refer to Figure 2):

1. Remove pan head screws (item 26) from resistor bracket and swing resistor assembly out of contactor molding.
2. Disconnect wires from resistor assembly (item 53). Under normal conditions (resistor cold) resistance will be 120-130 Ω for assembly or 495-505 Ω for individual resistor. If the resistor measures open, or less than value specified above, it is inoperable and must be replaced.
3. Route wires through wire protective tube attached to resistor bracket and away from resistors.
4. Connect wires to resistor assembly. Reinstall resistor assembly into contactor frame. Tighten screws (item 26).

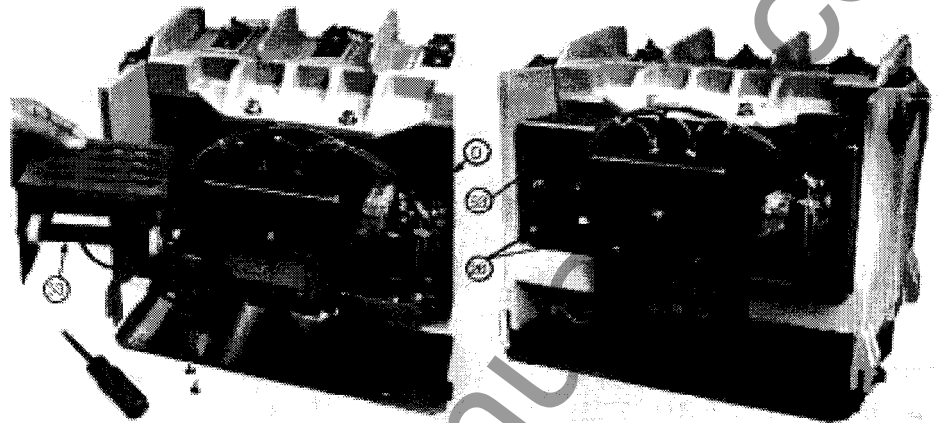


Figure 2 Control Circuit Receptacle and Resistor Assembly

ARMATURE SPRING REPLACEMENT

To replace armature spring (refer to Figure 3 for item locations):

1. Before removing armature spring (item 41), evenly loosen hex head screws (item 47) and allow spring guide (item 43) to release spring pressure.
2. Remove hex head screws (item 47), spring guide (item 43) and armature spring (item 41) without disturbing spring guide hex head screw (item 27).

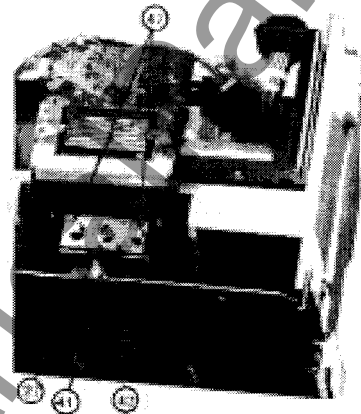


Figure 3 Armature Spring Assembly

To reinstall armature spring:

1. Seat the armature spring on the spring guide located on the armature extension.
2. Position front spring guide onto armature spring and fasten to the spring guide to the spring bracket by evenly tightening hex head screws (item 47).

CONTACT SPRING REPLACEMENT

The vacuum interrupter assembly must be removed from the contactor to replace the contact spring (item 22). Refer to "Removing Existing Interrupter Assembly" on page 7, also Figure 12. Prior to removing the vacuum interrupter assembly, the contact tip gap measurement must be recorded for use when reinstalling the interrupter. Refer to "Contact Tip Gap Measurement" on page 3.

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Reinstallation of the vacuum interrupter assembly is referred to in "Installing Interrupter Assembly" on page 8. Follow these instructions and verify that the contact tip gap measurement is adjusted to the value recorded prior to vacuum interrupter assembly removal. This ensures accuracy of future contact tip measurements.

MANUAL CONTACTOR OPERATION

To operate the contactor manually, the armature spring must be removed. Refer to "ARMATURE SPRING REPLACEMENT" above. With the armature spring removed, the contacts are closed but the armature is not sealed against the magnet frame.


