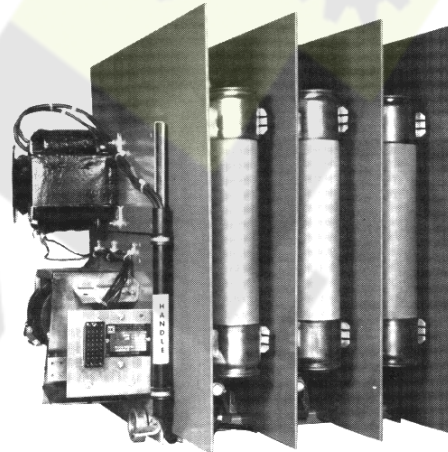


SERVICE BULLETIN **8110-7**

AUGUST, 1978

Supersedes SB 8110-7 Dated 11/76



Class 8110 High Voltage Drawout Contactor Type E, Series A

- General
- Inspection
- Preparation for installation
- Maintenance
- Parts listing
- Troubleshooting

SQUARE D COMPANY

P. O. Box 9247, Columbia, S. C. 29290

GENERAL DESCRIPTION

The Class 8110 Contactor is a 3 pole, drawout, clapper type, air break device. The contactor is rated at 5000 volts, 360 amperes (enclosed), 60 KV BIL, and has an interrupting capacity of 50 MVA RMS symmetrical.

This contactor is designed to meet UL Standard No. 347 and NEMA Standard ICS 2-324.

The contactor can be supplied in four configurations, consisting of the following assemblies, for various applications:

1. Standard Contactor Assembly (figure 1) includes:

- ★ a. Basic contactor.
- b. Three power fuses with fuse clips.
- c. Control power transformer: 750VA, 1 Φ 120V secondary, with two primary fuses.

Note: This contactor assembly is used as:

Main Contactor (M) on:

- Full voltage non-reversing starters
- Reduced voltage auto-transformer starters
- Wound rotor motor starters

Start Contactor (S) on:

- Reduced voltage primary reactor starters

2. Contactor with Third-Stab Assembly includes:

- a. Standard contactor assembly as described under 1 above.
- b. Third-stab assembly mounted below the blowout coil assembly (see figure 2 for location).

Note: Third-stab assembly is supplied on "Forward" (F) contactor of reversing starter. It is also used as disconnect switch for potential transformers or static exciter for a synchronous motor starter.

3. Special Contactor Assembly includes:

- a. Basic contactor.
- b. Third-stab assembly mounted below the blowout coil assembly (see figure 2, rear view, for location).
- c. Front bus assembly in place of power fuses and fuse clips (see figure 2, front view, for location).

Note: This contactor assembly is used as:

RUN (R) contactor on:

Reduced voltage starters

REVERSE (R) contactor on:

Reversing starter

4. Mechanically Latched Contactor Assembly includes:

- a. Standard contactor assembly, described under 1 above.
- b. Latching mechanism mounted on the left hand side plate of the contactor (see figure 3 for location).

Note: Mechanically latched contactor assembly is used primarily for:

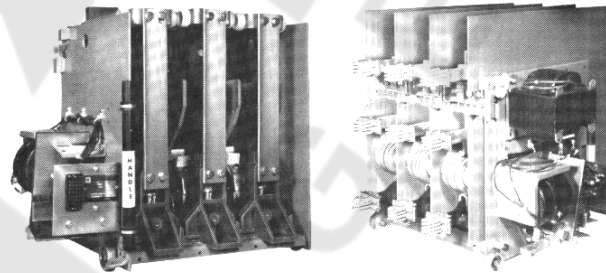
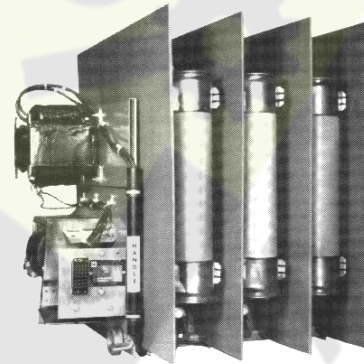
- Transformer feeder circuits
- Transfer schemes
- Applications where it is desirable to have the contactor remain closed, should the voltage dip or fall.

One 750VA control transformer with two primary fuses is supplied as standard on 1, 2 and 4 above; however, a maximum of 2500VA capacity control transformer can be mounted on the contactor. Two 750 control transformers can be supplied on the contactor to obtain three phase power. In this case, three primary current limiting control fuses are furnished (figure 4). Wiring diagram of the starter should be consulted to determine control transformer capacity and arrangement.

★ NOTE: The basic contactor assembly for Class 8198 and Class 8196 starters are the same except for additional pins on side plates of contactor to be used on 8196 starters. See page 7 for details.

FIGURE 1

Standard Contactor Assembly



FRONT VIEW

FIGURE 2

REAR VIEW

Front View: Special contactor assembly with front-bus assemblies (without control transformer, power fuses and fuse clips).

Rear View: Special contactor assembly with third-stab assemblies.

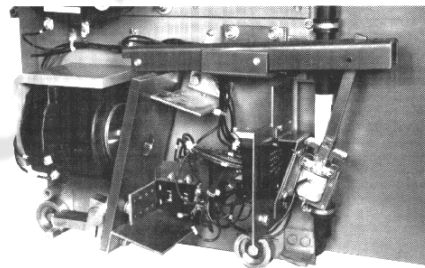


FIGURE 3

Mechanically latched contactor with latching mechanism. Tripping solenoid mounted in front is optional.