To fully close the contactor and seal the armature, avoid the threaded shaft of the vacuum interrupters and push down on the contactor shaft insulator (refer to item 11, Figure 12). Approximately 20 pounds of force is required. Reinstall armature spring before proceeding.

CONDITION OF VACUUM INTERRUPTER ASSEMBLIES

If contactor has been exposed to fault conditions as indicated by blown motor fuses, the following checks must be made for the vacuum interrupter assemblies.

1. Physical evidence of stress (distorted, discolored, or cracked interrupters).
2. Contact wear measurement (see "Contact Tip Gap Measurement" on page 3).
3. Dielectric voltage withstand test.

Remove contactor from controller to perform the inspections and tests.

 CAUTION
<p>POSSIBILITY OF X-RAY EXPOSURE. This device may emit x-rays if voltage higher than rated maximum is applied across the open contacts or if contacts are spaced less than rated stroke. In such a case, personnel must be protected with appropriate shielding. Exposure to x-rays can cause injury.</p>

The dielectric voltage withstand strength of each vacuum interrupter should be checked. Each interrupter is tested in the factory at 18.2 kV rms, 60 Hz, 60 second duration. Repeat test shall be 14.4 kV rms, 50/60 Hz, 60 seconds duration across the open gap.

If unit fails the test, replace interrupter assembly with a new unit.

It is unlikely, but possible to have some loss of vacuum which might seriously damage the ability of the interrupter to interrupt the circuit. This condition may go unnoticed in a three-phase, ungrounded circuit, since it is possible for any two good interrupters to successfully interrupt the circuit. To guard against this condition, periodic dielectric tests across open contacts are desirable.

REPLACEMENT OF VACUUM INTERRUPTER ASSEMBLIES

Three major operations are required to replace a vacuum interrupter assembly.

- Removing existing interrupter assembly
- Preparing new interrupter assembly for installation
- Installing interrupter assembly

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Removing Existing Interrupter Assembly

To remove the interrupter assembly (refer to Figure 4 for item locations):

1. **Prior to removing vacuum interrupter assembly, the contact tip gap measurement must be recorded** for use when reinstalling the interrupter. Refer to "Contact Tip Gap Measurement" on page 3.
2. Remove hex nut (item 20) and spring washer (item 4) holding flexible shunt to the contactor line bus. **Do not remove the bolt holding the shunt to the interrupter assembly.**
3. Remove bottom cap screw (item 27) and two washers (item 5 & 6) holding vacuum interrupter assembly to the contactor.
4. Remove the jam nut (item 1) and gap adjustment nut (item 2) from the top of the interrupter assembly.
5. Lift up on the vacuum interrupter assembly. Pull out then down on the bottom portion of the interrupter assembly to remove it from the contactor.

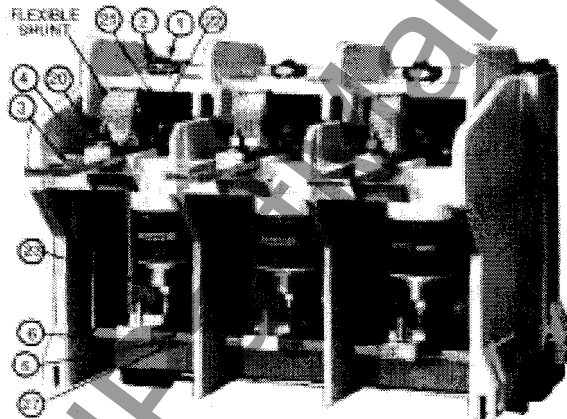


Figure 4 Interrupter Location and Hardware

Preparing New Interrupter Assembly

To prepare a new interrupter assembly (refer to Figure 5 for item locations):

1. Remove cap screw (item 27) and washers (item 5 & 6) from the bottom of the interrupter assembly.

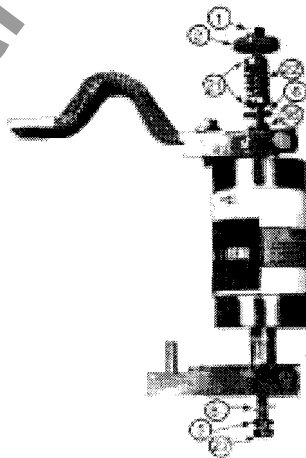


Figure 5 Interrupter Assembly

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD.

Do not allow the shaft of the vacuum interrupter assembly to turn. Turning the shaft will damage the interrupter.

Failure to observe this precaution could result in personal injury, product damage or property damage.

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2. Remove the jam nut (item 1) and gap adjustment nut (item 2) from top of interrupter assembly.
3. Do not remove contact spring (item 22), spring cups (item 21), hex nut, locking (item 36) and washer (item 6) from the interrupter assembly.
4. Interrupter assembly is now ready to be installed in contactor.

Installing Interrupter Assembly

To install interrupter assembly (refer to Figure 4 for item locations):

1. Place interrupter assembly (item 23) into contactor by putting top of interrupter assembly behind the line bus (item 3). Seat spring cup (item 21) in recess at top of contactor.
2. Place bottom of the interrupter assembly into contactor.
3. Gently rotate complete assembly until the flexible shunt lines up with the contactor line bus. **Do not rotate shaft of interrupter assembly.**
4. Install spring washer (item 4) and hex nut assembly (item 20) connecting shunt to line bus.
5. Install cap screw (item 27) and two washers (item 5 & 6) to bottom of interrupter assembly.
6. Install gap adjustment nut (item 2) on top of interrupter assembly and turn nut until it rests about halfway down the shaft. Install jam nut (item 1) until it rests above the adjusting nut, but not touching the adjusting nut.
7. With contactor deenergized, turn hex nut (item 36) until contact spring (item 22) is firmly seated between spring cups (item 21) but not compressed. Measure distance (A) between spring cups (refer to Figure 6).

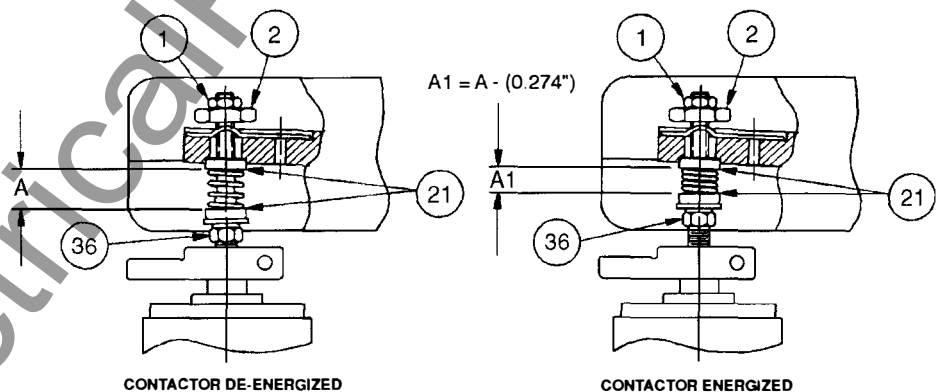


Figure 6 Tip Pressure Adjustment

8. Close contactor by energizing main coil.
9. Turn hex nut (item 36) counter clockwise until distance between spring cups (item 21) is equal to $A_1 = A - (0.274")$.

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 **DANGER**

HAZARDOUS VOLTAGE.

Voltage is present at coil terminals, resistors, capacitors and electrical interlocks. Do not touch these items.

Electrical shock will cause severe personal injury or death.