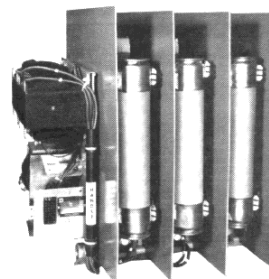


FIGURE 4

Contactor with two control transformers and three primary control fuses to obtain 3 Φ power.

UNCRATING

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 local Square D field office of damage.

INSPECTION

A. PRELIMINARY INSPECTION

1. Check the contactor visually for good condition. Inspect all parts for secure mounting and good electrical connections.
2. Check that fuse holder clips are not bent or deformed. Be sure that all fuses fit firmly in fuse clips.
3. Pull out power fuses by hand—first from top clip and then from lower clip. Next, remove phase barriers by lifting straight up (approximately 1") then tilting backward and sliding them out. Also remove the arc chutes by lifting straight up with both hands until clear of contactor.

NOTE: NO TOOLS ARE REQUIRED TO REMOVE THESE PARTS.

4. Check to be sure that the operating shaft rotates easily. Close contactor armature manually to check contact tip alignment (see figure 5). Release armature slowly and check that shaft rotates out of engagement freely.
5. Check to be sure that all connections are secure.
6. Inspect control circuit receptacle for possible damage.

B. ROUTINE INSPECTION

The contactor should be inspected at intervals determined by the service conditions. The following table can be used as a guide:

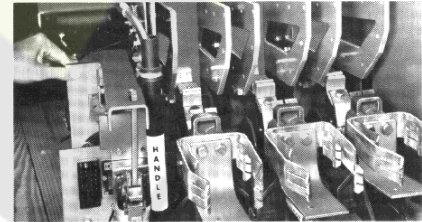
OPERATING CONDITION	ENVIRONMENT	INSPECTION TIME PERIOD
<ul style="list-style-type: none"> • Contactor in continuous operation up to 16 hours during a 24 hour day except for isolated instances. • Maximum two start-stop operations per day. 	Contactor operating in clean atmosphere.	Every two months
<ul style="list-style-type: none"> • Contactor under intermittent operating conditions for 24 hours during a day. • Maximum one start-stop operation within 3 hour time period except for isolated instances. 	Contactor operating in clean atmosphere.	Every month
<ul style="list-style-type: none"> • Contactor under intermittent operating conditions for 24 hours during a day. • Maximum one start-stop operation within 3 hour time period except for isolated instances. 	Contactor operating in highly contaminated atmosphere with chemical fumes, gases and/or fine dust.	Every week

NOTE: If trouble is found during inspection, repairs should be made immediately.

MAKE SURE, FOLLOWING ANY INSPECTION, THAT ALL CONNECTIONS ARE TIGHT, ARC CHUTES, FUSES AND ALL FOUR PHASE BARRIERS ARE NOT DAMAGED AND ARE PROPERLY INSTALLED BEFORE ENERGIZING THE CONTACTOR. SEE FIGURE 6.

CAUTION

DO NOT USE CONTACTOR LINE AND LOAD STABS TO MOVE OR LIFT THE CONTACTOR. THE STABS ARE ALIGNED AT THE FACTORY. TO ROLL THE CONTACTOR, USE HANDLE IN FRONT.



Contactor with power fuses, phase barriers and arc chutes removed. Contacts closed manually.

FIGURE 5

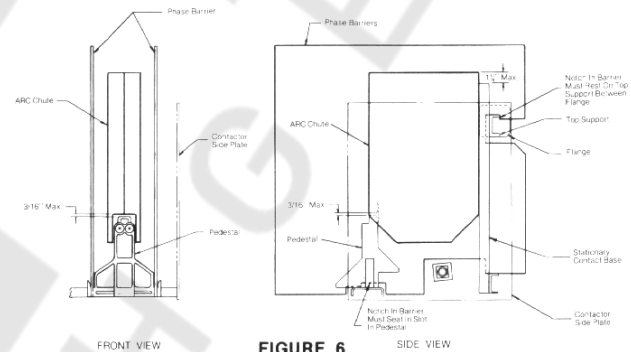


FIGURE 6

Front View:

(Right Pole of Contactor)

- Clearance between arc chute and pedestal must not exceed 3/16"
- Remove power fuses to check this clearance.

Contactor Right Side View:

(Blowout Coils, Line & Load Fingers not shown)

- Distance between top of arc chute and stationary contact base must not exceed 1-1/8"
- Check that phase barriers are installed as shown.

* PREPARATION FOR INSTALLATION

CAUTION

DO NOT USE CONTACTOR LINE AND LOAD STABS TO MOVE OR LIFT THE CONTACTOR. THE STABS ARE ALIGNED AT THE FACTORY. TO ROLL THE CONTACTOR, USE THE HANDLE IN FRONT.

NOTE: Before installation, check that contactor part number (P.N.) on its nameplate matches the contactor part number on label located inside high voltage compartment door of the starter.