To adjust the gap (refer to Figure 7 for item locations):

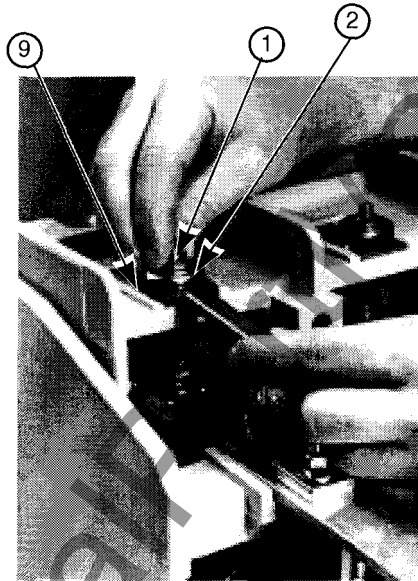


Figure 7 Gap Adjustment

10. Upon replacing a new interrupter assembly, place a 0.095" gauge between contactor pivot plate (item 9) and gap adjustment nut (item 2). For reinstallation of a used interrupter assembly, ensure that the contact tip gap measurement is adjusted to the value recorded prior to removal.
11. Tighten gap adjustment nut until it touches the gauge. **Do not tighten or torque down this nut.**
12. Hold gap adjustment nut with a wrench. **Do not allow the nut and shaft to rotate.** Tighten jam nut (item 1) down on gap adjustment nut and re-check gap.

 **CAUTION**

EQUIPMENT DAMAGE HAZARD.

Do not allow shaft of the vacuum interrupter assembly to turn. Turning the shaft will damage the interrupter.

Failure to observe this precaution could result in personal injury, product damage or property damage.

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13. Remove gauge.
14. For reinstallation of a used interrupter, **adjust gap adjustment nut (item 2) to produce a gap equal to the one recorded before removing interrupter assembly.** Measure between points as shown in Figure 6 .
15. Open contactor by deenergizing main coil.
16. Do not make adjustments to interrupter assemblies that have not been changed.
17. It is recommended that the condition of vacuum interrupter assemblies be checked. Refer to "CONDITION OF VACUUM INTERRUPTER ASSEMBLIES" on page 6.

Magnet Coil Replacement

Coil resistance may be measured to determine if the coil is inoperative. Under normal operating conditions the coil resistance will vary from 12 to 16 Ω . If the coil measures open or less than 10 Ω , it is inoperative and must be replaced. If coil resistance exceeds 16 Ω and the coil is hot, overheating is indicated. Refer to Table 2 for possible cause and corrective action.

To remove magnet coil (refer to Figure 12 on page 15 for item locations):

1. Disconnect coil wires from the coil.
2. Remove pan head screws (item 26) from resistor bracket and swing resistor assembly out of contactor molding.
3. Remove hex head screw (item 38) from magnet frame and slide magnet assembly to the left for removal of coil. **Do not remove spring washer (item 34) from core.**
4. Install new coil (item 33) on magnet core (item 31) and reinstall magnet assembly to contactor.
5. Reattach coil wires and reinstall resistor assembly.

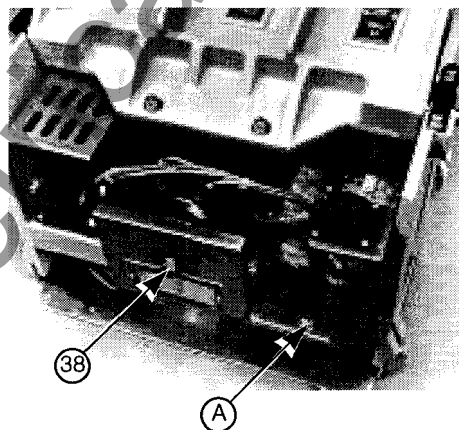


Figure 8 Magnet Frame Hex Head Screw

Electrical Interlock Contact Block Replacement

To replace electrical interlock assembly:

1. Swing resistor assembly out of contactor frame (refer to "RESISTOR ASSEMBLY CHECK AND REPLACEMENT" on page 4) and remove magnet coil.

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2. Remove two front hex head screws (item 47) to free electrical interlock assembly.
3. Install electrical interlock assembly and magnet coil.
4. Loosen screw (item A) until loose enough to permit control assembly to slide back and forth.
5. Place 0.030" gauge between armature and magnet frame (refer to Figure 9).
6. Energize contactor and adjust assembly (front/back direction) until coil current drops between 0.4-0.8 A, or coil voltage between 8-12 VDC.

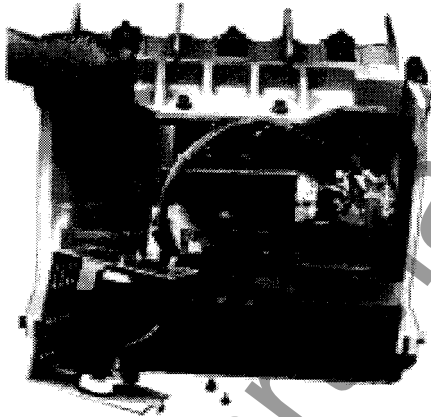


Figure 9 Adjustment Location

7. Before tightening screw (item A), ensure that the control circuit contact operator tab is centered between control assembly flanges (item C).

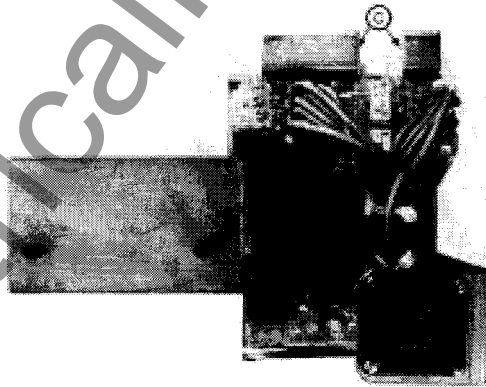


Figure 10 Electrical Interlock Assembly

8. Make sure that coil current and voltage is still as described above in step 6 and that all N.O. control contacts are closed and choke N.C. contacts are open.
9. Deenergize contactor and remove 0.030" gauge.
10. Place 0.085" gauge between armature and magnet frame.
11. Energize contactor. All power contacts (vacuum interrupter) must be closed and all N.C. control contacts must open and all N.O. control contacts must remain open.
12. Deenergize contactor and remove 0.085" gauge.

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13. Individual contact blocks may be replaced as required with the assembly mounted to the contactor. Disconnect control wires from block and unfasten block mounting screw. Replace block and connect control wires. After the control contact block is replaced, assembly adjustment is not required. To check adjustment of the electrical interlock, follow steps 5 through 12 above.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD.
 Make sure, following any maintenance, that all connections are tight. Also, make sure vacuum interrupter assemblies are not damaged and are properly installed before energizing contactor.
 Failure to observe this precaution could result in personal injury, product damage or property damage.