- Remove contactor from shipping pallet to contactor lift jack, Class 8198 Type HJ-2 (can be purchased from Square D Company, see figure 7).
- Make sure the two front wheels of the contactor are positioned in the slots provided on the tray of the lift jack.
- Secure the contactor by inserting safety pin into the hole on the tray behind the front right wheel of the contactor.** The pin is attached to the lift jack tray.
- With the lift jack tray in its lowest position, move the contactor near its proper compartment (see note above). **The contactor should be transported on the lift jack with the tray lowered to bottom position.**
- Move drawout handle for the High Voltage Compartment to the down position and open the door.

Note: Drawout handle is not provided for 'Reverse' (R) contactor in reversing starter, 'Start' (S) and 'Run' (R) contactors in Autotransformer starter and 'Run' (R) contactor in Primary Reactor starter.

* NOTE: This section does not apply to Class 8196 starters since contactors are shipped inside the starter section.



FIGURE 7

INSTALLATION

For details, refer to instructions on the label inside the High Voltage Compartment Door.

TESTING

For details, refer to Service Bulletins 8198-2 or 8196-1.

CAUTION

WHEN CHECKING CONTACTOR ENGAGEMENT BE SURE INCOMING LINE TO VERTICAL SECTION IS DE-ENERGIZED.

CAUTION

ALL POWER SHOULD BE DISCONNECTED FROM THE STARTER EQUIPMENT PRIOR TO PERFORMING ANY TROUBLESHOOTING OR MAINTENANCE WORK ON THE CONTACTOR. HOWEVER, THE EQUIPMENT HAS BEEN DESIGNED TO PERMIT LIMITED MAINTENANCE AND/OR TESTING ON THE CONTACTOR AFTER IT HAS BEEN ISOLATED FROM THE MAIN POWER. WHEN PERFORMING THIS WORK, EXTREME CAUTION MUST BE EXERCISED IN VIEW OF THE PRESENCE OF HAZARDOUS VOLTAGE.

IT IS RECOMMENDED THAT CONTACTOR BE REMOVED FROM THE HIGH VOLTAGE COMPARTMENT FOR ADDITIONAL SAFETY AND EASE OF MAINTENANCE.

Note: See page 7 and 8 for item number listing.

MAINTENANCE

1. CLEANING

Clean all dirt or dust from the contactor. Pay particular attention to insulators and tracking surfaces. Foreign materials from these surfaces should be removed.

2. CONTACT TIP INSPECTION AND REPLACEMENT

Remove power fuses if used (85) or front bus assembly, phase barriers (94) and arc chutes (93). See page 3 for instructions. Discoloration of surfaces and slight pitting is normal. If contact surfaces show grooves, deep pits or are structurally weakened, they should be replaced.

To check for contact wear, move the armature by hand until the contacts just close. Gauge the distance from the armature to the top of the magnet frame. If this distance is less than $\frac{1}{4}$ " (see figure 8) due to contact wear or erosion, the contact tips should be replaced.

For contact tips replacement, refer to instruction sheet (51033-510) enclosed with contact tip replacement kit.

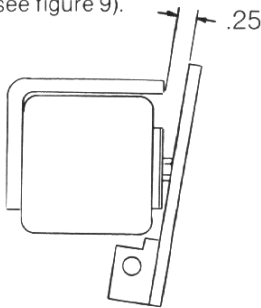
3. CONTACT FORCE

The contact force should be 22 ± 4 pounds on each power contact. This force will be maintained unless contact arm springs (64) have been badly overheated or damaged. In this event, the entire assembly (63) must be replaced. To measure initial contact pressure, hold the armature in a position just to close the contacts. Insert the cloth tape around one of the moving

MAINTENANCE

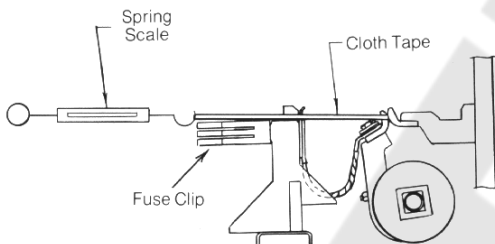
CONTACT FORCE (continued)

contacts as shown in figure 9 and pull the tape with spring scale until the contact just opens. For proper angle of pull, the tape should barely touch the top edge of the fuse clip (see figure 9).



Checking Contact Wear

FIGURE 8



Initial Contact Force Measurement

FIGURE 9

4. LINE AND LOAD FINGERS (DISCONNECT ASSEMBLY) REPLACEMENT

If disconnect fingers become pitted, burned, or damaged, entire Disconnect Assembly (74) must be replaced. Before installing replacement assembly, coat sides of the Power Fuse Bus Assembly (76) with special deoxidizing lubricant (item #107, page 8) where finger assemblies mate. Under no circumstances should any other lubricant be used on these surfaces.

Note: Should pitting or burns be observed on the contactor fingers, inspection should be made of the mating stabs in the starter compartment from which the contactor is removed.

CAUTION
POWER MUST BE DISCONNECTED FROM
STARTER VERTICAL SECTION BEFORE IN-
SPECTING STABS.