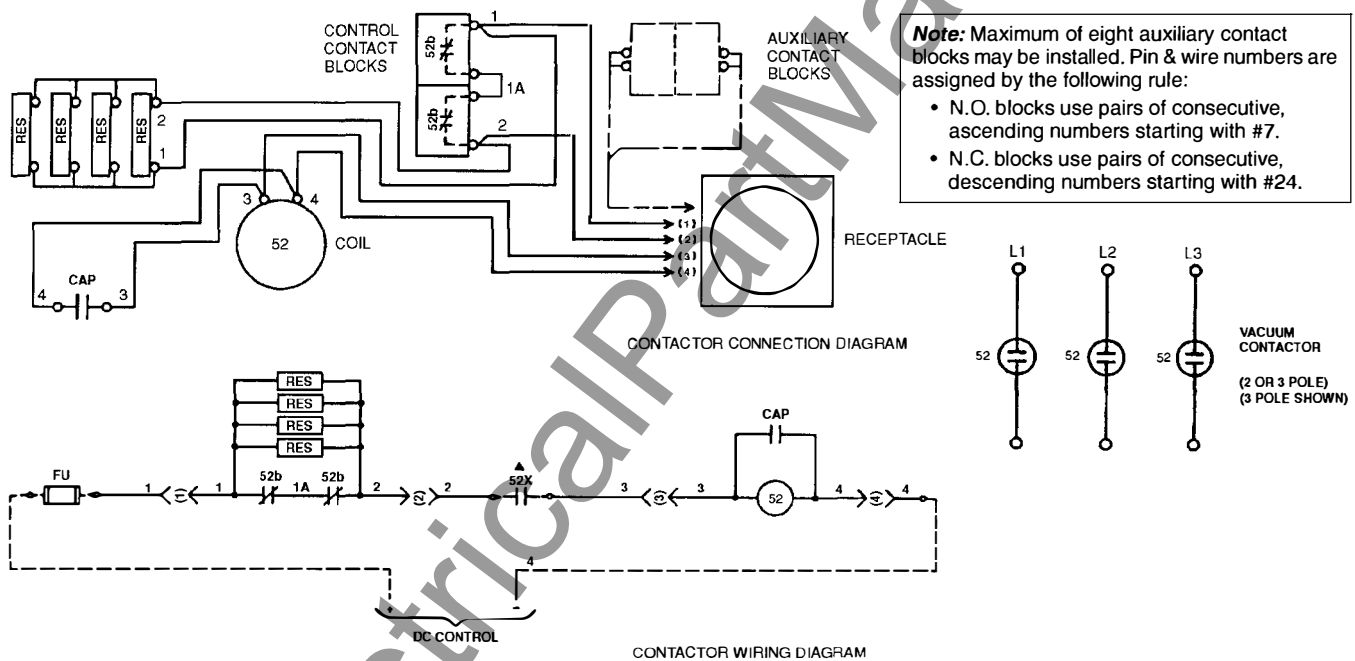


Figure 11 Wiring Diagram

⚠ DANGER

HAZARDOUS VOLTAGE.
 All power should be disconnected from the controller equipment before performing any troubleshooting or maintenance work on the contactor.
 Electrical shock will cause severe personal injury or death.

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Table 2 Troubleshooting Chart

Problem	Possible Causes	Corrective Action
Contactors does not close.	<ol style="list-style-type: none"> 1) Low control voltage. 2) External control interlock open. 	<ol style="list-style-type: none"> 1) Check that voltage to control terminals 1 & 4 is 90 to 100 VDC (refer to Figure 11). If control voltage is low refer to TROUBLESHOOTING section of controller bulletin. 2) Check that voltage at terminals 2 & 3 is 0 VDC (refer to Figure 11). If voltage is present, refer to TROUBLESHOOTING section of controller bulletin.
Contactors cycles.	<ol style="list-style-type: none"> 1) Resistor inoperative. 2) Operating coil inoperative. 3) Control electrical interlock inoperative or out of adjustment. 	<ol style="list-style-type: none"> 1) Refer to "RESISTOR ASSEMBLY CHECK AND REPLACEMENT" on page 4. 2) Refer to "Magnet Coil Replacement" on page 10. 3) Refer to "Electrical Interlock Contact Block Replacement" on page 10.
Magnet/armature chatters.	<ol style="list-style-type: none"> 1) Low control voltage. 2) Control electrical interlock out of adjustment. 3) Operating coil inoperative. 	<ol style="list-style-type: none"> 1) Check that voltage to control terminals 1 & 4 is 90 to 100 VDC (refer to Figure 11). If control voltage is low, refer to TROUBLESHOOTING section of controller bulletin. 2) Refer to "Electrical Interlock Contact Block Replacement" on page 10. 3) See "Magnet Coil Replacement" on page 10.
Sluggish contactor operation.	<ol style="list-style-type: none"> 1) Low control voltage. 2) Operating coil hot. 3) Contactor moving parts binding. 4) Vacuum interrupter assembly out of adjustment or inoperative. 	<ol style="list-style-type: none"> 1) Check that voltage to control terminals 1 & 4 is 90 to 100 VDC (refer to Figure 11). If control voltage is low, refer to TROUBLESHOOTING section of controller service bulletin. 2) See "Operating coil hot" below. 3) See "MANUAL CONTACTOR OPERATION" on page 6. 4) Refer to "CONDITION OF VACUUM INTERRUPTER ASSEMBLIES" on page 6 and "REPLACEMENT OF VACUUM INTERRUPTER ASSEMBLIES" on page 6.
Operating coil hot.	<ol style="list-style-type: none"> 1) Control electrical interlock out of adjustment. 2) Operating coil inoperative. 	<ol style="list-style-type: none"> 1) Refer to "Electrical Interlock Contact Block Replacement" on page 10. 2) Refer to "Magnet Coil Replacement" on page 10.
Vacuum interrupter assembly and/or associated power connectors overheat.	<ol style="list-style-type: none"> 1) Contact spring inoperative. 2) Loose connections. 3) Vacuum interrupter assembly inoperative. 	<ol style="list-style-type: none"> 1) Check contact spring. If broken, refer to "CONTACT SPRING REPLACEMENT" on page 5. 2) Check and tighten as necessary. 3) Refer to "RESISTOR ASSEMBLY CHECK AND REPLACEMENT" on page 4 and "RESISTOR ASSEMBLY CHECK AND REPLACEMENT" on page 4.

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Table 3 Class 8110 Type X2720 and X3720 Vacuum Contactor Parts List

Item No.	Part No.	Description	Item No.	Part No.	Description
①1		5/16-18 Jam nut	31	51034-230-01	Magnet core
2	51034-036-01	Gap adjustment nut	①32		5/16-18 Hex nut
3	51034-238-50	Line bus	33	51034-306-50	Coil
4	23903-32002	5/16 Spring washer	34	51020-041-01	Spring washer
①5		5/16 Lock washer	35	51034-229-01	Magnet frame
①6		5/16 Plain washer	36	23201-20251	3/8-24 Hex nut, locking
7	23201-00200	1/4-20 nylon nut	37	22903-25480	3/8-24 x 1-1/2 Set screw
①8		1/4 Plain washer	①38		3/8-16 x 1-1/4 Hex head screw
9	51034-038-01	Pivot plate	39	51034-325-01	Control circuit contact operator
①10		#10-32 x 1 hex head screw	40	51034-234-01	Armature stop
11	51034-002-50	Shaft insulator	41	50502-602-31	Armature spring
12	51034-225-01	Mounting base	42	51034-227-50	Spring bracket
①13		1/4-20 x 1/2 Hex head screw	43	51034-228-01	Spring guide
①14		1/4 Lock washer	①44		3/8 Lock washer
15	51034-035-01	Bearing retainer	45	52904-020-50	Capacitor, 10 µf 440 VAC
16	51034-001-50	Contactorm frame	46	29903-12000	Capacitor Boot
①17		#10 Plain washer	①47		5/16-18 x 2 Hex head screw
18	23201-00171	#10-32 Nyloc nut	48	51034-332-50	Control assy for basic contactor (includes items 51, 52, 54 & 58)
19	29002-54000	Bearing	①49		#10-24 x 1-1/4 Pan head sems screw w/helical spring lock washer
20	23427-02200	5/16-18 Hex nut assy	50	51034-329-50	Resistor mounting base
21	51034-039-01	Spring cup	51	25410-03739	Receptacle
22	50502-601-40	Contact spring	52	25410-06089	Male contact pin
23	51034-338-50	Vacuum interrupter assy (includes items 1, 2, 6, 21, 22 & 38)	53	51034-335-50	Resistor assy
①24		#10-24 Hex nut	54	9001 KA5	Control contact block
①25		1/4-28 Hex head screw	55a	51034-240-50	N.O. Electrical interlock contact block assy (includes 9001 KA2 contact block, wire & male contact pins (item 52))
①26		#10-24 x 5/6 pan head screw	55b	51034-240-51	N.C. Electrical interlock contact block assy (includes 9001 KA3 contact block, wire & male contact pins (item 52))
①27		5/16-18 x 1 Hex head screw	56	51034-336-50	Capacitor mounting bracket
28	51034-328-01	Armature plate	57	29903-03979	Capacitor mounting clamp
①29		1/4-20 x 1-1/8 Hex head screw	58	9001 KA3	Control contact block
①30		1/4-20 x 5/8 Hex head screw			

①Standard hardware, obtain replacements through local hardware distributor.