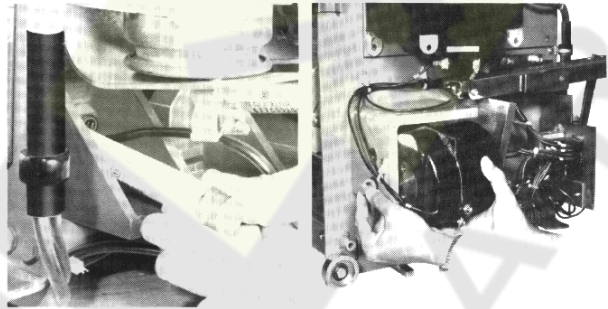
5. POWER FUSE REPLACEMENT

Fuse size and rating are determined by motor full load and locked rotor currents. Information on size of the fuse is given on the nameplate of the starter. Make sure replacement fuse is identical to original fuse. Pull fuse from top fuse clip first and then from lower clip. When installing new fuse, make sure it is centered between fuse clips and is firmly held by the fuse clips at top and bottom.

6. CONTROL TRANSFORMER PRIMARY FUSE REPLACEMENT

Control transformer primary fuses are selected on basis of transformer rating. Make sure replacement

fuse is identical to original fuse. Pull down front end of fuse gently, then pull the fuse from rear fuse clip as shown in figure 10. When installing replacement fuse, insert rear end first and then push up front end so that it sets firmly in clips.



CPT Fuse Replacement

Magnet Coil Replacement

FIGURE 10

7. ARC CHUTES

New arc chutes are pre-conditioned and give the appearance of having been used. Under normal service these arc chutes rarely need replacement. If the arc chute is broken or arc runners are eroded, the arc chute should be replaced. When operating under adverse environmental conditions, contamination of arc chutes may occur.

Note: Deterioration of arc chutes can be detected by performing 'HIPOT' test (13,250 volts ac for one minute) between arc runners. If breakdown (arc-over) occurs, arc chute should be replaced.

8. MAGNET COIL REPLACEMENT

Note: Coil resistance may be measured to determine if it is defective. The coil resistance should be 33 ± 3 ohms at 25°C.

Disconnect the two wires from coil. Remove the two bolts (4) and two washers (67) holding the core to the back of the magnet frame. Be sure to support coil to prevent dropping. Coil along with core can now be removed by sliding it away from contactor side plate. Remove the coil from core and replace it with new one. Attach core and coil assembly in same position with the two screws and the two washers. Be sure to insert large spring washer (61) between coil and magnet frame (15) as before. Reconnect the two wires to coil terminals (see figure 10). The hole in the armature plate must clear the core cap screw (8) and the lock washer (9).

9. RECTIFIER REPLACEMENT

Rectifier output can be measured to determine if it is defective. To measure rectifier output:

- Disconnect 2 wires connected to the coil and put insulating tape around them.
- Energize control circuit.
- Check the dc output across terminals "+" and "-" of rectifier. Rectifier output should be 107 ± 5 volts dc, with 120 volts ac input.
- If rectifier is defective, replace it with new one.

10. REACTOR (CHOKE) REPLACEMENT

Check reactor resistance. DC resistance should be 10 ± 2 ohms at 25°C. Replace it if resistance is not within these values.

MAINTENANCE (continued page 6)

MAINTENANCE

11. ELECTRICAL AUXILIARY CONTACT BLOCK REPLACEMENT

To replace an electrical auxiliary contact block, it is necessary first to remove magnet control assembly (32) by removing three screws (54) and lockwasher (14). Individual blocks may be replaced as needed and the assembly can then be mounted to side plate. Contact block to which coil is connected is mounted in the fourth position from the side plate and is offset 0.1" from the other blocks. **DO NOT USE N.O. CONTACT OF THIS AUXILIARY CONTACT BLOCK (see figure 11).**

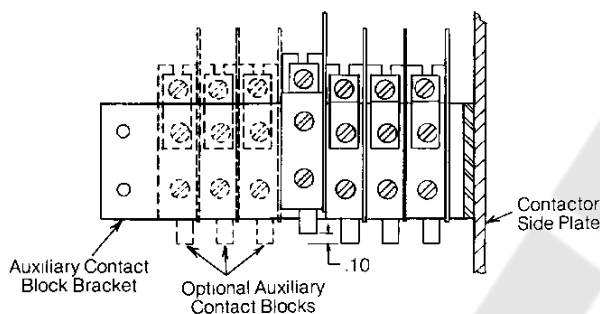


FIGURE 11

12. CHANGING RECEPTACLE (CONNECTOR)

The receptacle for the control circuit plug consists of connector block (45) and connector pins with wire leads inserted from rear. No tool is required for inserting connector pins but to remove pins in order to replace broken ones requires an extraction tool, item #108, page 8. This tool, inserted into the connector block from front, compresses retention spring, allowing the lead and pin to be withdrawn from block.

13. SHAFT BEARINGS

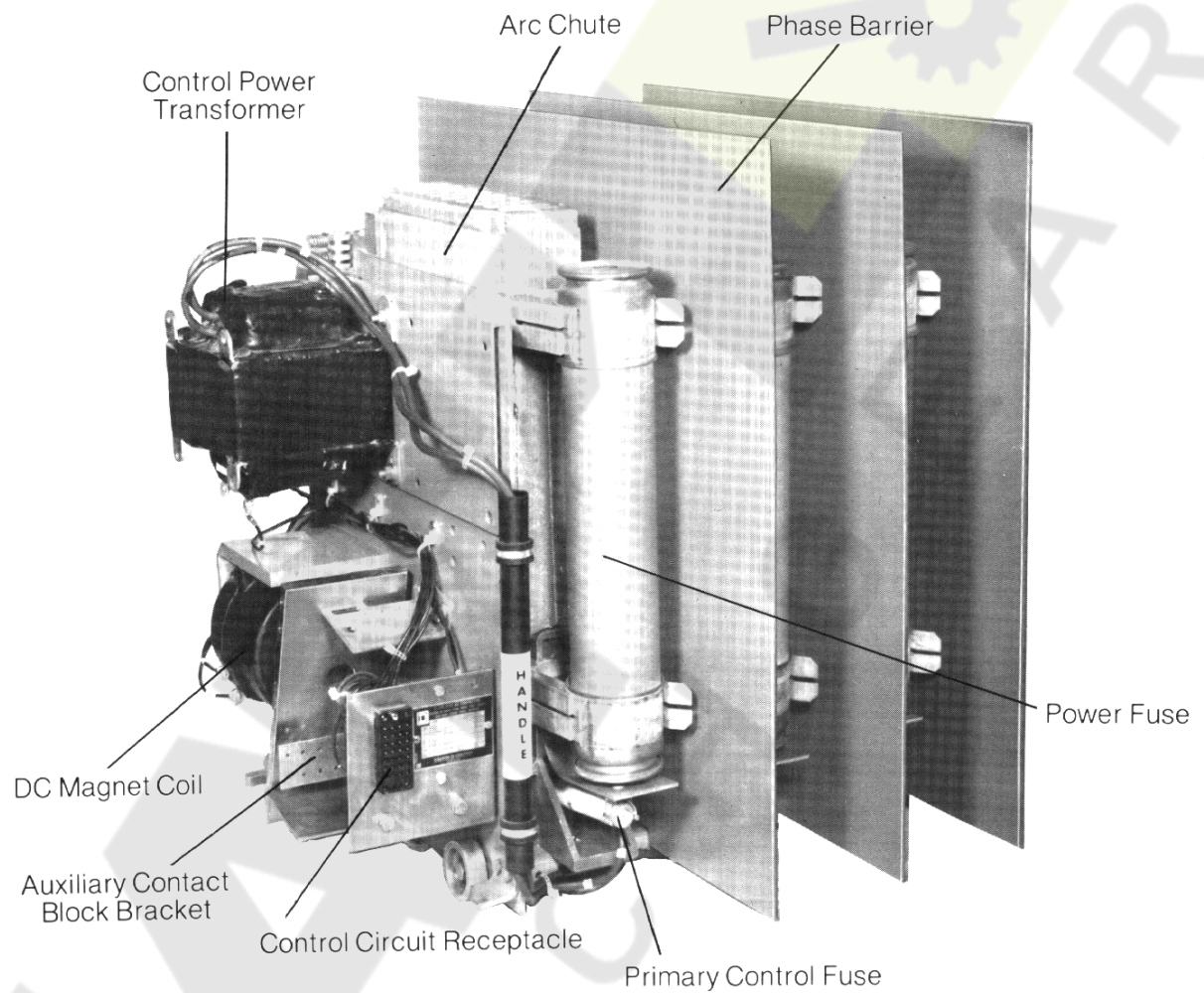
These are pre-lubricated, sealed bearings and need no further lubrication.