www.ElectricalPartManuals.com

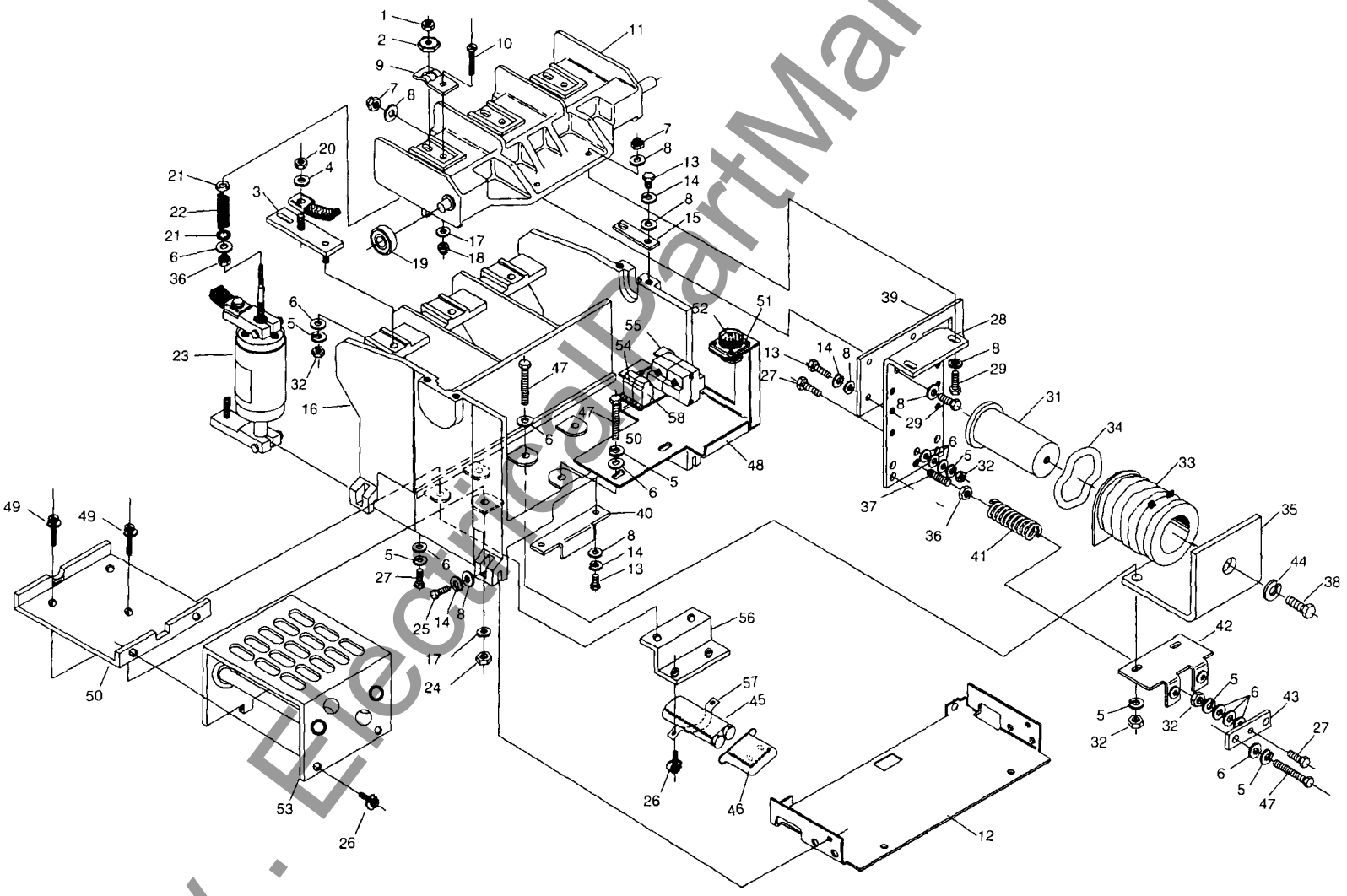


Figure 12 Item Locations

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Notes:

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