CAUTION

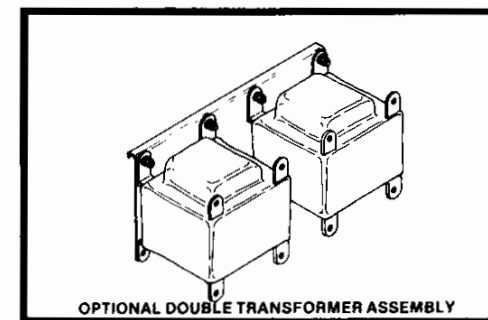
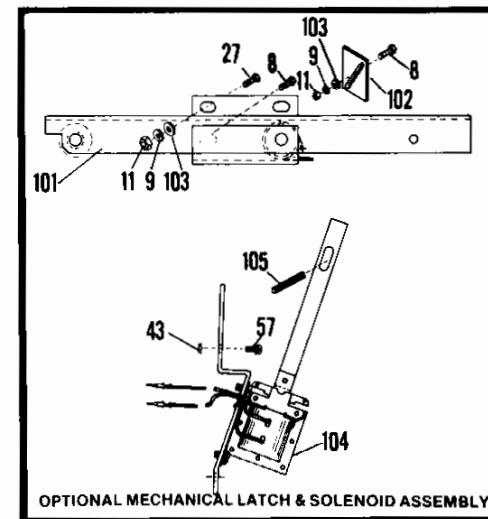
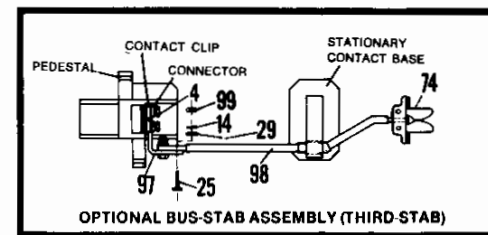
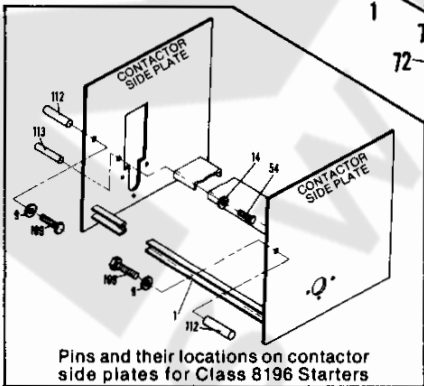
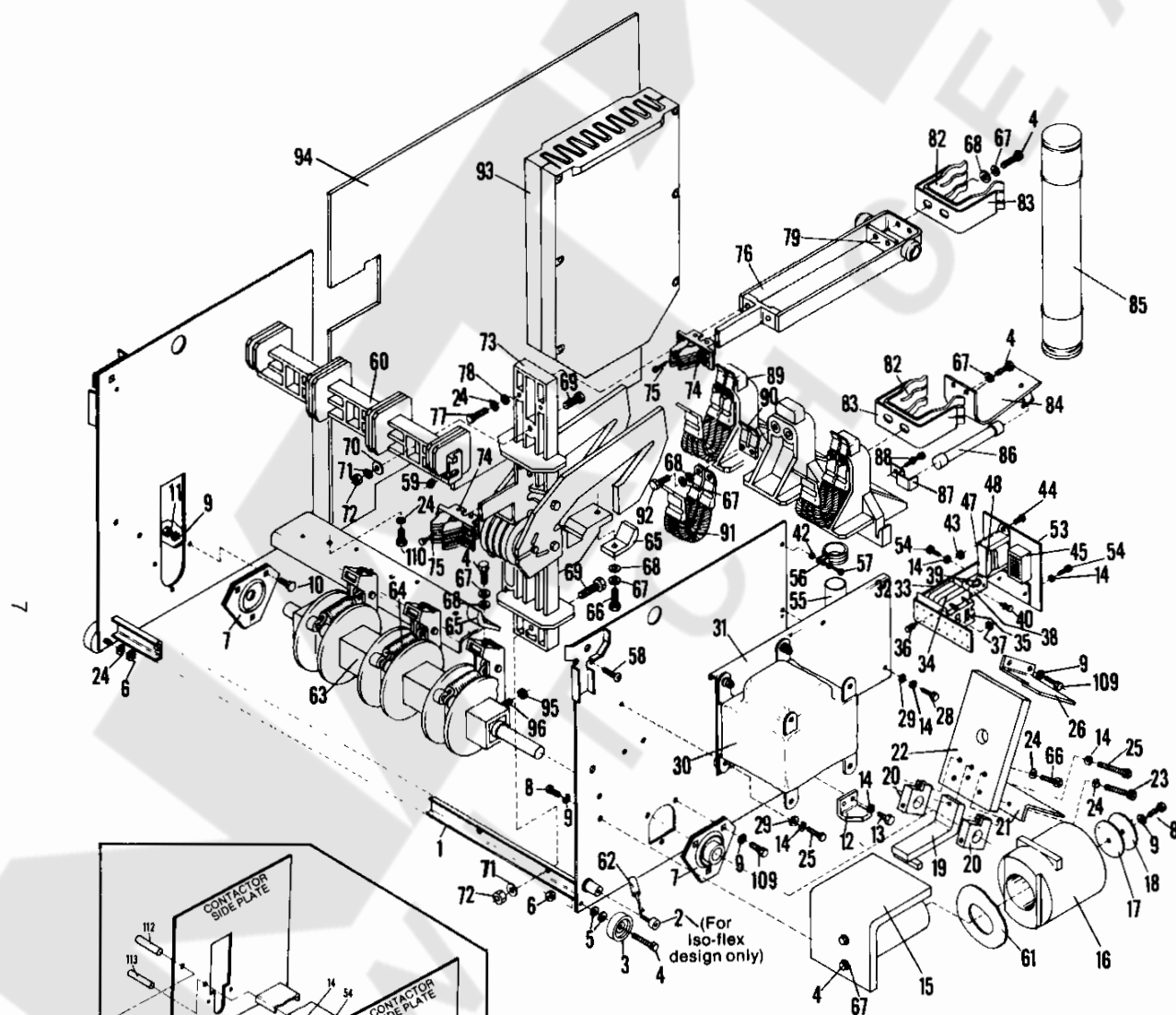
MAKE SURE, FOLLOWING ANY MAINTENANCE, THAT ALL CONNECTIONS ARE TIGHT; ARC CHUTES, FUSES AND ALL FOUR PHASE BARRIERS ARE NOT DAMAGED AND ARE PROPERLY INSTALLED BEFORE ENERGIZING THE CONTACTOR. See Figure 6.

TROUBLESHOOTING CHART

TROUBLE	POSSIBLE CAUSE	REMEDY
Magnet-Armature Chatters	<ol style="list-style-type: none"> 1) Loose connection in control circuit. 2) Defective control relay. 3) Defective magnet: Coil/Rectifier/Reactor (Choke) 4) Auxiliary contact block in coil circuit out of alignment. 5) Low control circuit voltage 	<ol style="list-style-type: none"> 1) Check connections and tighten if loose 2) Check control relay, replace if defective 3) Check coil, rectifier, and reactor (choke) see page 5 for details. Replace if defective. 4) Check alignment, see figure 11, page 6. 5) Check control circuit voltage. Should be minimum 100 volts for proper operation
Sluggish Operation	<ol style="list-style-type: none"> 1) Mechanical interference in armature or contactor shaft 2) Interference with mechanical interlocks between contactors. 3) Defective coil or control circuit 	<ol style="list-style-type: none"> 1) Check to see if shaft rotates freely. Check to see if bolthead and lockwasher on coil core clear hole in the armature 2) Mechanical interlock binding. Refer to 8198-2 Service Bulletin Supplement 8198-2.1 for details to make the check 3) Check coil (see page 5 for details) and control circuit
Contacts Overheat and Contact Life Short	<ol style="list-style-type: none"> 1) Loose connections. 2) Stationary and moving contact tips not properly aligned 3) Dirt or foreign matter on surfaces 4) Contact surfaces scored, burned or contact tips worn beyond limits 5) Contact pressure weak/contact bounce due to defective contact springs. 6) Arc Chutes not installed properly. 	<ol style="list-style-type: none"> 1) Check Connections and tighten if loose 2) Align contact tips 3) Remove dirt or foreign matter. 4) Inspect contact surfaces. Check for contact wear, see figure 8, page 5. 5) Check initial contact force, see figure 9, page 5, for details 6) Check figure 6 page 3 for proper installation.
Contacts Do Not Close	<ol style="list-style-type: none"> 1) Protective relay tripped, or power fuses blown. 2) Control circuit fuse blown 3) Magnet coil/rectifier defective. 4) Control relay defective 5) Control transformer primary fuses blown. 	<ol style="list-style-type: none"> 1) Check the protective relays. Reset if tripped. Check the power fuses; replace if blown *Note Before resetting protective relays and/or replacing blown fuses, a check must be made to determine the cause 2) Inspect the fuse, replace if blown 3) Check coil and/or rectifier. See page 5 for details. Replace if defective 4) Check control relay. Replace if defective 5) Inspect fuses, replace if blown
Coil Overheats	<ol style="list-style-type: none"> 1) Defective reactor (Choke) 2) Defective auxiliary contact block in coil circuit. 3) Defective coil (short circuited turns). 	<ol style="list-style-type: none"> 1) Check reactor (see page 5 for details). Replace if defective. 2) Check auxiliary contact block. Replace if defective. 3) Check resistance of the coil. See page 5 for details. Replace if defective.
Line/Load Fingers Overheat	<ol style="list-style-type: none"> 1) Dirt or foreign matter on surfaces. 2) Defective springs in finger assembly. 3) Lack of special lubricant (item 107, page 7). 	<ol style="list-style-type: none"> 1) Remove dirt or foreign matter. 2) Check springs. Replace entire finger assembly if springs are defective 3) Apply special lubricant. See page 5 for details

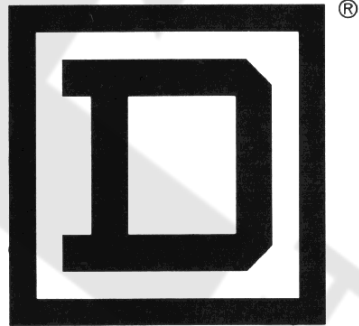


**MAIN COMPONENTS
CLASS 8110 HIGH VOLTAGE CONTACTOR**



Parts List for Class 8110 High Voltage Contactor

Item No.	Part Number	Description	Item No.	Part Number	Description	Item No.	Part Number	Description
1	851033-375-50	Frame Assembly (Includes items 12, 13 & 14)	39	27920-81500	Transient Voltage Suppressor	74	A51033-042-51	Disconnect Assembly (part of Items 73 and 76) (includes Item 75)
2a	A52910-005-50	Cam Follower Roller (1/4-28)	40	21915-14320	#8 - 32 x 1 Fil. Hd. Screw Assembly	75	21410-16200	#10 - 24 x 5/8 Hex Hd. Tap Screw (part of Items 73, 74 & 76)
2b	A52910-006-50	Cam Follower Roller (5/16-24) (After August 1977)	41	A51033-432-50	Reactor Assembly	76	C51033-406-50	Power Fuse Bus Assembly (includes Item 74)
3	851033-431-50	Wheel Assembly	42	23001-00170	#10 - 32 Hex Nut	77	21401-24400	3/8 - 16 x 1 1/4 Hex Screw
4	21401-24320	3/8 - 16 x 1 Hex Screw	43	23201-00170	#10 - 32 Hex. Lock Nut	78	23601-00242	3/8 Washer, Plain
5	23602-12409	3/8 Washer (Spacer)	44	21507-17120	#10 - 32 x 3/8 Pan Hd. Screw	79	A51033-410-01	Clamping Bar
6	23002-00240	3/8 - 16 Hex Nut	45	25410-03560	Electrical Separable Connector Housing	82	D51033-506-01	Fuse Clip
7	29013-07640	Bearing - Housing Assemblies	46	21101-12160	#6 - 32 x 1/2 Fil. Hd. Screw	83	851033-507-01	Fuse Clip, Spring
8	21401-22240	5/16 - 18 x 3/4 Hex Screw	47	23704-00120	#6 Internal Tooth Lockwasher	84a	851033-526-50	Fuse Stop Bracket with Control Fuse Clip
9	23701-00220	5/16 Plain Lockwasher	48	23001-00121	#6 - 32 Hex Nut	84b	851033-525-51	Fuse Stop Bracket without Control Fuse Clip
10	22710-22240	5/16 - 18 x 3/4 Rd. Hd. Sq. Neck Bolt	49	25410-90025	Fixed Jack Screw - Female, with lockwasher and nut	85		Power Fuse, Refer to wiring diagram supplied with specific equipment.
11	23002-00220	5/16 - 18 Hex Nut	50	25410-90024	Fixed Jack Screw - Male, with lockwasher and nut	86		Control Transformer Fuse, Refer to wiring diagram supplied with specific equipment.
12	A51033-442-01	Contact Stop	51		#4 External Tooth Lockwasher (furnished with Items 49 & 50)	87	A51033-413-01	Fuse Retainer Spring
13	21401-20160	1/4 - 20 x 1/2 Hex Screw	52		#4 - 40 Nut (furnished with Items 49 & 50)	88	21911-17120	#10 - 32 x 3/8 Pan Hd. Screw Assembly
14	23701-00200	1/4 Plain Lockwasher	53	B51033-425-01	Connector Mounting Plate	89	D51033-382-50	Pedestal Assembly
15	A51033-388-50	Magnet Frame Assembly	54	21402-21160	1/4 - 28 x 1/2 Hex Cap Screw	90	A51033-383-01	Contact Clip
16	C51020-056-85	Operating Coil	55	A51033-476-01	Handle, Contactor	91	851033-387-50	Connector, Assembled (400 Amps)
17	B50502-006-22	Core Cap	56	25901-05560	Clamp, Tube	92	21401-24240	3/8 - 16 x 3/4 Hex Screw
18	B50502-006-15	Core Cap Spacer	57	21916-17160	#10 - 32 x 1/2 Pan Hd. Screw Assembly	93	A51033-073-50	Arc Chute, Assembled
19	851033-391-50	Interlock Arm Assembly	58	21711-22320	5/16 - 18 x 1 Hex Socket Button Hd. Self-Locking Cap Screw	94	A51033-076-01	Barrier
20	A51033-392-01	Armature Clamp	59	23001-00220	5/16 - 18 Hex Nut	95	23045-22000	5/16 - 18 Heavy Hex Jam Nut (part of Item 63)
21	A51033-393-01	C.C.C. Knocker	60	D51033-380-01	Top Support	96	A51033-022-01	Adjusting Screw (part of Item 63)
22	A51033-390-01	Armature	61	A51020-041-01	Spring Washer	97	851033-439-01	Third-Stab Bracket
23	21401-24660	3/8 - 16 x 2 1/4 Hex Screw	62	1571-002020	Loctite, Grade A (Loctite Corp. #88)	98	851033-438-50	Thrd-Stab Bus
24	23701-00240	3/8 Plain Lockwasher	63	D51033-384-50	Operating Shaft Assembly, including Contact Arm Assembly, Spring, Pins, and Retaining Rings	99	23002-00200	1/4 - 20 Hex Nut
25	21401-20320	1/4 - 20 x 1 Hex Screw	64	A51033-023-01	Spring (part of Item 63)	100	A51033-320-01	Jumper (Front Bus Assembly)
26	851033-394-01	Armature Stop	65	Class 9998 Type LA-2 Parts Kit	Contact Tip (Kit containing 6 contact tips with mounting hardware)	101	C51033-447-50	Mechanical Latch Assembly
27	21401-22480	5/16 - 18 x 1 1/2 Hex Screw	66	21401-24360	3/8 - 16 x 1-1/8 Hex Screw	102	A51033-453-01	Adjustment Plate
28	21401-20240	1/4 - 20 x 3/4 Hex Screw (for 2500VA trans. or 2 - 750VA trans. use ref. 25)	67	23903-32402	3/8 Spring Washer	103	23601-00220	5/16 Washer, Plain
29	23601-00200	1/4 Washer, Plain	68	23601-00240	3/8 Washer, Plain	104	C51033-441-50	Electrical Release Assembly
30		Control Transformer Assembly (Refer to wiring diagram supplied with the specific equipment)	69	21401-28480	1/2 - 13 x 1 1/2 Hex Screw	105	24209-16640	1/4 x 2 Slotted Spring Pin
31	C51033-421-50	Transformer Mounting Plate Assembly	70	23601-00280	1/2 Washer, Plain	106	23201-00170	#10 Plain Lockwasher
32		C.C.C. and Magnet Control Assembly, Completely Wired (includes items 33 thru 54) Consult Factory	71	23701-00280	1/2 Plain Lockwasher	107	PJC-7201	Disconnect Stab Lubricant
33	C51033-422-01	C.C.C. Mounting Bracket	72	23002-00280	1/2 - 13 Hex Nut	108	AMP # 305183	Extraction Tool. Order from AMP Incorporated, Harrisburg, Pennsylvania 17105
34	A51042-096-01	Liner	73	C51033-401-50	Stationary Contact Base Assembly, including Base, Bracket, Contact Clip, Contact Tip, Blowout Coil and Ears, Washers, and Disconnect Assembly	109	21401-22200	5/16 - 18 x 5/8 Hex Screw
35	A51033-435-50	Electrical Interlock Assembly				110	21401-24200	3/8 - 16 x 5/8 Hex Screw
36	21911-12160	#6 - 32 x 1/2 Pan Screw Assembly				111	851033-575-50	Adapter for 7" power fuse (Not Shown)
37	23101-00120	#6 - 32 Square Nut				112	A51033-567-01	Contact Pin
38	27907-34121	Rectifier				113	A51033-568-01	Contact Pin



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